Value Stack Calculator Training

February 2024

NEW YORK STATE | NYSERDA

Welcome and Context

In 2017, the New York Public Service Commission established the Value Stack methodology to compensate distributed energy resources (DERs) for energy provided to the grid

The Value Stack is a nuanced tariff structure to value energy based on both when and where it is injected to the grid

NYSERDA and E3 developed a calculator tool to help developers estimate project revenue under the Value Stack

- This calculator is available in two versions, for projects that qualified for the Value Stack on or before July 26, 2018 (“Phase One”), and those that have qualified since (“Phase Two”)

A prior presentation and training for the Value Stack Calculator from 2019 is available on NYSERDA’s website, on the NY-Sun: Value Stack Resources subpage

This training is intended as a supplementary update to accompany the Value Stack Calculator Phase Two Version 3.0

Agenda

Review of the Value Stack

Model Overview

Using the Value Stack Calculator: Sample Model Runs

- Community Distributed Generation (CDG)
- Remote Crediting with Solar and Storage
- Behind-the-Meter Solar with On-site Load (Small customer)
- Standalone Storage

Disclaimer

NYSERDA has provided the Value Stack Calculator as a tool to help developers understand the Value Stack Tariff and estimate project revenues. Estimated project revenue modeled by the calculator is not guaranteed by NYSERDA and is heavily dependent on user-input factors – actual project revenue will be based on variables including weather and future market rates for energy and capacity.

Chapter 1:
The Value Stack

Components and Resources

What is the Value Stack?

The Value Stack is a successor tariff to Net Metering in New York State, and serves to determine the value of energy provided to the electrical grid by DERs

VDER provides customers with monetary rather than volumetric energy credits for the electricity their resources produce. Compensation takes the form of utility bill credits rather than cash payments to project owners.

Each individual benefit provided by DERs is recognized as a separate component – together, they make up the ‘Value Stack’

Different project technologies may be eligible for different combinations of value stack components.

Value Stack Components

Value Name	Description	Eligible DERs
Energy Value (LBMP)	LBMP is the day-ahead wholesale energy price as determined by NYISO. It changes hourly and is different according to geographic zone.	All technologies: PV, storage, CHP, digesters, wind, hydro, and fuel cells.
Capacity Value (ICAP)	ICAP is the value of how well a project reduces New York State's energy usage during the most energy-intensive days of the year. Developers can choose from three payout alternatives and most ICAP rates change monthly.*	All technologies receive ICAP. Dispatchable technologies (stand-alone storage, CHP, digesters, and fuel cells) will receive Alternative 3.
Environmental Value (E)	E is the value of how much environmental benefit a clean kilowatt-hour brings to the grid and society. The E value is locked in for 25 years.**	PV, wind, hydro, and storage charged exclusively from PV or wind energy. Stand-alone storage is not eligible at this time.
Demand Reduction Value (DRV)	DRV is determined by how much a project reduces the utility's future needs to make grid upgrades. DRV is locked in for 10 years.**	All technologies.
Locational System Relief Value (LSRV)	LSRV is available in utility-designated locations where DERs can provide additional benefits to the grid. Each location has a limited number of MW of LSRV capacity available. The LSRV is locked in for 10 years.**	All technologies. Project must be on a utility-specified substation.
Community Credit (CC)	CC is available on a limited basis to encourage the development of Community Distributed Generation (CDG) projects. CC is the successor to the Market Transition Credit (MTC) and is similar in structure. The CC is locked in for 25 years.** PV projects in utility territories that have fully expended their CC may be eligible for the Community Adder – an upfront incentive administered by NY-Sun.	Available for CDG projects including PV and digesters. Wind, hydro, and fuel cells receive CC at a derated value. Not available for stand-alone storage or CHP.

NYSERDA's Value Stack Website

https://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Contractors/Value-of-Distributed-Energy-Resources

Navigate by NY-Sun → Contractors → The Value Stack, or search engine

Includes:

> Links to Value Stack Orders
> Summary presentations/webinar recordings (including this training!)
> FAQs
> Incentive tranche updates
> Links to utility monthly filings
> VDER Order source documents, etc.
> Link to VDER Calculator subpage

NYSERDA's Value Stack Calculator Website

https://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Contractors/Value-ofDistributed-Energy-Resources/Solar-Value-Stack-Calculator

Includes:

> "Phase Two" and "Phase One" VDER calculator files
> Revision notes
> Sign up for email notifications

Chapter 2:
Model Overview

The Value Stack Calculator

Free, Excel-based model developed by E3 and NYSERDA

Answers the question: “What is the estimated value of energy produced by my solar or storage system?”

Includes explanation of value stack components, documentation of source data, and visualization of results for a user-input project

Updated periodically to address revisions to the Value Stack tariff and new available market data

Separated into “Phase One” and “Phase Two” VDER versions

Models solar (front-of-the-meter and behind-the-meter), PV+storage where the storage is charged by solar, and standalone, front-of-the-meter storage.

Standalone storage is a new functionality with Rev 3.0 (for all utilities). Users must provide relevant details to estimate revenues and charging costs.

The Value Stack Calculator Does Not

Include a full project financial pro forma for an individual project

The calculator does not account for project costs, incentives or tax credits, contract structures, non-VDER tariffs, etc.

Guarantee of future project revenue

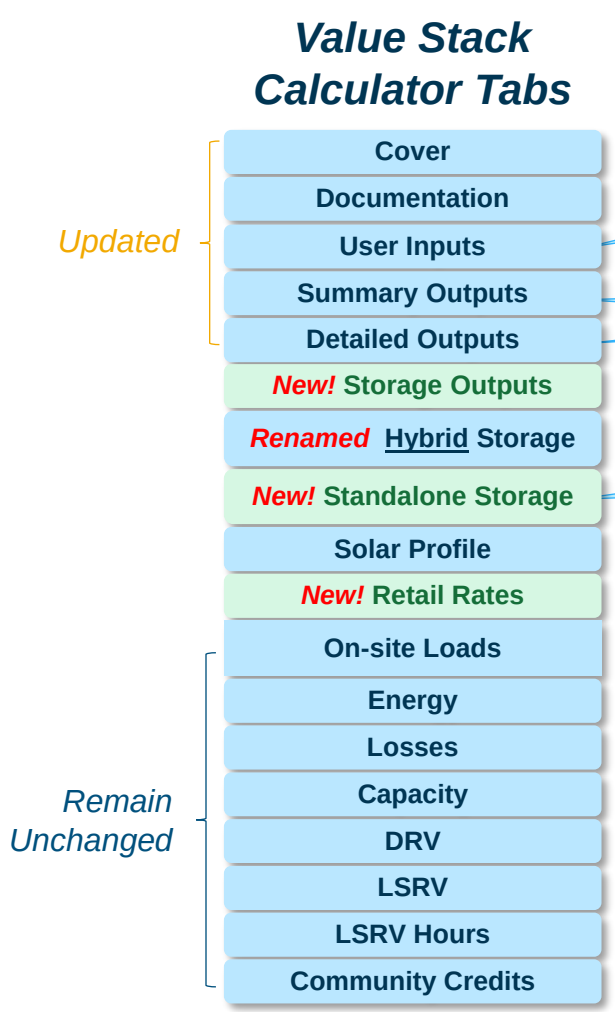
The calculator is a modeling/estimating tool. Actual bill credits will be calculated by the utility

This model is not compatible with behind-the-meter storage

Summary of Key Changes in v3.0

- **Merged the functionality of the Standalone Storage calculator with the Solar Value Stack Calculator**
  - Existing model inputs remain largely unchanged, but have been re-organized to accommodate the new inputs for front-of-the-meter standalone storage
  - A standalone storage dispatch module has been added, incorporating utility retail rates for charging costs. Energy dispatch logic for solar or solar + storage projects remains unchanged from the prior version
  - Calculation flow through the workbook has been modified slightly to allow for an updated Storage tab summarizing results of either solar + storage ("Hybrid Storage") or stand-alone storage dispatch
  - Model outputs now incorporate charging costs for stand-alone storage and include additional charts for visualizing results
  - Model documentation has been updated to address stand-alone storage inputs and eligibility for value stack components
- **Added 2023 historic LBMP (energy) pricing, historic 2023 ICAP pricing, and 2023 LSRV hours**
- **No changes to DRV or E Value as these value stack items have not changed in the past year**
  - Solar generation curves within the calculator were adjusted as needed to maintain the calculator's functionality, but new profiles have not been added in v3.0

Updated v3.0 Value Stack Calculator



- Updated layout and additional retail rate section
- New standalone storage functionality

- Improved visualization
- Now incorporates grid charging costs for standalone storage

- Incorporates standalone storage dispatch with grid charging costs (rather than charging from solar only)

Key Update Considerations:

+ Maintain familiar user functionality
+ Provide nuanced dispatch modeling for both solar + storage and stand-alone storage projects
+ Recognize differences in Value Stack Component eligibility for stand-alone storage projects
+ Expand database of utility retail rates for user selection

Tips, Do's, and Don'ts

The Documentation tab is a key resource – give it a read before using the calculator!

The first input is the most important – Be sure to select the appropriate Project Type

Double-check LSRV eligibility with hosting capacity map and/or utility monthly filings.

Most LSRV zones have been fully allocated.

If in ConEdison territory, double-check the CSRP window with the most recent year's CSRP map

Found on ConEdison's Smart Usage Rewards for Aggregators page. 2024 map available **here**

Keep in mind how on-site projects receive benefits

If under 750kWac, choice of net metering or value stack
kWh consumed onsite offset retail purchases (so double check the customer's retail rate).
kWh exported to the grid receive the value stack

Remember that project revenue does not necessarily equal developer's revenue

For a PPA with 10% customer savings, the customer will only pay the developer 90% of the values in the "Summary Outputs" tab

Tips, Do's, and Don'ts

Consider – do I want an optimistic, a conservative, or a best-guess estimate of revenue?

Think carefully about escalators – they compound a lot over a 25-year cashflow!

Double check your inputs and units (for instance kW vs MW)

If uncertain of what inputs mean, look to the notes on the right side of the User Inputs tab or to the Documentation tab for help

Send calculator questions or feedback to vder@nyserda.ny.gov

Password to unlock the calculator is nysun

Provided for the purposes of tracing formulae

Chapter 3:
Using the Value Stack Calculator

Sample Model Runs

Sample Model Runs

Updated Model Overview

1. **Community Distributed Generation (CDG) – National Grid**
2. **Remote Crediting with Solar and Storage – ConEdison**
3. **Behind-the-Meter Solar with On-site Load (Small customer) – Orange & Rockland**
4. **Standalone Storage – ConEdison**

Value Stack Calculator v 3.0, for Projects Impacted by the 2019 Value Stack Order (Qualified after 7/26/2018)

Instructions

1. Make sure macros have been enabled using the yellow ribbon at the top of the Excel window. We also recommend closing other large files in order to reduce run time.
2. Enter project inputs and compensation inputs below.
3. Click the Calculate button just below (or at the bottom of this tab) to run the calculator. There is an identical button at the bottom of the sheet. **None of the remaining tabs will update until you hit Calculate.**
4. See calculator results on the Summary Outputs and Detailed Outputs tabs.

CALCULATE

Input Format Key

	Cells where the user can enter inputs
	Cells containing user input dropdowns
	Cells updated or overwritten by formula or based on other user inputs - please do not change

General Project Inputs

			Notes
1	**Project Type**	Solar	
1a	Interconnection limit (kW AC)	5000	*Limits grid exports in any hour from solar and/or storage, if applicable. Max 5,000 kW.*
2	**Utility**	National Grid	
3	**NYISO zone**	F-Capital	*Used to select Locational-Based Marginal Price (LBMP). Skip if using user-input 8760 LBMPs.*
4	**Financial Analysis Specifications**		
4a	Project start year	2024	*Between 1997 and 2050.*
4b	Analysis lifetime (years)	25	*Maximum of 25 years.*
4c	Annual inflation rate	2.0%	*Used for grossing up historic data to nominal dollars in project start year for consistency.*
4d	Project discount rate (nominal)	8.0%	*Used for net present value (NPV) calculations over the lifetime of the project (Detailed Outputs row 208).*

Solar Project Inputs

5	Project Includes Solar?	*Yes*
6	**Project Category**	Community distributed generation
7	CDG mass-market offtaker compensation type	Volumetric Crediting
7a	% of output serving demand-based commercial customers	0%

Cover | User Inputs | Summary Outputs | Detailed Outputs | Documentation | Data & Processing>>> | Storage Outputs | Hybrid Storage | Standalone Storage | Retail Rates | Solar Profile | On-site Loads

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Community Distributed Generation (CDG)

National Grid CDG System

7.5MW DC system, 5MW AC

Fixed tilt system under ICAP Alternative 1:

Year 1 credits = ?

Single-axis tracking system under ICAP Alternative 2:

Year 1 credits = ?

Community Distributed Generation (CDG)

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General Project Inputs

			Notes
1	**Project Type**	Solar	
1a	Interconnection limit (kW AC)	5000	*Limits grid exports in any hour from solar and/or storage, if applicable. Max 5,000 kW.*
2	**Utility**	National Grid	
3	**NYISO zone**	F-Capital	*Used to select Locational-Based Marginal Price (LBMP). Skip if using user-input 8760 LBMPs.*
4	**Financial Analysis Specifications**		
4a	Project start year	2024	*Between 1997 and 2050.*
4b	Analysis lifetime (years)	25	*Maximum of 25 years.*
4c	Annual inflation rate	2.0%	*Used for grossing up historic data to nominal dollars in project start year for consistency.*
4d	Project discount rate (nominal)	8.0%	*Used for net present value (NPV) calculations over the lifetime of the project (Detailed Outputs row 208).*

Solar Project Inputs

5	Project Includes Solar?	*Yes*	
6	**Project Category**	Community distributed generation	*See Documentation tab for Project Category definitions.*
7	CDG mass-market offtaker compensation type	Volumetric Crediting	
7a	% of output serving demand-based commercial customers	0%	

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Ready Calculate Accessibility: Investigate Display Settings 90%

Community Distributed Generation (CDG)

Fixed tilt system under ICAP Alternative 1

Value Stack Calculator v 3.0, for Projects Impacted by the 2019 Value Stack Order (Qualified after 7/26/2018)												
MONTHLY COMPENSATION FOR EXPORTS - SOLAR:												
	2024_1	*2024_2*	*2024_3*	*2024_4*	*2024_5*	*2024_6*	*2024_7*	*2024_8*	*2024_9*	*2024_10*	*2024_11*	*2024_12*
	Jan-24	**Feb-24**	**Mar-24**	**Apr-24**	**May-24**	**Jun-24**	**Jul-24**	**Aug-24**	**Sep-24**	**Oct-24**	**Nov-24**	**Dec-24**
Exports												
Solar generation immediately exported by solar system (kWh)	537,651	696,360	902,436	837,474	929,791	928,569	868,504	838,337	834,595	546,837	548,742	383,819
Value stack compensation from solar exports ($Nominal)												
Energy value	$ 50,211	$ 60,306	$ 48,373	$ 41,432	$ 53,577	$ 52,504	$ 70,028	$ 64,023	$ 51,887	$ 28,821	$ 34,114	$ 29,191
Capacity value (36-month average Alternative 1 Rate (Jan 2021-Dec 2023) selected)	$ 10,525	$ 12,970	$ 6,823	$ 2,887	$ 12,805	$ 13,684	$ 13,526	$ 13,584	$ 15,867	$ 14,374	$ 9,623	$ 8,457
Environmental value	$ 16,683	$ 21,608	$ 28,003	$ 25,987	$ 28,851	$ 28,814	$ 26,950	$ 26,014	$ 25,897	$ 16,968	$ 17,027	$ 11,910
Demand reduction value	$ -	$ -	$ -	$ -	$ -	$ 8,254	$ 43,891	$ 46,064	$ 20,288	$ -	$ -	$ -
Locational system relief value	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Community Credit	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Value Stack compensation from solar generation immediately exported	$ 77,420	$ 94,884	$ 83,199	$ 70,306	$ 95,234	$ 103,256	$ 154,394	$ 149,684	$ 113,940	$ 60,163	$ 60,764	$ 49,559

Single-axis tracking system under ICAP Alternative 2

Value Stack Calculator v 3.0, for Projects Impacted by the 2019 Value Stack Order (Qualified after 7/26/2018)												
MONTHLY COMPENSATION FOR EXPORTS - SOLAR:												
	2024_1	*2024_2*	*2024_3*	*2024_4*	*2024_5*	*2024_6*	*2024_7*	*2024_8*	*2024_9*	*2024_10*	*2024_11*	*2024_12*
	Jan-24	**Feb-24**	**Mar-24**	**Apr-24**	**May-24**	**Jun-24**	**Jul-24**	**Aug-24**	**Sep-24**	**Oct-24**	**Nov-24**	**Dec-24**
Exports												
Solar generation immediately exported by solar system (kWh)	471,241	690,757	1,037,603	1,014,792	1,214,567	1,261,621	1,126,792	1,028,274	946,600	544,539	478,646	307,025
Value stack compensation from solar exports ($Nominal)												
Energy value	$ 44,421	$ 59,725	$ 57,185	$ 51,654	$ 71,638	$ 71,768	$ 91,371	$ 79,399	$ 60,071	$ 29,224	$ 30,206	$ 23,536
Capacity value (36-month average Alternative 2 Rate (Jan 2021-Dec 2023) selected)	$ -	$ -	$ -	$ -	$ -	$ 8,994	$ 49,245	$ 49,193	$ -	$ -	$ -	$ -
Environmental value	$ 14,623	$ 21,434	$ 32,197	$ 31,489	$ 37,688	$ 39,148	$ 34,964	$ 31,907	$ 29,373	$ 16,897	$ 14,852	$ 9,527
Demand reduction value	$ -	$ -	$ -	$ -	$ -	$ 10,994	$ 59,247	$ 60,137	$ 26,214	$ -	$ -	$ -
Locational system relief value	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Community Credit	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Value Stack compensation from solar generation immediately exported	$ 59,044	$ 81,160	$ 89,382	$ 83,143	$ 109,326	$ 130,904	$ 234,827	$ 220,637	$ 115,658	$ 46,121	$ 45,059	$ 33,063

Community Distributed Generation (CDG)

National Grid CDG System

7.5MW DC system

Fixed tilt system under ICAP Alternative 1:

Year 1 credits = $1,112,801

NPV: $12,753,587

Single-axis tracking system under ICAP Alternative 2:

Year 1 credits = $1,248,324

NPV: $14,252,765

Remote Crediting with Solar and Storage

ConEdison System with Remote Crediting

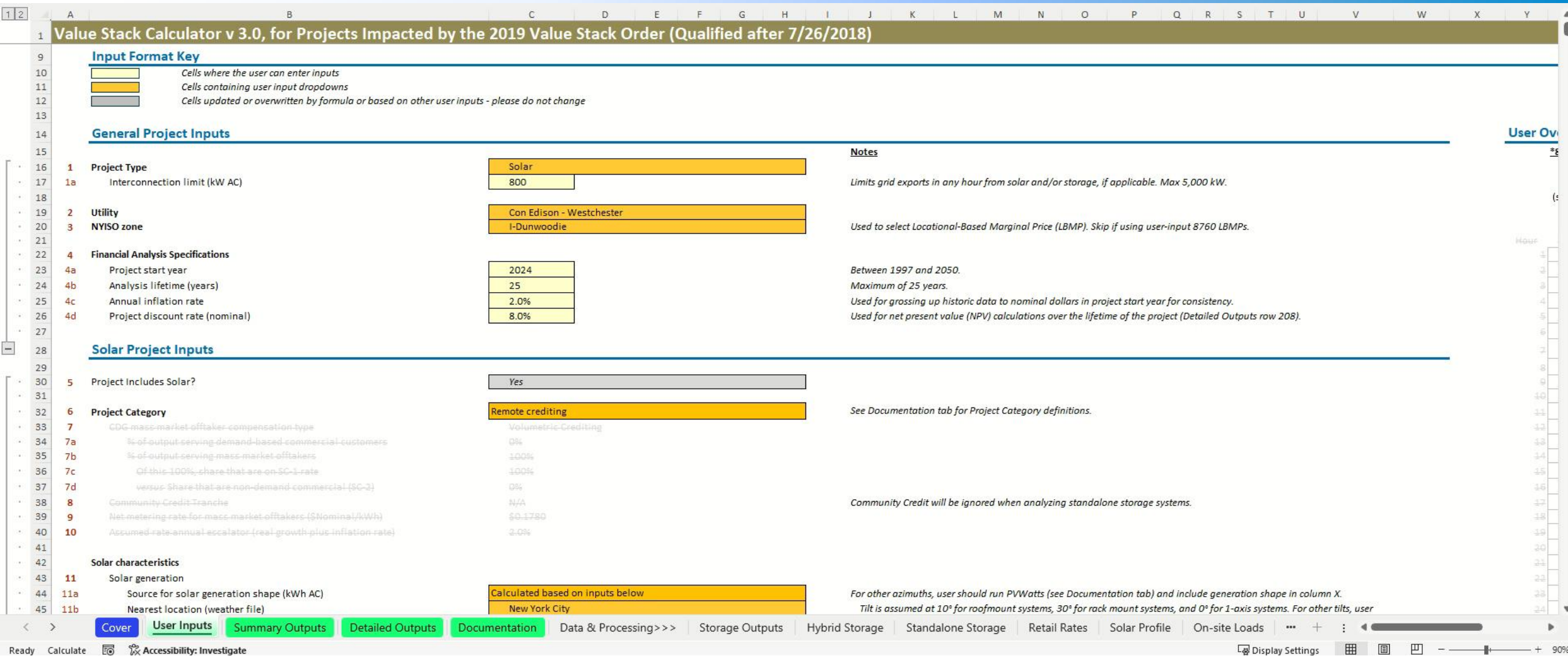
1 MWdc of PV, 800kWac interconnection limit, no on-site load, 2-6PM peaking window

Year 1 revenue = ?

Add 200kW, 4-hr battery, under ICAP Alternative 2

Year 1 revenue = ?

Remote Crediting with Solar and Storage



Value Stack Calculator v 3.0, for Projects Impacted by the 2019 Value Stack Order (Qualified after 7/26/2018)

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General Project Inputs

			Notes
1	**Project Type**	Solar	
1a	Interconnection limit (kW AC)	800	*Limits grid exports in any hour from solar and/or storage, if applicable. Max 5,000 kW.*
2	**Utility**	Con Edison - Westchester	
3	**NYISO zone**	I-Dunwoodie	*Used to select Locational-Based Marginal Price (LBMP). Skip if using user-input 8760 LBMPs.*
4	**Financial Analysis Specifications**		
4a	Project start year	2024	*Between 1997 and 2050.*
4b	Analysis lifetime (years)	25	*Maximum of 25 years.*
4c	Annual inflation rate	2.0%	*Used for grossing up historic data to nominal dollars in project start year for consistency.*
4d	Project discount rate (nominal)	8.0%	*Used for net present value (NPV) calculations over the lifetime of the project (Detailed Outputs row 208).*

Solar Project Inputs

5	Project Includes Solar?	*Yes*	
6	**Project Category**	Remote crediting	*See Documentation tab for Project Category definitions.*
7	~~CDG mass market offtaker compensation type~~	~~Volumetric Crediting~~	
7a	~~% of output serving demand-based commercial customers~~	~~0%~~	
7b	~~% of output serving mass market offtakers~~	~~100%~~	
7c	~~Of this 100%, share that are on SC-1 rate~~	~~100%~~	
7d	~~versus Share that are non-demand commercial (SC-2)~~	~~0%~~	
8	~~Community Credit Tranche~~	~~N/A~~	*Community Credit will be ignored when analyzing standalone storage systems.*
9	~~Net metering rate for mass market offtakers ($Nominal/kWh)~~	~~$0.1780~~	
10	~~Assumed rate annual escalator (real growth plus inflation rate)~~	~~2.0%~~	
	Solar characteristics		
11	Solar generation		
11a	Source for solar generation shape (kWh AC)	Calculated based on inputs below	*For other azimuths, user should run PVWatts (see Documentation tab) and include generation shape in column X.*
11b	Nearest location (weather file)	New York City	*Tilt is assumed at 10° for roofmount systems, 30° for rack mount systems, and 0° for 1-axis systems. For other tilts, user*

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Behind-the-Meter Solar with On-site Load

O&R small commercial customer with on-site load

40kW DC system

Customer currently consumes 50,000kWh/year at $0.14/kWh

A) Solar reduces customer's O&R bill purchases by $? / yr
B) Solar provides value stack credits of $? /yr
C) Customer's annual savings from solar (bill savings + value stack credits) = A+B

Behind-the-Meter Solar with On-site Load

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General Project Inputs

			Notes
1	**Project Type**	Solar	
1a	Interconnection limit (kW AC)	5000	*Limits grid exports in any hour from solar and/or storage, if applicable. Max 5,000 kW.*
2	**Utility**	Orange & Rockland	
3	**NYISO zone**	G-Hudson	*Used to select Locational-Based Marginal Price (LBMP). Skip if using user-input 8760 LBMPs.*
4	**Financial Analysis Specifications**		
4a	Project start year	2024	*Between 1997 and 2050.*
4b	Analysis lifetime (years)	25	*Maximum of 25 years.*
4c	Annual inflation rate	2.0%	*Used for grossing up historic data to nominal dollars in project start year for consistency.*
4d	Project discount rate (nominal)	8.0%	*Used for net present value (NPV) calculations over the lifetime of the project (Detailed Outputs row 208).*

Solar Project Inputs

5	Project Includes Solar?	*Yes*	
6	**Project Category**	Projects with on-site load	*See Documentation tab for Project Category definitions.*
7	CDG mass-market offtaker compensation type	Volumetric Crediting	
7a	% of output serving demand-based commercial customers	0%	

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Ready | Accessibility: Investigate | Display Settings | 90%

Stand-alone Storage

ConEdison stand-alone storage customer

1000kW, 4-hr battery system under ICAP Alternative 3

Year 1 revenue = ?

Year 1 charging cost = ?

Year 1 net revenue = ?

Stand-alone Storage

Value Stack Calculator v 3.0, for Projects Impacted by the 2019 Value Stack Order (Qualified after 7/26/2018)

Instructions

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CALCULATE

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General Project Inputs

			Notes
1	**Project Type**	Standalone Storage	*Standalone storage systems are only eligible for Alternative 3 rate for capacity compensation. Standalone storage must be front-of-the-meter.*
1a	Interconnection limit (kW AC)	5000	*Limits grid exports in any hour from solar and/or storage, if applicable. Max 5,000 kW.*
2	**Utility**	Con Edison - New York City	
3	**NYISO zone**	J-NYC	*Used to select Locational-Based Marginal Price (LBMP). Skip if using user-input 8760 LBMPs.*
4	**Financial Analysis Specifications**		
4a	Project start year	2024	*Between 1997 and 2050.*
4b	Analysis lifetime (years)	25	*Maximum of 25 years.*
4c	Annual inflation rate	2.0%	*Used for grossing up historic data to nominal dollars in project start year for consistency.*
4d	Project discount rate (nominal)	8.0%	*Used for net present value (NPV) calculations over the lifetime of the project (Detailed Outputs row 208).*

Solar Project Inputs

5	Project Includes Solar?	*No*
6	Project Category	Community distributed generation
7	CDG mass market offtaker compensation type	Volumetric Crediting
7a	% of output serving demand-based commercial customers	0%
7b	% of output serving mass market offtakers	100%
7c	Of this 100%, share that are on SC-1 rate	100%

This row fills automatically so that rows 34 and 35 sum to 100%.

User Overrides

Use these

***8760 override data belo**
Solar generation overrid
(8760 hours)
(select user input in cell C44)

Hour	Solar generation (kW)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	

Cover | User Inputs | Summary Outputs | Detailed Outputs | Documentation | Data & Processing>>> | Storage Outputs | Hybrid Storage | Standalone Storage | Retail Rates | Solar Profile | On-site Loads

Calculate | Accessibility: Investigate | Display Settings | 85%

Thank you!