

PUBLIC LANDS: LEVERAGING CITY REAL ESTATE TO SUPPORT MORE CLEAN ENERGY INFRASTRUCTURE

ABSTRACT

This research area focused on ways to use City-owned property for clean energy development more efficiently. Research focused on developing community solar on public land using site access agreements and power purchase agreements, consistent with how the City currently develops rooftop solar for its own power generation. The research included a financial analysis of the optimal financing structure for community solar development in a post-IRA context, a prioritization framework for development site selection, and an initial list of potential sites for a City-run community solar pilot project.

The public land research led to key findings that will assist the City in meeting sustainability targets and providing community energy. Using the prioritization framework described in the methodology section, a list of potential sites that should be considered for a community solar pilot, including schools and an FDNY office across the boroughs, was identified. While the list provided is non-exhaustive, the prioritization framework can be used to select public community solar sites moving forward. Additionally, the financial analysis examined available tax benefits on a state and federal level. If the City were to maximize available community solar incentives projects could reach prices as low as \$53 per MWh for a 500-kW project with project revenue rates at \$0.18 per kWh in 2023.

RESEARCH AREA OVERVIEW AND OBJECTIVE

The PowerUp NYC research included an assessment of how City real estate may support the interconnection of new clean generation and grid resources. The public lands research focused on using City real estate, including buildings and land, specifically to support community solar and standalone energy storage systems.

The City has established a goal of installing 100 MW of solar on City-owned buildings by the end of 2025. As of April 2023, over 21 MW of generation has been installed, with an additional 211 projects in process for 52.6 MW. Outside of projects that are underway, about 200 public sites within NYC are considered “solar-ready.” These sites are anticipated to provide approximately 17 MW of additional solar capacity.

In terms of community solar, although New York State has a significant amount of development, NYC has room for growth. NYSERDA data shows that while 1.15 GW of community solar capacity has been installed within NY outside of NYC, only 33.37 MW has been installed within the city as of October 2022.ⁱ Existing incentives and new policy developments may have the potential to shift the City’s role in community solar development, and this study aimed to explore how this may happen and what administrative initiatives are needed to expand access to community solar citywide. Additionally, the research examined potential legal or administrative changes that should be implemented to allow the City to speed up solar project deployment to meet sustainability targets.

The purpose of this research was to determine how City real estate can be used most effectively to support solar and storage development; this has been done through a short-term and long-term lens. The short-term analysis focused on establishing community solar on City land via site access agreements and power purchase agreements (PPA), which is the administrative pathway currently used by the City for rooftop solar development. The short-term analysis also includes a financial analysis, which examines the optimal financing structure and potential bill savings for community solar subscribers given new and existing incentives. The long-term lens looked at developing solar and energy storage on public land by bundling multiple properties into one lease agreement and land use review. The analytical work used to identify City-owned sites that would be prime candidates for energy storage development, as well as any storage-related findings, can be found in the concurrent PowerUp energy storage research findings.

METHODOLOGY

A large portion of the research findings in this area are qualitative; information was uncovered via ongoing conversations with various City Agencies and qualitative research. The primary quantitative analysis for this research area was the financial analysis used to evaluate optimal financing structures for community solar development on City land. Additional analysis was done to develop the prioritization frameworks for sites to be used for community solar and standalone storage projects.

Financial Analysis

The financial analysis was conducted using the E3 Pro Forma, an internal financial model used to determine a project's levelized all-in cost of energy (LCOE). Potential rate savings were based on E3's Value of Distributed Energy Resources (VDER) revenue forecasted for NYISO Zone J, modified to account for typical distribution of VDER revenues across community solar stakeholders in Consolidated Edison service territory. The following inputs were used in the analysis:

NYC LTEP Input Summary					
Input	Unit	Value	Source	Uncertainty	Notes
Project characteristics					
Project size	MWac	0.5	DCAS	Low	Maximum viable project size
Inverter loading ratio	MWdc/MWac	1.15	E3	Low	E3 default assumption
Net capacity factor	%	0.1	DCAS	Low	Derived from indicative production profiles on existing NYC solar projects
Degradation	%	0.5%	E3	Low	E3 default assumption
Project costs					
Capital costs	\$/kWac	3,000	DCAS	Medium	Based on existing DCAS PPA price with Generate Capital assuming 6% ULAT IRR
Interconnection cost	\$/kWac	50	DCAS	Low	Average of DCAS site data
Annual fixed O&M	\$/kWac-yr	24.9	E3	Medium	E3 default assumption; 2% annual escalation
Federal corporate tax	%	21.0%	E3	Low	Published rate
State corporate tax	%	6.5%	E3	Medium	Further diligence required around potential exemptions for solar equipment
NYC corporate tax	%	4.5%	E3	Medium	Further diligence required around potential exemptions for solar equipment
Financing Assumptions					
Financing lifetime	yrs	35	E3	Low	E3 default assumption
Debt period	yrs	20	E3	Low	E3 default assumption

NYC LTEP Input Summary					
ITC monetization	%	90%	E3	Medium	E3 default assumption
Direct pay monetization	%	100%	E3	Medium	E3 default assumption
NY-SUN incentive	\$/W	Available	NYSERDA	Low	Based on existing Block 1 NY Sun incentive rates for nonresidential projects in Con Ed region
Debt sizing haircut (collateral reduction value)	%	10% for 50% ITC NY Sun 25% for 60% ITC NY Sun	E3	Medium	E3 internal assumption

The key constraints and uncertainties involved in this analysis are:

- At the time of this analysis, certain definitions in the Inflation Reduction Act of 2022 (IRA) remained uncertain pending further guidance from the IRS and Department of Treasury. As of July 2023, the IRS has released clarification and guidelines on several covered programs including the investment and production tax credits, and tax credit bonuses. Notably, the White House and the U.S. Department of Energy recently released mapping tools that identify energy and low-income communities relevant to bonus tax credits for solar facilities smaller than 5 MW.ⁱⁱ Despite these updates, uncertainty remains regarding funding streams for decarbonization initiatives. Many IRA grants such as the Greenhouse Gas Reduction Fund (GGRF) have recently released Notices of Funding Opportunities (NOFOs), but are not yet awarded. States and municipalities are in the midst of developing proposals to access these federal funds, but the local impacts will depend on the awarded amount. Additionally, while the IRS released draft guidance on IRA direct pay for tax-exempt entities, it has not yet been finalized, providing another source of funding uncertainty.ⁱⁱⁱ
- Debt sizing assumptions are indicative and would be subject to commercial negotiations between prospective lenders, developers, and the City.
- While this analysis assumed that community solar projects would be financed by non-recourse project-level debt under either private or municipal ownership, city governments may also elect to use corporate debt backed by municipal credit as a financing mechanism. For heavily subsidized projects with limited revenue to support debt service coverage under a typical project loan, the corporate financing approach may be more value-accretive than a non-recourse project financing. Modeling this approach is beyond the scope of this analysis.

Site Prioritization

A site prioritization framework was developed to identify sites that would make strong candidates for community solar projects, and to recommend a small group of sites for consideration of a community solar pilot. The first framework was built off the existing criteria used in the most recent City of New York Municipal Solar-Readiness Assessment report, which is prepared in compliance with Local Law 24 of 2016. The report lists City-owned properties that are considered “solar-ready” based on factors including roof age, roof condition, gross building square feet, and building structural condition. Additional factors were considered to identify which solar-ready buildings would be strong candidates for a community solar pilot program. Factors included:

- Whether the property is in an Environmental Justice (EJ) area: a location’s EJ status was used as a proxy to determine if the project would be eligible to receive community solar tax incentives made available by the IRA for projects in low-to-moderate income (LMI) communities
 - LL24 information defines an EJ area as a low-income community or minority community, as determined by U.S Census Bureau, 2014 – 2018 American Community Survey.^{iv}

- LMI areas are generally defined as regions where at least half of all households have an income below 60% of the area’s median income, or a 25% poverty rate.
- How LMI areas would be defined by the IRA was unknown at the time of analysis; therefore, EJ area designation was used as a proxy. In February 2023, the IRS released guidance that defined LMI areas and energy communities for targeted IRA programs.^v
 - Additionally, the White House released a Climate and Economic Justice Screening tool, and in March 2023, New York State finalized the Disadvantaged Communities criteria and map, which the City has adopted. These new resources will be used to identify priority areas for community solar and low-income solar deployment.^{vi}
- Estimated capacity and annual energy production at each site: community solar projects that are less than 5 MW in AC (alternating current) nameplate capacity receive additional tax incentives under the IRA, but sites that had a higher estimated capacity beneath this threshold should be given priority.
- Hosting capacity: using the Con Edison hosting capacity map,^{vii} a location’s network hosting capacity can be determined and compared to the estimated solar power capacity for each site; only sites with adequate hosting capacity should initially be considered.

KEY FINDINGS

Through qualitative research and ongoing conversations with City Agency officials, the research team uncovered key findings regarding community solar development on City land. One key finding was that the current administrative pathway used by the City for rooftop solar development (site access agreement via PPA) can be extended to community solar development. The extent to which the development community and financial institutions are willing to invest in these types of projects will be uncovered through further communication. As such, the City plans to issue a Request for Information (RFI) to learn more about this topic. Additionally, it became clear the goal of installing 100 MW of solar on City land by 2025 is not limited to projects wherein the City is the sole offtaker – power generated by community solar projects on City land can contribute to the 100 MW goal. Given recent policy developments, particularly Tier 4 of the Clean Energy Standard which will increase availability of renewable energy credits (RECs) in NYC, the City can maintain sustainability targets and also allocate more solar capacity to community solar projects.

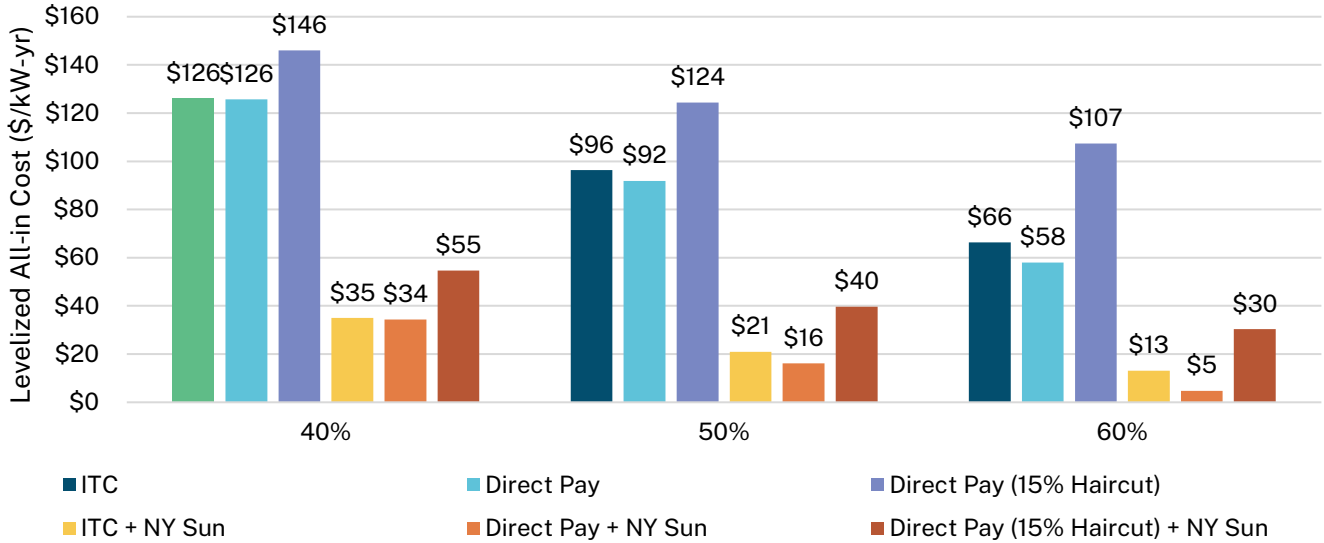
The site prioritization framework aided to identified the following locations for community solar pilot project consideration:

- J.H.S. 151 Lou Gehrig: DOE, located in the Bronx, 259 kW of estimated capacity
- Emma Lazarus High School: DOE, located in Manhattan, 206 kW of estimated capacity
- FDNY Bronx Central Office: 180 kW of estimated capacity
- P.S. 329 Surfside: DOE, located in Brooklyn, 161 kW of estimated capacity
- I.S. 077: DOE, located in Queens, 97 kW of estimated capacity

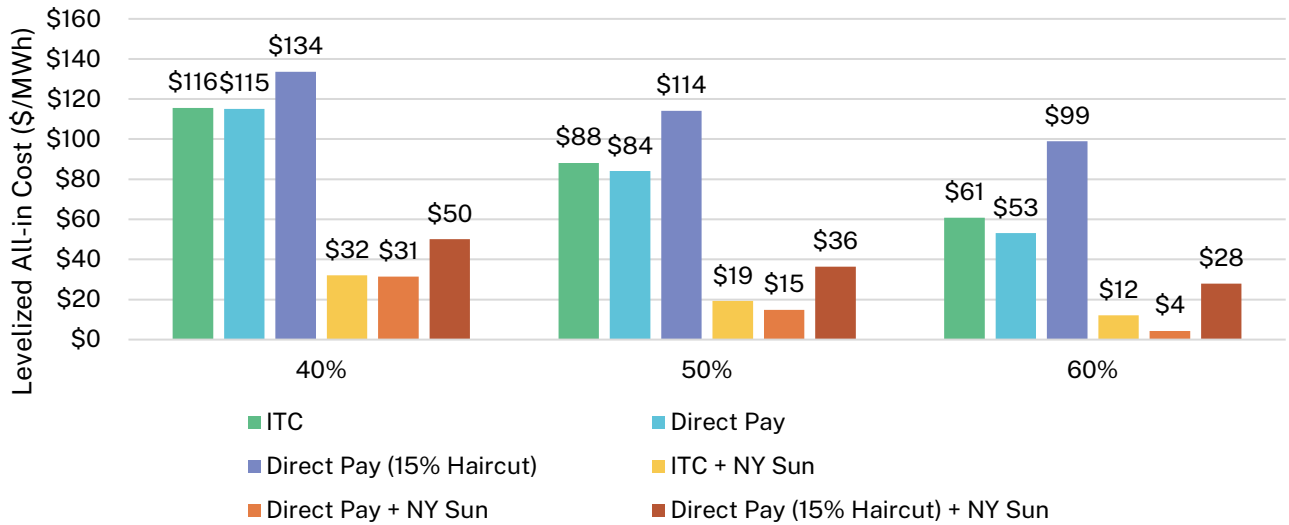
While this is a non-exhaustive list of potential sites that meet the criteria provided above, prioritization framework assumptions can be used as a starting point for project site identification. Non-energy benefits, including green jobs and educational or vocational training opportunities, should also be considered. In the list provided above, schools rooftops are prioritized as solar installations sites as they provide opportunities to teach students about clean energy and climate change. One such project example is the rooftop solar installation at Thomas A. Edison Career and Technical Education High School in Jamaica Hills, Queens.^{viii} It is important to note that, while it would not affect site selection, the portion of subscribers from low-income households impact a project’s tax incentives. As discussed below, at least 50% of subscribers must be low-income to receive maximum tax incentive and minimize costs.

Based on a preliminary analysis of the LOCE of commercial-scale solar in New York City, it would be financially advantageous for the City to prioritize siting solar projects in Disadvantaged Communities and provide benefits from those projects to low-income communities. This approach would enable the City to claim an additional 10% and 20% investment tax credit, respectively, on top of the 40% credit already available for projects that meet prevailing wage and apprenticeship requirements and are manufactured using domestic materials. The LCOE impact of each incremental 10% increase in the federal investment tax credit is about \$30/MWh for a 500-kW system, as shown in Figure X:

Levelized All-in Cost of Community Solar (500 kW)



Levelized All-in Cost of Community Solar (500 kW)

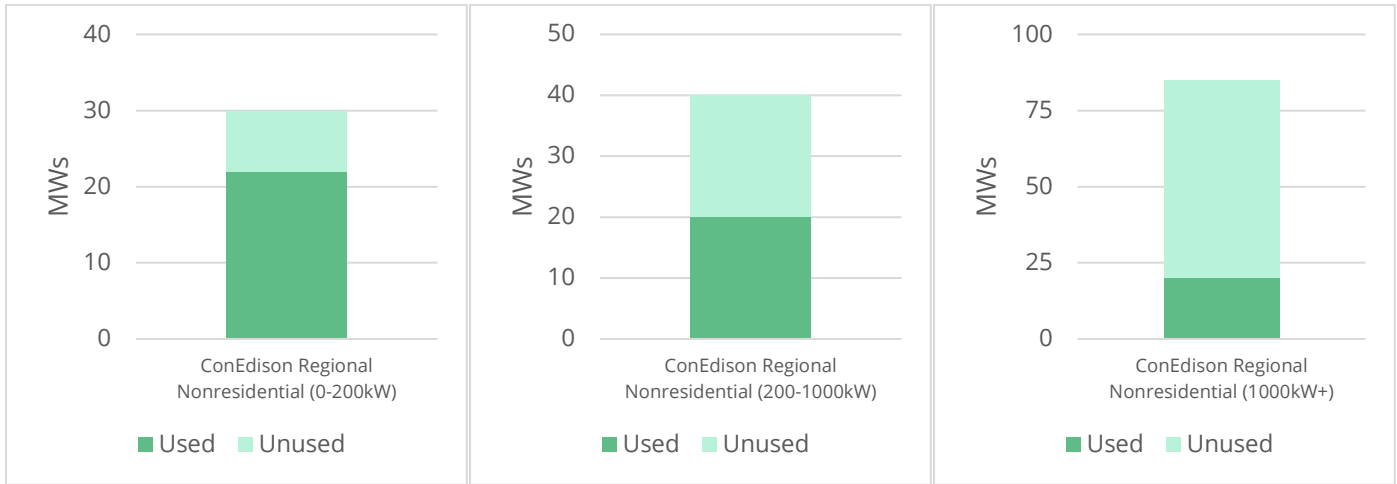


Furthermore, analysis suggests the City should consider financing structures that allow projects to monetize the ITC via direct pay, particularly for projects receiving both the low-income siting and low-income enrollment IRA bonus credits. Direct pay is available to tax-exempt organizations as well as state, local, and Tribal governments. Direct pay functions to allow project owners to receive the nonrefundable investment tax credit directly, rather than partnering with financing counterparties that can better use the full credit amount. This analysis assumes solar projects electing to receive direct pay tax benefits will receive a 10% higher credit upfront due to reduced financing costs, but will be ineligible to claim bonus depreciation, unlike projects receiving the typical ITC. These differences in financing structure are negligible for projects receiving the 40% credit but become more pronounced as overall tax benefits increase due to the available bonus credits.

One key constraint of the direct pay approach is that any use of tax-exempt financing to develop a project will yield a corresponding reduction in collateral value, or “haircut,” in the value of the available federal incentive, up to a maximum 15% reduction for projects with funding comprised of 15%+ tax-exempt debt. Accounting for this

reduction increases the levelized cost between \$20-40/MWh for projects that receive direct pay as part of a non-recourse project financing compared to equivalent projects using the ITC.

Another major factor affecting the upfront cost of community solar is the availability of the NY Sun incentive for nonresidential projects under 5 MW. NYSERDA’s NY-Sun program guarantees an upfront payment to projects based on their deliverable capacity, with projects under 200 kW currently eligible for \$1.20/W in incentives and projects between 200-1,000 kW eligible for \$1.00/W. The incentive is awarded based on a project’s entry into specific subscription blocks and steps down as each block becomes fully subscribed. The currently open blocks include 8 MW in available capacity for projects smaller than 200 kW and 20 MW available for projects between 200-1,000 kW. For a 500-kW project, the LCOE effect of receiving the NYSERDA incentive ranges from \$49/MWh to \$81/MWh, depending on the project’s available federal tax incentive. The variance is due to the combined federal and state tax incentives’ effect on a project’s debt ratio. The higher the incentive a project receives, the lower its revenue requirement to achieve the project owner’s desired return on equity becomes, which limits the ability to raise back-leveraged debt under a typical non-recourse project financing.



Source: [NYSERDA Con Edison Dashboard](#) (Jan. 30, 2023)

Rate Impacts of Community Solar

This study conducted a preliminary analysis of revenue streams available to distributed community solar resources in NYISO Zone J under the New York VDER program. The VDER value stack compensates projects in the form of bill credits based on when and where they provide electricity to the grid. The analysis assumed 90% of VDER revenues would accrue to the project owner and 10% would be distributed to subscribers based on precedent from earlier projects in the Con Edison region. However, the IRA created a 10% bonus adder to the ITC for solar projects under 5 MW that provide greater than 50% of the economic benefits¹ of generated electricity to low-income households. Pending further IRS guidance around the definition of “economic benefits,” it is possible developers will allocate a greater share of VDER revenues to subscribers going forward. Another factor affecting these results is the status of the Inclusive Community Solar Adder (ICSA), an incentive offered through NYSERDA for community solar projects enrolling LMI customers that is currently suspended pending program design revisions.

Results of the analysis through 2028 are shown in Table X and Table Y. As demonstrated in Table Y, bill credits distributed to subscribers based on VDER revenues are worth approximately \$0.02/kWh.

Zone J Community Solar – Project Revenues (\$2022/kWh)						
Year	2023	2024	2025	2026	2027	2028
Energy value	\$0.059	\$0.047	\$0.039	\$0.037	\$0.035	\$0.032
Capacity value	\$0.030	\$0.032	\$0.040	\$0.028	\$0.013	\$0.016
Environmental value	\$0.025	\$0.027	\$0.029	\$0.025	\$0.027	\$0.028
Demand reduction value	\$0.069	\$0.064	\$0.059	\$0.056	\$0.051	\$0.047

¹ “Economic benefits” to be defined by US Department of the Treasury
PowerUp NYC Public Land

Total	\$0.184	\$0.169	\$0.167	\$0.146	\$0.126	\$0.123
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Zone J Community Solar – Community Credits (\$2022/kWh)						
Year	2023	2024	2025	2026	2027	2028
Energy value	\$0.007	\$0.006	\$0.004	\$0.004	\$0.004	\$0.004
Capacity value	\$0.003	\$0.003	\$0.005	\$0.005	\$0.003	\$0.001
Environmental value	\$0.003	\$0.003	\$0.003	\$0.003	\$0.003	\$0.003
Demand reduction value	\$0.004	\$0.004	\$0.004	\$0.003	\$0.003	\$0.003
Total	\$0.017	\$0.016	\$0.016	\$0.015	\$0.013	\$0.011

ⁱ Source: [New York State](#)

ⁱⁱ Source: [White House CEJST](#), [DOE Energy Communities Map](#)

ⁱⁱⁱ Source: IRS Draft Guidance on Direct Pay [IRS Draft Guidance on Direct Pay Federal Register :: Section 6417 Elective Payment of Applicable Credits](#) [Federal Register :: Section 6417 Elective Payment of Applicable Credits](#)

^{iv} Source: [United States Census Bureau](#)

^v Source: [U.S. Department of the Treasury](#)

^{vi} Source: [NYSERDA DAC Map](#), [White House CEJST](#)

^{vii} Source: [Con Edison](#)

^{viii} Source: [New York City Department of Citywide Administrative Services](#)