COMMUNITY SOLAR NY PROGRAM

Final Initiative-Level Logic Model Report

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The New York State
Energy Research and Development Authority

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1 Initiative Context, Stakeholders, Intent, and Design

NYSERDA's Community Solar NY program is a new effort, established in 2014, which seeks to "make solar easier and more affordable through community-driven initiatives."[1] It provides technical assistance, standardized outreach and program support materials, and modest funding to community-based efforts to expand the use of solar photovoltaic (PV) electricity generation. At present, the program is focusing on residential aggregation or "solarize" projects, but it expects to address other community-based models in the future. Typical solarize campaigns share certain key features, including competitive selection of a participating solar contractor or contractors; community-led outreach and education to increase awareness and promote increased enrollment by residents; and a limited-time offer, guaranteeing set prices for solar PV systems purchased within a set timeframe (e.g., six months).[2]

Community Solar NY is a component of Governor Cuomo's NY-Sun Initiative. The initiative seeks to reduce the cost of installed PV systems and sets aggressive targets for solar PV deployment in New York State. It provides long-term funding certainty through a nearly $1 billion commitment over 10 years to support PV projects across New York State. The initiative also draws on programs across multiple agencies to achieve its goals, leveraging existing resources and staff expertise to develop holistic solutions. Other programs under NY-Sun include the Solar Cost Reduction program, which funds third-party projects to reduce balance-of-system (BOS) PV costs through the development and demonstration of new products, business and financing models, and other innovative strategies; the Megawatt (MW) Block program, a deployment effort that subsidizes purchases of PV systems; and K-Solar (run by NYPA), which follows a similar approach to Community Solar NY but focuses specifically on schools. Other solar-focused efforts also fall under the umbrella of NY-Sun. IEc is conducting a separate logic modeling effort covering Community Solar NY, MW Block, and Solar Cost Reduction, which will provide further detail on these related efforts.

The Community Solar NY program is being implemented in the midst of significant changes in New York's energy market. Currently, the Department of Public Service is undertaking an initiative, known as Reforming the Energy Vision (REV), to reform the state's energy industry and regulatory practice. Core policy goals relate to customer knowledge, market animation, system-wide efficiency, fuel and resource diversity, system reliability and resiliency, and carbon reduction.[3] Distributed energy resources such as solar PV are expected to increase in importance as the REV proceeding moves forward. The Community Solar NY program aims to respond to these anticipated changes and support the broader market goals being developed.

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[1] "NY-Sun Brings Solar to Your Community." NY-Sun, http://ny-sun.ny.gov/Get-Solar/Community-Solar. Accessed June 2, 2015.

[2] Irvine, Linda et al., "The Solarize Guidebook: A Community Guide to Collective Purchasing of Residential Systems." Northwest Sustainable Energy for Economic Development (Northwest SEED). Prepared for the National Renewable Energy Laboratory (NREL). DOE/GO-102012-3578, May 2012.

[3] 14-M-0101: Reforming the Energy Vision (REV)." New York Department of Public Service, 2015, accessed June 7, 2015, http://www3.dps.ny.gov/W/PSCWeb.nsf/All/26BE8A93967E604785257CC40066B91A?OpenDocument

Targeted Problem

The overall cost of solar PV installations has fallen considerably in recent years.[4] This trend has been driven largely by reductions in the average cost of PV modules; other cost components of PV systems, known collectively as balance-of-system (BOS) costs, have remained comparatively stable. BOS costs currently constitute more than 50 percent of the cost of installed residential and commercial PV systems in New York.[5] These BOS costs must drop for solar-generated electricity to achieve greater market penetration. High costs also limit access to solar PV for low-income and other disadvantaged groups.

Several specific BOS cost components can be effectively reduced through solarize or other community-based efforts. For instance:

- Customer acquisition refers to the marketing and other costs required to secure the sale of a PV system. For residential systems in particular, customer acquisition represents a major proportion of solar PV companies' overall expenses.[6] Existing strategies for targeting potential customers are inefficient, with limited use of marketing partnerships, referral programs, and online outreach materials.[7] Community-led outreach and education can overcome this barrier by providing a cheap and effective means to engage with potential customers, often leading to a dramatic increase in customers in a particular location for comparatively little effort on the part of the solar installation company.

- Contracts for PV installations are not always standardized, necessitating more time-consuming and expensive due diligence processes.[8] By signing up hundreds of customers from the same community at the same time, solarize efforts can provide at least some degree of standardization and realize economies of scale in this regard.

[4] Alan Goodrich, Ted James, and Michael Woodhouse, "Residential, Commercial, and Utility-Scale Photovoltaic (PV) System Prices in the United States: Current Drivers and Cost-Reduction Opportunities," National Renewable Energy Laboratory, February 2012, page 2.

[5] State University of New York – Albany, College of Nanoscale Science & Engineering, "Analyzing Solar PV Installation Data in NY," page 6.

[6] Friedman, Barry, et al. "Benchmarking Non-Hardware Balance-of-System (Soft) Costs for U.S. Photovoltaic Systems, Using a Bottom-Up Approach and Installer Survey – Second Edition." National Renewable Energy Laboratory. October 2013, p. 1.

[7] Ardani, Kristen, et al. "Non-Hardware ('Soft') Cost-Reduction Roadmap for Residential and Small Commercial Solar Photovoltaics, 2013-2020." National Renewable Energy Laboratory and Rocky Mountain Institute. August 2013, page 6.

[8] Mendelson, Michael, and David Feldman. "Financing U.S. Renewable Energy Projects Through Public Capital Vehicles: Qualitative and Quantitative Benefits." National Renewable Energy Laboratory. April 2013, page 5.

- Other aspects of permitting, inspection, and interconnection and interconnection processes could be streamlined:[9]

    - Permitting processes are often cumbersome, requiring extensive paperwork and rarely allowing online application;

    - Specific permitting requirements are often opaque, and accessing information about regulations can be difficult for both developers and customers;

    - Grid interconnection requirements vary by location, and information on specific sites is often not available before beginning project development; and

    - Multiple inspections from local governments and utilities increase project cost and time.

  The Community Solar program requires participating jurisdictions to commit to streamlining their permitting, inspection, and interconnection processes as a condition of receiving program support.

- Potentially, the competitive nature of the contractor selection process could incentivize selected contractors to offer more attractive prices to customers, while still profiting from the higher customer volume.

In addition, numerous other barriers to BOS cost reduction could be addressed through the range of projects possible under Community Solar NY's innovation track. The Logic Model Report for the Solar Cost Reduction Program discusses these additional barriers in detail.

The social component of solar PV purchasing presents another challenge, distinct from cost. Researchers have documented "peer effects" wherein people are more likely to purchase a solar PV system if their neighbors have already installed PV systems.[10,11] This means that, holding costs constant, increasing market penetration will be a slower process in areas with fewer existing installations of PV systems. Consequently, interventions that significantly increase the number of PV systems in a defined geographic area can be expected to have indirect peer effects that continue to increase solar PV market penetration after the program has concluded. Because solarize programs are generally implemented in relatively compact geographic areas (e.g., cities or towns), they could be a potentially effective means of using peer effects to accelerate solar PV adoption.

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[9] City University of New York, NYSERDA, and NYPA. "NYSolar Smart Survey Final Report." January 2014, pages 9-22, 28, and 35-36.

[10] Gillingham, Kenneth, Bryan Bollinger, and Hilary Staver. "The Role of Information and Social Interactions on Solar Adoption Decisions and Equilibrium Prices: Evidence from a Field Experiment." Presentation to Resources for the Future. September 18, 2014.

[11] Gillingham, Kenneth and Bryan Bollinger. "Peer Effects in the Diffusion of Solar Photovoltaic Panels." August 5, 2012. http://environment.yale.edu/gillingham/BollingerGillingham_PeerEffectsSolar.pdf

Program Design

The Community Solar NY program uses a twofold approach.

First, through 'standard path' projects, the program aims to support the widespread deployment of fairly standardized, community-based solar purchasing and/or ownership models. Initially, the standard path is promoting the 'solarize' model of aggregated residential and commercial purchasing. Solarize efforts have met with success in other states, but have been underutilized to date in New York. Program staff modeled the Community Solar NY approach in particular on efforts in Massachusetts and Connecticut. The Community Solar NY program provides modest financial support, standardized marketing and other materials, and technical assistance to jurisdictions throughout New York that undertake community-led solarize campaigns. In the future, Community Solar NY expects to move from solarize to other community-based efforts, but the exact nature of these future projects is not yet defined. Aggregated purchasing and/or financing for municipalities, nonprofit institutions, and commercial buildings provide one possible example. The program's future direction will be driven in part by lessons learned from its initial solarize efforts, as well as by regulatory, policy, or market changes driven by New York's Reforming the Energy Vision (REV) proceeding.

Second, Community Solar NY also features 'innovation path' projects. Innovation path projects are more variable in focus and structure than standard path projects, and may employ a variety of approaches to reduce costs and increase market access to solar PV. Current innovation path projects were moved to the Community Solar NY program from other NYSERDA programs. Potential innovation project types could introduce new business models, greater scale, or greater complexity compared to standard path projects. Successful innovation path projects could achieve replication effects by providing the basis for future standard path projects.[12,13]

[12] Community Solar NY Program Plan, May 28, 2014, p. 3.

[13] Personal communication with Max Joel, NYSERDA, May 14, 2015.

2 Program Objectives (High-Level)

Through a review of the Community Solar NY Program Plan and other materials, IEc has identified the following main objectives for the Community Solar NY program:[14]

- Increase solar deployment, reduce solar soft costs and advance NY-Sun objectives;
- Increase uptake of efficiency and other distributed energy resources by solar customers;
- Advance workforce development and job creation;
- Achieve community-level project priorities;
- Increase public awareness of solar PV and market power of consumers; and
- Improve access to solar PV for underserved income groups and geographic areas.

The Community Solar NY also aims to respond to and support the objectives being articulated in New York's Reforming the Energy Vision proceeding, and to further the objectives and focus of New York's Clean Energy Fund (CEF). The CEF includes four portfolios of activity intended to achieve self-sustaining clean energy industries in New York, greater levels of private capital invested in clean energy and jobs in the state, and significant reductions in greenhouse gas emissions from the state's energy sector. Community Solar NY is one of the community-based market enabling strategies under the CEF. Community Solar NY is also closely coordinated with NYSERDA's overall community and local government program area.

[14] Community Solar NY Program Plan, May 28, 2014, pp. 1, 8-9.

3 Resources

The Community Solar NY program has received a total of $13.5 million in funding for the duration of the NY-Sun Initiative (2014-2023). Approximately $10 million of this is budgeted for the first five years of the program. Funding for the NY-Sun Initiative comes from NYSERDA, the Long Island Power Authority (LIPA), PSEG Long Island, and the New York Power Authority (NYPA). Table 3-1 presents the allocation of total Community Solar NY funding by type of use. The Community Solar NY program has also inherited several BOS cost reduction projects that had already received funding under other NYSERDA programs, such as Cleaner Greener Communities and Solar Cost Reduction; funding for these projects is not reflected in Table 3-1.

Table 3-1. Community Solar NY Budget

Community Solar NY Budget				
	Average Annual ($)	**Total Funding 2014-2018 ($)**	**Total Funding 2019-2023 ($)**	**Total Funding ($)**
Program Staffing and Administration	225,000	1,250,000	1,000,000	2,250,000
Program Incentives	$550,000	$4,750,000	$750,000	$5,500,000
Direct Program Implementation Resources and Contractors	450,000	3,000,000	1,500,000	4,500,000
Program Outreach, Education, and Marketing	100,000	-	-	1,000,000
Total	**1,350,000**	**~10,000,000**	**~3,500,000**	**13,500,000**

Source: NYSERDA, “Community Solar NY Program Plan,” May 28, 2014, and personal communication with Max Joel, NYSERDA, July 10, 2015.

Staffing for the Community Solar NY program consists of three FTE, with additional support provided by contractors and a part-time intern.

4 Program Activities

This section provides a description of NYSERDA's activities under the Community Solar NY program. These activities fall into three major categories:[15]

Preliminary Activities:

- **Research and adapt existing community solar strategies for New York State context; consider opportunities presented by REV proceeding**: Prior to beginning program implementation, NYSERDA program staff participated in Department of Energy (DOE) and New York-based working groups and held conversations with program managers and participants of existing community solar programs in other states. Program staff also reviewed relevant research on community-based solar campaigns and projects, as well as existing literature on solar diffusion, peer effects, and network effects. To date, program staff have identified group purchasing of solar PV systems ("solarizing") as one community-based model that can be adapted, scaled, and standardized in the New York market. Program staff also intend to pursue other community-based models during later iterations of the program, by prioritizing rapid learning from experience and building feedback loops into program processes. They also intend to examine new opportunities presented by the changing regulatory context of New York's ongoing Reforming the Energy Vision (REV) proceeding.

- **Develop and adapt templates and other materials for installer selection process, media communications, and customer education**: Based on the insights and best practices gleaned from the efforts noted above, program staff developed standardized templates and other materials for community-based solar campaigns. These materials, which are intended to serve as a toolkit for community participants, include a model RFP for installer selection, website templates, and other "branded" Community Solar NY materials. For the initial solarize campaigns, program staff built upon materials developed for similar programs. Program staff also intend to revise the existing materials over time, based on changes in market conditions and the emergence of new community-based solar models.

- **Design custom web application form**: Program staff designed a custom web-based application form for communities seeking to participate in solar projects. While the participant selection process is framed as competitive, the program seeks to support all potential participants able to demonstrate readiness, community support, and local capacity and resources sufficient to implement a community-based solar campaign. The web application form is meant to establish a different relationship with community partners than would be the case with a traditional Program Opportunity Notice (PON) solicitation process. The

[15] Personal communication with Max Joel, Jennifer Phelps, and Lisabeth Tremblay, NYSERDA, May 14, 2015; and NYSERDA, "Community Solar NY Program Plan," May 28, 2014.

program seeks to provide communities with considerable ownership over the process of planning and launching their campaigns.

- **Conduct outreach to potential applicants and provide technical support for applicants**: During the application process, program staff provide communities with technical assistance and support in planning and preparing for their solar campaigns. Program staff also conduct outreach to potential applicants, including public webinars about group purchasing.

Standard Path Activities:

- **Provide grants, performance-based incentives, and technical assistance for community-led solar campaigns, including a streamlined customer acquisition platform, with contractor support**: Following its preliminary activities, the Community Solar NY program works to implement standardized community-based solar models across New York State. The program provides financial support and technical assistance for participating communities. To date, the program has secured the participation in solarize campaigns of over 30 towns, counties, and regions across the state. With contractor support, the program has provided these communities with templates for installer selection and educational materials; access to its newly created platform for streamlining customer acquisition; and assistance from expert consultants on contractor selection, project oversight, and related issues. Towns and counties participating in solarize campaigns have also received grants from NYSERDA in the range of $2,500 to $10,000 to accelerate project implementation and facilitate participation from community residents and organizations. The program began enrolling local governments, school districts, and other community partners in the second round of solarize campaigns in September 2015, with the campaigns launching in spring 2016.

  During later iterations of the program, participants will be able to apply for performance-based incentives based on the number of installations or the amount of solar PV capacity installed through community campaigns. The program also intends to track cost reductions to encourage installers to provide their own incentives, or match NYSERDA incentives, for future group purchases of solar PV installations.

- **Conduct outreach and education and facilitate sharing of best practices for community-led solar campaigns, with contractor support**: As communities plan and launch their solar campaigns, the program conducts further outreach and education for participants. For the solarize campaigns already underway, program staff and their contractors have jointly organized workshops, conferences, and webinars. These engagements have facilitated sharing best practices among community solar participants and between participants and other solar industry practitioners and professionals.

- **Assist participating communities in coordinating with other solar campaigns and NYSERDA programs, with contractor support**: The program also encourages participating communities to engage with other NYSERDA programs. Through these collaborations, communities might receive assistance in streamlining their permitting processes or zoning codes for solar PV installations, for example. During later

iterations of the program, communities might be encouraged to work with other NYSERDA programs to combine solar PV installations with other clean energy or distributed energy technologies, such as microgrids.

Community Solar NY has worked closely with contractors from NYSERDA's Economic Development Growth Extension (EDGE) program to raise community awareness of other relevant opportunities, particularly those that might also achieve local economic development objectives. Community Solar NY also seeks to assist participating communities in building local capacity, leveraging community networks, and incorporating local decision-making into clean energy programs.

Innovation Path Activities:

- **Provide investment and technical assistance to support innovative approaches to reduce BOS costs and expand solar market**: Under the "Innovation Path," the program will support community-based solar projects that are introducing new business and financing models, achieving greater scale, or reaching higher levels of complexity and impact. Although wide-ranging in their approaches, these projects seek to reduce balance-of-system costs for solar PV systems in New York State or to expand access to the solar market for underserved communities and geographic areas. Examples of potential projects include solar aggregation with community third-party ownership (C3PO), integration of solar PV with microgrids, or Community Shared Solar (CSS) models.

  The program will provide Innovation Path projects with both funding and technical assistance, which may include troubleshooting support, coordination between projects, or sharing of best practices and lessons learned. To date, the program has inherited existing projects that were initially funded by other NYSERDA programs, such as Cleaner Greener Communities and Solar Cost Reduction.

5 Program Outputs

This section describes the anticipated short-term results (i.e., outputs) associated with Community Solar NY activities. Outputs are the direct and measurable results of specific program activities. Outputs tend to be readily identified and quantified, often by reviewing program records.

Table 5-1. Outputs, Indicators, and Potential Data Sources for Community Solar NY Activities

Outputs		Leading Indicators	Data Sources and Potential Collection Approaches
Outputs from Preliminary Activities			
Established community solar models adapted for New York market, with attention to REV proceeding		Identification of community solar models suitable for New York market (yes/no)	Program staff knowledge: interviews
Standardized marketing and outreach materials and templates for installer selection created and shared with participating communities		Number of standardized marketing and outreach materials and templates created	• Program documentation: review of materials created • Program staff knowledge: interviews
Web application form developed		Development of web application form (yes/no)	Program documentation: reviewed development of web application form on program website (done)
Communities empowered to conduct community solar projects; applications received; jurisdictions selected for program participation		• Number of applications received from communities • Number of communities participating in solar programs	• Program documentation: review of documentation on applications received and jurisdictions selected • Program staff knowledge: interviews
Outputs from Standard Path			
Solarize and other community-led solar campaigns launched	Communities issue RFPs to solar installers; installer proposals evaluated	• Number of RFPs issued • Number of installer proposals received • Number of installers selected	Community/participant knowledge: survey
	Outreach and education conducted to market solarize and other community-led solar campaigns	• Number of communities where outreach and education campaigns are conducted • Number of individuals reached through campaigns • Number of attendees at presentations and webinars	Community/participant knowledge: survey
	Streamlined permitting processes and zoning code reforms achieved in participating jurisdictions	Number of communities with streamlined permitting processes and/or zoning code reforms	• Program documentation: review of participating communities' applications • Community/participant knowledge: survey
Collaborations with other NYSERDA programs and local initiatives established		Number of partnerships or other collaborations established with other NYSERDA programs and local initiatives	• Program staff knowledge: interviews • Community/participant knowledge: survey
Outputs from Innovation Path			
New business and financing models supported (e.g., crowd financing, shared solar ownership)		Number of new business and/or financing models supported	• Program documentation: review of documentation on supported projects • Program staff knowledge: interviews
Demonstration projects held for BOS soft cost reduction and/or market expansion strategies		Number of demonstration projects held	• Program documentation: review of documentation on supported projects • Program staff knowledge: interviews

6 Program Outcomes and Logic Diagram

This section contains the anticipated short-, mid-, and long-term outcomes of the Community Solar NY program. Outcomes are the expected effects of a program, which are often closely related to the program's goals and objectives. These outcomes include changes in awareness, behavior, or conditions. Compared to outputs, they are less certain to occur and should be prioritized as potential areas for investigation as part of a formal program evaluation.

Table 6-1 details expected outcomes of the Community Solar NY program, as well as the observable indicators that would signify the presence of these outcomes. Table 6-1 also shows data sources and potential data collection approaches that an evaluation effort might undertake to evaluate the achievement of the expected outcomes.

Table 6-1. Outcomes, Indicators, and Potential Data Sources for Community Solar NY Activities

Outcomes	Potential Indicators	Data Sources and Potential Collection Approaches
Short-Term Outcomes from Standard Path		
Improved understanding of successful community-based solar models in New York	Program structured and standardized materials designed effectively to address barriers to community-based solar models in New York State	• Program staff knowledge: interviews • External expertise on community solar: expert interviews
Established community solar models scaled and standardized in New York market	Community-based solar models implemented at scale in New York State	• Program staff knowledge: interviews • External expertise on community solar: expert interviews
Capacity of community organizations increased	Increases in funding, staffing, and/or membership of community organizations	Community/participant knowledge: survey
Local economic development and other priorities achieved	Number of local projects realized or assisted through collaboration with community solar campaigns	Community/participant knowledge: survey
Underserved income groups and geographic areas gain increased access to solar electricity	• Number of solarize campaigns conducted and/or solar PV systems installed directly through Community Solar NY projects in historically underserved geographic areas • Number of solar PV systems installed among other historically underserved demographic groups	• PowerClerk and/or other program data: analysis of PV installations in underserved geographic areas • Community/participant knowledge: survey
Community members participate in campaigns	Number of solar installations developed directly through Community Solar NY projects (preliminary target is 10,000 residential installations and 1,000 non-residential installations)	PowerClerk and/or other program data: analysis of PV installations through community solar projects
Solar capacity installed through Community Solar NY projects	Solar capacity installed directly through Community Solar NY projects (preliminary target is 50 MW)	PowerClerk and/or other program data: analysis of PV installations through community solar projects
Workforce development advanced and jobs created in participating communities	Number of jobs created by Community Solar NY projects in participating communities	• Economic impact models (e.g., Implan, REMI, or NREL's JEDI model): analysis of employment impacts • Installer reporting: follow-up installer survey

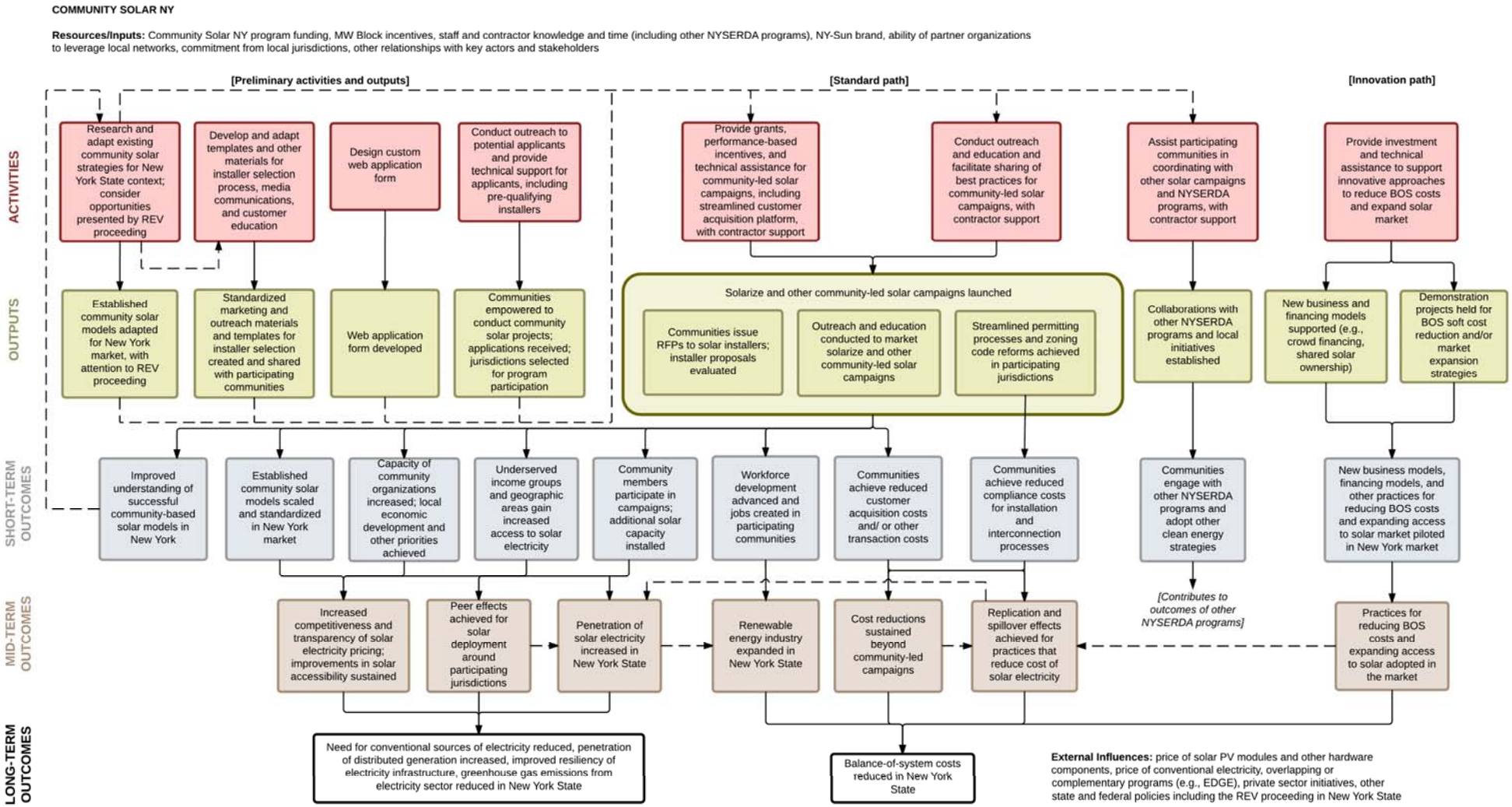
Outcomes	Potential Indicators	Data Sources and Potential Collection Approaches
Communities achieve reduced customer acquisition costs and/ or other transaction costs	• Change in average costs to supplier of identifying and converting new customers, and change in average costs to customers of identifying and selecting suppliers in participating communities • Cost per watt of new solar capacity installed directly through program (preliminary target is less than $0.10/W)	• PowerClerk: analysis of cost per installed system • Community/participant knowledge: survey • Installer reporting: baseline BOS cost survey and follow-up installer survey
Communities achieve reduced compliance costs for installation and interconnection processes	• Change in average costs of complying with installation and/or interconnection requirements in participating communities • Average length of permitting and interconnection processes in participating communities as compared to baseline • Cost per watt of new solar capacity installed directly through program (preliminary target is less than $0.10/W)	• PowerClerk: analysis of cost per installed system • Community/participant knowledge: survey • NY Solar Smart Study: analysis of baseline practices • Installers reporting: baseline BOS cost survey and follow-up installer survey
Communities engage with other NYSERDA programs and adopt other clean energy strategies	Number and percentage of participants that install both solar PV and energy efficiency measures or that incorporate advanced distributed energy strategies such as energy storage and microgrids	Community/participant knowledge: survey
Short-Term Outcomes from Innovation Path		
New business models, financing models, and other practices for reducing BOS costs and expanding access to solar market piloted in New York market	Number of pilot projects held for new and underused business models, financing models, and other practices	• Program documentation: review of reporting from supported projects • Funding recipient knowledge: interviews
Mid-Term Outcomes from Standard Path		
Increased competitiveness and transparency of solar electricity pricing	Lower spread between price and cost of residential PV systems in impacted geographies	• Stakeholder knowledge: interviews • Economic modeling: analysis of industry competition levels (e.g., comparison of system costs from installer survey to reported prices using PowerClerk) • Installer reporting: baseline BOS cost survey and follow-up installer survey
Improvements in solar accessibility sustained	Additional solar capacity installed in impacted geographies, especially in underserved regions or among underserved demographic groups	• PowerClerk and/or other program data: analysis of PV installations in impacted geographies • Potentially community/participant knowledge: survey
Peer effects achieved for solar deployment around participating jurisdictions	Additional solar capacity installed through projects in impacted geographies (preliminary target is 100 MW)	• PowerClerk: analysis of PV installations in impacted geographies • Community/participant knowledge: survey • Statistical analysis: propensity score matching or other approach[16]

[16] Propensity score matching is a statistical technique that estimates the probability of being in the treatment group to account for covariates between receiving treatment (e.g., participating in a solarize campaign) and the outcome under consideration (e.g., realizing peer effects in the deployment of solar PV). See, for example, Kenneth Gillingham, Bryan Bollinger, and Hilary Staver, "The Role of Information and Social Interactions on Solar Adoption Decisions and Equilibrium Prices: Evidence from a Field Experiment," presentation to Resources for the Future, September 18, 2014.

Outcomes	Potential Indicators	Data Sources and Potential Collection Approaches
Penetration of solar electricity increased in New York State	Penetration of solar electricity in impacted geographies (including participating and non-participating communities) during and after the program, as compared to other areas in New York State	• PowerClerk: analysis of PV installations in impacted geographies • Community/participant knowledge: survey • Statistical analysis: propensity score matching or other approach
Renewable energy industry expanded in New York State	• Number of jobs created by solar projects in surrounding communities (non-participating) • Number of jobs maintained beyond project term in participating communities	• Economic impact models (e.g., NREL's JEDI model): analysis of employment impacts • Installer reporting: follow-up installer survey
Cost reductions sustained beyond community-led campaigns	Cost per watt of new solar capacity in impacted geographies (preliminary target is less than $0.10/W)	• PowerClerk: analysis of cost per installed system • Statistical analysis: identification of cost reductions in impacted geographies
Replication and spillover effects achieved for practices that reduce cost of solar electricity	Market penetration of supported practices, beyond participating communities and projects directly funded by Community Solar NY program	• Stakeholder knowledge: interviews • Customer and/or installer knowledge: survey
Mid-Term Outcomes from Innovation Path		
Practices for reducing BOS costs and expanding access to solar adopted in the market	• Dollar value of commercial sales of supported BOS products and technologies • Valuation of companies or company divisions using those business models	• R&D Metrics database: review of commercial sales data • Documentation from funding recipients: review of documentation
Long-Term Outcomes		
Need for conventional sources of electricity reduced	Conventional generation avoided from installation of PV systems	• Electricity generation modeling: estimation of electricity generated from incremental number of solar installations from Community Solar NY program • Economic and engineering studies: analysis of avoided conventional generation
Penetration of distributed generation increased	Penetration of solar electricity and other relevant distributed generation resources (e.g., microgrids, energy efficiency measures) in participating communities after conclusion of program and in broader impacted geographies	Electricity generation modeling: estimated electricity generated from incremental number of solar installations and other distributed generation from Community Solar NY program
Greenhouse gas emissions from electricity sector reduced in New York State	Avoided emissions of carbon dioxide and other pollutants	• Standard emissions factors from avoided fossil fuel energy generation • Electricity generation modeling: estimation of electricity generated from incremental number of solar installations from Community Solar NY program
Balance-of-system costs reduced in New York State	Balance-of-system costs in New York State as compared to contemporary average (target 20 percent cost reduction as compared to New York State baseline)	Installer reporting: BOS baseline study and subsequent follow-up installer survey. It will not necessarily be possible to disentangle longer-term BOS cost reductions attributable to Community Solar NY versus other New York State solar initiatives, such as NY-Sun's Megawatt Block program.

Figure 6-1 presents a logic model diagram for the Community Solar NY program. The diagram shows causal linkages between activities; outputs; and anticipated short-, mid-, and long-term outcomes; as well as program resources and potential external influences.

Figure 6-1. Community Solar NY Program Logic Model



7 Assumptions About Strategies

This section describes testable assumptions about the Community Solar NY program that may be explored in later evaluations. IEc intends to address some or all of these assumptions through process and market impact evaluations, but limited data availability may impede our ability to conduct robust analyses for all of the areas listed below.

Testable Assumptions

1. The Community Solar NY program's approach of accepting most applications for program participation is more effective in increasing market adoption and lowering costs of solar PV than a more selective, narrowly targeted approach.

2. The resources NYSERDA offers to program participants are both necessary and sufficient incentive for communities to undertake solarize campaigns or other community-based approaches.

3. The key elements of solarize campaigns, including competitive contractor selection, community outreach, and a limited-time offer, are effective in lowering costs and overcoming barriers to adoption of solar PV and will result in increased installation of solar PV capacity.

4. Solarize campaigns and other community-based approaches will make solar PV more accessible and affordable for underserved income and geographic groups.

5. Solarize campaigns and other community-based approaches will create jobs and advance workforce development related to solar PV in participating communities.

6. Streamlining permitting processes and instituting zoning code reforms will reduce compliance costs for installation and interconnection processes.

7. Peer effects for solar adoption that have been observed in solarize efforts in other states will also be realized in New York State.

8. Customer aggregation and other community solar models can contribute to the adoption of other energy efficiency and renewable energy technologies (e.g., energy storage, microgrids, etc.); customer aggregation and other community solar models are an efficient means of promoting these other technologies.

9. Increased competitiveness and transparency of solar electricity pricing will last beyond the project term and spread to non-participating communities.

10. Streamlined processes for permitting, inspection, and interconnection, will last beyond the project term and spread to non-participating communities.

11. If NYSERDA supports the development and demonstration of new business models, financing models, and other practices for reducing BOS costs and expending access to the solar market, additional market actors will adopt these models in New York State.

12. Changing program focus over time (i.e., from solarize to other forms of community-based ownership or financing) will be more effective at reducing costs and increasing market penetration of solar PV than maintaining the same focus.

8 External Influences on Program Outcomes

This section describes factors external to the Community Solar NY program over which NYSERDA has no direct influence that may affect program outcomes.

Prices of solar PV modules and other hardware components: While soft costs account for more than half of the overall cost of a solar PV system in New York, hardware costs, which comprise the remainder, are nearly as important. The global market for module and non-module PV hardware components has had a considerable influence on overall PV system prices in recent years. The emergence of additional hardware suppliers, such as the dramatic expansion of Chinese module manufacturers between 2006 and 2012, could reduce the price of PV systems. Conversely, shortages of key commodities, like the shortage of polysilicon between 2004 and 2008, could raise the price of PV systems.[17] These price changes affect the overall financial attractiveness of PV systems, and thus their levels of market adoption.

Price of conventional (nonrenewable) electricity: The attractiveness of solar PV systems depends in large part on the cost of electricity from other sources, such as natural gas and coal. Because natural gas currently provides almost half of New York's electricity, its price will be especially relevant in determining the state's overall electricity generation profile over the long run.[18]

Overlapping or complementary programs, such as EDGE: Other national and state-level programs seek to reduce BOS costs and increase market penetration of solar PV. The U.S. Department of Energy's SunShot Initiative seeks to reduce the cost of solar PV systems by 75 percent between 2010 and 2020.[19] Within New York, NYSERDA efforts include the Megawatt Block incentive program; the Solar Cost Reduction program; and programs on workforce training and development, and permitting initiatives. Workforce development initiatives affiliated with NY-Sun, for example, include technical and more general training for local officials involved in permitting and inspection processes for PV systems.

The Economic Development Growth Extension (EDGE) program may be particularly important for Community Solar NY. In the EDGE program, Regional Outreach Contractors (ROCs) assist communities by matching energy project needs with available NYSERDA support opportunities.[20] As such, they play a

[17] Alan Goodrich, Ted James, and Michael Woodhouse, "Solar PV Manufacturing Cost Analysis: U.S. Competitiveness in a Global Industry," National Renewable Energy Laboratory, October 10, 2011, and Ucilia Wang, "Polysilicon Prices Head for a Steep Fall," Greentech Media, November 13, 2008, accessed May 15, 2014, http://www.greentechmedia.com/articles/read/polysilicon-prices-head-for-a-steep-fall-5174.

[18] U.S. Energy Information Administration, "State Electricity Profiles: New York Electricity Profile 2012," released May 1, 2014, http://www.eia.gov/electricity/state/newyork/index.cfm.

[19] U.S. Department of Energy. "SunShot Vision Study," February 2012, page 86.

[20] "Economic Development Growth Extension (EDGE) Program: Building Community Support for Energy Projects." NYSERDA, 2014, accessed June 7, 2015, ny-sun.ny.gov/-/media/files/EERP/EDGE/EDGE-fs.pdf

key role in representing NYSERDA throughout the state, and in linking different NYSERDA programs together. Community Solar NY staff have identified EDGE contractors as a valuable program resource.

Private sector initiatives: Private sector efforts to establish competitive advantage in the PV industry may result in reduced BOS costs. Similar to the Community Solar NY program, companies such as Clean Energy Collective are seeking to develop community-based ownership to reduce customer acquisition and contracting costs for widespread PV deployment.[21] Other companies like Mosaic are pioneering new financing models, such as peer-to-peer lending, to lower PV financing costs.[22] Addressing BOS hardware costs, Google has offered a $1 million prize for the development of a smaller and lower cost inverter.[23]

Federal and state energy policies: Residential and commercial PV systems receive federal government support through the Investment Tax Credit (ITC). Commercial PV systems receive additional tax benefits through the Modified Accelerated Cost Recovery System (MACRS). Within New York, solar installations receive support through direct incentives, administered through the MW Block program; state tax credits; sales and property tax exemptions; loan programs; and net metering, among other initiatives. The expiration of any of these policies could stunt the development of the solar PV industry. New York's Reforming the Energy Vision (REV) proceeding will be of particular interest in shaping the future policy landscape. It is expected to spur far-reaching regulatory changes in the state, and in particular, changes to promote the use of distributed energy generation and other customer-side resources as a "primary tool in the planning and operation of the utility system."[24] The Community Solar NY program aims to respond to these developments by adapting its activities and outputs over time.

Electricity distribution infrastructure: Existing distribution infrastructure may be unable to support high penetrations of solar PV, particularly within certain geographic areas participating in community solar campaigns. As a consequence, interconnection costs may become prohibitively expensive in certain areas, or utilities may not approve grid interconnection of additional solar resources in other areas. The changing roles of distribution utilities in New York State under the REV proceeding may also influence the reliability of existing distribution infrastructure as well as levels of investment in infrastructure improvements.

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[21] "About CEC." Clean Energy Collective, 2015, accessed June 7, 2015, http://www.easycleanenergy.com/aboutUS.aspx

[22] "About Mosaic." Solar Mosaic, Inc., 2015, accessed June 7, 2015, https://joinmosaic.com/about-mosaic

[23] Tim Worstall, "Google's Little Box Challenge; A $1 Million Prize for Creating a Better, Smaller, Solar Power Inverter," Forbes, May 10, 2014, accessed May 16, 2014, http://www.forbes.com/sites/timworstall/2014/05/10/googles-little-box-challenge-a-1-million-prize-for-creating-a-better-smaller-solar-power-inverter.

[24] "14-M-0101: Reforming the Energy Vision (REV)." New York Department of Public Service, 2015, accessed June 7, 2015, http://www3.dps.ny.gov/W/PSCWeb.nsf/All/26BE8A93967E604785257CC40066B91A?OpenDocument

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