



NY Green Bank Market Transformation Study

Mosaic, Inc. Case Study
March 2019

Albany, New York

Prepared by



Notice

This report was prepared by DNV GL in the course of performing work contracted for and sponsored by the New York State Energy Research and Development Authority (hereafter “NYSERDA”). The opinions expressed in this report do not necessarily reflect those of NYSEDA or the State of New York, and reference to any specific product, service, process, or method does not constitute an implied or expressed recommendation or endorsement of it. Further, NYSEDA, the State of New York, and the contractor make no warranties or representations, expressed or implied, as to the fitness for particular purpose or merchantability of any product, apparatus, or service, or the usefulness, completeness, or accuracy of any processes, methods, or other information contained, described, disclosed, or referred to in this report. NYSEDA, the State of New York, and the contractor make no representation that the use of any product, apparatus, process, method, or other information will not infringe privately owned rights and will assume no liability for any loss, injury, or damage resulting from, or occurring in connection with, the use of information contained, described, disclosed, or referred to in this report.

NYSERDA makes every effort to provide accurate information about copyright owners and related matters in the reports it publishes. Contractors are responsible for determining and satisfying copyright or other use restrictions regarding the content of reports that they write, in compliance with NYSEDA’s policies and federal law. If you are the copyright owner and believe a NYSEDA report has not properly attributed your work to you or has used it without permission, please email print@nyserda.ny.gov.

Information contained in this document, such as web page addresses, are current at the time of publication

Table of Contents

1 NY GREEN BANK – MOSAIC, INC. WAREHOUSE CREDIT FACILITY: CASE STUDY OVERVIEW 1

2 RESIDENTIAL SOLAR LOAN AGGREGATION: THE MOSAIC WAREHOUSE CREDIT FACILITY..... 4

2.1 Warehouse Credit Facilities in the Residential Solar Industry 4

2.2 The Residential Solar Finance Market 5

2.3 Case Study: NY Green Bank and the Mosaic Solar Loan 7

2.4 Assessment of Market Effects 10

APPENDIX: TABLE OF MARKET INDICATORS..... 16

1 NY GREEN BANK – MOSAIC, INC. WAREHOUSE CREDIT FACILITY: CASE STUDY OVERVIEW

NY Green Bank. NY Green Bank (“NYGB”) is a \$1.0 billion investment fund designed to accelerate clean energy deployment in NYS and is globally recognized as a leading sustainable infrastructure investor. NYGB’s participation in a growing number of transactions spurs clean energy development in New York State (“NYS” or the “State”), with benefits for New York residents and more broadly. NYGB is a division of the New York State Energy Research and Development Authority (“NYSERDA”).

Since its formation, NYGB has worked to increase the size, volume and breadth of sustainable infrastructure investment activity throughout the State, expand the base of investors focused on NYS clean energy and increase market participants’ access to capital on commercial terms. To achieve these objectives, NYGB collaborates with the private sector to develop transaction structures and methodologies that overcome typical clean energy investment barriers. These barriers include challenges in evaluating risk and addressing the needs of distributed energy and efficiency projects where underwriting may be oriented toward larger opportunities and/or toward groups of somewhat homogeneous investments that make up larger portfolios.

NYGB invests where there are limited precedents, less familiar asset structures and/or deal structuring complexities that require specialized skillsets. NYGB applies project and structured finance transaction approaches that isolate project assets, allocate, and protect against downside risks to the greatest possible extent and monetize low volatility project-generated cash flows to generate appropriate risk-adjusted returns.

NYGB focuses on opportunities that create attractive precedents, standardized practices, and roadmaps that capital providers can readily replicate and scale. As funders “crowd in” to a particular area within the sustainable infrastructure landscape, NYGB moves on to other areas that have received less investor interest.

Mosaic Case Study. DNV GL developed this case study of NYGB’s participation in a warehouse credit facility for Mosaic, Inc. (“Mosaic”) as one aspect of the first independent



Initiated Operations: 2014
First Financing Transaction: 2015
Financings through 2018: 44
Number of Counterparties: 55
Capital Committed: \$637.6 million
Cost of Projects Financed: \$1.51 – \$1.75 billion



WAREHOUSE CREDIT FACILITY CASE STUDY

2015: NYGB participates with one other bank in first, major unrated credit warehouse to support innovative residential solar loan product: \$50 million for NY State projects.

2017: Mosaic uses the initial credit facility to demonstrate success of its business model and achieve an A rated term securitization. This transaction was oversubscribed by institutional investors, refinancing the warehouse to be used for further project loan aggregation.

2017 – 2019: Financial institutions respond favorably to subsequent opportunities. Mosaic issues five rated securitizations in 2017 – 2019 totaling over \$1.1 billion to support lending volumes of \$40 - \$50 million/month.

Over 30 financial institutions participate in Mosaic securitized financings.

In 2018, Mosaic assumes national lead in volume of residential solar installations financed, with a 14% market share.

assessment of NYGB's impacts, conducted as part of customary and ongoing evaluations by NYSERDA with respect to its programs and divisions. The purpose of this and other case studies is to provide a more detailed narrative of NYGB's involvement in individual transactions and to identify the impact of those transactions on the State's clean energy sector and participants more broadly, including project developers and the financiers that support their activities.

Mosaic is a specialty financing company focused on residential solar PV installation. In 2014, Mosaic launched a novel business model that greatly reduced the high customer acquisition and financing costs that had begun to inhibit growth in the solar PV industry. By mid-2015, Mosaic sought an infusion of capital to support its loans to homeowners through a nationwide network of participating dealers. The credit risk of the portfolio was unknown because the performance history of the underlying loans was unknown. In early 2016, after extensive due diligence and credit underwriting activities to assess the viability of Mosaic's approach, NYGB joined one other bank and committed \$50 million in two stages to a warehouse credit facility.¹ This credit facility grew to \$270 million with the addition of two other lending institutions, once the initial facility had developed a track record and evidenced success.

Mosaic used the credit and operating experience gained with the warehouse credit facility to support the development of a credit-rated securitization, which was immediately oversubscribed. Mosaic issued four additional securitizations over the next 20 months with progressively more favorable borrowing terms, raising over \$1.1 billion from more than 30 banks and investor groups. After only four years in the market, the Mosaic Solar Loan program commands 14% of the national market for residential solar project financing, by capacity installed.

The Mosaic transaction represents an instance of NYGB's early involvement in support of what was, in 2015, an innovative approach to residential solar installation financing. Since that time, Mosaic has grown to be the largest US residential solar finance provider, and its strategies have been adopted by other market participants. Mosaic executives identify NYGB's involvement in this transaction as a key factor driving the company's growth and success.

***“Mosaic, with the help of NY Green Bank, has paved the way for the industry. There is an entire [financial] ecosystem that benefits everyone.” – Alex Kaplan:
Director of Capital Markets, Mosaic, Inc.***

¹ Mosaic had earlier established a small (\$20 million) warehouse facility prior to the transaction in which NYGB participated.

Market Effects Assessment. DNV GL identified strong and consistent evidence of NYGB’s influence on the development of clean energy finance markets through the case study of NYGB’s investment in a credit warehouse credit facility for Mosaic, Inc., as summarized in Table 1.

Table 1. Evidence of NY Green Bank Effects on the Market for Residential Solar PV Financing

Market Indicators	Evidence
Increase in volume of similar clean energy projects in NY	<ul style="list-style-type: none"> • The pace of residential solar installations in NYS increased through 2016 faster than in other states with advanced solar markets and did not decrease as much through 2018. • NYGB counterparties installed or financed 38% of the residential solar capacity installed in New York during the period 2016 – 2018.
Replication of demonstrated financing arrangements by other developers	<ul style="list-style-type: none"> • By the end of 2018, loans had displaced leases and Power Purchase Agreements (“PPAs”) as the most frequently-used vehicle for financing residential solar installations, in terms of MW capacity installed. • Several national competitors have adopted the business model first developed by Mosaic, with support at a critical juncture from NYGB.
Increase in the scale of transactions of the type supported by NYGB	<ul style="list-style-type: none"> • The average size of all residential solar aggregation transactions increased from \$250 million in 2015 to over \$320 million by 2018. Subsequent transactions were oversubscribed.
Increase in the volume of similar transactions	<ul style="list-style-type: none"> • The annual volume of residential solar project securitizations issued industry-wide increased from \$250 million in 2015 to \$2.6 billion in 2018. • Mosaic issued 35% of the total securitization volume between 2017 – 18.
Increase in number of financial firms in similar transactions	<ul style="list-style-type: none"> • NYGB was joined by only one other financial institution in Mosaic’s initial warehouse credit facility. Twenty-nine banks and financial institutions participated in Mosaic’s loan securitizations issued in 2018.
Increased awareness of investment opportunities among financial institutions	<ul style="list-style-type: none"> • Industry observers report there are 40 – 50 institutional investors active in financing residential solar aggregations.

The remainder of this case study describes NYGB’s involvement with Mosaic and discusses the indicators of NYGB’s impact on Mosaic’s success and the development of the market for residential solar financing more broadly.

2 RESIDENTIAL SOLAR LOAN AGGREGATION: THE MOSAIC WAREHOUSE CREDIT FACILITY

2.1 Warehouse Credit Facilities in the Residential Solar Industry

Warehouse credit facilities advance funds to a clean energy project developer or financing company for the completion of qualifying projects that aggregate into a sizable portfolio. These portfolios may subsequently be marketed to commercial lenders and other investors through the process of securitization. In general, the securitization process pools small transactions such as credit card debt, auto loans, residential mortgages and equipment leases, and sells claims to cash flows, tax credits, and depreciation deductions associated with those assets to third party investors. The securitization process creates liquidity in the marketplace by enabling a wide range of investors to effectively participate in the larger asset pool.

Large residential solar installers and lenders that specialize in financing residential solar projects have relied heavily on warehouse credit facilities and securitization to grow their businesses. While straightforward in concept, the operations of warehouse credit facilities are complex. Loan or lease origination and payment processes must be easy for borrowers to use and sufficiently standardized to handle thousands of transactions. This ease of use for the borrower must be balanced against robust due diligence and credit operations to assure investors that they will receive the returns they expect.

Between early 2016 and May 2017, NYGB participated in six warehousing/aggregation transactions backed by loans, leases, or PPAs for residential solar projects. The lending supported by these transactions supported roughly 38% of total residential solar PV capacity installed in NYS from 2016 through 2018.



2.2 The Residential Solar Finance Market

The annual volume of residential PV capacity installed nationwide increased nearly ten-fold between 2010 and 2016.² This rapid growth was driven by several factors, including:

- **Steep decrease in the installed cost of residential PV systems.** Between 2010 and 2016 the average cost per watt of capacity installed decreased roughly 60%, from \$7.24 to \$2.98. These cost reductions reflect decreases in the prices of panels, electronics and rack mounting systems, and increased competition among installers.³
- **Widespread introduction of net metering.** By 2015, over 40 states had adopted net metering provisions, which increased the economic value of PV installations to their owners.
- **Product and business model innovation coupled to third-party financing.** Installed costs for residential solar PV systems have typically ranged from \$12,000 to \$30,000 prior to application of tax credits and other incentives. Initial costs have been, and continue to be, identified by homeowners as the major barrier to adoption of solar PV. However, surveys of actual and potential PV system purchasers found that homeowners were deterred from using conventional bank credit by several factors, including: lack of confidence in the long-term financial benefits of PV, the perceived hassle of getting a bank loan, and an unwillingness to place additional liens on their homes.⁴

To address these barriers, large solar installers including Solar City, Vivint, Sunrun, and SunEdison created new products, including PPAs and leases with variable terms to ensure positive cash flow to their customers. These customer arrangements were backed by complex lease and aggregation transactions that entailed selling claims to the tax credits and depreciation benefits associated with the PV systems to third-party investors. To generate the scale needed to support the legal and accounting requirements of such structures, these large installers spent heavily on customer acquisition, including door-to-door sales in high-potential neighborhoods.

As depicted in Figure 1, this approach was associated with a rapid increase in the volume of residential solar PV installed between 2009 and 2016. During this period, the national market share of the three largest installers – Vivint, Solar City, and Sunrun – grew to over 54%. However, the customer acquisition and financing costs associated with the new business model proved to be unsustainable. By the end of 2016, customer acquisition costs for the three largest installers amounted to 19% of the total cost of installations, more than offsetting the operational efficiencies these larger firms could achieve.⁵ SunEdison exited the residential market in 2016, and the market share for the top three firms decreased as did the percentage of installations owned by third parties. In

² Solar Energy Industry Association, 2018. *U. S. Solar Market Insight Report*. <https://www.seia.org/us-solar-market-insight>.

³ R. Margolis, D. Feldman, and D. Boff. 2017. Q4 2016/Q1 2017 Solar Market Update. National Renewable Energy Laboratory. <https://www.nrel.gov/docs/fv17osti/68425.pdf>.

⁴ Mitchell Rosenberg and Gomathi Sadhasivan. 2018. "Here Comes the Sun, Maybe". *Proceedings of the ACEEE Summer Study on Energy Efficiency in Buildings*.

⁵ Alison Mond, "Beyond SolarCity, Vivint Solar and Sunrun: Who Is Actually Growing in the Residential Solar Market?" GTM Research. January 10, 2018. <https://www.greentechmedia.com/articles/read/beyond-solarcity-vivint-solar-and-sunrun-residential-solar-market-long-tail#gs.AVYaD=E>.

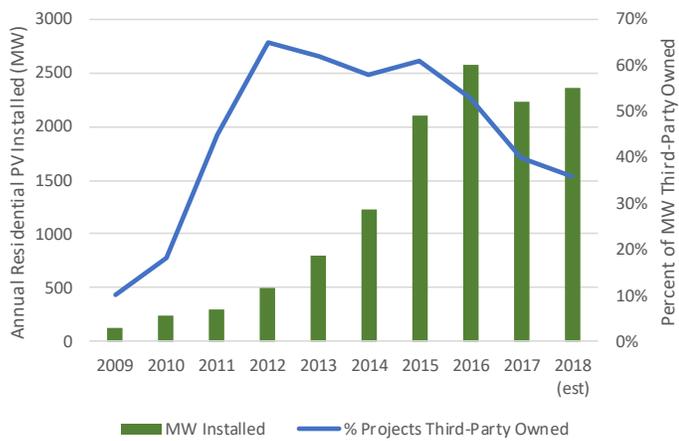
Field Code Changed

Field Code Changed

Field Code Changed

2016 and 2017, some mid-sized installers began to develop their own credit facilities, primarily with regional commercial banks. However, the scale supported by these arrangements could not match the volumes attributed to the early generation of solar leases.

Figure 1. Annual Residential PV Installed in the U. S. and Percentage Third-Party Owned



The Mosaic Solar Loan. Mosaic is a specialized lending company that offers loans to homeowners for solar PV systems and other home improvements through a network of solar installers and contractors across the country. The company was founded in 2011 and introduced its Solar Loan product in 2014. Mosaic developed its solar PV business model specifically to address the problematic cost structure of first-generation third-party financing for residential solar PV. The company's approach incorporated the following features:

- **Simplified and streamlined project financing.** The transaction with the end customer is a straightforward consumer loan of up to \$100,000, with repayment periods from 10 to 25 years.⁶ The customer selects the preferred terms and may change repayment periods to adjust cash flows. There are no pre-payment penalties. Applications and credit assessments are accomplished online and customers can be approved for loans in as little as 24 hours.

⁶ Mosaic has evolved some aspects of its loan products, including available repayment period selections, over time.

- **Marketing through dealer networks.** The Solar Loan product is marketed by the employees of independent dealers. Over time, Mosaic has recruited over 230 such companies into its network and trained over 1,800 sales staff to market the product.
- **Standardized customer and dealer agreements.** Mosaic has standardized its agreements with end customers and dealers to simplify sales and administration. Some customization is permitted to accommodate the needs of larger dealers.
- **Streamlining of credit facility arrangements.** Mosaic has not attempted to package and sell tax credits and depreciation associated with the solar PV systems it finances, which reduces legal and accounting complexity and cost. This approach enables the company to maintain a relatively simple, low-cost credit facility.

As of December 2015, Mosaic was originating \$25 to \$30 million per month in loans through its installer network. It had exhausted its initial rounds of funding and required an infusion of project financing to maintain its rapid growth.

2.3 Case Study: NY Green Bank and the Mosaic Solar Loan

Case Summary

Developer/Owner: Mosaic, Inc.	Financial Product: Warehousing/Aggregation
Other Financial Institutions: DZ Bank, BNP Paribas, Guggenheim Partners	Product Sub-Type: Senior Debt Amount Financed: \$50 million
Project Impact: NYGB's commitment will support up to 9,000 residential solar systems in NYS.	NYGB Participation: NYGB committed \$50 million in two stages to a loan warehousing facility totalling \$270 million to aggregate consumer loans provided to finance residential solar PV installations nationwide.
Energy savings and other benefits. Capacity installed: 15.4 MW Estimated Generation: 6,200 MWh/year Emissions Reduced: 3,260 MTce/year	Market Barriers Addressed Insufficient commercial financing for loan originators focusing on residential solar PV Insufficient pace of securitization by institutional lenders to keep up with demand
Impact of NYGB Participation <i>"[NY Green Bank's] involvement in our first major warehousing was significant and led directly to investor confidence in later securitizations."</i> Alex Kaplan, Director of Capital Markets, Mosaic, Inc.	

Project Initiation and Participation of Private Financial Institutions. Mosaic's initial venture was a crowd-funded model for commercial solar projects. The company moved into the residential market in 2014. Mosaic's first major round of external capital came in October 2014 with reinsurer PartnerRe funding \$100 million of Mosaic residential solar loans. With its expanded lending capacity, Mosaic was also able to expand its network of participating installers. Mosaic also raised \$220 million of equity financing through the private equity firm Warburg Pincus.

Field Code Changed

Guggenheim Securities, a division of Guggenheim Partners, initiated the proposal to NYGB in 2015 to be an anchor participant in a credit facility for Mosaic that was undersubscribed by traditional capital sources. NYGB's initial commitment to the credit facility was \$10 million of a total \$110 million, to be used exclusively to fund residential solar projects in NYS. In 2016, the credit facility was expanded to \$240 million; NYGB increased its commitment by an additional \$40 million specifically earmarked for NYS projects. BNP Paribas also joined the credit facility at that time with a \$90 million commitment.

The Credit Facility. The credit facility in which NYGB participated operates as follows:

1. Mosaic originates loans to customers to finance residential solar PV installations through trained representatives employed by a network of independent solar installers.
2. Through a special purpose entity, Mosaic purchases the receivables created through the loans, up to a contractually-specified fraction of the loan amount, known as the advance rate. The remainder of the amount needed to purchase the receivables comes from the equity of the parent company.⁷
3. Borrowers pay principal and interest to Mosaic LLC, which in turn pays principal and interest on the money advanced by the lenders, as well as a return on equity to the parent company.

Impact of NYGB Participation on Mosaic. According to Alex Kaplan, Director of Capital Markets at Mosaic's parent company, NYGB's participation in Mosaic's first large warehouse credit facility helped the company address four critical growth challenges related to financial markets: funding early growth, scaling operations, attracting new investors into securitized transactions, and reducing the costs of borrowing. The following summarizes Mr. Kaplan's observations on the effect of NYGB's participation in meeting these challenges:

- **Funding early growth.** In the year prior to the launch of its first warehouse credit facility in April 2016, Mosaic had increased its monthly pace of solar loan initiation from \$3.2 million in December 2014 to \$25.2 million by November 2015. NYGB was the second financial institution to commit funds to the credit facility, with an initial tranche of \$10 million. NYGB quickly upsized its commitment by a further \$40 million as loan originations gained pace, which, according to Mr. Kaplan, was instrumental in attracting a third investor to the initial warehousing facility in July 2016.
- **Scaling operations.** Mr. Kaplan noted that lending operations supported by this round of funding enabled Mosaic to extend its dealer networks and improve its IT platforms, which in turn increased efficiency and Mosaic's ability to meet its financial obligations:

"NY Green Bank assisted our [efforts to scale operations], so that we had fewer "foot faults." We are more efficient now, enjoy greater flexibility, better systems, which facilitates our scaling up. This is reflected in better execution of our securitizations, so we can invest more in our business."

⁷ The advance rate is an indicator of the lenders' confidence in the credit of underlying loans. The higher the advance rate, the more the lenders are exposed to risk of delinquencies or non-payment.

- **Attracting investors into securitized transactions.** In February 2017, Mosaic closed its first credit-rated securitization for \$140 million. The issue earned an “A” credit rating by the Kroll Bond Rating Agency. This high rating reflected Kroll’s assessment of the quality of the underlying credit. The issue was five times oversubscribed, meaning Mosaic received over \$700 million in qualified offers to purchase the securities. Between October 2017 and January 2019, Mosaic issued four securitizations for \$310 million, \$235 million, \$315 million, and \$260 million respectively. These issues have attracted the participation of over 50 investors.⁸ According to Mr. Kaplan, “That first major warehousing helped assure the [subsequent securitizations] and facilitate future capital partnerships. We are now working with lenders and capital providers comfortable with what is no longer a new concept. We no longer have to explain distributed generation.”

Mr. Kaplan expressed the view that NYGB’s participation in the first major warehousing facility was decisive in helping to attract other capital partners to subsequent securitizations. For example, when asked about his satisfaction with NYGB’s role, Mr Kaplan reported: “Yes, their involvement in [Mosaic’s] first major warehousing was significant and led to investor confidence in later securitizations. NYGB led to involvement of other warehouse lenders.”

- **Reducing borrowing costs.** Interest rates charged to Mosaic decreased continuously from the first credit facility through the subsequent three securitizations. According to Mr. Kaplan, “These lower interest costs enable us to invest more in our business and is a reflection of investor confidence in our business due to our performance history. With our better execution comes also a larger investor base.”

⁸ Allison Mond, 2017. ‘Solar securitizations expected to pass \$1 billion in 2017’. *Greentech Media*. November 2017 <https://www.greentechmedia.com/articles/read/solar-securitizations-expected-to-pass-1-billion-in-2017#gs.QLp8fNu>.

Field Code Changed

2.4 Assessment of Market Effects

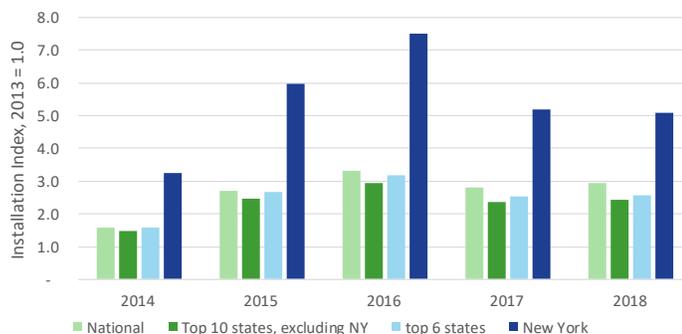
Working with NYGB, NYSERDA staff developed an evaluation approach designed to assess the influence of NYGB’s early activities on the following NYS clean energy market characteristics:

1. Knowledge of and confidence in clean energy investments among financial institutions;
2. Number and type of financial institutions active in clean energy markets;
3. Availability of favorable terms in financing offered to clean energy projects and companies;
4. Pace of clean energy project deployment; and
5. Volume of clean energy project financing.

DNV GL evaluated 14 indicators that NYSERDA expected to reflect the five clean energy finance market characteristics listed above.⁹ Through the Mosaic case study, DNV GL identified evidence of NYGB’s effect on six of the market indicators, as summarized in Table 1 above and described in this section in greater detail.

Acceleration of residential solar PV deployment in NY State. Figure 2 shows that, in 2015 – 2016, the pace of growth in residential solar installations in NYS far exceeded that in the U.S. and in other top states for solar installations. The NYS market’s rapid growth may be explained by factors specific to NYS, including the availability of financial incentives from NY Sun’s Megawatt Block program and relatively generous net metering provisions. In 2017 and 2018, the pace of installations slowed in New York, as they did nationwide and in the 6 states other than New York with the highest total residential solar capacity installed. During this latter period, NYS-specific factors, such as decreases in the level of Megawatt Block incentives and proposed changes in pricing for net metering, may have dampened the pace of residential solar installations.

Figure 2. Indexed Annual Volume of Residential Solar PV Installed: New York, U. S., and other Leading States. 2013 = 1.0.¹⁰



Source: Wood, Mackenzie Power & Renewables

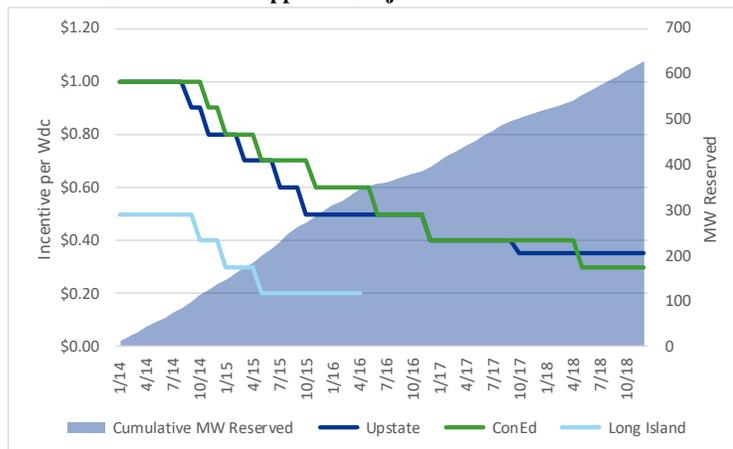
⁹ See the Appendix of this Case Study for a list and descriptions of these indicators.

NYGB closed its first transactions with residential solar installers in Q4 2015. Between early 2016 and the end of 2018, firms financed by NYGB installed or financed 186 MW or 38% of total residential solar PV capacity installed in NYS.¹¹

There were many other economic influences at work on the residential solar market in New York during the period under review.

- NYS launched a cash incentive program for residential solar PV in the two years prior to NYGB’s investments. Beginning in January 2014, the NY-Sun Megawatt Block program made cash incentives available to homeowners who installed rooftop solar PV. The incentives were structured in tranches by three regions, with declining values over time. Figure 3 displays the level of incentives per Watt_{dc} installed through the program, along with the cumulative nameplate capacity of the projects receiving incentives. Despite reductions in the level of the incentives, the volume of installations supported by the program remained stable through the period under review.

Figure 3. Incentives Paid by the Residential NY-Sun Megawatt Block Program and Cumulative Volume of MW for Supported Projects¹²



Measures of the Megawatt Block program’s intervention into the NYS residential solar market include the following:

¹¹ DNV GL analysis based on NY Green Bank records and data on solar installations from Wood Mackenzie, Annual U.S. PV Installed Capacity and Forecasts (MWdc), Cumulative Pre-2010 - 2023E, GTM Research/SEIA U.S. Solar Market Insight

¹² DNV GL analysis based on NYSERDA, Solar Electric Programs Dataset, 2000 – 2018.

- NY-Sun paid out \$152 million in incentives for residential projects during the Study Period v. \$282 million in investments in residential solar financing vehicles from NYGB. Not all of these investments were deployed in NYS.
- The value of residential projects that received NY Sun incentives during the study period was \$1.75 billion v. \$566 million for NYGB investments.
- NY-Sun incentives are limited and decrease in terms of \$/watt over time, providing customers with some urgency to act.
- Between 2014 and 2018, the Megawatt Block program paid incentives for 85% of the total residential capacity installed in NYS.
- **Uncertainty over net metering regime.** Through a process initiated in 2015, the New York Public Service Commission (“PSC”) significantly revised the State’s net metering rules and pricing. These changes were summarized in a decision dated March 2017 and implemented in an order dated September 2017.¹³ Most residential customers will remain eligible for net metering through 2020. However, the uncertainty over the outcome of the proceeding may have deterred some potential customers from installing solar PV systems on their homes. Also, given that the pay-back periods of rooftop solar systems are more than just a few years, uncertainty around the post-2020 economic situation would also be expected to have a chilling effect until the succeeding principles of the Value of Distributed Energy Resources (“VDER”) are well-understood in NYS.

The evidence of NYGB’s influence on the volume of residential solar PV installed in New York during the Study Period was thus mixed.

Evolution of more favorable financing terms for developers. During the period 2015 to 2018, several factors drove a reduction in borrowing costs for developers. These included:

- **Decrease in interest rates.** Nominal interest rates charged to all borrowers increased over the period 2015 – 2018 as the recovery from the 2008 recession proceeded. However, the spread charged above the benchmark LIBOR rate at which banks borrow money decreased over that period for residential solar securitizations. According to Keith Martin, project finance attorney at Norton Rose Fulbright LLP, the spread for seven-year bank loans was 135 basis points (1.35%) in April 2018 versus an average of 200 basis points a year earlier. Construction loan rates also decreased.¹⁴
- **Increase in the advance rate.** The advance rate is the share of project financing provided by investors in a securitization versus by the loan originator. The higher the advance rate, the greater the share of risk assumed by the investors. The average advance rate on securitizations increased from 62% in 2013 to 80% in 2017 and 2018.¹⁵

¹³ State of New York Public Service Commission. Order on Phase One Value of Distributed Energy Resources Implementation Proposals, Cost Mitigation Issues, and Related Matters. Case 15E-0751 – In the Matter of the Value of Distributed Energy Resources. September 14, 2017.

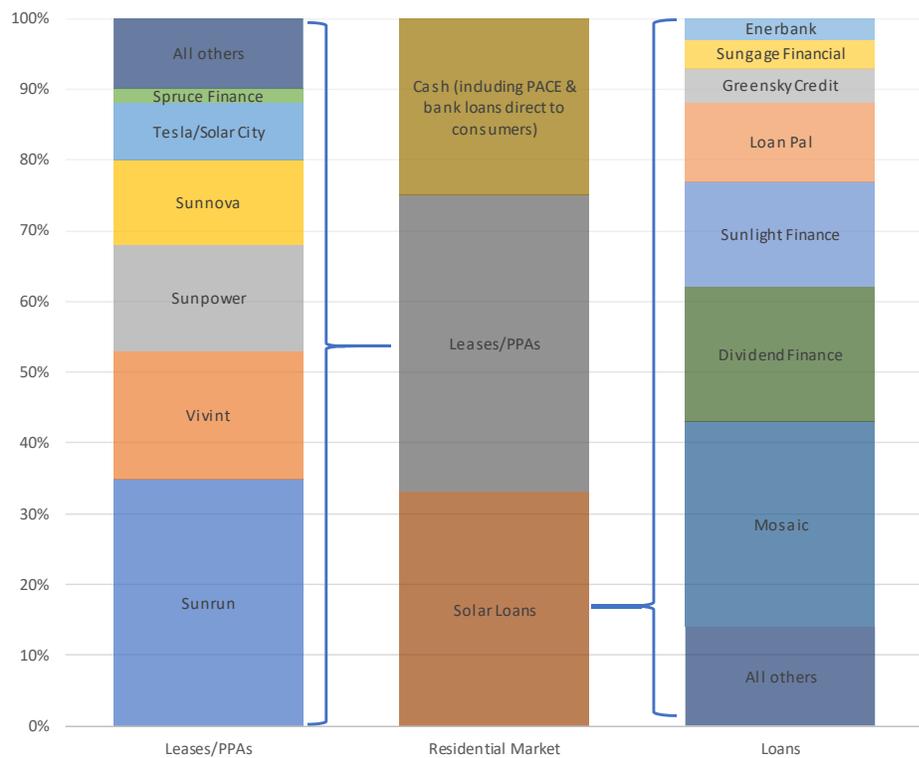
¹⁴ Brian Eckhouse, “Banks are Sweetening Their Terms for Solar as Confidence Rises”. Bloomberg New Energy Media. April 19, 2018.

¹⁵ David Feldman and Paul Schwabe. *Terms Trends and Insights on PV Project Finance in the United States, 2018*. National Renewable Energy Laboratory.

These trends in interest and advance rates suggest increased investor knowledge of, and confidence in, the residential solar asset class.

Replication of financing arrangements. As discussed above, Mosaic’s approach to solar lending reduced customer acquisition and transaction costs associated with financing residential PV projects. As of the second half of 2018, loans had overtaken leases and PPAs as the most frequently used approach to financing residential solar installations nationwide. Figure 4 shows market share for the largest companies engaged in significant lending activity in the first half of 2018. All of these companies began offering loans after Mosaic launched its solar loan product, and Mosaic remains the largest player in the market, with a 14% nationwide share.

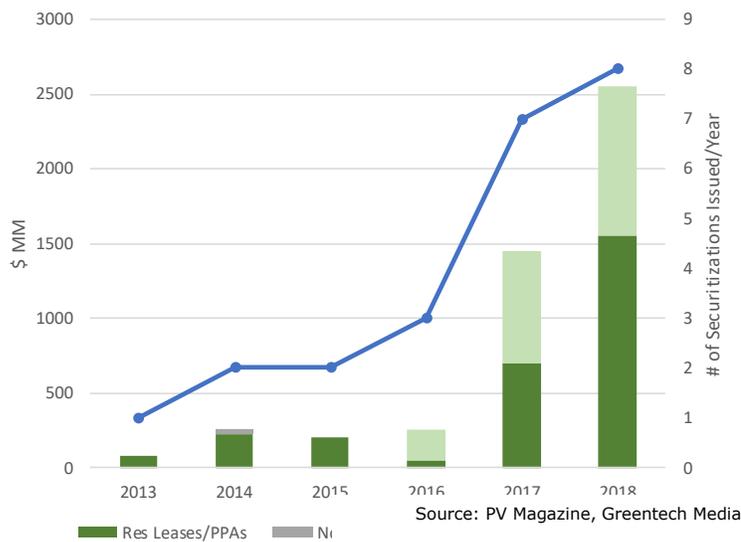
Figure 4. Residential Solar Market Shares by Ownership Type and Issuer: Percentage of Total Capacity Installed, First and Second Quarters 2018¹⁶



¹⁶ John Weaver, “Cash is king in residential solar, long live the lease”, PV Magazine, November 14, 2018, <https://pv-magazine-usa.com/2018/11/14/cash-is-king-in-residential-solar-long-live-the-lease/>.

Increase in the scale and volume of residential solar loan aggregations. Figure 4 presents the growth of residential solar aggregation transactions between 2013 and 2018. Solar loan products drove the increase from \$250 million in 2016 to \$2.6 billion in 2018. Mosaic accounted for nearly 40% of the volume of residential solar securitizations in 2017 and 2018.

Figure 4. Annual Residential Solar Securitizations by Number, Volume, and Asset Type



Increased number of financial firms in the market. The increase in the number of financial institutions participating in Mosaic securitizations is consistent with industry trends. Financial officers participating in the August 2017 Wall Street Renewable Energy Finance Forum reported that the number of financial institutions participating in such transactions had increased from roughly a dozen in 2015 to 40 – 50 at the time of the forum.¹⁷

Conclusion. NYGB provided capital to Mosaic at a critical juncture early in the development of its business model. NYGB was one of only two participants in the first major warehouse credit facility. The systems, experience, and volume Mosaic built using the credit facility enabled the company to complete over \$1 billion in securitized financing of its project receivables over the subsequent two years. Since issuing its first securitization in early 2017, Mosaic has completed the largest share of residential solar securitizations of any issuer in the market – about 40%. According to a key Mosaic executive, NYGB’s participation in the early stages of the development of Mosaic solar loans contributed significantly to the success of the product.

There is strong evidence that the success of the initial credit facility in which NYGB played a key role influenced the development of the residential solar market. In addition to trends in the

¹⁷ Keith Martin. Proceedings of the 2017 Wall Street Renewable Energy Finance Forum, Norton Rose Fulbright LLP.

volume of securitizations, numbers of institutional investors participating, and advance rates and interest rates, several other companies, including Dividend Finance and Vivint have adopted elements of this model and financing strategy.

According to Alex Kaplan, Director of Capital Markets Mosaic, Inc:

“There is now widespread acceptance of solar among capital providers, a night and day difference from my days [in the industry] in 2013. Now Mosaic, with the help of NY Green Bank, has paved the way for the industry. There is an entire ecosystem that benefits everyone.”

APPENDIX: TABLE OF MARKET INDICATORS

This table summarizes the market indicators developed by NYSERDA to assess the effects of NYGB on clean energy finance markets in New York State. It displays the working definition of the indicator used to guide data collection and analysis, as well as the principal sources used to generate those data.

Indicator	Definition	Timeframe*	Financiers Interviews / Surveys	Developers Interviews / Surveys	Press	Industry Sources	Government Reports & Statistics
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.	Short	●		○	○	
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.	Short				○	●
Increased awareness in financial community of clean energy investment opportunities	Increase over time in the proportion of financiers who report being aware of clean energy investment opportunities.	Short / Medium	●	●		●	
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.	Medium	●	○	●	●	
Increase in the scale of individual clean energy project financing transactions	Increase over time in the average size or characteristic range of sizes for clean energy projects or financial transactions of a given type.	Medium	○	●	●	●	○
Increase in number of clean energy project financings	Increase over time in the number of clean energy project financings of a given type.	Medium / Long	●	○	●	●	○
Increase in the number of financiers offering products supported by NYGB	Increase over time in the number and type of financiers offering financial products similar to those offered by NYGB.	Medium / Long	●	●	●	●	○
Increase in the number of third-party owners	Increase in the number of financiers participating as third-party asset owners through leases or Power Purchase Agreements (PPAs). Not assessed; deleted from study plan.	Medium / Long	●	○	●	●	●
Replication by developers of NYGB financing approaches – Residential/Commercial	Reports of financing approaches that are the same or similar to those used by NYGB.	Medium / Long	○	○	●	●	○
Increase in the total volume of clean energy project financings	Increase over time in number of clean energy project financings of a given type	Long	○	○	●	●	○
Increase in the volume of clean energy projects	Increase in the number, capacity or dollar volume of clean energy projects of a given type in a given market	Long	●	○	●	●	●
Emergence of secondary markets	Increase in the volume over time of sales of loan or lease receivables to secondary markets, either directly or through securitization.	Long	●	○	●	●	●
Reduction in financing costs: interest rate, transaction costs, equity requirements, etc.	Reduction over time in financing costs, primarily interest rates and equity requirements (advance rates).	Long	●	●	○	●	○
Reduced elapsed time to complete transactions	Reduction in time interval between application for financing and transaction closing.	Long	●	●			
Reduction in clean energy technology costs	Reduction over time in the unit installed cost of a given market. Not assessed in this phase.	Long	○	○	○	●	●

○ = Sources Used; ● = Productive Sources Used
 * Short = 0-3 years from start of operations; Medium = 3-5 years from start of operation; Long >5 years from start of operation