



Market Transformation Evaluation Plan

Indicators and Plan

Feb 15, 2022

Prepared for:

New York State Energy Research and Development Authority

Agreement Number: 167099

PO Number: 167425

Submitted to:



NYSERDA

1359 Broadway, 19th Floor
New York, NY 10018-7842

<https://www.nyscrda.ny.gov/>

Attention: Carley Murray, Senior Project Manager
carley.murray@nyscrda.ny.gov
518-862-1090 x3277

Prepared by:



Dunsky Energy + Climate Advisors

50 Ste-Catherine St. West, suite 420
Montreal, QC, H2X 3V4

www.dunsky.com | info@dunsky.com
+ 1 514 504 9030

With the support of:
Evergreen Economics and NEIF

About Dunsky

Founded in 2004, Dunsky supports leading governments, utilities, and others across North America in their efforts to **accelerate the clean energy transition, effectively and responsibly.**

Working across the buildings, renewable energy, and clean mobility sectors, we support our clients through three key services: we **quantify** opportunities (technical, economic, market); **design** go-to-market strategies (programs, plans, policies); and **evaluate** performance (with a view to continuous improvement).

Overview

Expertise

Buildings **Renewables** **Mobility**

Services

QUANTIFY **DESIGN** **EVALUATE**
Opportunities Strategies Performance

Clients

GOVERNMENTS
UTILITIES
SOLUTION PROVIDERS

Table of Contents

- Evaluation Approach 4**
 - 1. Introduction4
 - 2. Evaluation Objectives5
 - 3. Evaluation Development Framework6

- Evaluation Indicators 7**
 - 4. Evaluation Indicators7
 - 4.1 – Market Transformation Indicators7
 - 4.1.1 – Market Effects Indicators7
 - 4.1.2 – Market Transformation Effect Indicators9
 - 4.2 – Process Indicators9
 - 5. Measurement Plan.....10
 - 5.1 – NYGB’s Approach to Market Transformation10
 - 5.2 – Overall Measurement Approach10
 - 5.3 – Baselineing for New Sectors13
 - 5.4 – Case Study Selection.....15
 - 5.5 – Measuring Indicators17

- Appendix A: Evaluation Framework Supporting Models 19**
 - A.1 – Theory of Change.....19
 - A.2 – Program Theory and Logic Model (PTLM)22
 - A.3 – Network Analysis23

- Appendix B: List of Potential Market Indicators 24**

- Appendix C: Past NYGB Investment Solicitations 24**

Evaluation Approach

1. Introduction

New York Green Bank (NYGB) is a State-sponsored, specialized financial entity that works with the private sector to increase investments in New York's clean energy markets, creating a more efficient, reliable, and sustainable energy system. Since its establishment in 2013, it has committed over \$1.7 billion of capital as of December 31, 2021. These investments, and additional supporting activities, allow NYGB to complement other components of New York State's clean energy programs portfolio.¹ By working with clients and counterparties, NYGB helps address and alleviate specific gaps and barriers in clean energy markets using a variety of approaches and transaction structures. For this evaluation, clean energy markets are defined as combinations of energy-systems and end-users (e.g., solar community distributed generation, residential energy efficiency).

NYGB is a critical component of the State's climate and clean energy agenda formalized under the Climate Leadership and Community Protection Act (Climate Act). The Climate Act sets the State on a path to economy-wide carbon neutrality by mandating a 100% clean electricity grid by 2040; an 85% reduction in greenhouse gas emissions (GHGs) by 2050; and creation of a policy roadmap that ensures at least 35% of clean energy program resources benefit disadvantaged communities (DACs).²

As the first update to the *2019 NYGB Financial Market Transformation Baseline Study* ("Study"),³ this evaluation plan will build upon the processes and findings of the last Study. As such, this Evaluation Plan includes the:

- **Evaluation Objectives:** Inform NYGB, NYSERDA, and other stakeholders of the progress NYGB has made in achieving its goals;
- **Evaluation Development Framework:** Describes the approach used to develop the market indicators;
- **Market Indicators:** Outlines the key performance indicators and associated data sources; and
- **Measurement Framework:** Describes the evaluation's approach to measuring the market indicators.

The Evaluation Objectives and Evaluation Development Framework are described below, while description of the Market Indicators and Measurement Framework follow in the next section.

¹ NYGB is a division of the New York State Energy Research and Development Authority (NYSERDA).

² The Climate Justice Working Group is in the process of drafting DAC definition criteria. Draft criteria, including a geographic DAC definition and individual criteria, were included on slide 13 of the December 13, 2021, Climate Justice Working Group Meeting. Accessed at: <https://climate.ny.gov/Our-Climate-Act/Climate-Justice-Working-Group>

³ DNV GL (2019). NY Green Bank Financial Market Transformation Study. Accessed at: <https://greenbank.ny.gov/-/media/Project/Greenbank/files/2019-03-financial-market-transformation-evaluation-study.ashx>

2. Evaluation Objectives

While NYGB could undertake several relevant types of evaluations (see the “*Evaluating clean energy initiatives*” call out), it is important to note that the focus is on conducting a **market transformation evaluation**. In conversation with NYGB and NYSERDA, the Evaluation Team decided to expand the scope from what would typically be considered a market transformation evaluation, to include some indicators that are more reflective of typical impact and process reviews. Note that NYGB regularly reports on its impact via its Metrics, Reporting & Evaluation Quarterly Reports and Annual Financial Metrics Reports.⁴ Nevertheless, all indicators for this study will ultimately focus on determining how NYGB’s market interventions have reduced market barriers to decarbonize the New York State (NYS) economy.

Evaluating clean energy initiatives

Three general evaluation categories exist for clean energy initiatives, which are typically defined as:

1. **Impact evaluation:** Assesses and documents the direct and indirect benefits of an initiative. Involves the assessment of performance, which can include clean energy production, energy and demand savings, and/or non-energy benefits. Impact evaluations can also support cost-effectiveness analyses aimed at identifying costs and benefits.
2. **Process evaluation:** Assesses and documents the initiative’s operations. Includes the identification and recommendation of improvements that are likely to increase delivery efficiency or effectiveness, while maintaining high levels of participant satisfaction.
3. **Market transformation evaluation:** Assesses the structure or functioning of a market, the behavior of market participants, and/or market changes that result from an initiative’s efforts. Indicate how the overall supply chain and market for products have been affected by an initiative.

Evidence of **market transformation effects**, the results of market transformation activities, is determined by monitoring market indicators which are likely to last after the intervention has been withdrawn, reduced, or changed. One means of determining if a market transformation initiative is deemed a success is when the subject measures or practices simply become part of common practice.

This Market Transformation Evaluation has three main objectives:

1. **Define the progress made** by NYGB in achieving its goals of:
 - a) Addressing financing market barriers and gaps;
 - b) Increasing investor confidence in clean energy projects; and
 - c) Achieving scale in clean energy financing.
2. **Highlight market transformation successes** through the development of Case Studies; and
3. **Outline recommendations** to help increase NYGB’s momentum towards its market transformation goals.

⁴ NYGB’s Quarterly and Annual reports can be found on their website: <https://greenbank.ny.gov/Resources/Public-Filings>

3. Evaluation Development Framework

A typical market transformation evaluation focuses on the mechanisms that induce change in adoption of the targeted technologies or solutions. Considerable attention is placed on tracking market transformation effect indicators over time. For example, a market transformation evaluation may first report changes in volumes for a particular clean energy product as an indication of an initiative's progress in meeting its goals. Ultimately, the first goal of a market transformation evaluation is to establish a baseline by which it can characterize and quantify the size of the effects of an initiative on the adoption of targeted technologies or solutions, regardless of whether those adopting have directly participated or interacted with the initiative. The second goal is to attribute the market effects that are due to the initiative.

Therefore, market transformation effects must be traced back to a specific initiative. This can be accomplished using either a top-down approach, focusing on a large segment of the market and trying to identify changes and causality, or a bottom-up approach, hypothesizing expected changes based on an initiative's activity and validating whether those hypotheses have come to fruition. **This evaluation will use a bottom-up approach to identify market transformation effects due to NYGB's activities.**

To determine the appropriate indicators to establish whether market transformation effects have resulted from NYGB's efforts, the Evaluation Team has:

- Developed a NYGB **Theory of Change** model to understand the expected preconditions required for market transformation;
- Developed an updated NYGB **PTLM** to understand how NYGB's activities impact the anticipated outcomes; and
- Developed a **Network Analysis** to understand how NYGB interacts with the broader clean energy ecosystem in New York State.

Each of these models can be found in *Appendix A*. The Theory of Change and PTLM are visual representations of the theory that drives an initiative toward its targeted outcomes. Indicators, that will be tested to understand the effectiveness of market transformation activities to date, were developed based on those outcomes (and are presented in the following section).

Evaluation Indicators

As noted above, this evaluation will use a bottom-up approach to **determine how NYGB has supported the growth of the clean energy market in NYS**. The evaluation approach laid out below provides a description of the indicators and the approach for their evaluation.

4. Evaluation Indicators

4.1 – Market Transformation Indicators

It is important in a longitudinal study to maintain consistent metrics across iterations of the evaluation. As such, this approach includes some of the same metrics used in the 2019 evaluation study. However, this evaluation relies on the Theory of Change and PTLM to inform whether past indicators should be removed and additional indicators should be included to ensure that the potential market effects and changes in NYGB programming since the last study was conducted are captured. It is also important to note that this evaluation will follow a modified approach, seeking to validate market transformation effects in targeted Energy-System and End-User categories, as opposed to a broad top-down market transformation effect review of all systems and users (refer to the Overall Measurement Approach for additional details). This approach will allow for metrics from the targeted markets to be reevaluated in future studies.

To undertake this task, the study will validate **Market Effects Indicators** and **Market Transformation Effect Indicators**, each described below.

4.1.1 – Market Effects Indicators

These indicators will highlight the changes that have occurred in the targeted markets. It is important to note that even if a change is observed, **these changes need to be attributed to NYGB to conclude that it has had a market transformation impact**. The indicators below will be individually established for each target market. In some cases, NYGB investments in the target market will have only recently begun, thus the indicator findings will serve as a baseline for future market transformation evaluations.

Table 1 outlines the revised market indicators. Note that the metrics from the past evaluation were reviewed and informed the selection of new metrics. In addition, the timeline of the baseline will be noted for each metric in the evaluation report, as these may vary depending on whether the metric was captured in the past evaluation. Additional information regarding the process to incorporate these metrics can be found in Appendix B.

Table 1: Market transformation evaluation market effect indicators.

Term ⁵	#	Market Effect Indicator	Definition	Captured in 2019 Study
Short	1	Increase in the perceived market opportunity for investment	Financiers rely on a large enough market opportunity to invest the time and effort needed to support a developing market. ⁶ Market opportunity is the scale (\$) of potential clean energy projects.	No, new for this evaluation
Medium	2	Increase in clean energy transactions with risk/return profiles acceptable to financiers	Increase over time in the number of clean energy projects or businesses that meet financiers' criteria for funding.	Yes
Medium / Long	3	Increase in number (#) of financings of clean energy projects by financiers independent of NYGB	Increase over time in the number and type of financiers offering financial products like those offered by NYGB.	Yes
Medium / Long	4	Change in type of financiers investing in the clean energy projects	Change over time of the types of financiers that are willing to invest in the market and financial product. Generally, a market grows through these stages: 1. <i>Angel investor</i> – innovators willing to take on higher risks for the potential of higher returns 2. <i>Equity investor</i> – early adopters are comfortable taking higher risks that target appropriately high rewards 3. <i>Small scale debt investor</i> – early majority adopt new innovations after they are proven and feel comfortable that they understand the risk 4. <i>Large scale debt investor</i> – late majority are more conservative, risk averse, and extremely cautious (large financial institutions)	No, new for this evaluation
Medium / Long	5	Increase in number (#) of clean energy project financings	Increase over time in the number of clean energy project financings of a given type.	Yes
Long	6	Increase in total volume (\$) of clean energy project financings	Increase over time in the dollar volume of clean energy project financings in a market (e.g., solar community distributed generation, residential energy efficiency).	Yes
Long	7	Emergence of secondary markets in clean energy asset classes	Increase in the volume over time of sales of loan or lease receivables to secondary markets, either directly or through securitization. While the occurrence of activity in the secondary market is a clear signal that the market has matured, it will not be an occurrence for every market.	Yes
Long	8	Increased access of disadvantaged community members to clean energy projects	Increase over time in access and rate of participation of members of disadvantaged communities.	No, new for this evaluation

⁵ Defined as short (1 – 3 years), medium (3 – 5 years), and long (5+ years) term from beginning of investment in the target market.

⁶ The definition of “large enough” will vary depending on the market / technology / investor type. By measuring perceive market opportunity for different sub-sectors (as described in [section 5.2](#) of this report), the evolution over time for each sub-sector will help indicate if the threshold is being met.

4.1.2 – Market Transformation Effect Indicators

In addition to determining when a change has occurred in a market, it will be important for this evaluation to note the extent to which the change was supported by NYGB's activities. Areas to investigate that point towards NYGB having an attributable market transformation effect include:

1. NYGB offered a financing product that was not readily available in NYS for the target market that showed proof of concept.
2. NYGB financially supported the target market in NYS in the early days of market development which later allowed developers to obtain financing from private financiers.
3. Private financiers are investing in targeted markets using a similar approach to NYGB, after it was demonstrated successfully by NYGB.

Ultimately, this evaluation will look to understand the impact of NYGB activities on the broader market as NYGB activities are reduced or removed. A market transformation can be deemed to have occurred when an effect continues after NYGB reduces its support for a market.

As NYGB and NYSERDA often collaborate on their efforts, and separating NYGB's impact would be difficult to accomplish, this evaluation will consider their collaborative impact when attributing effects to NYGB.

4.2 – Process Indicators

Process evaluation metrics will help assess NYGB's operations with respect to market transformation and identify and recommend areas of improvement. The findings and recommendations will be actionable and lead to a positive impact, increasing NYGB market transformation impact. Potential processes for review in this evaluation include:

1. NYGB's approach to determining the appropriate sectors to target to create market transformation effects.
2. NYGB's approach to determining the appropriate time to exit a sector or sub-sector (i.e., allow private sector to support continued growth).
3. Perception by NYS market actors with respect to NYGB's market transformation abilities and impacts.
4. Perception by NYS market actors with respect to target sectors where NYGB could have a market transformation effect.

5. Measurement Plan

Market transformation evaluations are a significant undertaking, requiring collection and analysis of data from a wide range of market actors, as well as analysis of those data against a background developed out of secondary sources. To determine NYGB's market transformation impacts, this evaluation includes two parallel streams of work:

1. Determine the indicators, noted above, for pre-selected targeted markets (i.e., combinations of energy-systems and end-users), and
2. Develop case studies for five pre-selected NYGB engagements.

Pre-selection will target areas where this evaluation is most likely to find a market transformation effect attributable to NYGB's activities to date.

5.1 – NYGB's Approach to Market Transformation

NYGB's general approach to market transformation is outlined in Figure 1. Finding a discernible market transformation signal requires both that an initiative have been in the market for sufficient time and that the initiative have expended significant effort and resources to create the effect. As NYGB is still relatively new to the market, and many of the energy-systems have investments that have only begun in the last few years, finding wide-ranging market transformation signals will be difficult. In addition, NYGB has not had many opportunities to exit markets, which could indicate the realization of a market transformation.⁷



Figure 1: NYGB's activities supporting market transformation.

5.2 – Overall Measurement Approach

To measure the market transformation impacts in the sectors NYGB has invested, this evaluation added specificity to how “clean energy” is defined. This facilitates the ability of this evaluation to focus the

⁷ Opportunities have not been present for many reasons, including there being more NYGB support required to grow the market in order to crowd in other funders, and due to pandemic impacts (project delays, shifts in priorities, etc.).

evaluation on the sectors and technologies that are most likely to have identifiable market transformation effects influenced by NYGB. Table 2 provides an outline of which combinations of Energy-Systems and End-Users are included in this evaluation.

Table 2: Sub-sectors which will have a market transformation analysis conducted as part of this study.⁸

#	Energy-System	End-User	NYGB Investment	MT Analysis	Notes
1	Solar		\$773M		
1.1		Residential	\$353M	✓	
1.2		CDG	\$339M	✓	
1.3		Utility-Scale	\$35M		
1.4		MUSH	\$21M		
1.5		Multiple End-User	\$13M		
1.6		C&I	\$13M		
2	Energy Efficiency		\$113M		
2.1		Residential	\$44M	✓	The latest EE and RE Potential Study for NYS noted an achievable potential cost of \$33.3B (2012 dollars) over the 2013-2032 timeframe. ⁹ Using this value, NYGB's investment in EE over the past 5 years equates to roughly 1% of the achievable potential cost. Unless investments were targeted at reducing specific barriers, it is unlikely a market transformation effect will have occurred based on this level of spending. However, targeted residential investments (e.g., Sealed, GJGNY, RenewFund, NYCHA) may have resulted in some market transformation effect.
2.2		C&I	\$40M		
2.3		MUSH	\$23M		
2.4		Public	\$5M		
2.5		Utility-Scale	\$2M		
3	Wind		\$111M		
3.1		Utility-Scale	\$107M		
3.2		Agricultural	\$4M		

⁸ NYGB Investment is based on NYGB_Portfolio_and_Proposals.xlsx document shared by NYGB during the evaluation. It aligns with NYGB 2020-21 Impact Report. Page 12. Accessed at: <https://greenbank.ny.gov/-/media/greenbanknew/files/2020-21-NYGB-Impact-Report.pdf>

⁹ Energy Efficiency and Renewable Energy Potential Study of New York State (2014). *Optimal Energy*. Table S-2. Accessed at: <https://www.nyserda.ny.gov/-/media/Files/EDPPP/Energy-Prices/Energy-Statistics/14-19-EE-RE-Potential-Study-Summary.pdf>

#	Energy-System	End-User	NYGB Investment	MT Analysis	Notes
4	Fuel Cells		\$72M		
4.1		C&I	\$45M		
4.2		CDG	\$27M		
5	Sustainable Transportation	Public	\$54M		Only investments in bikes to date.
6	Bioenergy	Utility-Scale	\$48M		Specifically, landfill gas to renewable natural gas. As investments only began in 2021, only a baseline could be determined.
7	Sustainable Agriculture	Agricultural	\$7M		Investments limited to a single entity (Agbotic); limited likelihood of a market transforming effect.
8	Multiple Technologies	Multiple-End User	\$90M		Most of these projects appear to include solar, which is included in the studied sectors.
9	Other		\$41M		Remaining miscellaneous projects; limited likelihood of a market transforming effect for one-time projects.

While targeted sub-sectors are noted in the table above, through this evaluation, the Evaluation Team will continue to refine and narrow these sub-sectors based on **further input from NYGB and NYSERDA**. There is also an opportunity to determine baselines for other sub-sectors that NYGB is currently actively pursuing.

For each sub-sector, the evaluated market impact will include:

- **The direction of change** of market effect indicators, comparing the current condition to a baseline;¹⁰
- **NYGB's influence on the change** based on the market transformation effect indicators; and
- **The robustness of the data** in assessing the quality of the findings for each indicator.

Process indicators will be assessed more broadly at NYGB level, as opposed to the sub-sector level.

¹⁰ Baselines will be specific to each metric and each sub-sector.

5.3 – Baseline for New Sectors

The Climate Act has increased the speed at which decarbonization must occur throughout NYS. As such, it is possible that NYGB is aiming to target additional sub-sectors in the near term, for which it would be beneficial to create a baseline for future evaluations.

While the Climate Act Scoping Plan, which will provide recommendations and policies to achieve 85% GHG reduction by 2050, is only expected to be finalized in 2022, the Climate Action Council’s most recent meeting did provide an estimate of current emissions in New York State (see Figure 2).¹¹

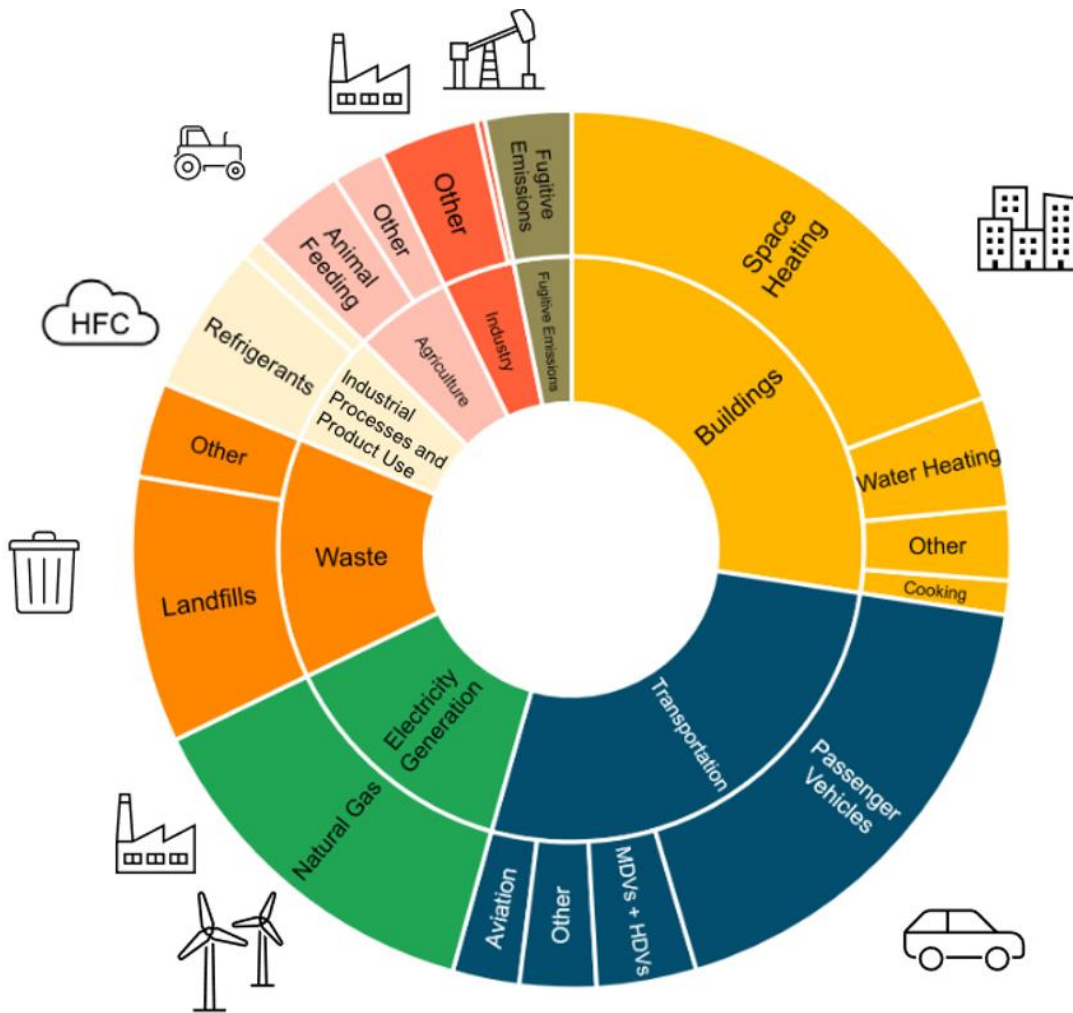


Figure 2: Current Estimated GHG emissions by sector in New York State. Draft 2020 results in line with DEC Climate Act accounting including upstream emission factors, 20-year GWP, and estimates from NY PATHWAYS.¹²

¹¹ New York State Climate Action Council (Oct 1, 2021). Meeting 15. Integration Analysis: Initial Scenario Results. Slide 35. Accessed at: <https://climate.ny.gov/-/media/CLCPA/Files/2021-10-01-CAC-Meeting-presentation.pdf>

¹² New York State Climate Action Council (Oct 1, 2021). Meeting 15. Integration Analysis: Initial Scenario Results. Slide 35. Accessed at: <https://climate.ny.gov/-/media/CLCPA/Files/2021-10-01-CAC-Meeting-presentation.pdf>

To achieve the Climate Act's goal of 85% GHG reduction by 2050, significant reductions across all the above sectors will be required. Comparatively, to date, NYGB has primarily supported emission reductions through initiatives targeting electricity generation (e.g., solar, wind, bioenergy), while also supporting projects in the building, transportation, waste, and agriculture sectors (as previously noted in Table 2). As such, it is expected that NYGB will need to expand its support to other sectors (e.g., energy efficiency in affordable housing, electric vehicles, and associated charging infrastructure).

As part of this market transformation evaluation, a baseline for two additional sectors in which NYGB plans on becoming active will be established. One of the additional sectors will focus on transportation and the other will focus on decarbonization, with the specific sub-sector for baselining to be refined based on **further input from NYGB and NYSERDA.**

5.4 – Case Study Selection

By focusing on specific examples of success, case studies will provide a structured retelling of NYGB’s market transformation impacts. The key findings for the case studies will highlight how NYGB has helped develop clean energy financing markets in NYS in the past; and can continue to do so in the future.

Table 3 outlines the selected case studies, based on discussion with NYSERDA and NYGB, to showcase the range of NYGB’s capabilities and their achievements to date. Note that expected findings have been noted for the case studies, as these helped determine which case studies to pursue (i.e., minimize overlap in findings, energy-systems, and end-users; ensure telling different / complementary stories). Ultimately, five case studies will be developed as part of this evaluation.

Table 3: Five case studies to develop as part of this evaluation.

#	Title	Description	Rationale for Inclusion	Expected Findings ¹³
1	CDG Solar	The expansion of Community Distributed Generation (CDG) in NYS.	Solar, and CDG more specifically, has been NYGB’s most prominent investment type. Thus, this sub-sector has the greatest likelihood of demonstrating a market transformation effect. Opportunity to showcase the impact NYGB has already had on DACs. In addition, call out how NYGB catalyzed private capital investment by leading a commercial bank (CIT Bank) to NYS’ community solar market.	<ol style="list-style-type: none"> 1. NYGB supported the launch of the CDG financing market in NYS 2. NYGB has invested in projects that benefit members of DACs 3. NYGB successfully promoted a large capital provider’s entry into the NYS clean energy ecosystem

¹³ The Expected Findings represent hypotheses that will be tested via interviews, Webscraping, secondary research, and surveys (as applicable).

#	Title	Description	Rationale for Inclusion	Expected Findings ¹³
2	Motivate	Expanding urban bike sharing in New York City	The only transportation related investment to date. Shows diversity among investment types. Financing primarily supported the addition of 2,000 bikes primarily in low-to-moderate income neighborhoods.	<ol style="list-style-type: none"> 1. NYGB is supporting growth and adoption of clean transportation in NYS 2. NYGB has invested in projects that benefit DACs
3	Sealed	Supporting an innovative approach to residential energy efficiency financing.	Showcases NYGB's support for energy efficiency and innovative business models. Enabling more residential upgrades, Sealed tackles key barriers to residential energy efficiency uptake.	<ol style="list-style-type: none"> 1. NYGB can support NYS residents by lending to businesses that specialize in consumer direct lending or financing 2. NYGB can support small developers that demonstrate early marketplace success but have limited opportunity to scale due to restricted access to capital
4	Residential Solar	An update to the previous case study. A review of the residential solar Asset Backed Securities market and NYGB's long-range support and participation.	Provides an update on the Mosaic Case Study from the last evaluation. Residential solar represents a large portion of NYGB's early investment activity. As the market matured, NYGB refined its approach to support new gaps in the market.	<ol style="list-style-type: none"> 1. NYGB has successfully modified their lending activities to continue supporting a rapidly changing residential solar market 2. NYGB successfully includes clauses in their financing agreements requiring minimum investment levels within NYS
5	RED Rochester	Supporting a more energy efficient commercial and industrial sector within NYS.	Showcases a C&I focused project type, demonstrating breadth of NYGB investments.	<ol style="list-style-type: none"> 1. NYGB has successfully supported energy efficient commercial and industrial projects in NYS 2. NYGB included clauses in its financing agreement that required the Sponsor to make meaningful investment in new/incremental energy efficiency improvements

5.5 – Measuring Indicators

A combination of the following tools will be used to measure indicators:

- **Web surveys** (target 50 – 100 completes) programmed in Qualtrics to provide quantitative data responses from financiers (e.g., lenders) and developers (e.g., contractors, building owners) who have both participated and not participated in NYGB transactions. While the range of completes will impacted the confidence and precision of the responses, such a sampling error is a lessor concern than ensuring the study population matches with the actual sample and respondents. The list of targeted participants and non-participants from the 2019 Study will serve as a starting point and be supplemented by new participants and further research of relevant non-participants. To improve the response rate, respondents will be offered a chance to win an iPad for completing the survey. Surveys will be 5 – 10 minutes in length.
- **Targeted interviews** (target 40 completes) of financiers and developers based on web survey results, program participants, industry reports, etc. will allow for the verification of quantitative data responses, exploration of further qualitative evidence, and provision of details for case studies. Interviews will also feature questions to support the identification of activities that may lead to future market transformation effects. Interviews will be 25 minutes in length, with the option for a 10-minute condensed interview, if needed.
- **Webscraping** to capture program mentions and profiles in online media and public reports to produce quantitative or qualitative results.
- **Industry sources**, such as reports and statistics, from relevant and credible industry publications, databases, conference proceedings, academic literature, or corporate materials (e.g., filings, annual reports) for quantitative data.
- **Government sources**, such as reports and statistics, from government agencies at the federal, state, and local levels for quantitative data.

Table 4 outlines the expected relevant sources for compiling data on each market transformation effects indicator. The market transformation indicators, process indicators, and case studies will primarily be populated using targeted interviews (including with NYGB staff, as required) and secondary research.

Table 4: Expected relevant sources for collecting data on each market transformation effect indicator.

Term	#	Market Indicator	Financiers Survey	Financiers Interviews	Developers Surveys	Developers Interviews	Webscrape	Industry Sources	Government Sources
S	1	Increase in the perceived market opportunity for investment	X	X			X	X	
M	2	Increase in clean energy transactions with risk/return profiles acceptable to financiers	X	X		X	X	X	
M/L	3	Increase in number (#) of financings of clean energy projects by financiers independent of NYGB	X	X	X	X	X	X	X
M/L	4	Change in type of financiers investing in the clean energy projects	X	X	X	X	X	X	
M/L	5	Increase in number (#) of clean energy project financings	X	X				X	X
L	6	Increase in total volume (\$) of clean energy project financings		X	X	X		X	X
L	7	Emergence of secondary markets in clean energy asset classes	X	X			X	X	
L	8	Increased access of disadvantaged community members to clean energy projects			X	X		X	X

Appendix A: Evaluation Framework Supporting Models

To support the development of the evaluation framework, an exercise to create or update models related to NYGB's efforts was undertaken, including:

- A NYGB **Theory of Change** model to understand the expected preconditions required for market transformation;
- An updated NYGB's **PTLM** to understand how NYGB's activities impact the anticipated outcomes; and
- A **Network Analysis** to understand how NYGB interacts with the broader clean energy ecosystem.

Each of the models are outlined in the following sections.

A.1 – Theory of Change

The Theory of Change model helps an organization tell the story of how the world will be different because of what it does. The model helped surface perspectives on NYGB's worldview to be explored, discussed, and enriched. The Theory of Change defines the outcomes and preconditions that need to be achieved to realize NYGB's long term goal.

The desired outcomes described in Figure 3 and Figure 4 are the necessary preconditions to achieving NYGB's goals. However, not all these preconditions fall within the purview of NYGB. In the figures, the higher-level desired outcome is dependent on its lower-level desired outcomes, which are deemed its preconditions. For example, in Figure 3, in order for "Sufficient capital is available...", there needs to first be "Private capital competes..." and "Aggregation occurs...". In addition, to improve readability, the Theory of Change Model was split between the two figures, the first showing the first and third branches (at the third rung from the top), and the second showing the middle branch.

To support the development of this evaluation plan, outcomes which NYSERDA supports are noted in the Theory of Change model (flagged using "(NYSERDA)"). When noted, this means that NYSERDA influences an outcome, but is not necessarily the only influencer. It also does not imply that the outcome is currently being met, simply that NYSERDA is undertaking some activities that make the outcome more likely to occur. For this evaluation plan, the indicators were developed based only on the outcomes which NYGB influences. Outcomes influenced solely by NYSERDA will not be evaluated.

Figure 3: Theory of Change Model for NYGB (1 of 2)

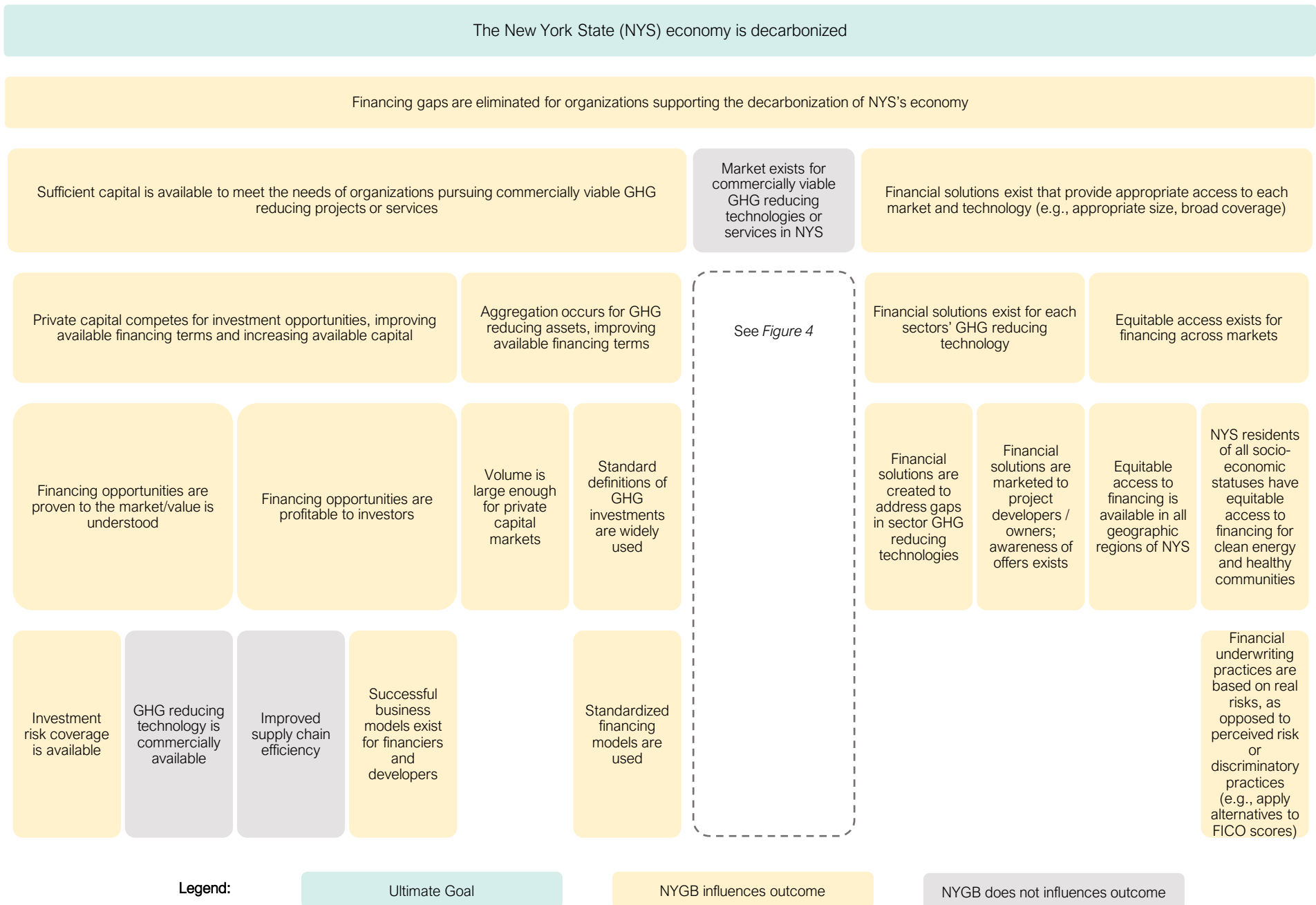
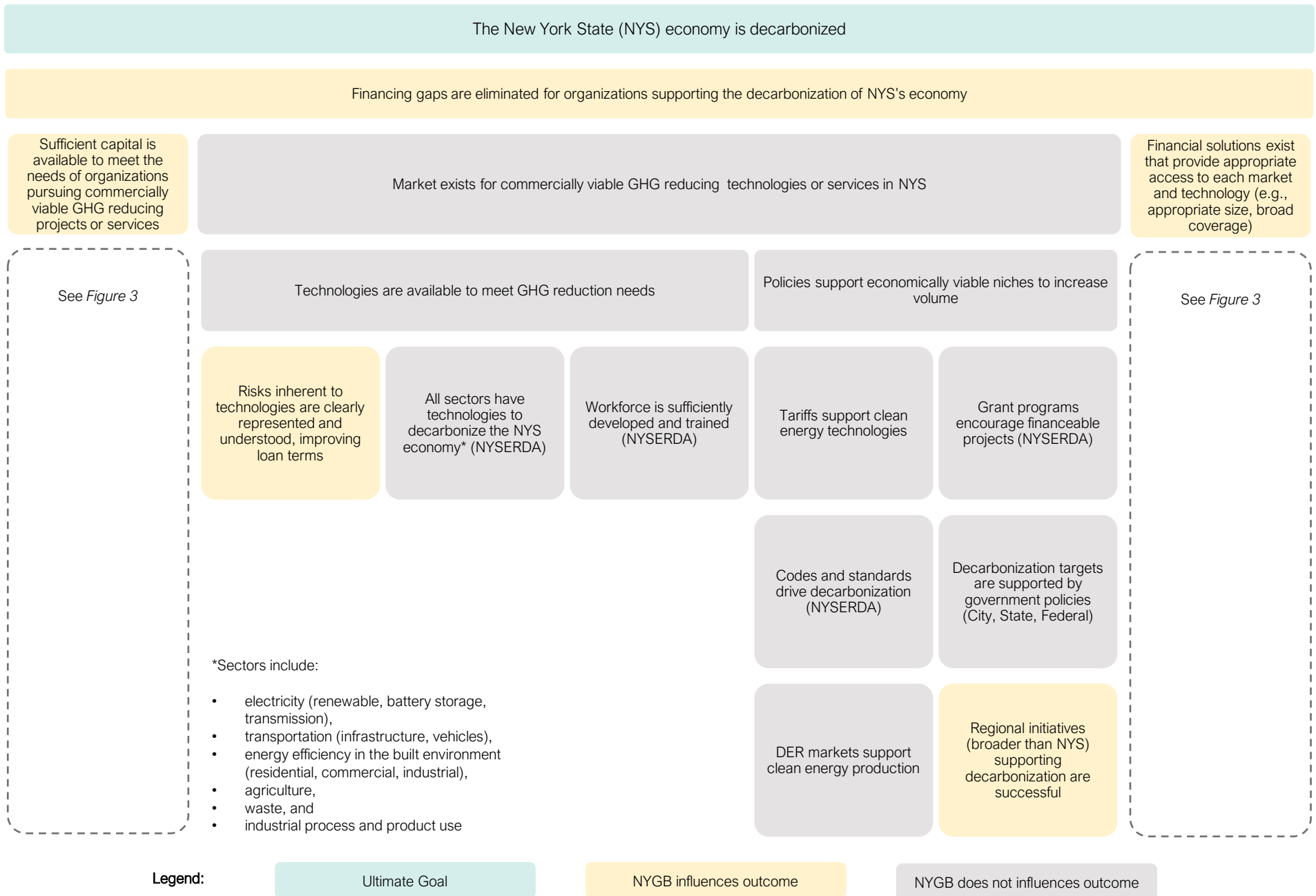
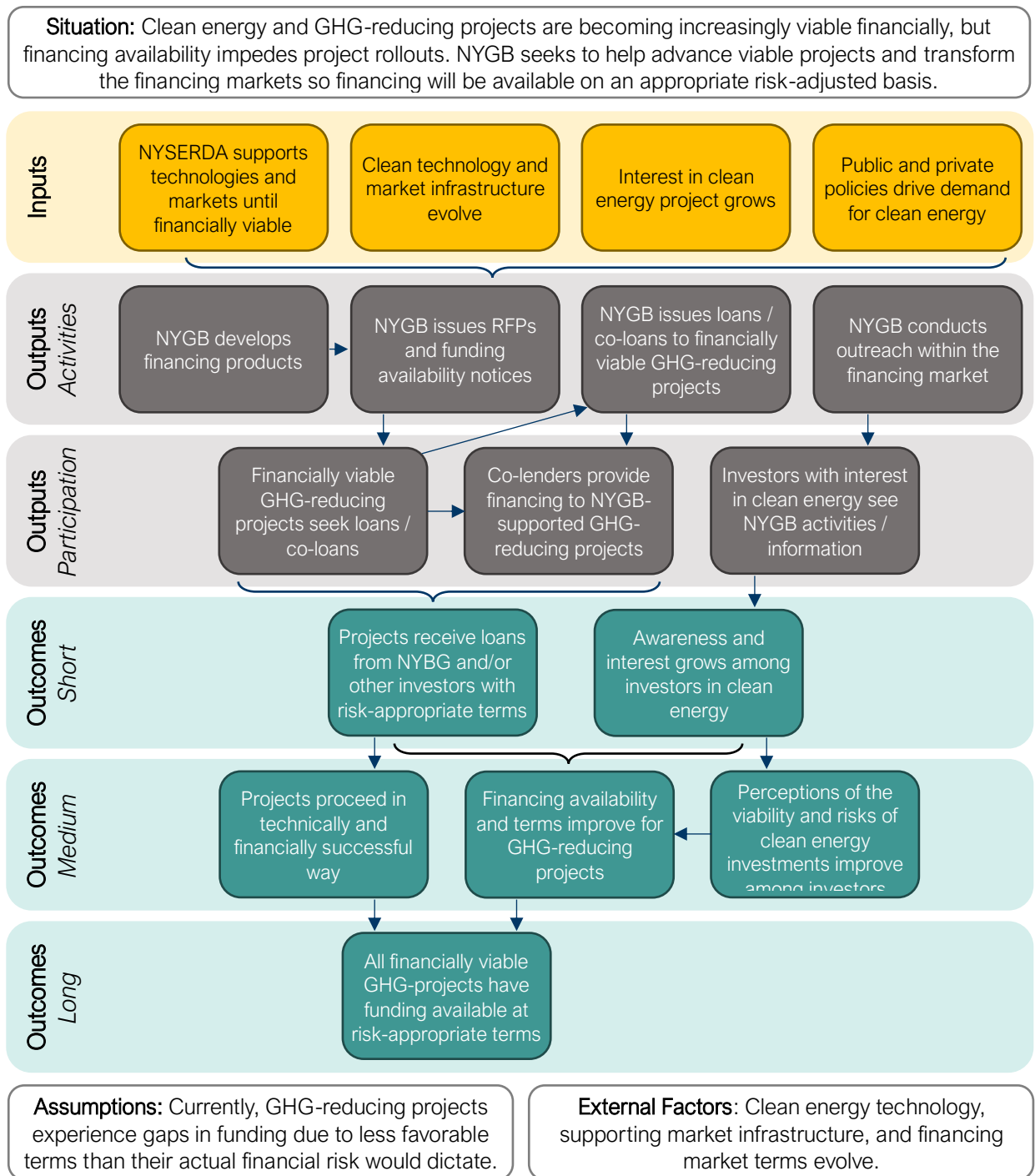


Figure 4: Theory of Change Model for NYGB (2 of 2)



A.2 – Program Theory and Logic Model (PTLM)

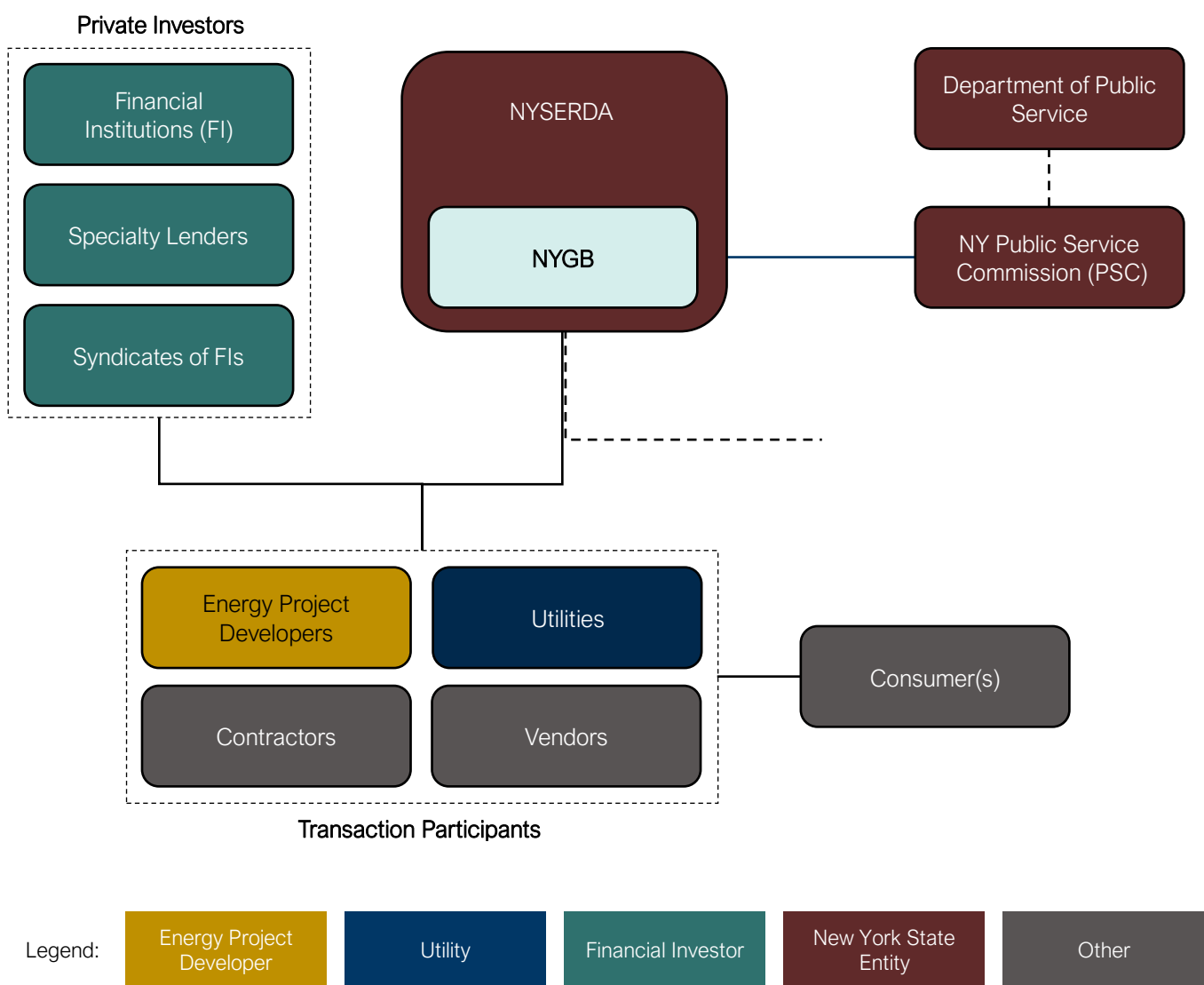
The PTLM is an organization’s roadmap for changing the world. It moves one step further from the Theory of Change by including the inputs and activities required to achieve the short, medium, and long-term outcomes. The Theory of Change outcomes were summarized to streamline the revised PTLM below.



A.3 – Network Analysis

An important benefit of market transformation initiatives is the effect they have on relationships within the immediate market and beyond. Figure 5 provides a visual representation of the individual actors, people, or things within the broader clean energy financing network along with their typical relationships or interactions in the context of working with NYGB. The network analysis will support the development of targeted lists for both the surveys and interviews.

Figure 5: Network overview of organizations and entities that interact with NYGB.



Further, by conducting a review of existing transaction profiles, it is noted that of the 118 publicly disclosed organizations that have worked with NYGB, 19 have participated in multiple transactions (refer to Figure 6 for participants and their number of transactions).¹⁴ Overall, there are no overpowering trends in terms of the specific organizations that participate in NYGB transactions; the portfolio is spread across a multitude of participants. Note that in the 2019 Study, two case studies were developed for the investments associated with BQ Energy and Bank of America Merrill Lynch (each bolded in the figure below).

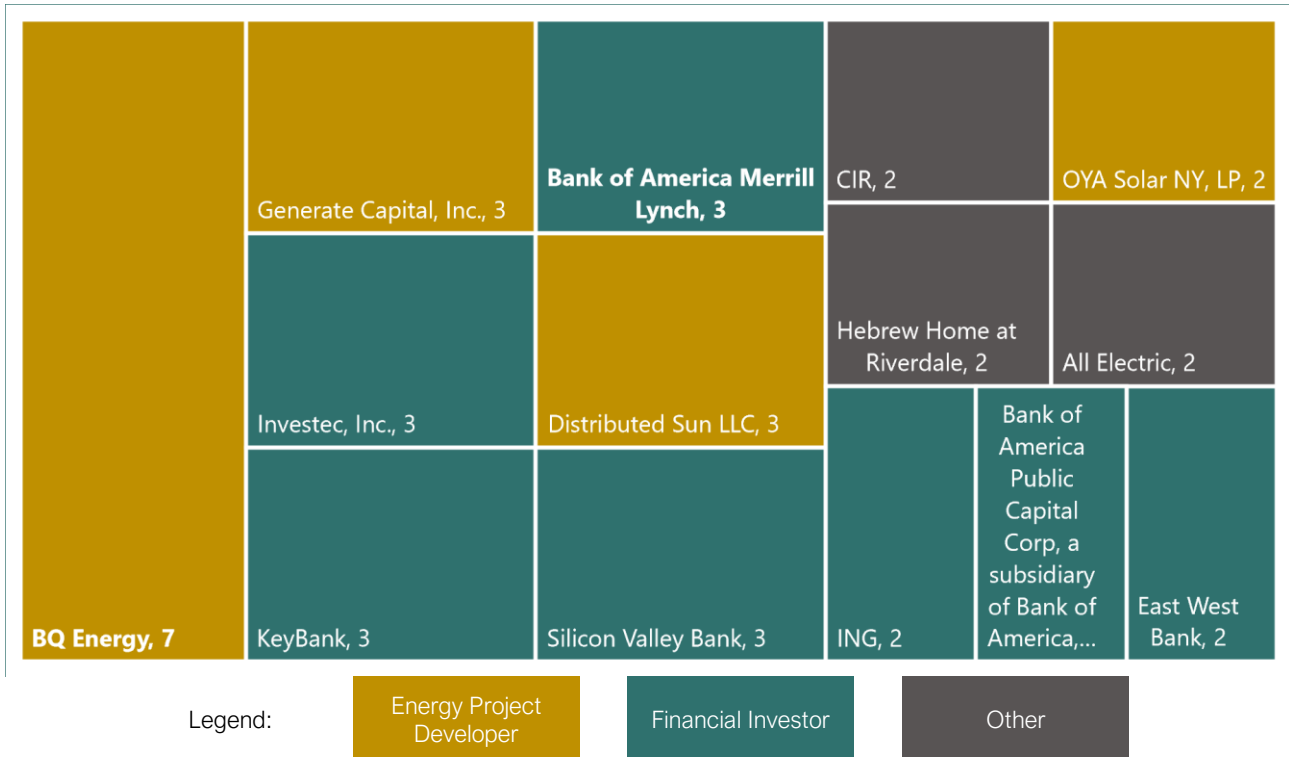


Figure 6: Number of transactions supported by NYGB for which individual organizations have participated.

¹⁴ Analysis is based on a review of Transaction Profiles, as of October 2021.

Appendix B: List of Potential Market Indicators

To determine the appropriate market indicators to use for this study, the evaluation team:

- Reviewed existing indicators from the last evaluation;
- Reviewed the new Theory of Change Model and updated PTLM to identify any gaps and/or overlaps with the existing indicators from the last evaluation; and
- Introduced new indicators to fill identified gaps.

Table 5 outlines the findings of this process, including recommendations on whether 2019 Study indicators should be removed, kept, or whether new metrics should be added. It is important to note that the indicators presented below will show whether a market has changed over time, but will not necessarily show that this change was the result of NYGB’s actions. Additional market transformation indicators will need to be reviewed and studied, as indicated in the body of this report.

Table 5: All considered market indicators with recommendations on which of the 2019 Study to keep and the rational why (in the notes).

Term	Indicator	Market Indicator	Definition	2019	Likely Quality of Evidence of MT	Likely NYGB Influence	Recommendation	Notes
Short	A	Availability of informative data on clean energy project financial performance	Availability of validated information on the financial performance of actual clean energy projects: e.g., rating agency pre-sale documents.	Yes	Medium	Very Low	REMOVE	NYGB observes standard commercial practices regarding disclosure of financial information, which does not allow for additional disclosure of financial performance.
Short	B	Availability of informative data on clean energy project technical performance	Availability of validated data on the field performance of clean energy technologies: e.g., M&V reports and cost-benefit analyses.	Yes	Medium	Very Low	REMOVE	While NYSERDA publishes technology performance data, NYGB does not. NYGB projects are evaluated alongside NYSERDA funded projects.

Term	Indicator	Market Indicator	Definition	2019	Likely Quality of Evidence of MT	Likely NYGB Influence	Recommendation	Notes
Short	1	Increase in the perceived market opportunity for investment	Financiers rely on a large enough market opportunity to invest the time and effort needed to support a developing market. Market opportunity is the scale (\$) of potential clean energy projects.	NEW	High	Low	ADD	One of the first questions financiers ask is “what is the size of the market opportunity (\$)?” Investments from NYGB can help increasing perception of market opportunity in targeted sectors. This metric will also help identify sectors to focus efforts.
Short / Medium	C	Increase in awareness of clean energy investment opportunities in financier community	Increase over time in the proportion of financiers who report being aware of clean energy investment opportunities.	Yes	Medium	Low	REMOVE	The perceived market opportunity (#1) captures a similar metric, do not need to capture both indicators.
Medium	2	Increase in clean energy transactions with risk/return profiles acceptable to financiers	Increase over time in the number of clean energy projects or businesses that meet financiers’ criteria for funding.	Yes	High	Medium	KEEP	NYGB investments showcase projects for targeted technologies / market sectors.
Medium	D	Increase in the scale (\$) of individual financing transactions of clean energy projects	Increase over time in the average size or characteristic range of sizes for clean energy projects or financial transactions of a given type.	Yes	Low	Low	REMOVE	Depending on the market, larger individual transactions may not necessarily be beneficial. While overall growth in the market is beneficial, this is captured in #5 and #6.
Medium / Long	3	Increase in number (#) of financings of clean energy projects by financiers independent of NYGB	Increase over time in the number and type of financiers offering financial products like those offered by NYGB.	Yes	High	Low	KEEP	Allows to compare between NYGB investments and non-NYGB investments in a sector.

Term	Indicator	Market Indicator	Definition	2019	Likely Quality of Evidence of MT	Likely NYGB Influence	Recommendation	Notes
Medium / Long	E	Replication of NYGB financing approaches by financiers in their respective market sector(s)	Reports of financing approaches that are the same or like those used by NYGB.	Yes	Low	Low	REMOVE	NYGB makes use of standard financing approaches, which would already be used by other financiers.
Medium / Long	4	Change in type of financiers investing in the clean energy projects	Change over time of the types of financiers that are willing to invest in the market. Generally, a market grows through these stages: 1. <i>Angel investor</i> – innovators willing to take on higher risks for the potential of higher returns 2. <i>Equity investor</i> – early adopters are comfortable taking higher risks that target appropriately high rewards 3. <i>Small scale debt investor</i> – early majority adopt new innovations after they are proven and feel comfortable that they understand the risk 4. <i>Large scale debt investor</i> – late majority are more conservative, risk averse, and extremely cautious (large financial institutions)	NEW	High	Low	ADD	NYGB tends to support investment opportunities that fall somewhere between needing an equity investor and a small-scale debt investor. Thus, NYGB’s ability to impact the market applies to technologies and sectors that have already reached that stage. As NYSERDA provides support for technologies and sectors throughout their lifecycle, it is important to note that NYSERDA will often provide support for technologies and sectors prior to NYGB involvement.

Term	Indicator	Market Indicator	Definition	2019	Likely Quality of Evidence of MT	Likely NYGB Influence	Recommendation	Notes
Medium / Long	5	Increase in number (#) of clean energy project financings	Increase over time in the number of clean energy project financings of a given type.	Yes	High	Medium	KEEP	This is a primary indication of a growing market. NYGB influence will be largely dependent on the asset class / product type.
Long	6	Increase in total volume (\$) of clean energy project financings	Increase over time in the dollar volume of clean energy project financings of a given type.	Yes	High	Medium	KEEP	See comment for #5.
Long	7	Emergence of secondary markets in clean energy asset classes	Increase in the volume over time of sales of loan or lease receivables to secondary markets, either directly or through securitization. While the occurrence of activity in the secondary market is a clear signal that the market has matured, it will not be an occurrence for every market.	Yes	Medium	Low	KEEP	The emergence of a secondary market will confirm that a given market has reached maturity but is not required to demonstrate maturity. Not all asset classes are well suited for the secondary market.
Long	F	Reduction in financing costs: interest rate, transaction costs, etc.	Reduction over time in financing costs, primarily interest rates and equity requirements (advance rates).	Yes	Low	Low	REMOVE	The type of investor will influence the type of financing available. Tracking #4 eliminates the need to also track this indicator. Further, if receivables are securitized, then one should expect lower financing costs for sponsors. In addition, can be very difficult to get reliable information from financiers.

Term	Indicator	Market Indicator	Definition	2019	Likely Quality of Evidence of MT	Likely NYGB Influence	Recommendation	Notes
Long	G	Reduction in elapsed time and cost to complete transactions	Reduction in time interval between application for financing and transaction closing. Will primarily be driven by reducing technology review efforts, as credit risk evaluation is fairly standard and well understood.	Yes	Medium	Low	REMOVE	Time and cost to complete a transaction is primarily driven by the technology review process. NYGB is not undertaking activities to speed up this process for non-participants.
Long	H	Reduction in clean energy technology costs	Reduction over time in the unit installed cost of a given market.	Yes	High	Very low	REMOVE	While there would likely be an influence by NYSERDA, there is minimal influence by NYGB as new technologies require a large volume of investments to reduce technology costs.
Long	8	Increased access of disadvantaged community members to clean energy projects	Increase over time in access and rate of participation of members of disadvantage communities.	NEW	Medium	Low	CONSIDER ADDING – long term indicator	NYGB increases awareness of financing models that deliver benefits to disadvantaged communities. However, will be difficult to measure without a clear definition of disadvantaged community. This could capture baseline involvement of various targeted communities in the clean energy market.

Appendix C: Past NYGB Investment Solicitations

To support the development of the list of market transformation sub-sectors to review and case studies to develop, the Evaluation Team reviewed the list of all past NYGB investment solicitations included in Table 6 (RFPs) and Table 7 (RFIs).

Table 6: NYGB RFP solicitations.

#	RFP Title	Description	Open
RFP 1	Clean Energy Financing Arrangements	Invites private sector capital providers and other clean energy industry participants to propose transactions that facilitate the financing of clean energy projects in NYS, consistent with NYGB's mandate, mission, and priorities in addressing financing market gaps and barriers.	Feb 2014
RFP 7	Construction & Back-Leveraged Financing for Ground-Mounted Solar	Targeted at developers of photovoltaic (PV) solar projects selling to commercial, industrial, and other institutional organizations (C&I) in NYS, which plan to use third-party tax equity and seek back-leveraged financing for projects that: <ol style="list-style-type: none"> (1) generate revenue by selling net metering credits (or equivalents) to C&I power users under applicable laws, regulations or administrative proceedings; (2) use Tier-1 Technology; (3) are in the advanced stage of development; and (4) are ground-mounted, canopy-mounted, and non-residential rooftop PV solar projects. 	Mar 2017
RFP 8	Efficiency & Renewables Financing Arrangements: Building & Property Owners	Targeted at commercial and multi-family building owners, relevant lenders and investors, and clean energy contractors/service providers focused on such properties, who seek to finance the purchase of energy efficiency and/or renewable energy assets.	Mar 2017
RFP 10	Financing for CDG Solar Projects Including Projects Paired with Energy Storage	Targeted at developers and/or owners of solar photovoltaic (PV) projects that: <ol style="list-style-type: none"> (i) are in advanced stages of development; (ii) form part of the Community Distributed Generation Program; (iii) are compensated under the Value of Distributed Energy Resources Phase One Tariff; (iv) comply with all applicable provisions established under the Uniform Business Practices for Distributed Energy Resource Suppliers; (v) generate power using Tier 1 technology; (vi) earn revenue by selling volumetric or monetary credits to project members under revenue contracts; (vii) are 500 kWac to 5 MWac in size, ground-mounted, canopy-mounted, or non-residential rooftop PV solar projects at a single location; and (viii) may be paired with an electrical energy storage component. 	2017

#	RFP Title	Description	Open
RFP 13	Financing for Energy Storage Projects	Invites energy storage developers and other storage market participants targeting NYS energy storage projects, to propose transactions to NYGB that contemplate the financing of the purchase and ownership of energy storage projects.	Nov 2019
RFP 18	Financing Arrangements for High-Performance Affordable Housing	Invites property owners and developers, energy service companies and equipment manufacturers, capital providers, and other market participants to submit proposals for NYGB investment in the construction or retrofit of multifamily affordable housing to high levels of energy performance in NYS.	2021

Table 7: NYGB RFI solicitations.

#	RFI Title	Description	Closed
RFI 3	Financing Interconnection Payments for Clean Energy Projects in NYS	Targeted private investors seeking to finance interconnection expenses involved in developing clean energy projects. Private finance is necessary to support grid upgrades, as required by utilities, to increase clean energy generation throughout NYS. The purpose of this RFI was to acquire information to assist NYGB's assessment of the availability of interconnection financing for clean energy.	Mar 2018
RFI 4	Financing Arrangements for Energy Storage Projects in New York State	Targeting energy storage developers and other market participants, in conjunction with the release of the NYS Energy Storage Roadmap.	2018
RFI 5	Low to Moderate-Participation in CDG Projects in NYS	Through the issuance and follow-up meetings and communications associated with RFI 5, NYGB and NYSERDA have connected with CDG project developers, sponsors, financiers, community-based organizations, and other market participants that specifically focus on, or are interested in, providing increased opportunities for LMI customers to participate in, and directly benefit from, the State's growing distributed energy resource market. At the submission deadline, NYGB had received a strong response from market participants and over the first quarter of 2019 NYGB engaged in follow-up meetings and discussions with respondents.	Dec 2018
RFI 6	On-Lease Commercial Tenant Energy Efficiency Financing	Explore financings to provide capital on a wholesale basis for use by building owners/managers that would in turn be made available to tenants to finance qualified energy efficiency improvements. RFI 6 seeks to: <ul style="list-style-type: none"> (i) solicit feedback from real estate market participants on a rolling basis with respect to NYGB's proposed on-lease commercial tenant energy efficiency financing product; (ii) identify prospective opportunities; and 	2019

#	RFI Title	Description	Closed
		<p>(iii) collaborate with potential end-users on their efficiency upgrade financing needs.</p> <p>NYGB is using the information received in response to this RFI to refine its on-lease commercial tenant energy efficiency financing product as well as to identify and develop other standardized, replicable, and scalable financing approaches for energy efficiency improvement projects or portfolios of projects.</p>	
RFI 7	Credit Enhancement Product for Tax Equity Providers in LMI-Inclusive CDG Projects	<p>Through its market engagement activities during the 2018 – 19 Plan Year, NYGB determined that a credit enhancement / loss reserve product for CDG tax equity could be impactful in further opening the CDG segment to and accelerating its deployment within LMI communities. Through RFI 7, NYGB sought information to identify specific ways in which NYGB might stimulate increased availability of tax equity financing for CDG projects that offer LMI-inclusive subscription terms (short term contracts, indexed contracts, non-FICO customer credit approval approaches, etc.) in NYS by addressing existing market barriers and financing gaps. Specifically, RFI 7 sought market feedback regarding how NYGB could structure a credit enhancement/loss reserve product for CDG tax equity investors.</p>	2020



This report was prepared by Dunsky Energy + Climate Advisors. It represents our professional judgment based on data and information available at the time the work was conducted. Dunsky makes no warranties or representations, expressed or implied, in relation to the data, information, findings and recommendations from this report or related work products.