



Solar Mosaic Inc. Mosaic Home Solar Loan

SunShot 9 Final Report

Award Number:
DE-EE0006686

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Executive summary

The 6686 Mosaic SunShot award has allowed Solar Mosaic Inc to progress from an early stage startup focused on commercial crowdfunding to a leading multi-state residential solar lender.

Our platform is now used by the majority of the nation's top solar installers and offers a variety of simple home solar loans. Mosaic has originated approximately \$1Bil in solar loans to date to put solar on over 35k rooftops. The DOE's efforts, combined with our own, are helping to reach homeowners with a wide range of credit scores across multiple states and mitigate boundaries preventing them from profiting from ownership of a home solar system.

The project included milestones in 5 main categories:

1. Lending to homeowners outside of CA
2. Lending to homeowners with FICO scores under 700
3. Packaging O&M with the home solar loan
4. Allowing residential installers to process home solar loans via API
5. Lowering customer acquisition costs below \$1500

A number of key learnings came out of the project. We found that many US homeowners are drawn to direct ownership through a loan and prefer this option to third party ownership (PPA's and Leases).

- Installers can realize substantial growth to their businesses by focusing on selling benefits of ownership (capturing the ITC & home value increases).
- High demand exists for home solar lending solutions outside of CA.
- Customer savings on their system is an import metric to predict default rates (the homeowner is unlikely to default if they save money with the solar system loan).
- Some solar installers are receptive to providing O&M along with a home solar loan, though most prefer to charge for this feature and package it with a Performance Guarantee.
- Most large residential installers have customized CRM systems where they process quote requests. Some prefer to submit loans via API and it has proven to be important for us to integrate with their sales processes.
- Most residential installers struggle with rising customer acquisition costs. Installers with refined lead processing practices such as efficient call center operations and automated follow up using marketing automation tools are most likely to close more loans at lower cost.

The Mosaic home solar loan platform is now used by over 250 installers across 40 states, who have found that they can offer home solar loans at reasonable cost to homeowners.



Homeowners save \$30,550 on average with a Mosaic Home Solar Loan and installers are able to grow their businesses with faster online approvals through the lending platform. Savings are based on savings of Mosaic borrowers between 11/3/2014 - 9/30/16 using our 20 year choice rate loan product. Savings depend on credit profile, timely monthly payments and making the prepayment target. Savings are calculated by (Electricity bill before solar) - (Bill after solar + Mosaic loan payment). Savings may vary above or below the average rate based on geography and weather variability particular to jurisdiction. We assume a solar panel life span of 30 years, a decline in panel production of 0.5% per year, inverter replacements at years 10 and 20, and retail electricity rates increasing 2.18% per year (National average utility bill increase of 2.18% based on EIA data for the last reported 20 years, nationally (1997-2017).

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Background history of Mosaic through the award

Mosaic began the cooperative agreement in 2014 by offering our first home solar loan to a limited set of partners through a basic lending platform. We explored 3 main concepts to generate home solar loan volume:

1. Channel partners - offering the use of our platform to solar originators
2. Lead generation - generating inbound web inquiries through digital marketing
3. Referral - creating partnerships with companies like Apple, Google, and others, along with exploring the creation of a large scale referral program to crowdsource interested homeowners

Following a pilot phase, it quickly became clear that the channel partner model would be the focus for customer acquisition and loan offerings. Additional funds and focus were used to develop the easiest application process in the industry, which was easy to use on both the consumer and installer end; a streamlined credit approval process, which returned a result in seconds; and a new lending portal built alongside our existing crowdfunding investment platform. Many investors became borrowers and vice versa.

As 2014 progressed, it became clear that the residential solar loan would be the main focus for the business and additional hires were made to expand partnerships with the largest solar companies, additional engineering staff was hired to improve the platform experience, customer support was added to handle increasing call/email volume, and finance staff was added to support discussions with capital partners to be sure we had the backing to scale the loan program.

In October 2014, we announced a \$100MM investment facility from PartnerRe, a large reinsurer. <http://www.bloomberg.com/news/articles/2014-10-20/partnerre-to-fund-100-million-of-Mosaic-home-solar-loans>. Holding us accountable to high standards of underwriting and accounting, PartnerRe helped us scale the offering and win the trust of the largest solar companies. This attracted additional capital providers and gave us more flexibility to offer the best loan to homeowners.

In 2015, we created custom loan products with large solar originators--such as Sungevity, NRG, SunPower, Vivint, and others--that helped us expand lending across states and lend down to 640 FICO scores. A variety of loan terms and interest rates were tested across different markets, all aiming to generate the highest savings for the homeowner, and all incorporating the Federal Tax Credit. We allowed the consumers to capture this value themselves, which stood in contrast to the predominant PPA and lease models. Studies performed by NREL on home value increase and the cost effectiveness of solar loans helped drive the market away from third party ownership and into the hands of the homeowners.

After small scale testing, we began to build out the lead generation program in 2015 by bringing on digital marketing experts, a consumer marketing attorney, and creating a special growth

engineering team to work on projects related to lead qualification and routing for our installer partners. We also built a lead routing/qualification system, which took in reporting from installers on lead quality, appointment setting, and close rates.

Further design and functional improvements were made to the loan platform over 2015, allowing partners to gain greater insight into their deal flow and approve more borrowers. We also completed numerous API integrations across our largest clients, which allowed them to submit loans directly from their call center/sales and proposal software. Integrating into their existing systems proved to be a key step in reducing friction and increasing loan volume. We quickly became the primary lending partner for many of our clients after completing these integrations.

In late 2015, due to restrictions placed on consumer lenders by the CFPB after the mortgage crisis making it cost prohibitive to continue the lead routing program, the DOE SunShot team approved a spinoff of the lead routing system into a separate entity called Wave Solar. This allowed us to continue scaling the program for Mosaic partners but focus on streamlining the program. The spinoff proved to be successful and since the shift, Wave Solar has completed development of an industry leading lead qualification platform, has merged with Between Ads Inc, a leading solar lead gen company, and now successfully serves 6 of the top 10 US solar installers.

At the start of 2016, Mosaic raised an additional \$200MM to fund our growth <http://www.reuters.com/article/us-solarMosaic-funding-idUSKCN0XO2BJ>, laying the groundwork for us to scale into funding over 1 billion in home solar loans. We are continuing to refine the loan product and platform to allow more borrowers to qualify for the loan.

Project objectives and results

The SunShot cooperative agreement was instrumental in our progress as a company by helping fund and anchor our work to these key metrics. The cooperative agreement required us to hit the following milestones, all of which we exceeded by the end of the performance period ending 3/31/16:

1. Baseline number +250 Mosaic originated solar contracts at under \$1,500 cost of acquisition. We signed 283.
2. 50 approved loans sent instantly to installer via API. We sent 1,521 since December 2015.
3. 50 signed loans outside of California. We signed 3,791.
4. 50 signed loans to homeowners with credit score under 700. We signed 2,136.
5. 5 signed loans with integrated O&M from at least 3 different O&M providers (15 loans total).
6. 50 tests run and documented to improve lead conversion rates; 30% improvement over base achieved in at least 2 of the 4 channels. We completed over 100 successful tests.
7. 680 residential solar leads from SEO sites. We generated 1,251.

Project results and discussion

Lending to lower FICO borrowers

Mosaic was required to sign at least 50 loans for borrowers with FICO score of less than 700. As a company, we have always tried to build products that democratized clean energy. Our company vision is 100% Clean Energy For All and we feel that solar should be accessible to as many homeowners as possible. This metric aligned perfectly our ethos and we had no trouble meeting and surpassing it.

After speaking to capital providers, it became clear that many institutional capital sources did not have enough data to accurately assess the default risk for solar loans. Generally lenders will backtest their credit models by looking at default rates across various FICO bands. With few residential solar loan portfolios to look at and almost no defaults, we were forced into a bucket with other loan types, such as mortgage and home improvement loans. Unlike these asset classes, most of our borrowers saved money with our loan from the start. We performed a study midway through 2015 across a set of our CA borrowers and found that their savings equated to \$67,083. With these large savings, customers would actually end up paying more to the electric company than if they made their loan payments on time, so few defaulted. With an extremely low default rate, we felt that a solar loan should be able to attract better terms from capital providers than other asset classes. This assumption has proven to be true in the solar lending space.

We then hired a professional credit analyst who previously headed up the Moody's solar team. He helped develop the credit and underwriting policies for Mosaic and he's one of the most competent people in the industry. His team at Moody's would take a portfolio of solar loans/bonds, deeply analyze how risky they were as an investment, and issue a rating or "grade" on them. All types of institutions have investment restrictions depending on the rating issued by his firm or two others. Mosaic had a medium to long-term goal of getting our portfolios rated, so he helped to advise exactly how to underwrite these loans to make sure we check all their boxes.

With our more robust credit data, we were well positioned to go into capital provider discussions and obtain the most favorable terms for our lower FICO score borrowers. Our efforts were successful and are currently able to lend down to 640 FICO scores. We have completed 2,136 loans under 700 FICO during the cooperative agreement period ending 3/31/16.

As our solar loan volume increases and the asset class develops into portfolios that can be backtested for default risk, we imagine that risk adjusted pricing will become more accurate as well. Interest rates will more accurately reflect the risk of the borrower defaulting and due to the extremely low default rates on solar loans, we should be able to consistently improve favorable loan terms for consumers.

Lending to homeowners outside of CA

Since our crowdfunding investment platform was originally only available to CA investors, we naturally had the most coverage and traction with CA partners. When we started offering the loan platform to the market, CA was also the most mature solar market so it made sense to pilot the program there. The SunShot program tasked us with signing loans to at least 50 borrowers outside of CA. As of 3/31/17, we have signed loans outside of CA in 17 states and done 3,791 loans outside of CA.

The Wave Solar lead program in particular is getting traction in east coast states and per lead pricing in NY, NJ, MA, RI, and CT is very favorable compared to CA. Naturally, we think that Mosaic will continue to gain popularity both in and outside of CA as our loan is offered by installers gravitating to new, cost-effective solar states.

As of 3/31/16, we offer the loan in 34 states and are gradually expanding to all 50. A dedicated section of our legal team is working on this expansion and obtaining state lending licenses.

Offering O&M with loans

With solar leases or PPAs, the provider of the solar equipment owns the Operations & maintenance ("O&M") risk compared to solar loans where this risk shifts to the homeowner.

Before offering our loan product, we surveyed a set of CA homeowners on why they would move forward with a solar lease vs. a loan. A number of misconceptions emerged about how a solar lease works, primarily due to homeowners experiences with car leases. A number of respondents were also concerned about the maintenance of the system and expected that the panels and parts would be replaced periodically throughout the life of the system. In reality, the life expectancy of brand name solar components is now well understood and can be forecasted with a high degree of accuracy. Nevertheless, many consumers were choosing third party ownership over loans for these reasons.

To address this issue, SunShot cooperative agreement mandated that we package O&M with at least 5 loans from 3 different installers.

We began examining this from the equipment perspective and successfully put together a unique package with one of the top inverter manufacturers in the country, Enphase: <http://www.renewableenergyworld.com/news/2014/07/Mosaic-and-enphase-packaging-solar-loans-with-maintenance-deals.html>. The package gave a 10-year uptime guarantee on the inverters, monitoring, and rolling trucks as necessary. Unfortunately even with positive press around the program, this didn't gain traction with our partners. In markets such as CA that are price sensitive, some partners are hesitant to package these expensive high quality inverters with systems and often prefer a lower overall system price.



Over time we recognized that installers preferred to package O&M packages as part of a Performance Guarantee (“PeGu”) with the loan itself, often as an upsell or incentive for the customer to sign with them. Certain installers (four installers in total, including Mosaic’s largest installer) offer O&M as part of the PeGu.

The risk to Mosaic’s borrowers related to system malfunction or breakdown is mitigated through equipment manufacturer warranties related to the solar system, workmanship warranties related to the installation by the installer and by a concierge service provided by Mosaic. Under the concierge service, borrowers who contract Mosaic can find a replacement installer through Mosaic (who works with Heliopower) to find subcontractors able to perform O&M at pre-negotiated rates. Most service related issues are related to installation problems or defective equipment which are covered by the workmanship warranty and equipment warranty.

Installers typically provide a minimum 2 year installation warranty. Manufacturers typically provide a 25 year warranty on Panels and 5+ year warranty on Inverters, 10 year warranties for defects, and 25 year warranties for power output. Manufacturer warranty typically covers 80% of nameplate production. Equipment damage is assumed to be covered by the borrower’s homeowner policy.

Under a Performance Guarantee (“PeGu”), the installer guarantees production output of the system. The guarantor agrees to pay the difference between a guaranteed system output and the actual measured system output multiplied by the agreed energy price per kWh. If the system generates more output than guaranteed output, the surplus is carried over and used to offset any deficits that may occur in the future. The large majority of Solar Mosaic’s installation partners do not offer a PeGu as it is not considered a standard industry practice to offer such guarantees for cash purchases (including those financed by a loan). However, approximately 26.9% of loan dollars include PeGu. To maintain eligibility for a claim under the PeGu, the homeowner is responsible for washing the panels, clearing the panels of snow, trimming trees, and refraining from modifying the equipment or home that would cause the system to underperform. Borrowers are required to pay Mosaic loan amounts regardless of system performance or payments made pursuant to a Performance Guarantee, however such conditions could result in borrowers selectively defaulting. The Company believes, in practice, the performance degradation sufficient to trigger a payout under a PeGu would likely be due to either an installation defect that would trigger the installer workmanship warranty or an equipment defect that would trigger the manufacturer warranties (which include a panel degradation warranty).

Integrating with installers via API

Our milestone required us to complete 50 loans sent instantly to installer via API and we have successfully completed over 1,500 as of 3/31/16.

Installers have utilized our API in a variety of ways, both putting us into their proposal systems and integrating their call center operations so they can provide financing comparisons on the phone. We want to reduce friction for our partners in any way possible and having an “API that doesn’t suck,” as our engineering team bluntly stated, has proven to be an important selling point.

Acquiring customers for under \$1500

The cost of customer acquisition in many solar markets is equal to the cost of the hardware. Two years ago, the biggest problem in the solar industry was cost of capital. Today, it is customer acquisition.

Our cooperative agreement milestone around customer acquisition required us to get over 250 deals signed at under \$1500 by 3/31/16. To help surpass this metric, we put together a robust lead generation strategy to test multiple channels:

1. Content Syndication
2. Solar Learning Center & Places (SEO)
3. Digital Media Buying on Google, Facebook, Yahoo and Bing
4. Community Organizing i.e. Heroes

Consumer lending laws / trigger terms

Through 2014 and September 2015 we implemented the lead generation strategies above while navigating key consumer lending laws, which substantially increased the cost to acquire each lead.

Under CFPB guidelines, put in place after the mortgage crisis, there were restrictions placed on the types of marketing that can be undertaken by a consumer lender. One that was particularly burdensome and proved to dramatically affect our cost per lead was trigger terms. The guidelines state that if you have any of the "trigger" terms you must disclose all of the "triggered" terms:

(Triggers) if it includes any of the following:

- Amount/percentage down payment
- Number of payments
- Term of repayment
- Amount of any payment
- Amount of any finance charge

(Triggered) Then it must include all of the following:

(In equal prominence and close proximity to the triggering term)

- Amount & percentage of down payment

- Terms of repayment (example or unit cost approach can be used)
- APR and fact it may increase if applicable

Listing a lengthy disclaimer after a lead form seemed to scare away consumers and in some cases even doubled our cost per lead. This put us at a substantial disadvantage relative to other solar marketers, who weren't consumer lending companies.

Additionally, we planned to undertake a crowdsourced lead referral platform called Heroes and this was deemed risky due to current consumer lending laws around incentivizing loan volume. We would not have been able to cover the cost of the platforms operations even after exploring this extensively with our consumer lending law firm.

In September 2015, we decided that it was no longer cost effective for Mosaic to continue this channel and proposed a shift to the DOE, which was subsequently approved where we would spin off the lead generation operation into a separate entity to be named Wave Solar. Wave Solar would provide leads to our partners and not be subject to the rigorous consumer lending laws. In October 2015, we successfully spun off this section of the business, which subsequently improved our cost per lead, cost per acquisition, and ensured that the technology built under the cooperative agreement would see commercial application well into the future. To further increase our ability to drive closed deals at under \$1500 per close, we proposed and were granted a merger with a lead generation company Between Ads Inc in 2016. The technology stacks of the firms were merged into Wave Solar and now the lead program continues to run and help partners acquire customers.

Content syndication

Content syndication entailed creating variations on educational blog content relating to solar. The content was then advertised on content syndication network called Outbrain to list the article titles and photos at the bottom of popular news websites. As we advertised the content, it would gain in popularity and some of the prospects would become leads and eventually customers.

During the term of the cooperative agreement, we explored a variety of tactics within this channel. We tried articles both on and off the Mosaic blog, direct response content, content promoting Mosaic and content promoting our installer partners. In late 2015 and into 2016, this channel began to get prohibitively expensive as other advertisers have latched onto this strategy. We gradually scaled back as costs began to climb.

Solar learning center / places (SEO)

When Mosaic launched our crowdfunding platform we received great press coverage from hundreds of major news outlets. This gave the joinMosaic.com site excellent trust on Google. We utilized this high trust rating under the cooperative agreement to build a new concept in 2014 as a test called Places. We encouraged individuals to nominate their schools, churches,

community centers etc... to go solar. If enough people voted, we would put the project up on the crowdfunding platform and actually fund the solar project for the location. This strategy generated excellent search rankings for a period of time. We decided to redirect that effort into a high conversion rate site in 2016 along with developing a solar learning center.

In mid-2015 we launched a new website, which was primarily focused on the consumer. This website utilized our trust we had gained with Google, through the crowdfunding platform and then Places, to rank high for terms that drove high volumes of leads generated through search engine optimization.

SunShot mandated that we generate over 680 leads from SEO and we successfully generated 1,251 leads using this strategy.

Digital marketing

Digital marketing staff time was included in the award budget, but not media. The majority of our closed deals at under \$1500 are currently coming from paid digital marketing. Demographic targeting has allowed us to target homeowners in specific utility zip code areas and generate high quality leads at low cost.

We've now begun to expand our efforts into running digital marketing services under our installer partners' brand names. We offer our knowledge base and expertise directly to partners in professional service engagements through the Wave Solar brand.

To date we have completed over 100 A/B tests across variations within our landing pages and ads. The cooperative agreement milestone mandated 50 tests run and documented to improve lead conversion rates: 30% improvement over base achieved in at least 2 of the 4 channels. We ran tests both within ad networks and on landing pages using unbounce.com and vwo.com.

Landing pages that efficiently convert prospects into leads can dramatically lower the cost of customer acquisition. For instance, if all other variables remain constant, simply improving a landing page conversion rate from 1-2% by using different colors, copy, imagery and/or form design, cuts the cost of acquiring the lead in half. Many of these tests were surprising, with disclaimer copy / size / color and button color / styling / copy leading to the most dramatic differences. Many of our conclusions can be seen on the current <https://joinMosaic.com/> website, which converts clicks to leads at a very high rate.

Referral platforms

50% of the solar industry's acquisition is from referral, yet nobody has built a game-changing referral or lead generation platform. During the term of the cooperative agreement we explored creating a concept that works to fill the information and perception gap by letting people spread solar through their physical and social networks. The referral platform is crowdsourced lead

generation and gives us the opportunity to cut costs of customer acquisition and provide a valuable service to our installer partners. As an important clarification for compliance reasons, the referral platform will not market Mosaic's loans but rather the solar value proposition itself.

Individual referrers

In early tests with finding referrers via free craigslist postings, we had 15 people complete the first interview and request to be trained as a solar referrer. Nearly all preferred being paid on a per lead basis (\$50/qualified lead) vs. closed deal because they valued immediate cash flow. About half of these folks felt comfortable finding people they could talk to for sign-ups, but the other half wanted help finding new leads once they exhausted their immediate networks.

We see two basic models to recruit and incentivize individual referrers

1. The Sungevity / Sunshine Network Model: Homeowners who have just gone solar use Mosaic developed tech tools to easily push the word out to their networks and receive commissions.
2. The SolarCity Ambassador Model: We recruit individuals who want supplemental income, such as nonworking spouses, college students, individuals in their 20s and those in the older demographic to receive commissions. Individuals are further incentivized to refer their friends / family / colleagues under them and receive incentives from second tier referrals.

Group / Organization referrers

We forecast higher loan volumes and higher quality leads will come from partnerships with organizations with strong existing canvassing networks. Initial research and discussion with several mid-sized environmentally focused nonprofits suggests the possible feasibility of engaging with them on a pay-per-close basis, either through supplying them with digital marketing assets (i.e. email templates) or adding Mosaic to the end of their canvassing scripts. Initial discussion showed the nonprofits strongly favoring a pay-per-loan model, despite the deferred payment schedule. More research is needed to determine if this preference would hold broadly.

We see an opportunity for Mosaic to execute on this vision and we plan on pursuing building technical referral tools for the community-organizing sector moving forward.

Partner technology

Our platform has proven to be the key reason for our attraction and retention of our installer partners throughout the cooperative agreement. We've put together a world-class engineering team that truly cares about providing an excellent user experience for both homeowners applying for loans and the installers offering them.

We consistently get feedback that the platform has simplified the solar process: consumers sing praise to the fact that they can fill out a form and get a loan approval in minutes. Our platform is

a clear cornerstone of our business relationships, both with homeowners and installer partners, so we continue to invest in and innovate this feature.

Conclusions: Path forward / Commercialization plan

Positioning & Product

The Mosaic platform

Our current focus is on the platform value-adds for the homeowner and our installer partners. If homeowners can easily complete a loan application and get a quick approval decision, more overall business will be done. Also, installer partners will prefer to use our system because they are able to easily track and process lending opportunities. We are experimenting with adding valuable tools for our installer partners in select markets as well. The cooperative agreement helped us fund engineering talent and build the simplest home solar loan application process in the industry.

Loan terms

As of the end of the performance period, we are offering a wide variety of loan terms to borrowers: 10 / 15 / 20 / 25 year terms. This gives our installer partners many options for different markets and borrower types. To encourage these loans, we need to present borrowers with simple, transparent loan terms at fair rates. The SunShot cooperative agreement encouraged us to move into markets outside of CA and diversify our borrower types and loan terms.

Simple user-friendly API

As our installer partners continue to move towards more automated proposal systems and online closes, we will see an increased adoption rate of API based approvals. Our API output and API based customers are key part of our marketplace value. The requirement that we complete a certain number of loans through API has allowed us to deploy our system rapidly to the largest residential installers and will continue to be an important market advantage.

Higher qualification rates

An installer partner experience is often dictated by how many customers they are able to approve. They will naturally gravitate towards the platform that approves more of their signed deals. Our ongoing negotiations with capital providers and sophisticated credit modeling will allow us to obtain the best available terms for our borrowers. The requirement that we fund at

least 50 loans for borrowers under a 700 FICO score was instrumental in helping us to move forward with improving qualification rates.

Interest rates

We are exploring various risk-based pricing models and our success will depend on obtaining the most favorable interest rates for borrowers while providing capital providers with protection against default risk. Interest rates currently range from 2.49% to 7.99% for borrowers. We will continue to present solar loan portfolios to capital sources as a unique asset class--one with extremely low default risk and unique characteristics--in order to obtain the lowest interest rates for our customers.

Lead program

By spinning off the lead gen system into Wave Solar, we have commercialized the lead routing and qualification system and provided a unique value-add to our installer partners. Any partner that signs up with Mosaic can now access not only a financing solution, but also a source of new business at low cost. The SunShot mandate--that we originate over 250 solar contracts at under \$1500 cost per acquisition--initiated a wide variety of tests across marketing channels and tactics and helped to build a system that is reducing soft costs across the industry.

Future positioning

Mosaic intends to remain anchored to our core vision: **100% Clean Energy For All**. All of our decision making, whether long or short term, is structured towards this goal. There are no compromises.

As a B-Corp, we will continue to use business as a force for good. We will continue to utilize our collective marketplace of borrowers, installers, capital providers, and staff to progress towards environmental change, while always holding ourselves to rigorous standards of social accountability, performance, and transparency.

The SunShot cooperative agreement helped us put solar on thousands of rooftops and decrease soft costs across the industry. We read a quote today, written by Yann Brandt who writes SolarWakeUp.com and is Regional Head of the Americas for Conergy, that we feel encapsulates the spirit of this award: "The best VC in the space is DOE SunShot which has invested \$138mm into companies that innovate which has resulted in over \$3bb in follow on investments. That's quite the track record in my opinion and we should do more to help them."

Publications

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