

NYC VDER ANALYSIS MEETING

February 8, 2018



SUSTAINABLE CUNY



CONTACT INFORMATION

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Solar Ombudsman

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AGENDA

1

Breakdown of the Value Stack

2

Understanding the Value Stack

3

NYC Solar Developer

4

Tools for VDER Transparency

5

VDER Phase Two



SUSTAINABLE CUNY FOCUS AREAS



Solar Infrastructure

- Permitting
- Zoning
- Grid Analysis
- Policy Support
- Installer Roundtable



Mapping the Way

- One stop Portal
- Solar Maps
- Data Analytics
- Roadmaps



Accessing Solar

- Group Purchasing
- Community Shared Solar
- Education
- NY Solar Summit

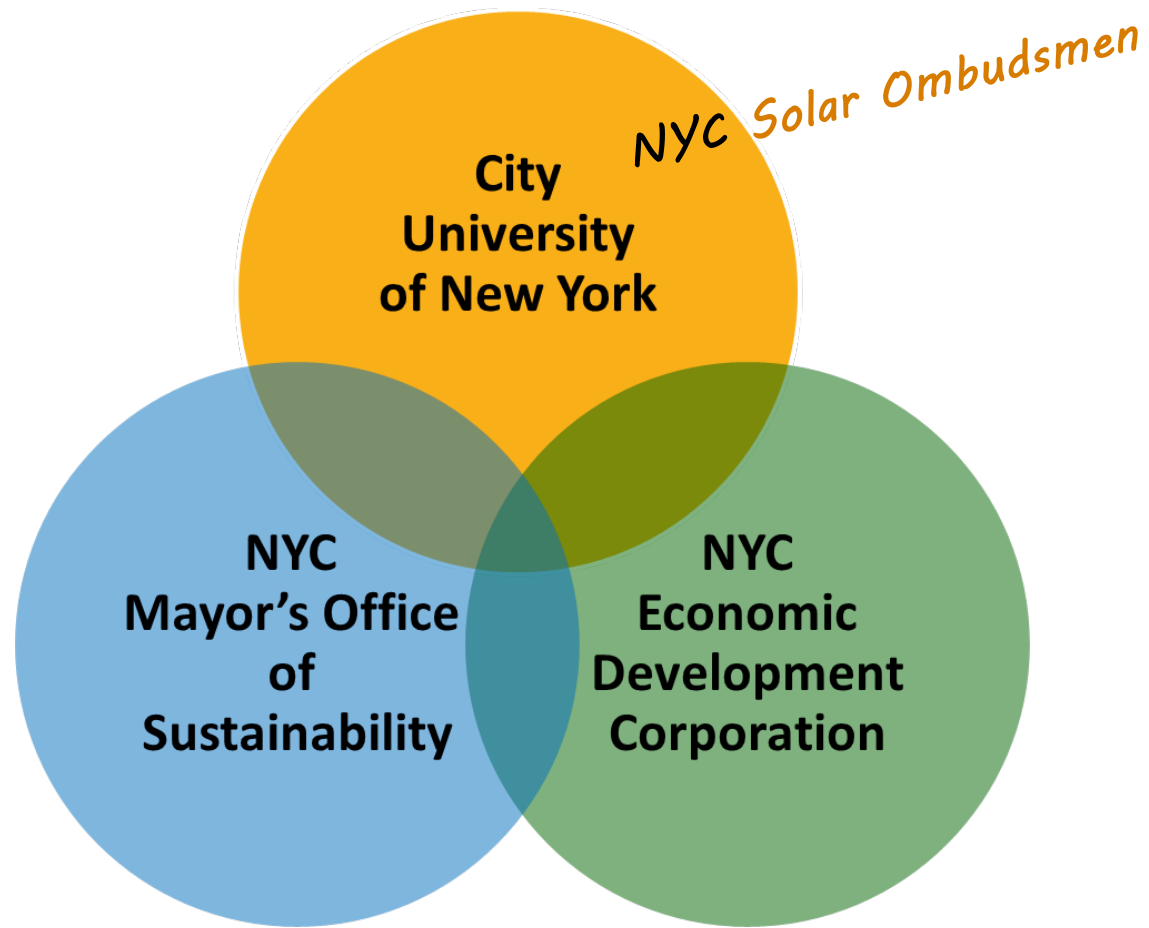


Resiliency

- Smart DG Hub
- Solar-plus-storage
- Critical Facility Support



5 NYC SOLAR PARTNERSHIP



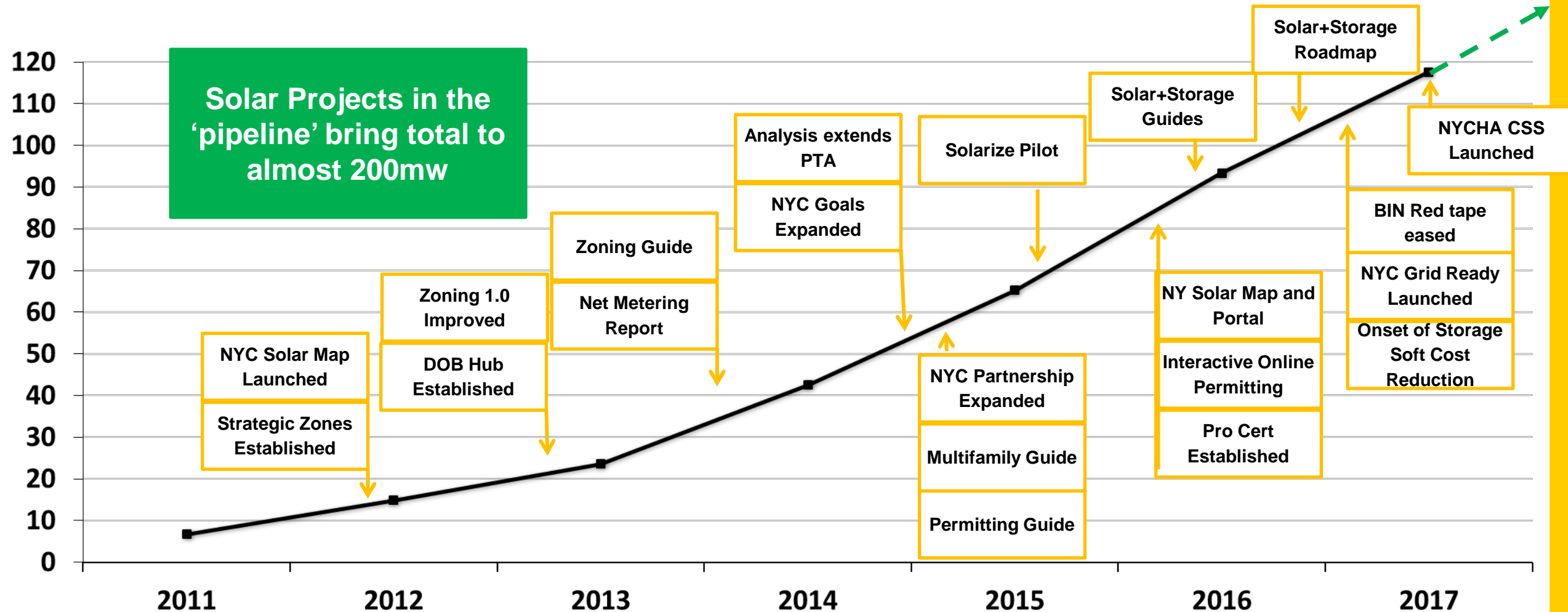
- Formed in 2006 and led by **Sustainable CUNY** of the City University of New York
 - Objective third party that brings stakeholders to the table
 - Market and data analysis
 - Solar Ombudsmen as subject matter experts across solar and storage sectors
 - Deep IT resources, i.e. NYC, NYS Solar Map and portal
- **Mayor's Office and NYC EDC**
 - Strategic focus on policies and programs that support solar and economic development
 - Actively Engaged
 - Vast network of resources



NYC SOLAR PARTNERSHIP

Solarize NYC | Shared Solar NYC

NYC SOLAR GROWTH-CUNY MARKET ACTIONS



NY Solar Ombudsman Support
Installer Training
Interagency Training
Annual NY Solar Summit
Conference, Summit and Event Presentations



FRAMEWORK FOR A SUCCESSFUL MARKET



VDER PHASE ONE TIMELINE

- **As part of Reforming the Energy Vision (REV), NYS is transitioning away from net energy metering (NEM)**
- **NYS' Public Service Commission (PSC) released 2 VDER Orders to start this transition**
 - Phase One (March 9, 2017)
 - Phase One Implementation Order (Sept 14, 2017)
- **Phase One projects are >200kW and/or projects with a Demand Meter**
- **VDER Phase Two will be an ongoing process with a approximate date of 1/1/2020**
 - This will be for Mass Market (Residential / <200kW) projects

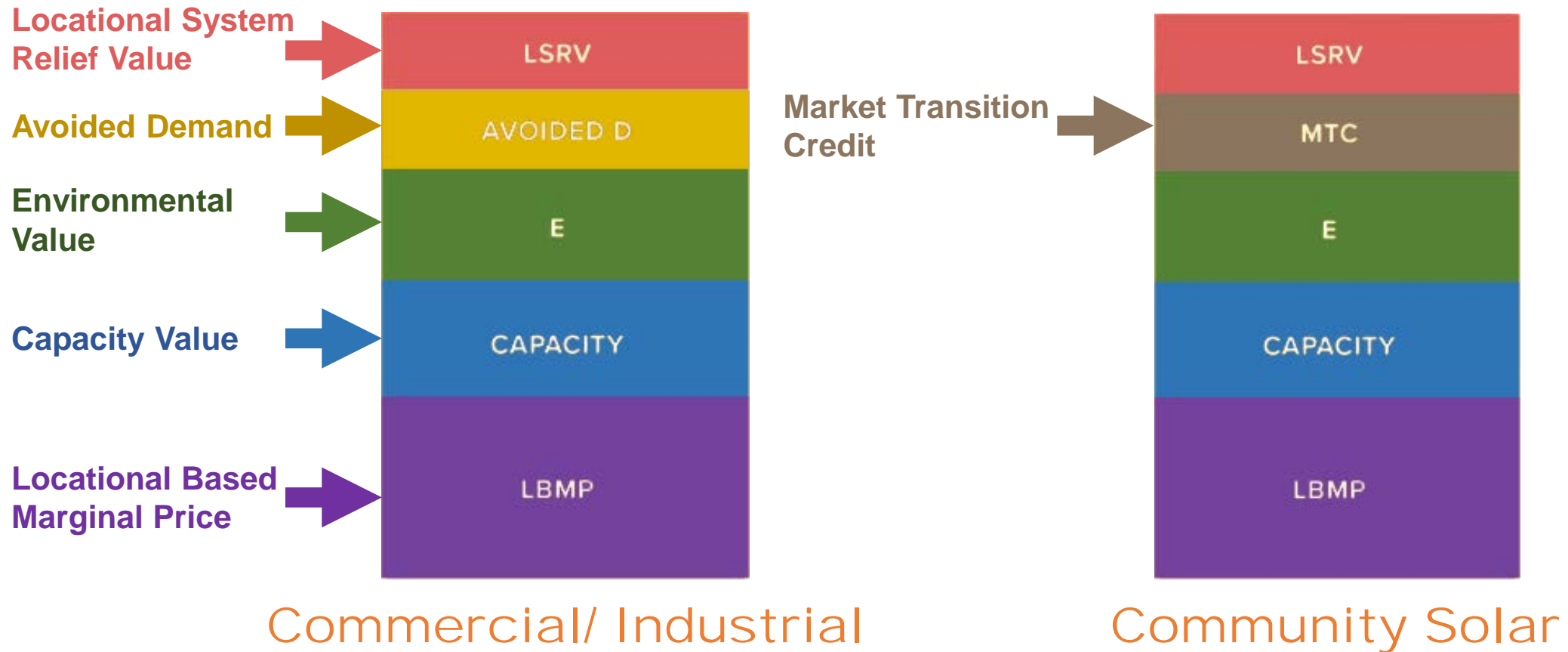


SECTION ONE

BREAKDOWN OF THE VALUE STACK



VALUE STACK – COMMERCIAL INDUSTRIAL VS. COMMUNITY SOLAR



VALUE STACK –TABLE BREAKDOWN

Variable Name	Comm/ Industrial	Community Solar	Fixed/ Variable	Value (\$) (as of Jan-2018)
Locational Based Marginal Price	LBMP			
Capacity Value	ICAP			
Environmental Value	E			
Avoided Demand	DRV			
Locational System Relief Value	LSRV			
Market Transition Credit	MTC			



SECTION ONE – BREAKDOWN OF THE VALUE STACK

LOCATIONAL BASED MARGINAL PRICE



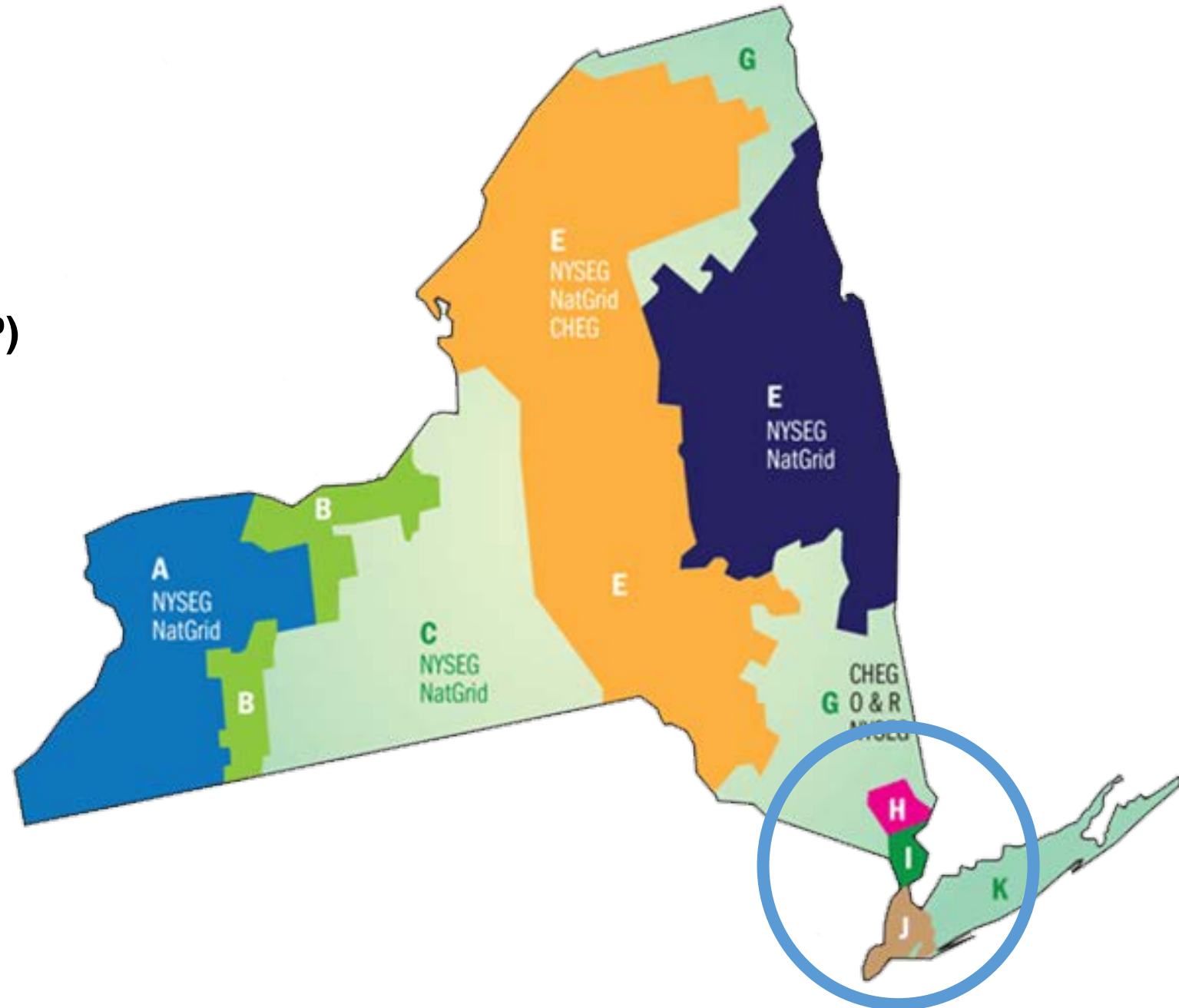
LOCATIONAL BASED MARGINAL PRICE (LBMP)

- **Definition:** The NYISO Clearing Price for Energy based on the Load Zone you are in.
 - Pricing is based on the Load (Bids) and Generation (Offers)
- **Equation:** **LBMP Price** = Day Ahead Price from the NYISO
- **Fixed/ Variable:** Hourly Variable on Location (NYISO Load Zone, NOT utility)



NYISO MAP

- 11 Load Zones (A-K)
- 4 External Zones (M-P)
 - Hydro Quebec
 - Ontario Hydro



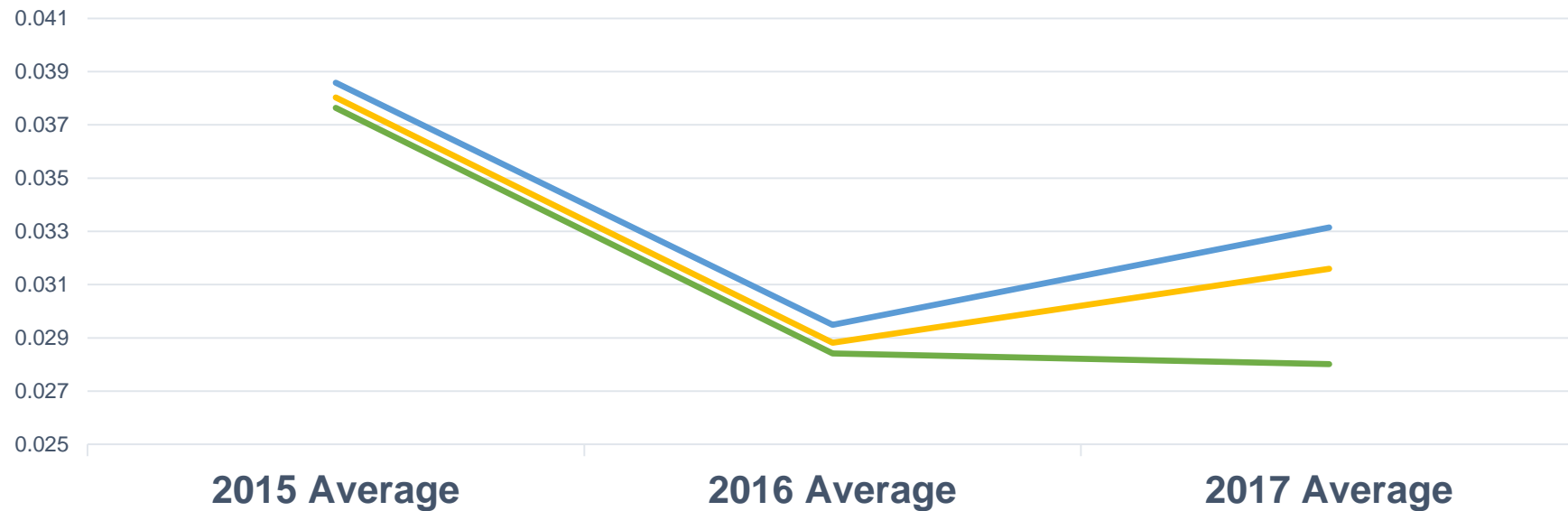
LBMP PRICING FACTORS

- **LBMP Pricing** is based on Load (Bids) and Generation (Offers), with generation coming from a wide variety of energy resource
- **LBMP Pricing** can be effected by:
 - Seasonality
 - Temperature
 - Time of Day
 - External Construction



LBMP PRICING – 3 YEAR AVERAGE

Region	2015 Average	2016 Average	2017 Average	3 Year Average
NYC – J	0.03858	0.02949	0.03315	0.03374
Dunwoodie - I	0.03803	0.02882	0.03160	0.03281
Milwood - H	0.03764	0.02842	0.02802	0.03136



LBMP PRICING – 2017 HIGH/LOW

Region	Zone	Low (Cents)	Date/Hour Beg	High (Cents)	Date/Hour Beg
NYC	J	.0058	Sept 10 / 4:00	.218	Dec 28 / 17:00
NYC	J	.0058	Sept 10 / 5:00	.216	Dec 28 / 18:00
NYC	J	.0063	Sept 10 / 3:00	.198	Dec 31 / 17:00
Dunwoodie	I	.0058	Sept 10 / 4:00	.217	Dec 28 / 17:00
Dunwoodie	I	.0058	Sept 10 / 5:00	.215	Dec 28 / 18:00
Dunwoodie	I	.0062	Sept 10 / 3:00	.196	Dec 31 / 17:00
Milwood	H	.0058	Sept 10 / 4:00	.219	Dec 28 / 17:00
Milwood	H	.0058	Sept 10 / 5:00	.217	Dec 28 / 18:00
Milwood	H	.0062	Sept 10 / 3:00	.198	Dec 31 / 17:00



LBMP DAY AHEAD DATA



http://www.nyiso.com/public/markets_operations/market_data/maps/index.jsp?load=DAM



LOCATIONAL BASED MARGINAL PRICE – TAKE AWAY

- **Consult the NYSERDA Calculator**
 - Calculator compared export of solar generation to Historic LBMP pricing



<https://www.nyserra.ny.gov/All-Programs/Programs/NY-Sun/Project-Developers/Value-of-Distributed-Energy-Resources>



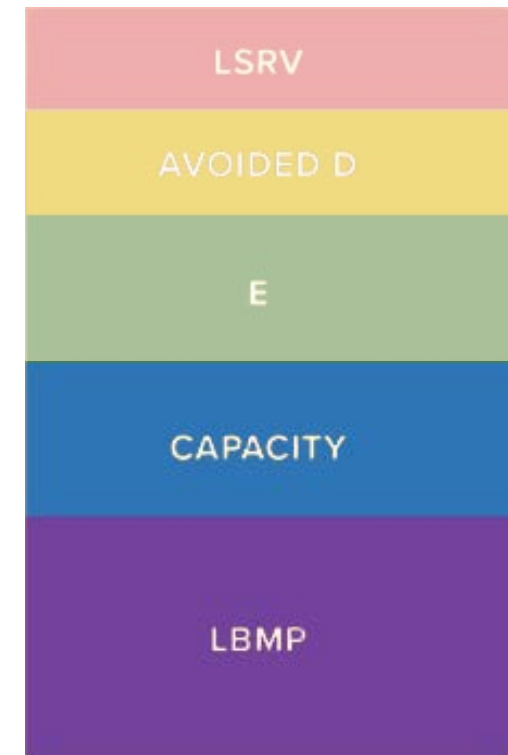
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Environmental Value	E				
Avoided Demand	DRV				
Locational System Relief Value	LSRV				
Market Transition Credit	MTC				



SECTION ONE – BREAKDOWN OF THE VALUE STACK

CAPACITY VALUE



CAPACITY VALUE (ICAP)

- **Definition:** Payment for Reducing Peak Load
- **Equation:** Three Different Alternatives to choose from each with their own equation. The developer must choose which Alternative to be compensated for with **Alternative 1 being the default.**
- **Fixed/ Variable:** Monthly Variable on Location (Utility AND NYISO Load Zone)



CAPACITY VALUE ALTERNATIVES

- **Alternative 1** – Spread Across All Hour of the Year
- **Alternative 2** – Tied to the 460 Summer Hours
- **Alternative 3** – Tied to Grid Injection During a Single Highest Annual Hour of Peak Demand



CAPACITY VALUE - ALTERNATIVE 1

- **Definition:** Spread across all hours of the year
- **Equation:** Monthly Credit = Total kWh Export x **Alternative 1 Rate**
- **Per kWh**

	NYC	Westchester
As of Jan 2018	.0091	.0073

- **Alternative 1** – Capacity Cost for Upcoming Period
 - Winter – Set in November
 - Summer – Set in May



CAPACITY VALUE - ALTERNATIVE 2

- **Definition:** Spread across the 460 Summer hours (2-7 PM, Jun-Aug)
- **Equation:** Monthly Credit = 460 x kW of Generation During 460 Summer Hours x **Alternative 2 Rate**
- **Per kWh**

	NYC	Westchester
As of Jan 2018	Not Released Yet	



CAPACITY VALUE - ALTERNATIVE 3

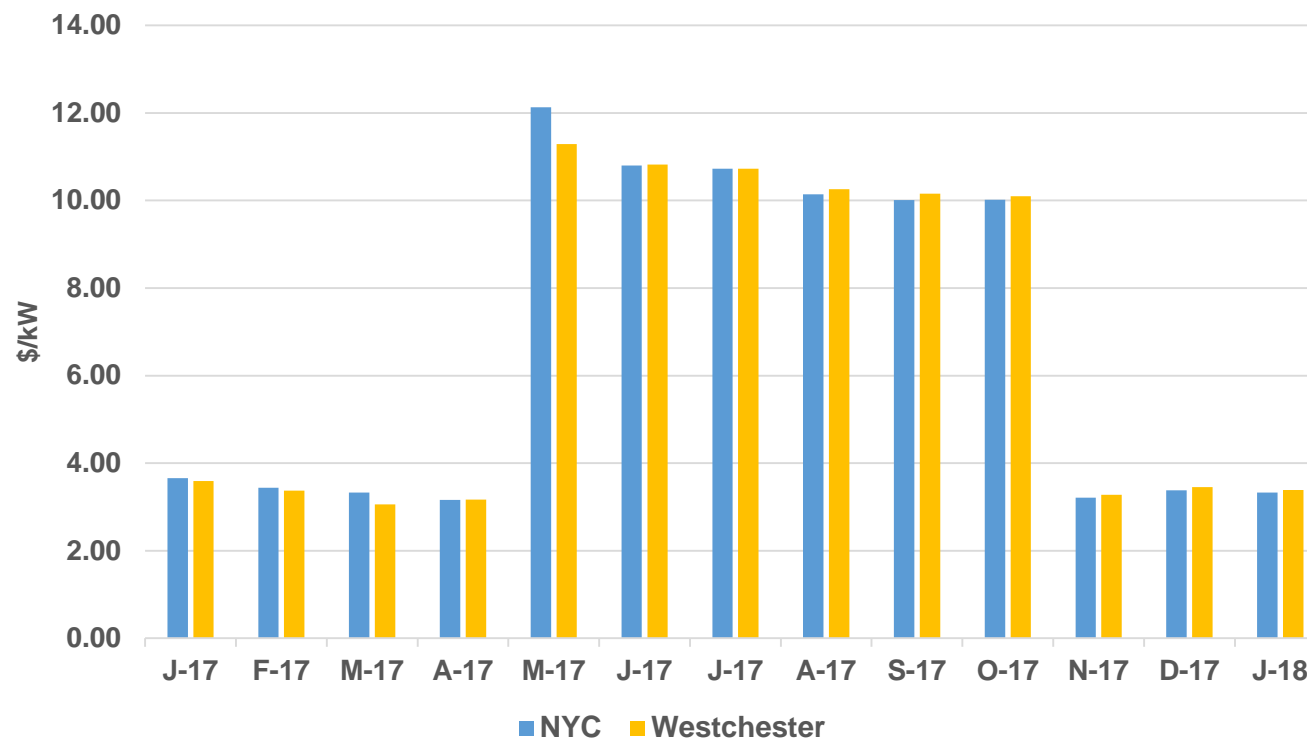
- **Definition:** Tied to Grid Injection During a Single Highest Annual Hour of Peak Demand
- **Equation:** Monthly Credit = **Alternative 3 Rate** x Prior Summer Peak kWh-coincident production
- **Per kW**

	NYC	Westchester
As of Jan 2018	3.33	3.39



CAPACITY VALUE – ALTERNATIVE 3 RATE (\$/KW)

Region	J-17	F-17	M-17	A-17	M-17	J-17	J-17	A-17	S-17	O-17	N-17	D-17	J-18
NYC	3.66	3.44	3.33	3.16	12.13	10.80	10.73	10.14	10.01	10.02	3.21	3.38	3.33
Westchester	3.59	3.37	3.06	3.07	11.29	10.82	10.73	10.26	10.16	10.10	3.28	3.45	3.39



CAPACITY VALUE – ALTERNATIVE 3 TOP 10 HOURS (CON ED - 2017)

11 AM - 3 PM			2 PM - 6 PM			4 PM - 8 PM			7 PM - 11 PM		
Date	Time	MW	Date	Time	MW	Date	Time	MW	Date	Time	MW
7/20/2017	2:00 PM	1,853	6/13/2017	5:00 PM	2,890	6/13/2017	6:00 PM	3,621	7/20/2017	9:00 PM	3,282
7/13/2017	1:00 PM	1,853	7/20/2017	5:00 PM	2,869	7/20/2017	5:00 PM	3,619	7/20/2017	8:00 PM	3,275
7/13/2017	3:00 PM	1,852	6/13/2017	6:00 PM	2,868	6/13/2017	7:00 PM	3,616	7/20/2017	7:00 PM	3,274
7/20/2017	3:00 PM	1,851	7/20/2017	4:00 PM	2,867	7/20/2017	6:00 PM	3,605	7/20/2017	5:00 PM	3,274
7/13/2017	2:00 PM	1,849	6/13/2017	4:00 PM	2,861	6/13/2017	5:00 PM	3,583	7/20/2017	6:00 PM	3,268
7/20/2017	1:00 PM	1,846	7/20/2017	3:00 PM	2,859	7/20/2017	4:00 PM	3,572	6/13/2017	7:00 PM	3,247
7/20/2017	12:00 PM	1,845	7/20/2017	2:00 PM	2,835	7/20/2017	7:00 PM	3,557	6/13/2017	10:00 PM	3,245
6/13/2017	3:00 PM	1,845	7/13/2017	3:00 PM	2,827	6/13/2017	8:00 PM	3,541	6/13/2017	9:00 PM	3,241
6/13/2017	4:00 PM	1,844	6/13/2017	3:00 PM	2,813	7/20/2017	8:00 PM	3,517	7/20/2017	4:00 PM	3,240
7/13/2017	12:00 PM	1,843	7/13/2017	2:00 PM	2,810	7/21/2017	6:00 PM	3,517	6/13/2017	8:00 PM	3,239



CAPACITY VALUE – ALTERNATIVE 3 COMPLEXITY

“The three alternatives were chosen to accommodate different types of developers with various levels of sophistication. If a developer finds Alternative 3 to be too risky, the other alternatives can be selected.”

Phase 1 Implementation Order



CAPACITY VALUE – TAKE AWAY

- **Select your Alternative carefully knowing that different alternatives have more/less complexity**
 - If you want to select **Alternative 2** or **Alternative 3**, you must inform NYSERDA/ Utility, with **Alternative 1** being the default
- **Know which Coincidence Zone the project is located in**
- **Top 10 Hours of the Year change, yearly. Model this precisely**



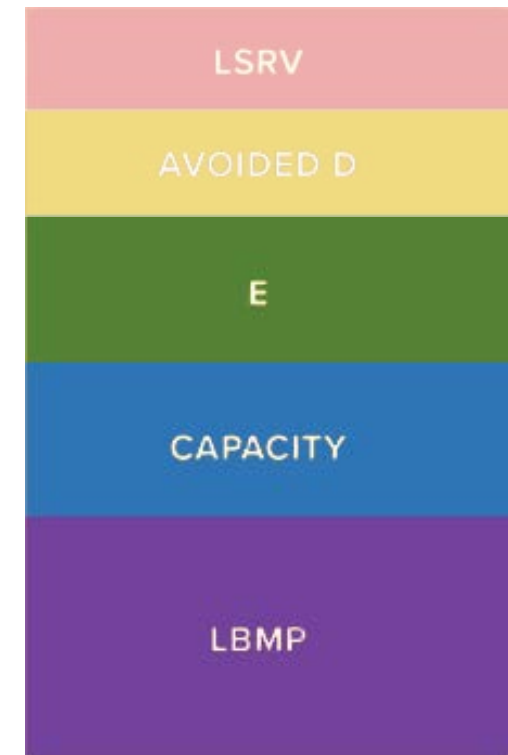
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Locational Based Marginal Price	LBMP	Yes	Yes	Variable	Changes Hourly
Capacity Value	ICAP	Yes	Yes	Variable	Changes Monthly
Environmental Value	E				
Avoided Demand	DRV				
Locational System Relief Value	LSRV				
Market Transition Credit	MTC				



SECTION ONE – BREAKDOWN OF THE VALUE STACK

ENVIRONMENTAL VALUE



ENVIRONMENTAL (E)

- **Definition:** Payment for producing a REC for LSE RES Tier 1 compliance requirements
- **Equation:** The higher compensation of:
 - The applicable Tier 1 REC price/kWh
 - The social cost of carbon/kWh minus Regional Greenhouse Gas Initiative
- **Fixed/ Variable:** Fixed at the REC Price at the time for 25 Years, if the REC is not retained
 - E will be fixed when “when a project pays 25% of its interconnection costs, or at the time of the execution of a Standard Interconnection Contract if no such payment is required.” - Phase I Order
- **Price:** As of January 2018 the price of E = \$0.02424/kWh



ENVIRONMENTAL VALUE – TAKE AWAY

- **The Environmental Value is locked in for 25 Years**
- **Pricing of the Environmental Value changes depending on higher the price of:**



[NYGATS Tier 1 REC Price](#)



[RGGI Social Cost of Carbon](#)



VALUE STACK –TABLE BREAKDOWN

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Locational Based Marginal Price	LBMP	Yes	Yes	Variable	Changes Hourly
Capacity Value	ICAP	Yes	Yes	Variable	Changes Monthly
Environmental Value	E	Yes	Yes	Fixed for 25 Years	\$0.02424/kWh
Avoided Demand	DRV				
Locational System Relief Value	LSRV				
Market Transition Credit	MTC				



SECTION ONE – BREAKDOWN OF THE VALUE STACK

AVOIDED DEMAND



AVOIDED DEMAND (DRV)

- **Definition:** Based on amount system will reduce distribution grid's peak demand.
 - For non-community solar projects
- **Fixed/ Variable:** Fixed for 3 Years at the **DRV Rate** – then updates with a new value 3 years from Contract date. Lasts for 25 Years.
 - **DRV Rate** will be fixed when “when a project pays 25% of its interconnection costs, or at the time of the execution of a Standard Interconnection Contract if no such payment is required.” - Phase I Order



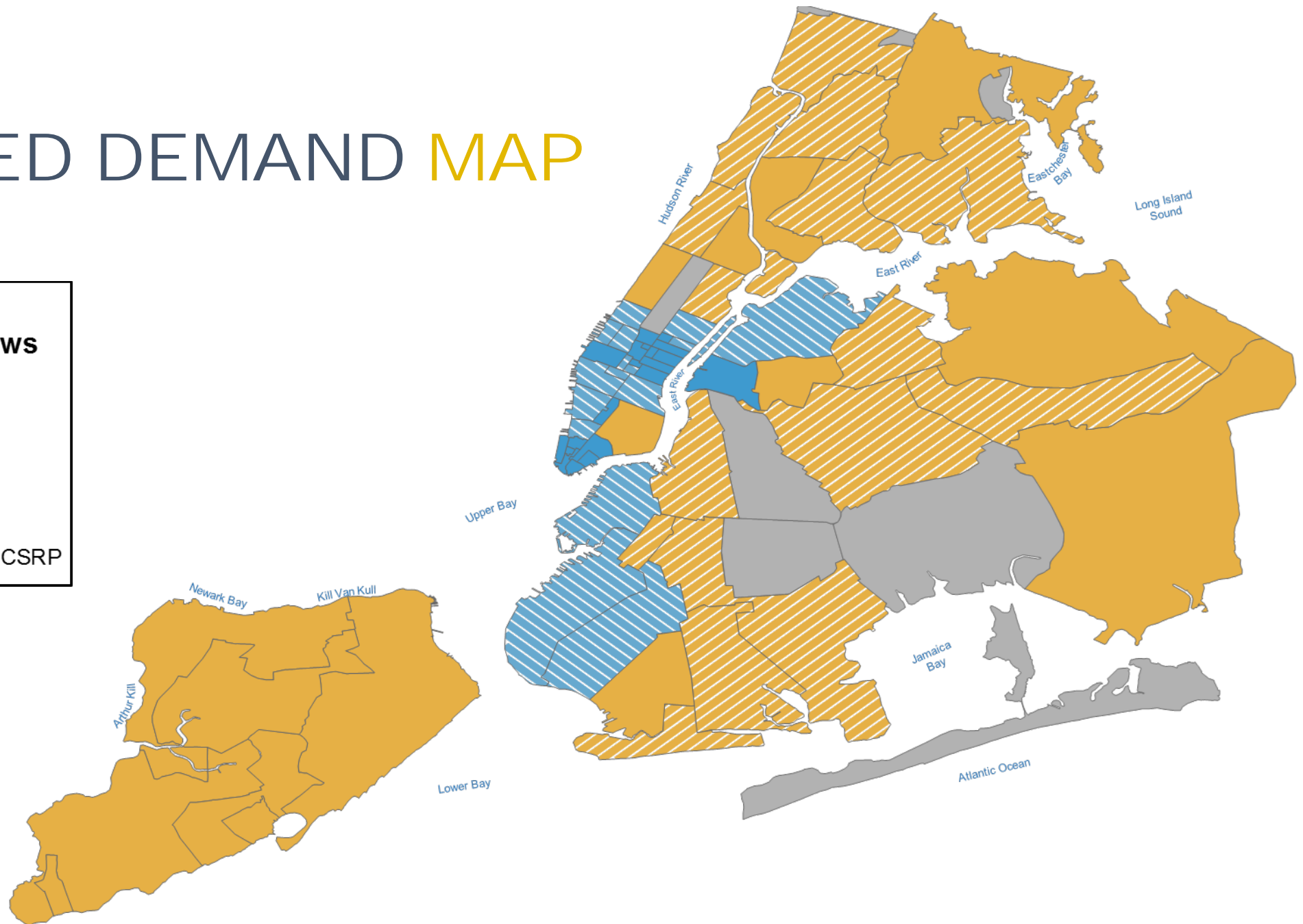
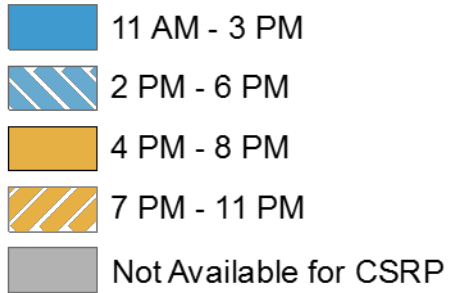
AVOIDED DEMAND EQUATION

- **Equation:** Monthly Credit = **DRV Rate** x **Average kW Coincidence** / 12
 - **DRV Rate** = \$199.40/kW-year (As of January 2018)
 - Based on utility marginal cost of service (MCOS) in non-high value areas (high value areas are compensated by LSRV)
 - **Average kW Coincidence** is tied to PV System Output during years 10 peak hours of utility demand



AVOIDED DEMAND MAP

Con-Edison Event Call Windows



AVOIDED DEMAND – CSRP ZONES AND WINDOWS

CSRP Zone	CSRP Window
Fordham	7 PM - 11 PM
Northeast Bronx	4 PM - 8 PM
Southeast Bronx	7 PM - 11 PM
Borough Hall	2 PM - 6 PM
Prospect Park	7 PM - 11 PM
Williamsburg	7 PM - 11 PM
Pennsylvania	11 AM - 3 PM

CSRP Zone	CSRP Window
Plaza	11 AM - 3 PM
Yorkville	7 PM - 11 PM
Borden	11 AM - 3 PM
Maspeth	7 PM - 11 PM
Sunnyside	4 PM - 8 PM
Wainwright	4 PM - 8 PM
Willowbrook	4 PM - 8 PM

Bronx

Brooklyn

Manhattan

Queens

Staten Island



AVOIDED DEMAND – CON ED TOP 10 DEMAND HOURS (2017)

11 AM - 3 PM			2 PM - 6 PM			4 PM - 8 PM			7 PM - 11 PM		
Date	Time	MW	Date	Time	MW	Date	Time	MW	Date	Time	MW
7/20/2017	2:00 PM	1,853	6/13/2017	5:00 PM	2,890	6/13/2017	6:00 PM	3,621	7/20/2017	9:00 PM	3,282
7/13/2017	1:00 PM	1,853	7/20/2017	5:00 PM	2,869	7/20/2017	5:00 PM	3,619	7/20/2017	8:00 PM	3,275
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6/13/2017	3:00 PM	1,845	7/13/2017	3:00 PM	2,827	6/13/2017	8:00 PM	3,541	6/13/2017	9:00 PM	3,241
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7/13/2017	12:00 PM	1,843	7/13/2017	2:00 PM	2,810	7/21/2017	6:00 PM	3,517	6/13/2017	8:00 PM	3,239



AVOIDED DEMAND – TAKE AWAY

- Know which Coincidence Zone the project is located in
- For highest **DRV Value**, increase Average kW Coincidence by exporting as much kWh during the Top 10 Demand Hours
- Top 10 Hours of the Year change, yearly. Model this precisely



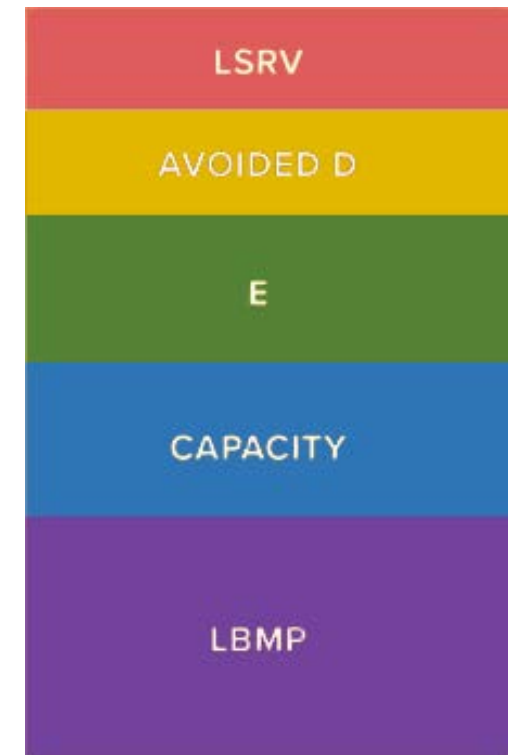
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Capacity Value	ICAP	Yes	Yes	Variable	Changes Monthly
Environmental Value	E	Yes	Yes	Fixed for 25 Years	\$0.02424/kWh
Avoided Demand	DRV	Yes	No	Fixed 3 Year \$ Value Variable Top 10 Hours	\$199.40/kW-year
Locational System Relief Value	LSRV				
Market Transition Credit	MTC				



SECTION ONE – BREAKDOWN OF THE VALUE STACK

LOCATIONAL SYSTEM RELIEF VALUE



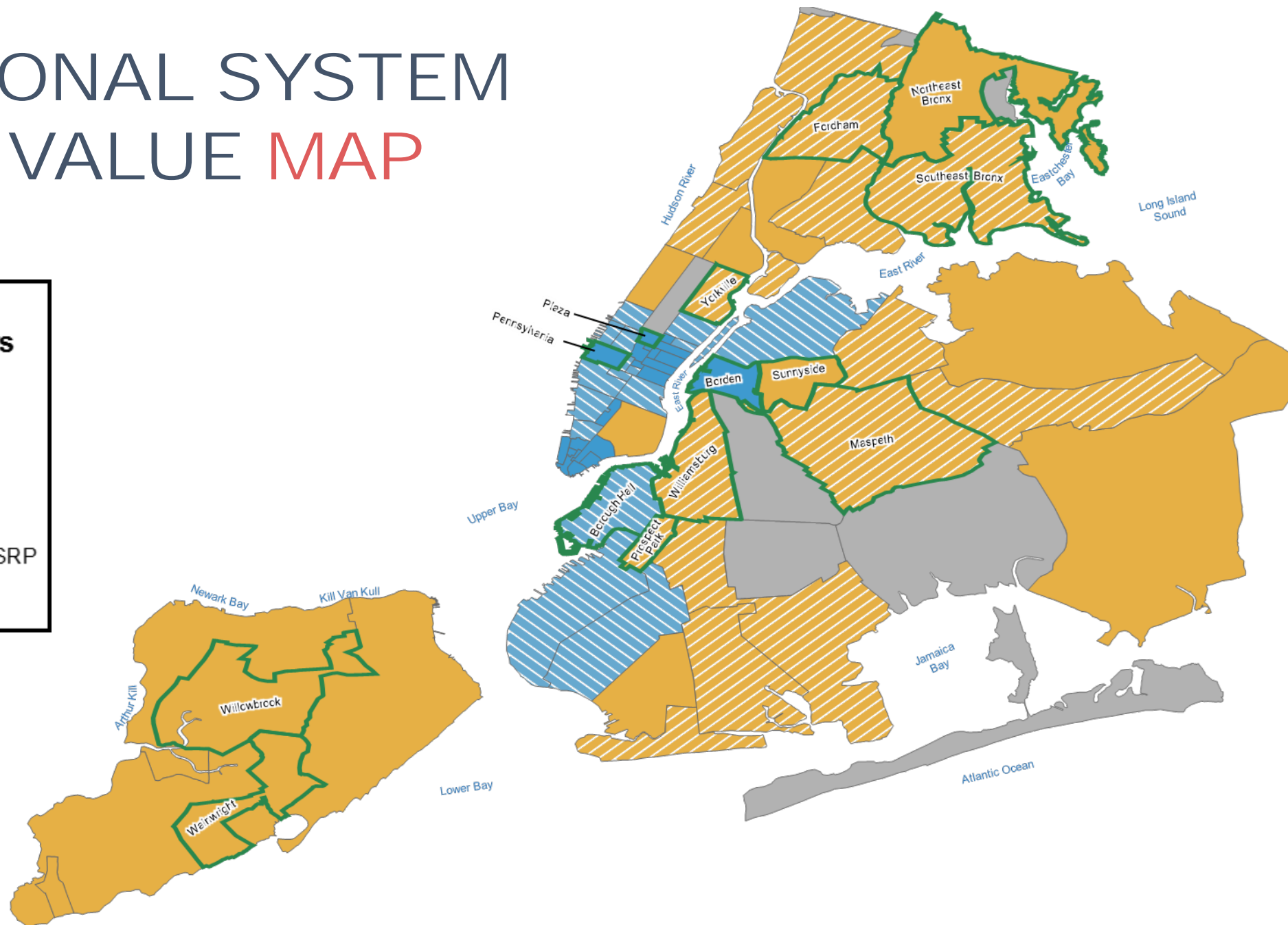
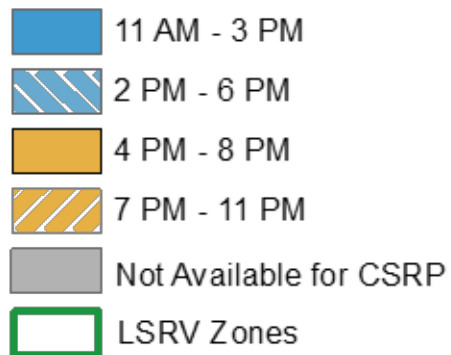
LOCATIONAL SYSTEM RELIEF VALUE (LSRV)

- **Definition:** Locational Adder for utility service areas with grid-constraint
 - Applicable to only those in an LSRV Zone
- **Equation:** Monthly Credit = **LSRV Rate** x Average kW Coincidence / 12
- **Fixed/ Variable:** Fixed 10 Years. After than LSRV Expires
 - **LSRV Rate** will be fixed when “when a project pays 25% of its interconnection costs, or at the time of the execution of a Standard Interconnection Contract if no such payment is required.” - Phase I Order



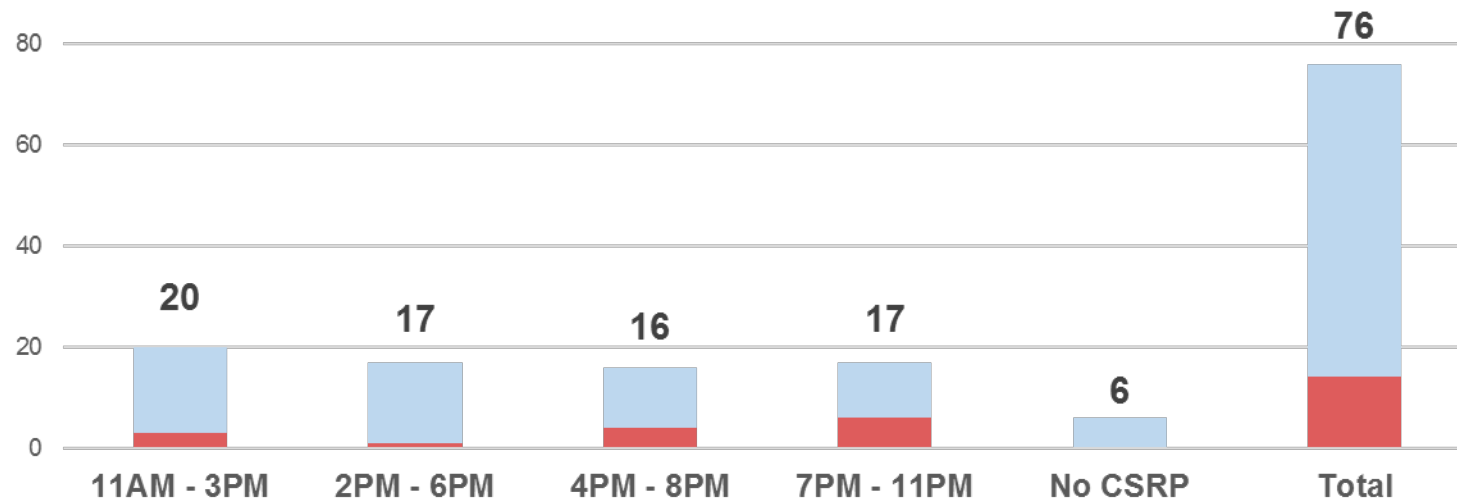
LOCATIONAL SYSTEM RELIEF VALUE MAP

Con-Edison Event Call Windows



LOCATIONAL SYSTEM RELIEF VALUE – COINCIDENCE ZONE COMPARISON

As of Jan 2018		11AM-3PM	2PM-6PM	4PM-8PM	7PM-11PM	No CSRP	Total
LSRV	Zones	3	1	4	6	N/A	14
	%	21%	7%	29%	43%		
Non-LSRV	Zones	17	16	12	11	6	62
	%	27%	26%	19%	18%	10%	



LOCATIONAL SYSTEM RELIEF VALUE – CON ED TOP 10 DEMAND HOURS (2017)

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LOCATIONAL SYSTEM RELIEF VALUE – CSRP ZONE - LSRV ZONE CAP

CSRP Zone	CSRP Window	LSRV Zone	LSRV Cap (MW)
Fordham	7PM-11PM	E. 179th St.	7.9
Northeast Bronx	4PM-8PM	Northeast Bronx Parkchester No. 2	0.4 2.8
Southeast Bronx	7PM-11PM	Parkchester No. 1	0.7
Borough Hall	2PM-6PM	Plymouth	14.3
Prospect Park	7PM-11PM	Water St.	30.1
Williamsburg	7PM-11PM		
Pennsylvania	11AM-3PM	W. 42nd St. No. 1	6.5

CSRP Zone	CSRP Window	LSRV Zone	LSRV Cap (MW)
Plaza	11AM-3PM	W. 65th St. No. 1	1.5
Yorkville	7PM-3PM	Yorkville	4.5
Borden	11AM-3PM	Glendale / Newtown	8.1
Maspeth	7PM-11PM		
Sunnyside	4PM-8PM		
Wainwright	4PM-8PM	Wainwright	7.2
Willowbrook	4PM-8PM	Willowbrook	0.3

Bronx

Brooklyn

Manhattan

Queens

Staten Island



LOCATIONAL SYSTEM RELIEF VALUE- TAKE AWAY

- Know if you are in an LSRV Zone
- Know which Coincidence Zone the project is located in
- For highest LSRV Value, increase Average kW Coincidence by exporting as much kWh during the Top 10 Demand Hours
- Top 10 Hours of the Year change, yearly. Model this precisely



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Environmental Value	E	Yes	Yes	Fixed for 25 Years	\$0.02424/kWh
Avoided Demand	DRV	Yes	No	Fixed 3 Year \$ Value Variable Top 10 Hours	\$199.40/kW-year
Locational System Relief Value	LSRV	If In Zone	If in Zone	Fixed 10 Year \$ Value Variable Top 10 Hours	\$140.76/kW-year
Market Transition Credit	MTC				



SECTION ONE – BREAKDOWN OF THE VALUE STACK

MARKET TRANSITION CREDIT



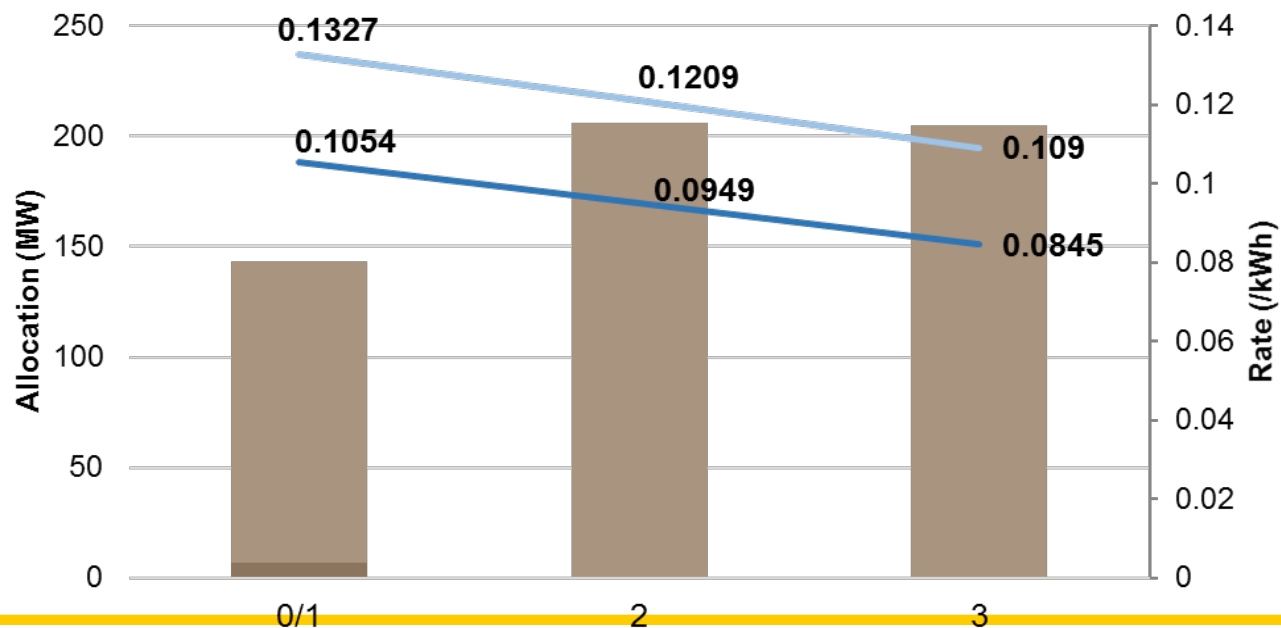
MARKET TRANSITION CREDIT (MTC)

- **Definition:** Transition credit based on difference between Base Retail Rate and Estimated Value Stack
 - Only for community-solar projects
- **Equation:** **MTC Rate** X kWh Exported
- **Fixed/ Variable:** **MTC Rate** is Fixed at the MTC Tranche Price at the time for 25 Years



MARKET TRANSITION CREDIT – TRANCHE ALLOCATIONS AND VALUES

As of Jan 2018		0/1	2	3
Allocated (MW)	Filled	7.1	0	0
	Allotted	136	206	205
Rate (/kWh)	SC No. 1	.1054	.0949	.0845
	SC No. 2	.1327	.1209	.1090



MARKET TRANSITION CREDIT – TAKE AWAY

- **The Market Transition Credit is locked in for 25 Years**
- **Pricing of the Market Transition Credit changes on which Tranche your project is in**
 - To check which Tranche the Utility is in:



<https://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Project-Developers/Value-of-Distributed-Energy-Resources>



VALUE STACK –TABLE BREAKDOWN

Variable Name		Comm/ Industrial	Community Solar	Fixed/ Variable	Value (\$) (as of Jan-2018)
Locational Based Marginal Price	LBMP	Yes	Yes	Variable	Changes Hourly
Capacity Value	ICAP	Yes	Yes	Variable	Changes Monthly
Environmental Value	E	Yes	Yes	Fixed for 25 Years	\$0.02424/kWh
Avoided Demand	DRV	Yes	No	Fixed 3 Year \$ Value Variable Top 10 Hours	\$199.40/kW-year
Locational System Relief Value	LSRV	If In Zone	If in Zone	Fixed 10 Year \$ Value Variable Top 10 Hours	\$140.76/kW-year
Market Transition Credit	MTC	No	Yes	Fixed for 25 Years	SC No.1 - .1054 SC No.2 - .1327



SECTION TWO

UNDERSTANDING OF THE VALUE STACK



MONETARY VS VOLUMETRIC CREDITING – UTILITY BILL

Name: JOHN DOE, LLC

Account number: 55-5555-5555-5555-5 Billing period ending: Dec 08, 2016

Page 2 of 2

Your electricity charges

These charges are for the electricity you used (supply) and getting that electricity to you (delivery). Rates are based on a 30 day period. When your billing period is more or less than 30 days, we prorate your bill accordingly.

Electricity you used during this 34 day billing period from Nov 04, 2016 to Dec 08, 2016

Rate: EL9 General Large

Meter# 8529592

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.

Dec 08, 16 actual reading	1094	20.75
Nov 04, 16 actual reading	-884	-18.75
Reading difference	210	1.00
Meter multiplier	X18	X18
Your electricity use	3,780 kWh	18.00 kW

► Your supply charges

Energy supply 3,780 kWh @4.9161¢/kWh **\$185.83**
Change for the electricity supplied to you by Con Edison.

Demand supply 18.0 kW @\$5.2589/kW **\$94.66**
Change for the electricity supplied to you by Con Edison.

Merchant function charge **\$8.21**
Charge associated with procuring electricity, credit and collection related activities and uncollectible accounts.

GRT & other tax surcharges **\$6.95**
Taxes on Con Edison gross receipts from sales of utility services and other tax surcharges.

Total supply charges **\$295.65**

Your total electricity supply cost for this bill is 7.8¢ per kWh. You can compare this price with those offered by energy services companies (ESCOs). For a list of ESCOs, visit www.PowerYourWay.com or call 1-800-780-2884.

► Your delivery charges

Basic service charge **\$9.19**
Includes a billing and payment processing charge of \$1.20, which may be avoided by switching to an energy services company (ESCO), and a charge for metering.

Energy delivery 3,780 kWh @4.2780¢/kWh **\$161.71**
Charge for maintaining the system through which Con Edison delivers electricity to you.

Demand delivery 18.0 kW @\$21.0078/kW **\$378.14**
Charge for maintaining the system through which Con Edison delivers electricity to you.

System Benefit Charge @0.6201¢/kWh **\$23.44**
The System Benefits Charge recovers costs associated with clean energy activities conducted by the New York State Energy Research and Development Authority (NYSERDA) and energy efficiency programs implemented by the Company.

Temporary NY State Surcharge @0.0865¢/kWh **\$3.27**
Seven new fees imposed by the state.

GRT & other tax surcharges **\$29.41**
See earlier definition.

Total delivery charges **\$605.16**

► Your sales tax

Sales tax @4.5000% **\$40.54**
Tax collected on behalf of New York State and/or your locality.

Total sales tax **\$40.54**

►► Total electricity charges **\$941.35**



Under NEM, this was the only charge you could reduce

Delivery Charge Portion of Utility Bill

Under VDER, this is the charge you can reduce

► Your delivery charges

Basic service charge **\$9.19**

Includes a billing and payment processing charge of \$1.20, which may be avoided by switching to an energy services company (ESCO), and a charge for metering.

➔ **Energy delivery 3,780 kWh @4.2780¢/kWh** **\$161.71**
Charge for maintaining the system through which Con Edison delivers electricity to you.

Demand delivery 18.0 kW @\$21.0078/kW **\$378.14**
Charge for maintaining the system through which Con Edison delivers electricity to you.

➔ **System Benefit Charge @0.6201¢/kWh** **\$23.44**
The System Benefits Charge recovers costs associated with clean energy activities conducted by the New York State Energy Research and Development Authority (NYSERDA) and energy efficiency programs implemented by the Company.

Temporary NY State Surcharge @0.0865¢/kWh **\$3.27**
Covers new fees imposed by the state.

GRT & other tax surcharges **\$29.41**
See earlier definition.

➔ **Total delivery charges** **\$605.16**

► Your sales tax

Sales tax @4.5000% **\$40.54**
Tax collected on behalf of New York State and/or your locality.

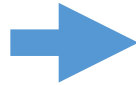
Total sales tax **\$40.54**

►► **Total electricity charges** **\$941.35**



MONETARY VS VOLUMETRIC – UTILITY NET METERING BILL

Net Metering
Portion of
Utility Bill



Cycle Date	Cycle Reading	Monthly kWhr	Billed kWhr	Monthly Conversion Factor (\$)	Cash Out Credit
3/10/2016	1373		0		\$0.00
4/8/2016	1364	-162	-162	\$0.13	-\$21.18
5/9/2016	1300	-1152	-1152	\$0.12	-\$133.53
6/8/2016	1163	-2466	-2466	\$0.09	-\$223.61
7/8/2016	996	-3006	-3006	\$0.11	-\$333.69
8/8/2016	882	-2052	-2052	\$0.11	-\$231.22
9/7/2016	799	-1494	-1494	\$0.09	-\$136.92
10/6/2016	813	252	252	\$0.09	\$0.00
11/4/2016	884	1278	1278	\$0.09	\$0.00
12/8/2016	1094	3780	3780	\$0.09	\$0.00



MONETARY VS VOLUMETRIC – DATA REQUIRED TO UNDERSTAND THE VALUE STACK

- **Hourly Exported to Grid kWh**
- **Hourly VDER Rate (\$)**
- **Hourly VDER Credit (Subtotal)**
- **Monthly Total VDER Credit**

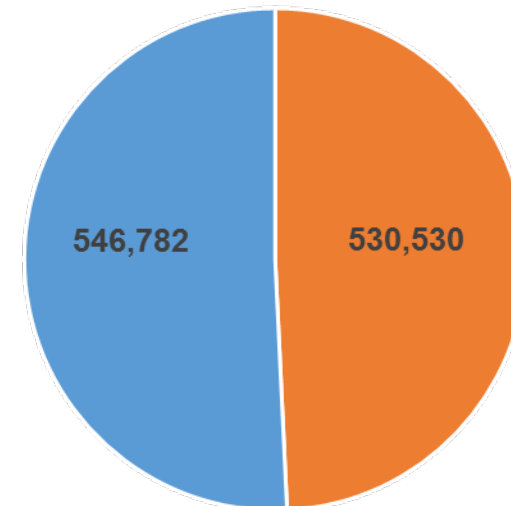
*** This is the monetary value of Exported Energy. For On-site Energy and PPA Bill, additional data acquisition and contractual language may be necessary**



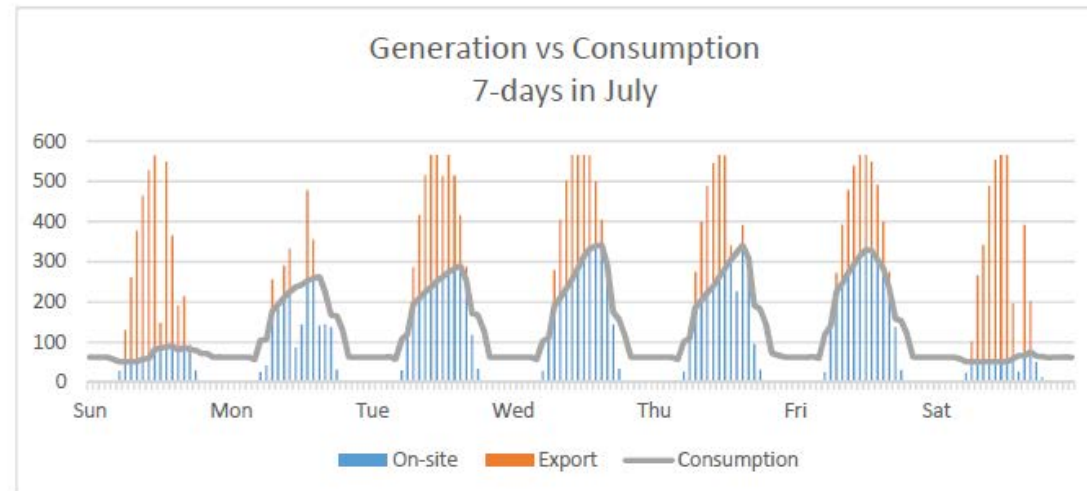
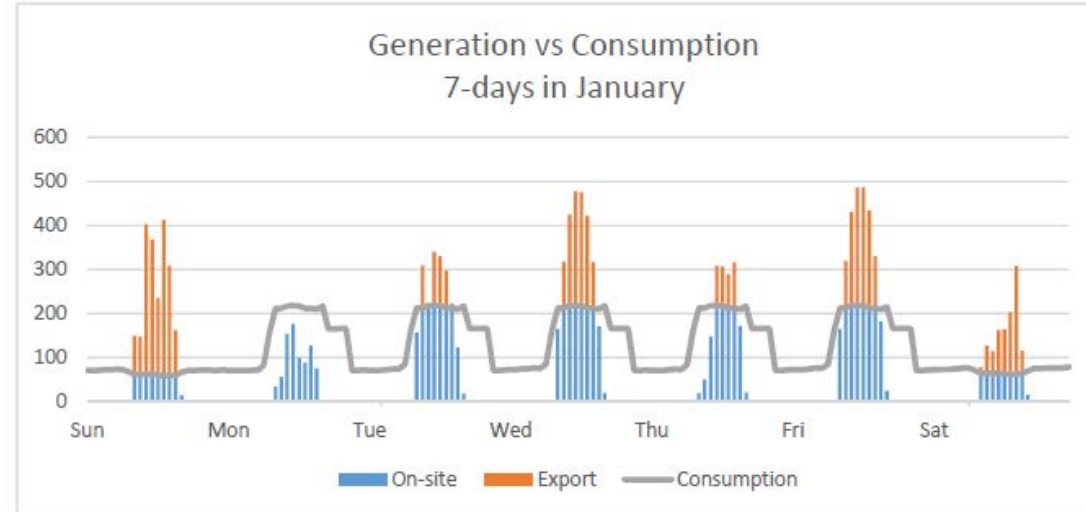
TIME OF USAGE VS. TIME OF GENERATION EXAMPLE

- **Location:** Primary School
- **Annual Consumption*:** 1,077,312 kWh
- **Solar Array Size to fulfill consumption:** 867 kW

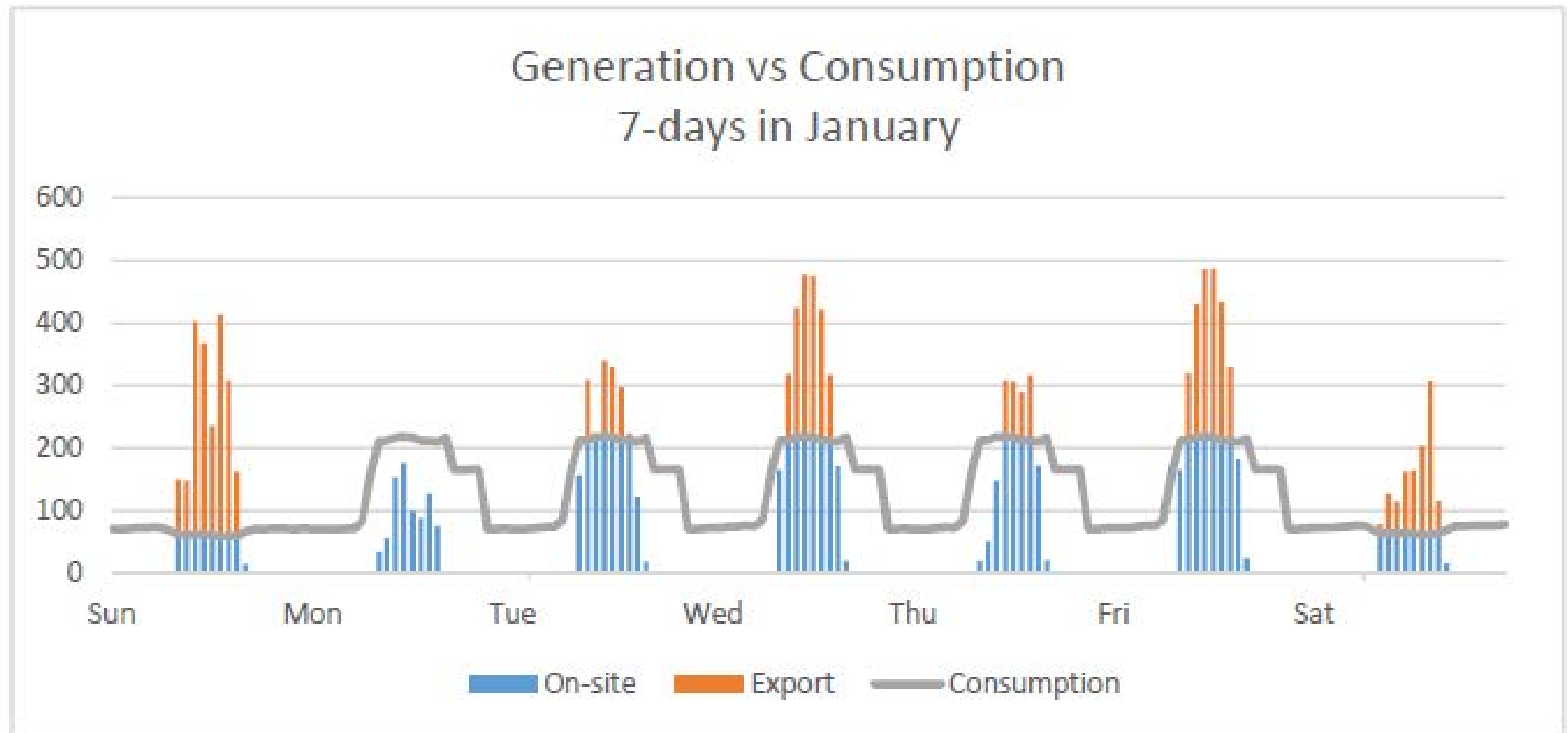
	kWh	%
Onsite	546,782	51%
Export	530,530	49%



TIME OF USAGE VS. TIME OF GENERATION: WEEKLY COMPARISON



TIME OF USAGE VS. TIME OF GENERATION: WEEK IN JANUARY

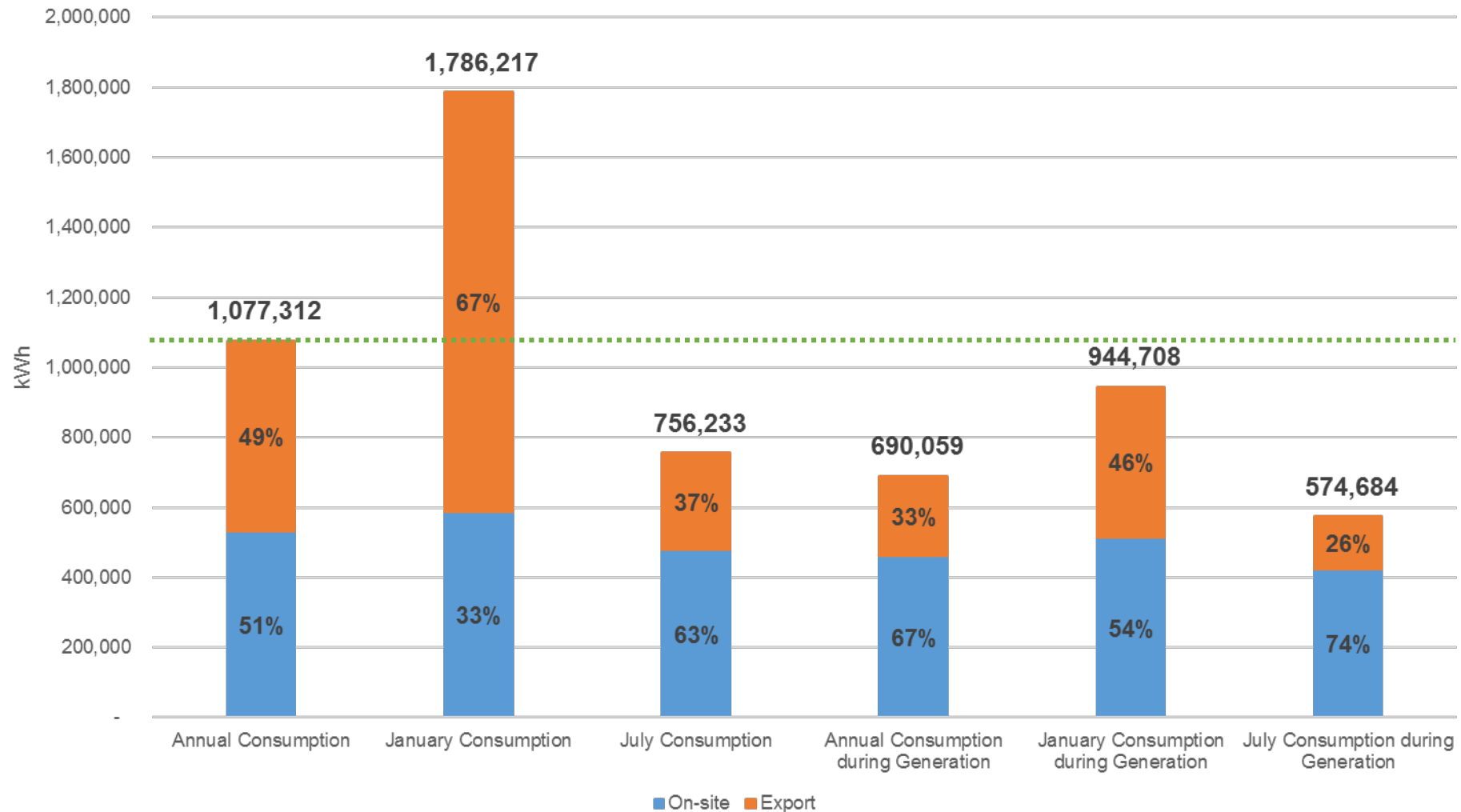


TIME OF USAGE VS. TIME OF GENERATION: MULTIPLE BUILD SCENARIOS

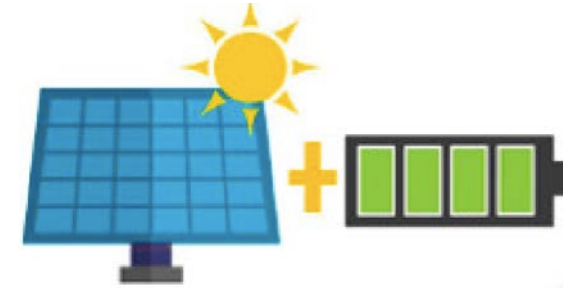
Primary School	Solar System (kW)	Annual Consumption (kWh)	Annual Solar Generation (kWh)	Consumption Supplied by Generation %
Annual Consumption	867	1,077,312	1,077,312	100%
January Consumption	1,438	1,077,312	1,786,217	166%
July Consumption	609	1,077,312	756,233	70%
Annual Consumption during Generation	555	1,077,312	690,059	64%
January Consumption during Generation	760	1,077,312	944,708	88%
July Consumption during Generation	463	1,077,312	574,684	53%



TIME OF USAGE VS. TIME OF GENERATION: MULTIPLE BUILD SCENARIOS



BATTERIES



- **Envisioning Stack Utilization through storage technology**
- **Discharge management that can anticipate peak windows**
 - Batteries that can discharge fully in 1 hour
- **Consider adding Load Control for BTM System**

Questions about Batteries?

Send an email to DGHub@cuny.edu



LOCATIONAL SYSTEM RELIEF VALUE – SOLAR BUILD POTENTIAL (BUILDING >200KW) BY CSRP ZONE TABLE

CSRP Zone	CSRP Window	Solar Potential >200kW (MW)
Fordham	7 PM - 11 PM	23.86
Northeast Bronx	4 PM - 8 PM	20.81
Southeast Bronx	7 PM - 11 PM	37.82
Borough Hall	2 PM - 6 PM	35.82
Prospect Park	7 PM - 11 PM	1.70
Williamsburg	7 PM - 11 PM	33.57
Pennsylvania	11 AM - 3 PM	11.31

CSRP Zone	CSRP Window	Solar Potential >200kW (MW)
Plaza	11 AM - 3 PM	0.22
Yorkville	7 PM - 11 PM	4.59
Borden	11 AM - 3 PM	33.00
Maspeth	7 PM - 11 PM	81.00
Sunnyside	4 PM - 8 PM	18.58
Wainwright	4 PM - 8 PM	1.84
Willowbrook	4 PM - 8 PM	37.79

Bronx

Brooklyn

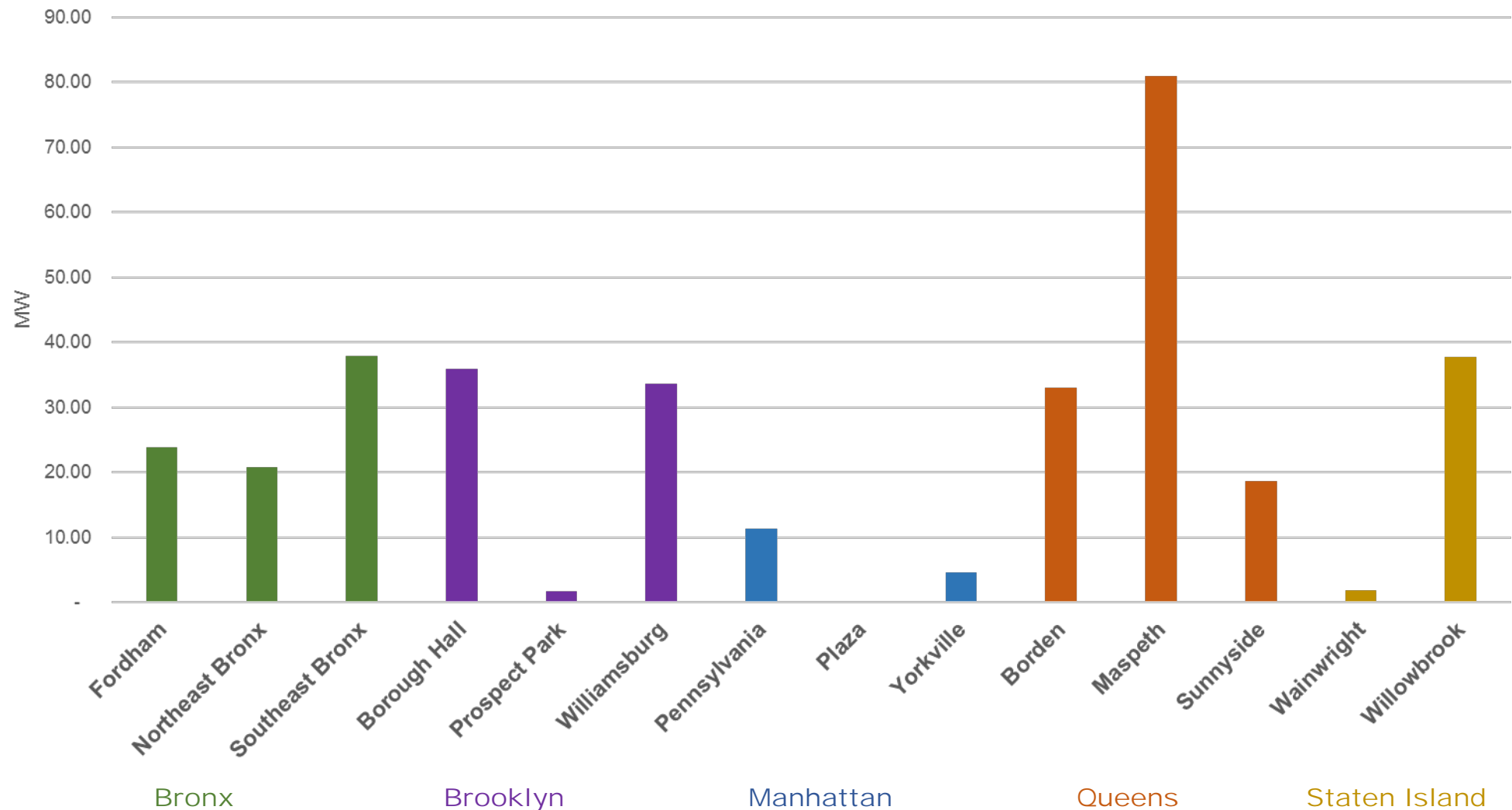
Manhattan

Queens

Staten Island



LOCATIONAL SYSTEM RELIEF VALUE – SOLAR BUILD POTENTIAL (BUILDING >200KW) BY CSRP ZONE GRAPH



LOCATIONAL SYSTEM RELIEF VALUE – CSRP ZONE - LSRV ZONE CAP

CSRP Zone	Solar Potential >200kW (MW)	LSRV Zone	LSRV Cap (MW)
Fordham	23.86	E. 179th St.	7.9
Northeast Bronx	20.81	Northeast Bronx	0.4
		Parkchester No. 2	2.8
Southeast Bronx	37.82	Parkchester No. 1	0.7
Borough Hall	35.82	Plymouth	14.3
Prospect Park	1.70	Water St.	30.1
Williamsburg	33.57		
Pennsylvania	11.31	W. 42nd St. No. 1	6.5

CSRP Zone	Solar Potential >200kW (MW)	LSRV Zone	LSRV Cap (MW)
Plaza	0.22	W. 65th St. No. 1	1.5
Yorkville	4.59	Yorkville	4.5
Borden	33.00	Glendale / Newtown	8.1
Maspeth	81.00		
Sunnyside	18.58		
Wainwright	1.84	Wainwright	7.2
Willowbrook	37.79	Willowbrook	0.3

Bronx

Brooklyn

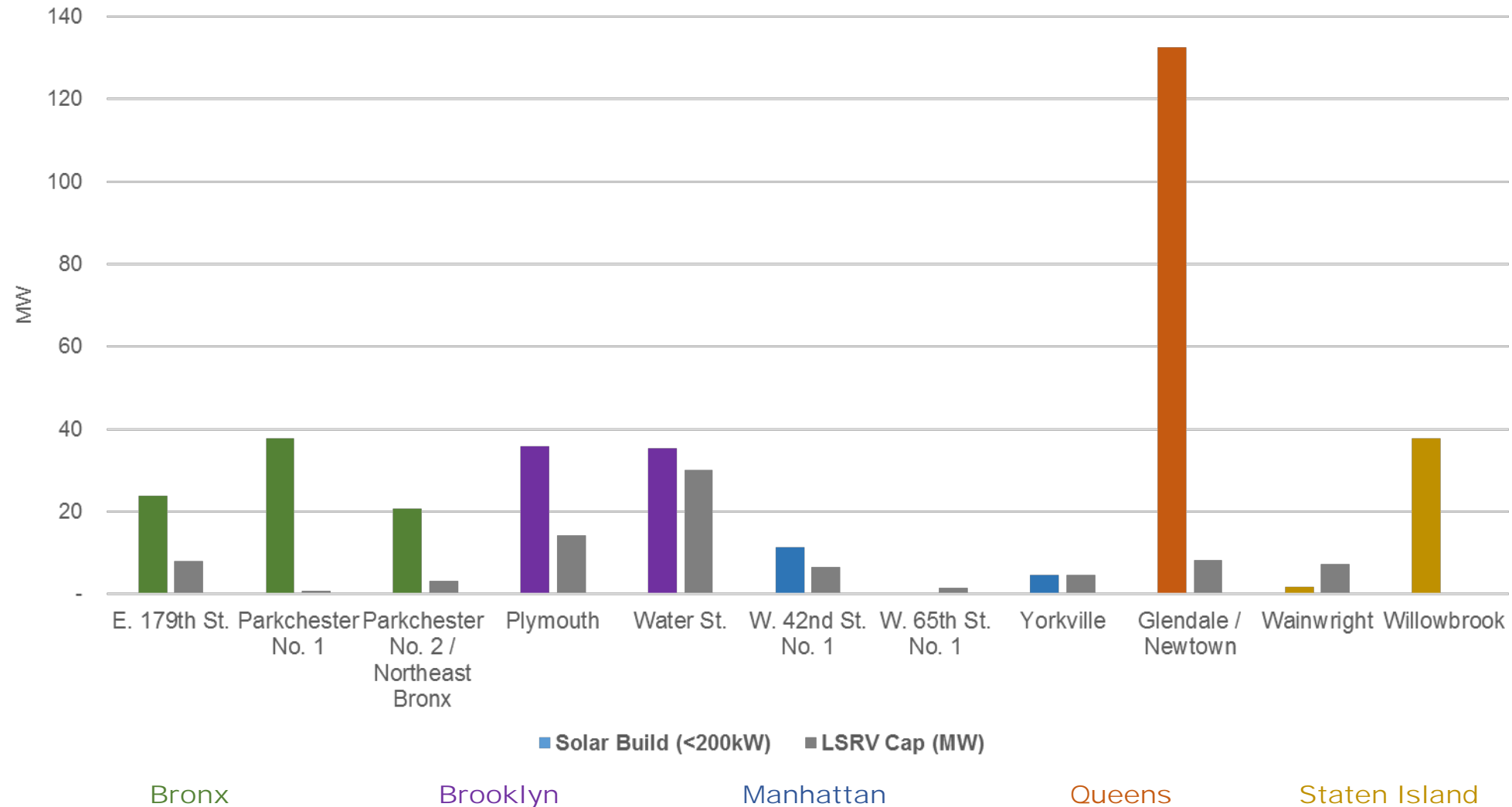
Manhattan

Queens

Staten Island



LOCATIONAL SYSTEM RELIEF VALUE – SOLAR BUILD POTENTIAL AND LSRV CAP GRAPH



SECTION THREE

NYC SOLAR DEVELOPERS



1

Leo Wiegman – Croton Energy Group

2

David Buckner – Solar Energy Systems

3

Dennis Phayre - EnterSolar



SECTION THREE – NYC SOLAR DEVELOPERS

LEO WIEGMAN
CROTON ENERGY

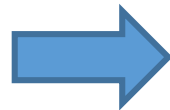
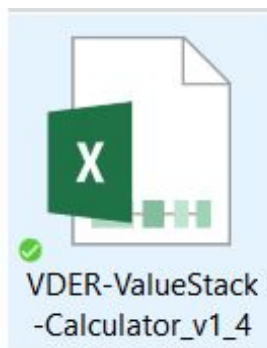


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GROUP INC

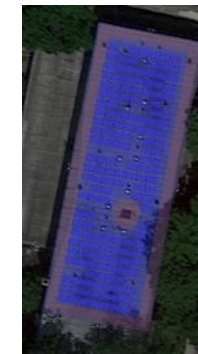


CAN I SHOW VDER?

- Challenge: How can we present VDER to customers nicely?
- CEG uses EnergyToolBase.com for proposal/contract management. **ETB** is working on integrating VDER, but it's complicated...
- Adding VDER monthly and yearly data to proposals requires a work-around
- When the VDER tool becomes an online platform, solar proposal tools can pull down VDER data via API
- But in the mean time...



 **ENERGY TOOLBASE™**



VDER OUTPUTS PAGE

	A	B	C	D
70				
71		Jan-18	Feb-18	Mar-18
73	On-site consumption served by solar (kWh)	536	569	781
75	Value of kWh consumed on site, at retail rate (from User Inputs row 87 - 89) (\$2017)	\$ 120	\$ 128	\$ 175
76				
77	MONTHLY TOTAL PROJECT VALUE:			
78				
79		Jan-18	Feb-18	Mar-18
80	Compensation for exports from solar (\$2017)	\$ 230	\$ 427	\$ 367
81	Compensation for exports from storage (\$2017)	\$ -	\$ -	\$ -
82	Value of kWh consumed on site (\$2017)	\$ 120	\$ 128	\$ 175
83	Total project value	\$ 350	\$ 554	\$ 542
84				
85	MONTHLY COMPARISON OF VALUE STACK AND PRE-VALUE STACK COMPENSATION:			
86				
87		Jan-18	Feb-18	Mar-18
88	Total compensation for project exports under Value Stack rates (\$2017)	\$ 230	\$ 427	\$ 367
89	Total compensation for project exports under pre-Value Stack rates (\$2017)	\$ 584	\$ 784	\$ 1,061
90	Difference (negative value indicates lower compensation under Value Stack)	\$ (354)	\$ (358)	\$ (693)
91				
92	Compensation for exports under Value Stack rates, per kWh exported (\$2017)	\$ 0.0885	\$ 0.1221	\$ 0.0777
93	Compensation for exports under pre-Value Stack rates, per kWh exported (\$2017)	\$ 0.2244	\$ 0.2244	\$ 0.2244
94	Difference	\$ (0.1359)	\$ (0.1023)	\$ (0.1467)
95				
96	ANNUAL VALUE STACK COMPENSATION - SOLAR:			
97				

- We export specific data from the VDER calculator into our own proposal tools
- Goal: Show client VDER monthly + annual cash flow impact, **WITHOUT** confusing them



OUR WORK-AROUND: MONTHLY DATA

- Paste monthly projected Energy Use data from your proposal tool (**ETB** in our case) into Excel worksheet (white cells below)
- Copy and paste Tab “Detailed Outputs,” Row 80, the monthly VDER Payout in \$ amounts from VDER tool.
- Paste – Transpose this data into new VDER Payout in Excel worksheet (gray cells below)
- To add “Net Bill Total” column on far right, subtract monthly VDER Payouts from the monthly Total Charges.

Bill Date Ranges			Energy Import (kWh)	Charges			Energy Export (kWh)	VDER Payout	Net Bill Total
Start Date	End Date	Season	Total	Other	Energy	Total	Total		
1/10/2017	2/10/2017	W	1231	\$26.01	\$250.81	\$276.82	3068	\$418.82	(\$142.00)
2/10/2017	3/10/2017	W	1209	\$26.01	\$246.33	\$272.34	3609	\$361.59	(\$89.25)
3/10/2017	4/10/2017	W	982	\$26.01	\$200.08	\$226.09	4639	\$344.57	(\$118.48)
4/10/2017	5/10/2017	W	864	\$26.01	\$176.04	\$202.05	6193	\$543.22	(\$341.17)
5/10/2017	6/10/2017	W/S	877	\$26.01	\$183.48	\$209.49	5692	\$591.85	(\$382.36)
6/10/2017	7/10/2017	S	1103	\$26.01	\$246.79	\$272.80	5666	\$593.84	(\$321.04)
7/10/2017	8/10/2017	S	1113	\$26.01	\$249.03	\$275.04	5601	\$567.19	(\$292.15)
8/10/2017	9/10/2017	S	1231	\$26.01	\$275.43	\$301.44	5080	\$460.53	(\$159.09)
9/10/2017	10/10/2017	S/W	1149	\$26.01	\$249.78	\$275.79	3665	\$309.43	(\$33.64)
10/10/2017	11/10/2017	W	1352	\$26.01	\$275.46	\$301.47	3368	\$147.91	\$153.57
11/10/2017	12/10/2017	W	1394	\$26.01	\$284.02	\$310.03	2276	\$168.64	\$141.39
12/10/2017	1/10/2018	W	1477	\$26.01	\$300.93	\$326.94	1895	\$228.74	\$98.20
Totals			13982	\$312.12	\$2,938.18	\$3,250.30	50752	\$4,736.32	(\$1,486.01)



WORK-AROUND: ANNUAL CASH FLOW

- Add a column to our Cash Flow table (in **ETB**) for annual “VDER value” payments.
- Insert the year 1 \$ value from “Detailed Output” tab, row 175, & escalate by 0.80%/year.

2.4 Current Electric Bill

The table below shows your annual electricity costs based on the most current utility rates and your previous 12 months of electrical usage.

Rate Schedule: ConEd - EL 2


Time Periods	Energy Use (kWh)	Charges		Charges	
		Total	Other	Energy	Total
1/10/2017 - 2/10/2017 W	1,812	\$26	\$369	\$395	
2/10/2017 - 3/10/2017 W	1,908	\$26	\$389	\$415	
3/10/2017 - 4/10/2017 W	1,776	\$26	\$362	\$388	
4/10/2017 - 5/10/2017 W	1,794	\$26	\$366	\$392	
5/10/2017 - 6/10/2017 W/S	1,998	\$26	\$419	\$445	
6/10/2017 - 7/10/2017 S	2,586	\$26	\$579	\$605	
7/10/2017 - 8/10/2017 S	2,502	\$26	\$560	\$586	
8/10/2017 - 9/10/2017 S	2,466	\$26	\$552	\$578	
9/10/2017 - 10/10/2017 S/W	2,034	\$26	\$443	\$469	
10/10/2017 - 11/10/2017 W	2,124	\$26	\$433	\$459	
11/10/2017 - 12/10/2017 W	1,980	\$26	\$403	\$429	
12/10/2017 - 1/10/2018 W	2,034	\$26	\$414	\$440	
Totals:	25,014		\$312	\$5,288	\$5,600

2.5 New Electric Bill

Bill Date Ranges			Energy Import (kWh)		Charges		Energy Export (kWh)		VDER Payout	Net Bill Total
Start Date	End Date	Season	Total	Other	Energy	Total	Total			
1/10/2017	2/10/2017	W	1231	\$26.01	\$150.81	\$276.82	3068	\$438.82	-\$142.06	
2/10/2017	3/10/2017	W	1209	\$26.01	\$146.33	\$272.34	3409	\$361.59	-\$80.25	
3/10/2017	4/10/2017	W	982	\$26.01	\$100.08	\$226.09	4639	\$344.57	-\$118.48	
4/10/2017	5/10/2017	W	864	\$26.01	\$176.04	\$202.05	6193	\$543.22	-\$141.17	
5/10/2017	6/10/2017	W/S	877	\$26.01	\$183.48	\$209.49	5492	\$501.85	-\$182.36	
6/10/2017	7/10/2017	S	1303	\$26.01	\$146.79	\$272.80	5666	\$503.84	-\$321.04	
7/10/2017	8/10/2017	S	1113	\$26.01	\$149.03	\$275.04	5601	\$567.19	-\$292.15	
8/10/2017	9/10/2017	S	1231	\$26.01	\$175.43	\$301.44	5080	\$460.13	-\$159.06	
9/10/2017	10/10/2017	S/W	1349	\$26.01	\$149.78	\$275.79	3665	\$300.43	-\$33.64	
10/10/2017	11/10/2017	W	1352	\$26.01	\$175.46	\$301.47	3368	\$147.91	\$153.57	
11/10/2017	12/10/2017	W	1394	\$26.01	\$184.02	\$310.03	2276	\$168.64	\$141.39	
12/10/2017	1/10/2018	W	1477	\$26.01	\$300.93	\$326.94	1895	\$228.74	\$88.20	
Totals			13982	\$312.12	\$2,938.18	\$3,250.30	50752	\$4,736.32	-\$1,686.01	

Annual Electricity Savings: \$7,085

Prepared By: Leo Wiegman Date: 1/12/2018
P: (914) 862-4177
E: lwiegman@crotonenergy.com

 CROTON ENERGY GROUP INC
Sylvan Ave PV page 7

3 Cash Flow Analysis


3.1 Cash Purchase-onsite consumption

Inputs and Key Financial Metrics

Total Project Costs	\$115,686	Payback Period	3.8 Years	Discount Rate	5%
30 Year IRR	19.63%	30 Year ROI	231%	Federal Income Tax Rate	30%
30 Year NPV	\$89,935	PV Degradation Rate	0.8%	State Income Tax Rate	8%

Years	Project Costs	VDER Value	NY Sun - Con Edison	Electric Bill Savings	Change in Federal Tax Liability	Total Cash Flow	Cumulative Cash Flow
Upfront	\$115,686	-	\$27,612	-	-	\$88,074	\$88,074
1	-	\$4,736	-	\$2,349	\$50,046	\$57,131	\$30,943
2	-	\$4,774	-	\$2,401	\$5,664	\$12,838	\$18,104
3	-	\$4,812	-	\$2,453	\$3,398	\$10,663	\$7,441
4	-	\$4,851	-	\$2,506	\$2,038	\$9,395	\$1,954
5	-	\$4,889	-	\$2,560	\$2,038	\$9,488	\$11,441
6	-	\$4,928	-	\$2,615	\$1,021	\$8,564	\$20,005
7	-	\$4,968	-	\$2,671	-	\$7,639	\$27,644
8	-	\$5,008	-	\$2,728	-	\$7,735	\$35,379
9	-	\$5,048	-	\$2,786	-	\$7,833	\$43,212
10	-	\$5,088	-	\$2,845	-	\$7,933	\$51,145
11	-	\$5,129	-	\$2,905	-	\$8,034	\$59,179
12	-	\$5,170	-	\$2,966	-	\$8,136	\$67,315
13	-	\$5,211	-	\$3,028	-	\$8,239	\$75,554
14	-	\$5,253	-	\$3,091	-	\$8,344	\$83,899
15	-	\$5,295	-	\$3,156	-	\$8,451	\$92,349
16	-	\$5,337	-	\$3,221	-	\$8,558	\$100,908
17	-	\$5,380	-	\$3,288	-	\$8,668	\$109,575
18	-	\$5,423	-	\$3,355	-	\$8,778	\$118,353
19	-	\$5,466	-	\$3,424	-	\$8,890	\$127,244
20	-	\$5,510	-	\$3,494	-	\$9,004	\$136,247
21	-	\$5,554	-	\$3,564	-	\$9,119	\$145,366
22	-	\$5,599	-	\$3,636	-	\$9,235	\$154,601
23	-	\$5,643	-	\$3,709	-	\$9,353	\$163,954
24	-	\$5,689	-	\$3,784	-	\$9,472	\$173,426
25	-	\$5,734	-	\$3,859	-	\$9,593	\$183,019
26	-	-	-	\$3,935	-	\$3,935	\$186,955
27	-	-	-	\$4,013	-	\$4,013	\$190,968
28	-	-	-	\$4,092	-	\$4,092	\$195,059
29	-	-	-	\$4,171	-	\$4,171	\$199,230
30	-	-	-	\$4,252	-	\$4,252	\$203,483
Totals:	\$115,686	\$130,495	\$27,612	\$96,856	\$64,206	\$203,483	-

Prepared By: Leo Wiegman Date: 1/12/2018
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E: lwiegman@crotonenergy.com

 CROTON ENERGY GROUP INC
Sylvan Ave PV page 8

NEW MARKET SEGMENT WITH VDER?

Community Solar:

- A lot of us want to develop Community Solar projects.
- VDER appears to offer a way to model the CDG value stack for various off-taker configurations.
- For ConEd territory, this will take off when inter-zonal projects are enabled. (The upstate apple orchard analogy.)

Energy Storage:

- Holy grail of NY's grid is decentralized energy storage.
- VDER offers pairing PV with energy storage. Hoorah!
 - But, what will NYS' energy storage incentive be for residential-small commercial customers?



VDER'S IMPACT ON SALES PROCESS?

- Yes. Our internal process has changed for commercial projects. We have to calculate and show the VDER value stack (see above method as work-around for now). And...
- No. We have not yet seen VDER \$ values big enough to alter how we present and discuss proposed solar projects with clients.
- We hope to use VDER value stack to accelerate Comm Solar!
- Our recent small commercial clients have ignored the VDER \$ we put in cash flow as “ConEd promises” (which they discount to \$0).
- Explaining “multiple remote net metering” to clients takes time (multiple in-person conversations). Reaction: Great concept, I have no idea how that would work.
- If client asks us to define the value stack, we stick to explaining the NYS shift from statewide “one size fits all” overproduction limit and kWh credit to a \$ value based on client’s location, season and time of day.



NEW MARKET SEGMENTS – IMPACT OF VDER

- **Business/commercial sector**
 - No limit on system size vs on-site electric load needs.
 - VDER is great for sites in optimal (sunny, no shade, spacious roof, etc) locations, because over production is now allowed by utilities.
- **Community Solar**
 - Offers fiscal model for community solar projects that didn't exist before.
- **Large PPA projects**
 - Unclear whether Funders will accept or discount VDER \$ estimates.



SECTION THREE – NYC SOLAR DEVELOPERS

DAVID BUCKNER SOLAR ENERGY SYSTEMS



SES INTRODUCTION

- **Brooklyn-based solar design/build firm founded in 1998**
- **Primary Markets**
 - NJ and NY
- **Primary Strengths**
 - Installation and Maintenance of PV systems
- **75 MW installed and maintained**



NET METERING TIMELINE

- **1997 – Residential Net Metering up to 10KW**
- **2008 – Net Metering Residential up to 25KW;**
 - Commercial up to 2MW but Capped at 12 Month Peak Demand
- **2009 -- Peak Demand Cap Removed**
- **2014 – Remote Net Metering**
- **2017 – VDER**
- **2020 – VDER Phase 2**



C&I BILL ANALYSIS – EL 9

Your electricity charges

These charges are for the electricity you used (supply) and getting that electricity to you (delivery). Rates are based on a 30 day period. When your billing period is more or less than 30 days, we prorate your bill accordingly.

Electricity you used during this 29 day billing period from Feb 27, 2017 to Mar 28, 2017		
Rate: EL9 General Large	Meter# 6251576	
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.		
Mar 28, 17 actual reading	13178	47.94
Feb 27, 17 actual reading	-13147	-47.79
Reading difference	31	0.15
Meter multiplier	X120	X120
Your electricity use	3,720 kWh	18.00 kW

► Your supply charges

Energy supply 3,720 kWh @6.2177¢/kWh	\$231.30
Charge for the electricity supplied to you by Con Edison.	
Demand supply 18.0 kW @ \$4.4856/kW	\$80.74
Charge for the electricity supplied to you by Con Edison.	
Merchant function charge	\$6.26
Charge associated with procuring electricity, credit and collection related activities and uncollectible accounts.	
GRT & other tax surcharges	\$7.66
Taxes on Con Edison gross receipts from sales of utility services and other tax surcharges.	
Total supply charges	\$325.96

Your total electricity supply cost for this bill is 8.8¢ per kWh. You can compare this price with those offered by energy services companies (ESCOs). For a list of ESCOs, visit www.PowerYourWay.com or call 1-800-760-2884.

► Your delivery charges

Basic service charge	\$7.18
Includes a billing and payment processing charge of \$1.20, which may be avoided by switching to an energy services company (ESCO), and a charge for metering.	
Energy delivery 3,720 kWh @3.7567¢/kWh	\$139.75
Charge for maintaining the system through which Con Edison delivers electricity to you.	
Demand delivery 18.0 kW @ \$19.6394/kW	\$353.51
Charge for maintaining the system through which Con Edison delivers electricity to you.	
System Benefit Charge @0.6666¢/kWh	\$24.92
The System Benefits Charge recovers costs associated with clean energy activities conducted by the New York State Energy Research and Development Authority (NYSERDA) and energy efficiency programs implemented by the Company.	
Temporary NY State Surcharge @0.0866¢/kWh	\$3.22
Covers new fees imposed by the state.	
GRT & other tax surcharges	\$13.55
See earlier definition.	
Total delivery charges	\$542.11
► Your sales tax	
Sales tax @8.8750%	\$77.04
Tax collected on behalf of New York State and/or your locality.	
Total sales tax	\$77.04
►► Total electricity charges	\$945.11

Demand - 46%



C&I BILL ANALYSIS

Ending Bill Period	kWh	\$	
Nov-17	3,240	811	
Oct-17	3,120	960	
Sept-17	3,240	999	
Aug-17	3,840	1,157	
Jul-17	3,840	1,234	
Jun-17	3,480	1,150	
May-17	3,240	916	
Apr-17	2,880	891	
Mar-17	3,720	945	
Feb-17	3,960	1,033	
Jan-17	3,600	912	
Dec-16	3,600	970	All In
	41,760	11,978	.\$0.29/kWh



VDER STACK

Site Address	127-25 Metropolitan Ave
Con Ed Network	Williamsburg
Network Peak	7 PM – 11 PM
LSRV Eligible	Yes
LSRV Cap	30.1 MW
Substation	Water Street
Energy Input	3 Year Average
Capacity Input	Alt 1
Energy Value	0.0506
Capacity Value(Current Alternative 1 Rate Selected)	0.0358
Environmental Value	0.0242
Demand Reduction Value	0.0120
Locational System Relief Value	0.0085
MTC	0.0000
Average Value Stack compensation, per kWh immediately exported	0.1312



VDER VS. NEM (ON-SITE KWH)

- **Average KWH charges = \$.09 / KWH**
- **VDER Stack = \$.131 / KWH**
- **Customer has no interval data meter**
- **Cannot determine import vs export**
- **Install new meter and export 100%**



VDER COMPARISON

PROS

- **Design systems to offset dollars spent rather than KWH used**
 - NYSERDA supporting this with incentive level increase
- **NEM would have limited the customer to a 35 KW system**
 - Customer would have been left with 46% of bill after solar
- **VDER allows for 70 KW system**
 - Customer left with minimal charges after solar

CONS

- **VDER rates are too low for many service classes**
- **VDER stack components are variable over time (but so is NEM)**
- **Export vs Import discrepancy requires hourly interval data**
 - Complicates both the sales process and utility implementation
 - New meter adds cost and complexity



SECTION THREE – NYC SOLAR DEVELOPERS

DENNIS PHAYRE
ENTERSOLAR



ENTERSOLAR INTRODUCTION

- **EnterSolar headquartered in Manhattan, 2005**
- **National Developer of large Corporate C&I Solar projects**
- **Among the top large C&I Developer NYS & NYC**
- **2015 Community Solar Projects NY & MA**
- **Early 2017 completed first CDG Project in NYS**
- **Participant in VDER proceedings and IPWG**



CLIENTS



Financial / Real Estate

Bloomberg



Regency
Centers.



PROLOGIS™

Retailers



SAFEWAY



Stewart's



ACME



Healthcare



REGENERON



Industrials

EASTMAN



PSEG

ASSA ABLOY



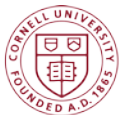
CRODA



CONTINENTAL™
BUILDING PRODUCTS

KINDER MORGAN

Education



CORNELL
TECH



KENT SCHOOL



Distribution



Misc. Services



Manufacturers



THULE



RICOH
imagine. change.



DYKES LUMBER, QUEENS – BTM NEM



BLOOMBERG, QUEENS - RNM



STEWART'S SHOPS, HALFMOON, NY - RNM



PITKIN AVENUE, BKLYN – CDG PHASE 1 NEM



VDER & ENTERSOLAR'S BUSINESS MODEL

- **Traditional On-site BTM NEM and RNM**
- **CDG NEM**
- **VDER (Value of Distributed Energy Resources)**
 - Marginal Cost “Production” Tariff
- **Time, Location & “Complication”**
 - **LBMP**, **CAP**, **ENV**, **DRV** & **LSRV** (and CSRP Zones)
 - CDG doesn't get **DRV**
 - Gets **Market Transition Credit (MTC)**
 - Advantage CDG



CDG & MTC

CDG	<u>Con Edison</u>	<u>O&R</u>	<u>CHG&E</u>	<u>NG</u>
	<u>Residential</u>	<u>Residential</u>	<u>Residential</u>	<u>Residential</u>
MTC				
Tranche #1	\$0.1054	\$0.0911	\$0.0599	\$0.0282
Tranche #2	\$0.0949	\$0.0821	\$0.0524	\$0.0229
Tranche #3	\$0.0845	\$0.0731	\$0.0449	\$0.0175
Tranche #4		\$0.0461	\$0.0374	
	500 MWs	15 MWs	20 MWs	
CDG Rate	\$0.2093	\$0.1798	\$0.1505	\$0.0999
	\$0.1988	\$0.1708	\$0.1430	\$0.0946
	\$0.1884	\$0.1618	\$0.1355	\$0.0892
CDG Rate		\$0.1348	\$0.1280	



CDG VS RNM OR BTM IN CON ED

REWARD

CDG Higher \$/kWh Rate than RNM/BTM

- VDER \$0.10/kWh to \$0.14/kWh
- CDG \$0.21/kWh (\$0.105/kWh MTC)

RISK

VDER “Bankability” issue (finance)

- Low Marginal Value & Uncertainty (DRV)
- CDG Avoids – gets MTC
- Advantage CDG



SITE ACQUISITION CHALLENGES (I.E. BATTLE FOR ROOF SPACE)

- **Limited # rooftops / Old Roofs**
- **Businesses Owners are not Building Owners**
- **Leasing the roof**
- **Valuable Real Estate**
 - Higher \$/Sq Ft values
- **CDG Higher \$/Sq Ft production value**
 - Higher \$/MW DC installed
 - Greater Revenues
 - Afford higher rent/lease
 - Advantage CDG



CDG CUSTOMER ACQUISITION & SUBSCRIBER MANAGEMENT

- **“High” Cost of Acquiring Customers**
 - Who doesn't Free “Green” money and bragging rights?
 - Low Supply of CDG and High Demand
- **Subscriber Management (billing) - real challenge**
 - Complex Rules and Regulations
 - CDG Sponsor and Customer
 - Subscriber Management Services
 - Advantage ESCOs



SECTION FOUR

TOOLS FOR VDER TRANSPARENCY

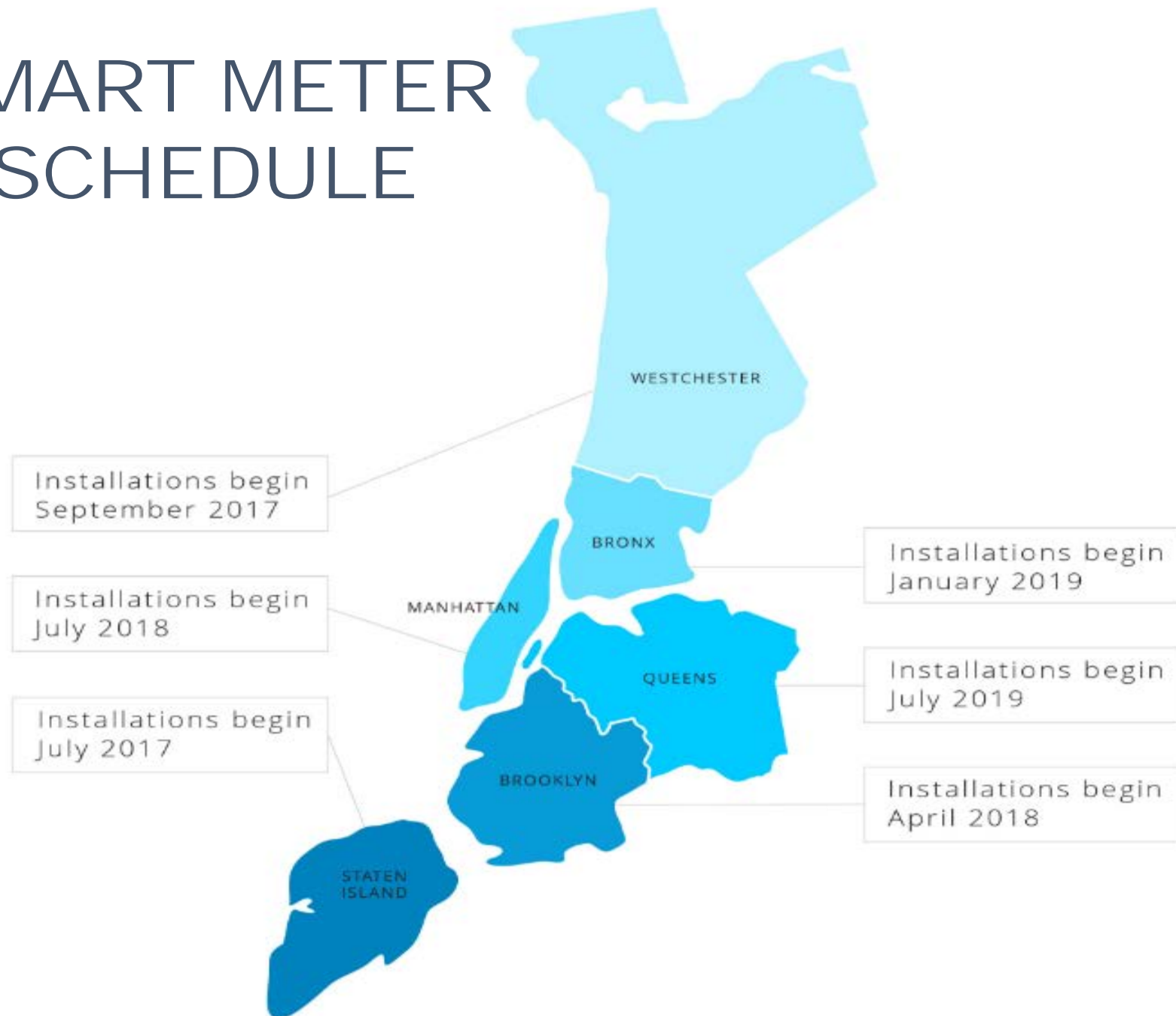


SMART METERS

- **Delivering Rich data and transparency in 15 (or 5?) minute intervals**
- **For DG there would be:**
 - Total Consumption
 - PV Export to Grid



CON ED SMART METER ROLLOUT SCHEDULE





GREEN BUTTON FOR MODELING VDER

A mechanism for an account holder to authorize a 3rd party to interact with historic energy data

RIGHT NOW:

- Monthly Billing amount on a CSV file
- Account holder has to log in to access the button
- No consumption info

INFORMATION FOR VDER:

- Break down of all line items in the bill
- If solar is already installed
 - On-site usage
 - Export
 - Total Solar Usage
- Easy 3rd party authorization of the Green Button
- Monthly kWh consumed



SECTION FIVE

VDER - PHASE TWO



THE FUTURE OF VDER

- **Value Stack - Phase Two**
- **Rate Design and “Mass Market”**
- **The VDER Orbit**



VALUE STACK – PHASE TWO

ENVIRONMENTAL VALUE

- **Modifying the Environmental Value**
 - Move Beyond REC-Based Compensation
 - Monetize Avoided Local Air Pollution
 - Environmental Justice/Resiliency/Others?
 - Second Half of 2018



VALUE STACK – PHASE TWO

AVOIDED D AND LSRV

- **Modifying DRV and LSRV**
 - Improving Marginal Cost of Service Studies
 - Role of Demand Response and Non-Wires Solicitations
 - First Half of 2018



RATE DESIGN AND “MASS MARKET”

- **Develop Mass Market NEM Successor**
 - Scope Elements of Successor (Q1 2018)
 - Utility Bill Impact Analysis (Q2 2018)
 - Vet Working Group Proposals (Q3 2018)
 - Staff Report (Q4 2018)
- **Standby and Buy-Back Rate Reform**



THE VDER ORBIT

- **Customer Issues Working Group**
- **Low-Income Programs**
- **Expanded Eligibility**
- **Interzonal Crediting/NYPA Customer Eligibility**
- **Size Increase**
- **Interconnection**
- **Tranche 4**
- **DER Oversight**
- **Stay Engaged!**



UPCOMING EVENTS

**March 12 – Annual Installer Training
at ConEd Queens Training Facility**

**June 19 – Annual Solar Summit
at John Jay College of Criminal Justice**

**More VDER and Market Support Events
Accepting ideas, watch your inbox**



SUSTAINABLE CUNY



THANK YOU
QUESTIONS?

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