

BlocPower, LLC

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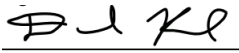
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EXECUTIVE SUMMARY

BlocPower's mission is to provide access to energy efficiency financing for underserved communities across the United States. This project, "Crowdsourced Microfinance for Energy Efficiency in Underserved Communities," is an extension of that goal and is grounded in the principles of providing engineering and financing services to those in need.

The project is based on the creation of a BlocPower Marketplace as a central hub for connecting shovel-ready green buildings to institutional investors. This 'connection' entails using online crowdfunding to aggregate debt and equity capital from institutional investors to connect to customers (building owners) across various financial portfolios. BlocPower Marketplace is intended to bring social, environmental, and financial returns to investors while also decreasing investor risk by loaning out funds for energy installations in individual buildings. In detail, the intended benefits of crowdsourcing are two-sided. Firstly, for building owners, clean energy retrofit installations improve building operations, reduce utility costs, and reduce harmful impacts to their surrounding environment. Secondly, for institutional investors, they gain access to a new market of energy efficiency and are able to provide debt or equity capital with high financial returns. This gives investors the opportunity to create social and environmental impact in communities around the country as well. With this in mind, BlocPower designed the marketplace to specifically answer exploratory research questions with respect to the pricing of energy financing.

Institutional investors typically charge high rates on project financing solutions in the energy space, particularly in low and middle-income communities, because of fears that required debt service will not be made. This makes access to energy capital exorbitantly difficult for those that need it the most. Through this project, BlocPower tested investor appetite to determine if crowdsourcing would lower prices and subsequently lower barriers to entry for underserved communities' access to energy capital.

BlocPower's results in this project were extremely informative for the industry. The project demonstrates that the marketplace is a scalable tool to help overcome barriers to entry for small building owners in underserved communities to access energy efficiency financing, but that crowdfunding by itself does not necessarily lower interest rates and make energy efficiency projects feasible. For that, we need a repayment mechanism that lowers perceived risk. That mechanism is on bill repayment.

HYPOTHESIS TESTING

Original Hypothesis and Strategy

BlocPower's original hypothesis was that an online marketplace for small buildings in underserved communities which demonstrated financial, environmental, and social returns would motivate institutional and accredited investors to invest in these projects at interest rates that enable building owners to achieve net savings.

To explore this hypothesis, BlocPower conducted the following steps:

1. BlocPower tested this value proposition (crowdfunding marketplace) with buildings owners on one side and institutional investors on the other;
2. BlocPower scheduled 100+ meetings and conversations with investors to test institutional investment appetite and feedback for our project and corporate finance needs;
3. BlocPower contacted over 300 small commercial property owners in New York City to test building retrofit project demand and scope; and
4. BlocPower collected engineering and financial data from these projects.

The set of buildings that BlocPower studied were diverse in multiple ways (neighborhood, size, energy demand, etc.) to ensure that our results were statistically sound and that our findings were not compromised by lurking variables.

Preliminary Findings and Reformulating the Hypothesis

Ultimately, these steps taken revealed that most investors were sensitive to the credit risks of individual projects, regardless of potential returns, and the pricing that most investors were offering was prohibitively expensive. Investors were not motivated to invest as we hypothesized because they feared prohibitively high default rates from small building owners. This suggested to BlocPower that the crowdfunding mechanism alone did not change the perception of borrow creditworthiness and did not motivate investors to lower pricing.

The only investors willing to participate in the crowdfunding marketplace employed a financing mechanism called on-bill recovery financing (OBR). OBR allows customers to finance energy efficiency through energy bill charges, which means that debt service from loans is added to utility bill payments so that they are paid together on one bill. Since debt service is paid inseparably from utilities, the rationale is that customers are more likely to pay back debt service, and thus institutional investors can lower the rates of their loans. This is based on the placement of utilities in the hierarchy of customer payments (to be discussed).

For instance, the New York State Energy Research & Development Authority (NYSERDA) used OBR and offered a 2.5% interest loan term over 10 years. These terms were much kinder to builder owners relative to the 7% interest rate term over 6 years that most other investors offer on the market. OBR is indeed a transformative payback tool that required further analysis by BlocPower.

This led BlocPower to reformulate its hypothesis: an online marketplace in the low and income space would stimulate an affordable investor crowdfunding mechanism *if the debt-service payback structure fundamentally changed the risk of individual loans*.

ON-BILL RECOVERY FINANCING MECHANISM IMPLEMENTATION

Introduction

Through an on-bill recovery (OBR) payment system, building owners repay their loans from investors through their energy bills. In other words, their debt service from an energy-financing loan is added on top of their utility costs on a single bill every month. Since energy loans from investors are used to cover the costs of energy retrofits and installations, utility bills are significantly decreased (15-30%). So, although debt service increases their bill total (in an OBR structure) because it is added to monthly utility costs, the overall bill is still lower than it otherwise might be because of the energy savings (net savings is positive). The important factor from the perspective of investors is that on-bill recovery places the utility bills and debt service on the same note; this significantly decreases the risk that debt service will not be paid. Evidence demonstrates that utilities are high on the customer payment hierarchy. This provides comfort to institutional investors since the debt service and utilities must be paid together.

Empirical Evidence and Case Studies

In a study conducted by McKinsey & Company in 2009 on consumer payment prioritization¹, the firm uncovered that consumers prioritize their utility payments over their healthcare insurance premiums, their credit card bills, their auto loans/leases, their cable/cell phone/internet bills, and other discretionary expenditures. The placement of utility bills in costumer payment

¹ Thomas Pellathy, Shubham Singhal, *Revisiting Healthcare Payments: An Industry Still in Need of Overhaul*, McKinsey Retail Healthcare Consumer Survey, 2009 (2009)

hierarchies assured investors that their pricing was prohibitively high and persuaded them to decrease costs. A number of cases demonstrate this. For instance, Manitoba Hydro, a Canadian-based natural gas utility provider, built a loan portfolio worth over \$100 million across 22,000 OBR rental housing loans between 2008 and 2010 and had a default rate of 0.2%. Arkansas' First Electric Cooperative similarly issued \$77,000 worth of on-bill financing loans across 7 loans and faced a default rate of 1% in 2009.² Uniquely, both of these programs used historical payments of utility bills as the driving measures of credit and found financial success. The diversity of successful on-bill repayment structures suggested similarly low default rate projections for our investors as well.

Results of successfully completed OBR program are demonstrated in the tables below with the percent of loans defaulted.³ Such results are the transformative factor for investors to decrease their pricing.

Program	Basis for Application Approval	Secured or Unsecured?	Project Approval Tied to Energy Savings?	Application Approval Rate	Default Rate	Number of Loans Closed
SMUD	Credit rating, good standing with utility, debt to income ratio	Both	No	65–70%	0.04–4%	84,000 (Oct 1990–Mar 2011)
SoCal Home	Credit rating, debt to income (Fannie Mae guidelines)	Unsecured	No	65–70%	NA—outperforms credit cards by 2–3 times	30,600 (1995–2011)
Sempre	Active utility account and >2 years in good standing	Unsecured	No—but the length of the loan term is	NA	0.5%	686 (2006–Mar 2011)
CT Home	Credit rating	Unsecured	No	61%	NA	1,117 (2009–Mar 2011)
CL&P CI	Credit rating and at least 3 years in business	Secured	NA	43%	NA	66 (2010)
CT SB	Utility bill must be in good standing for at least 6 months	Unsecured	NA	96%	<1%	1,400 (2010); 9,000 approximate (avg 1,000/year 2003–2011)
KS \$mart	Utility bill must be in good standing	Unsecured—nonpayment may result in utility disconnect	Yes—monthly payments must be less than 90% of energy savings	100%	0% as of 2008	540 (2007–Mar 2011)
MHELP	Credit rating and debt to income ratio	Unsecured	No	40%	0%	2 (early 2011)
Mass HEAT	Varies with lender	Both	NA	87%	<0.5%	10,000
MN CEE	No income guidelines	Unsecured	No	NA	NA	1,246 (1993–June 2011)
NE \$ES	NA	Both	No—but measures must meet payback timing requirements	Not tracked	0.1%	26,328
SmartSTART	Credit rating and good relationship with utility	Unsecured	Yes—repayment is 75% of savings	NA	NA	8 (2002–2011)
GJGNY	Fannie Mae guidelines and 2 years of utility bills	Unsecured	Yes—savings to investment ratio of 1	60%		126 (Nov 2010–Mar 2011)

² John Mitchell, Will Nissen, *Enabling Energy Efficiency in Rental Housing: Overcoming the Split Incentives Barrier* (University of Minnesota, 2011).

³ American Council for an Energy-Efficient Economy, *What Have We Learned from Energy Efficiency Financing Programs?* (2011).

Program	Basis for Application Approval	Secured or Unsecured?	Project Approval Tied to Energy Savings?	Application Approval Rate	Default Rate	Number of Loans Closed
NY RLF	Varies with lender	Both	No	NA	NA	411 (Dec 2009–Mar 2011)
OR SELP	Ability to secure the repay the loan	Secured with flexibility (not necessarily a lien)	Possibly—assessment of ability to repay loan conducted on a case-by-case basis	Almost 100%	0.044% (1980–2008); 3% (post 2008)	>700 (1980–Mar 2011)
OR CEW	Credit score and utility history	Unsecured	Yes	NA	NA	500 (June 2009–Feb 2011)
PA HELP	Credit score and debt to income ratio	Both	No	65%	0.5%	6,000
VT Ag	None	Unsecured, but guaranteed	NA	100%	2.5% (1 loan)	40 (2003–2010)
VT Light	None	Unsecured, but guaranteed	No	100%	0%	4 (2010)

OBR Implementation in Marketplace

As a result of these studies and our understanding of the energy financing market, BlocPower adopted an OBR mechanism to the crowdfunding process. In servicing loans through the marketplace with public and private investors such as NYSERDA, BlocPower found that OBR transformed investor appetite and significantly changed the access that building owners now had to capital.

Through OBR, BlocPower has successfully overseen and continues to oversee the financing of small commercial buildings across New York. In our portfolio of over 300 buildings, BlocPower has used OBR in a number of different building types, from small businesses to churches.

Value-Added to the Research Space

In these results, BlocPower adds value to exploratory research in the energy financing space. BlocPower’s marketplace is unique in that it combines OBR with microfinance crowdfunding. Typically, OBR programs that are managed by city and state institutions have strict limits on the loan amounts that are provided to customers. That is their drawback. Capital is limited and individual lenders need to hedge risks by providing lower loan amounts to a larger number of diverse borrowers. For instance, the NYSERDA OBR program for commercial buildings and non-profit organizations has a \$50,000 cap on its loans for energy financing. While its loan terms are friendly (2.5% and 10 years), the \$50,000 cap means that major energy installations cannot be completed without additional funds (boiler replacements, for example) from other sources because they are much more expensive.

Through the marketplace, however, BlocPower is able to motivate institutional investors such as NYSERDA to provide capped loan amounts at friendly rates to marketplace projects. The investors also have access to diverse energy projects to invest according to their preferences. On the other side of the marketplace, customers (building owners) benefit from blended loans at below-market rates. Instead of being limited to a \$25,000 or \$50,000 loan, customers have access to much larger amounts of energy capital at the same rate.⁴ In this way, BlocPower is uniquely positioned as a public benefit corporation to pool capital from private and public sources and serve them on a friendly marketplace for a diverse set of building owners.

Importantly, BlocPower uses machine learning and automated financial models to assess project feasibility on an individual basis. This guides BlocPower's assessment of risk for individual clients. Ultimately, this financial modeling process informs which projects make it to the marketplace.

FINANCIAL MODELING

Model Design and Purpose

In order for a project to receive an OBR loan that is feasible and risk-averse for both investors and the building owner, it must satisfy project feasibility criteria that BlocPower has created. This ensures that all funds generated on the marketplace are used appropriately and safely.

Model Inputs

For this project, our financial models are contingent on the following set of engineering and financial inputs and assumptions:

1. Building data: BlocPower collected information on an individual building's: historical operating expenses, energy usage, energy costs, building architecture, building equipment, and building occupancy.
 - a. Operating expenses, energy usage, and energy costs are used to determine the size of eligible loan amounts and inform the riskiness of a loan for the building
 - b. Building architecture, equipment, and occupancy are used to determine potential energy-savings
2. Pricing data: BlocPower collected information on the historical pricing of utility providers (oil, gas, electricity, water) to make projections of future pricing

⁴ A full visualization of the BlocPower Marketplace and its project financing mechanism is available at www.blocpower.io.

- a. Projections of future pricing is completed using ordinary least square (OLS) regression formulae
3. Global data: BlocPower collected information on weather data and inflation
 - a. Projections for weather data are important for estimating energy needs of individual clients; these projections are also completed using OLS regression
 - b. Projections for inflation inform future pricing; these projections are completed using OLS regression
4. Debt service: With the inputs above, BlocPower used financial determinants to make judgments of creditworthiness:
 - a. Projected Minimum Debt Service Coverage Ratio of 1.20x
 - i. This ratio represents the total project savings incurred to building owners (through historical data projections) versus the debt service owed.
 - b. Net Savings of > 5%
 - i. Net savings as being defined as the energy savings incurred to customers from energy retrofits after debt service is paid

A successfully implemented, typical OBR loan can be modeling as follows:



Net savings to the customer increase over time as OBR payments decrease relative to savings and ultimately end at the completion of the loan.

Criteria Demonstration

BlocPower used debt service projections as a driving factor of project finance modeling. In the example table below, a client does *NOT* qualify for the BlocPower Marketplace because the Debt Service Coverage Ratio condition is not met.

	2017	2018	2019	2020	2021	2022
Energy Savings	\$13,633.53	\$13,972.59	\$14,316.32	\$14,703.75	\$14,963.14	\$15,254.25
Energy Debt Service	\$12,487.32	\$12,487.32	\$12,487.32	\$12,487.32	\$12,487.32	\$12,487.32
DSCR	1.09x	1.12x	1.15x	1.18x	1.20	1.22x

In order to protect borrowers and lenders, the minimum annual DSCR projection must be at least 1.20x, as explained in the Model Inputs section. That condition is not satisfied for 2017-2020 in the project example given.

Below is an example of a potentially successful project.

	2017	2018	2019	2020	2021	2022
Energy Savings	\$14,324.19	\$15,183.64	\$16,094.66	\$17,060.34	\$18,083.96	\$19,169.00
Energy Debt Service	\$8,434.23	\$9,362.00	\$10,391.81	\$11,534.91	\$12,803.75	\$14,212.17
DSCR	1.70x	1.62x	1.55x	1.48x	1.41x	1.35x

The DSCR condition is met and net savings is greater than 5% for the client. These are the basic criteria used to assess surface-level project feasibility before BlocPower's risk-based pricing mechanism is implemented.

Risk-Based Pricing Mechanism

In pricing interest rates on OBR loans, BlocPower quantifies five major components on a project level: Risk Free Rate, Spread to Compensate for Default Rate, Liquidation Risk, Non-Diversifiable Risk, and Trader's Expectation.

1. Risk Free Rate: This rate is a benchmark for all investments. It is a reference to the annual return that a non-risky investment generates. Usually people use 3 months US treasury bill's annual return rate to represent risk-free rate.

2. Spread to Compensate for Default Rate

- a. *Spread to Compensate for Default Rate = Annualized Default Intensity * (1-Recovery Rate)*, where:

Recovery Rate: The annualized loan recovery from defaults. It includes borrower repayment and recovered principal from foreclosing collaterals.

Annualized Default Intensity: In most cases, this value is transmissible with the annual default rate.

- b. Annualized Default Intensity is calculated by:

$h = -1/T * \ln(1-d)$, where:

T – time period, year

d - the cumulative default rate for T years

h - the annualized default intensity over T years

3. Liquidity Risk: This risk stems from the lack of marketability of an investment that cannot be bought or sold quickly. In a trading market, a low liquidity investment asset usually has 0.10-0.35% higher interest rate than full-liquidity investment asset.
4. Non-diversifiable Risk: In BlocPower's case, non-diversifiable risk describes the default correlation. Higher default correlation means higher possible for more loans to default together.
5. Trader's Expectation: Trader's Expectation is a subjective premium that will be added onto the cost of capital. This index is driven by capital market (supply and demand), the driving force of investors (environmental friendly or return chasing), and negotiation results.

To compare energy efficiency projects with and without OBR, we built an illustrative case, demonstrating the possible interest rate/investment return can be offered.

Debt Type	Cum. Default Rate	Over Years	Default Intensity, Annual	Risk Free, bps
OBR Loan	2.00%	10	0.20%	200
Secured Loan	5.00%	10	0.51%	200
Unsecured Loan	10.00%	10	1.05%	200

Debt Type	Spread to Compensate for Default Rate, bps	Liquidation Risk, bps	Non-Diversifiable Risk, bps	Trader Expectation, bps	Interest Rate or Expected Return, %
OBR Loan	20	5	0	25	2.50%
Secured Loan	51	25	0	200	4.76%
Unsecured Loan	105	35	0	400	7.40%

Results of Financial Modeling

The results of our financial modeling are best illustrated through a case study.

In 2015, a Baptist church in New York City was in need of capital to finance energy retrofits in their building. Through BlocPower's marketplace, the church was able to qualify for \$50,000 in energy debt capital to be paid back over 10 years on a 2.5% interest rate on OBR. In the four months of data that we have since been able to collect on the church's OBR payback, they have averaged savings of \$486.61 per month with an OBR debt service of \$460.07 per month. This represents a net savings of \$26.54 per month for the duration of the loan.

Since launching the marketplace and implementing on-bill recovering financing, BlocPower has experienced zero defaults. While the BlocPower sample size certainly does not match the scope and size of other OBR loan programs like the Manitoba Hydro or First Electric Cooperative (discussed on page 6), historical results suggest that our expected default rate will remain below 2%.

SUMMARY COMPARISON OF PRELIMINARY GOALS AND EVENTUAL ACCOMPLISHMENTS



Image of a BlocPower client, Church of the Living Hope, receiving a \$21,707 loan for energy financing through the BlocPower marketplace.

Summary

Our preliminary goals were to increase access to energy efficiency capital for low and middle income communities by decreasing barriers to entry and increasing investor appetite.

Comprehensively speaking, BlocPower was able to achieve these goals through its marketplace, though its business strategy changed over time to accommodate for customer and investor behavior. As a result of successful pivots in the marketplace and crowdfunding strategies, BlocPower has successfully established relationships with the New York Green Bank, the New York City Energy Efficiency Corporation, and other partners.

Conclusion

BlocPower's marketplace profoundly changes the landscape of energy financing in the low and middle-income market. Building owners in these communities, typically desperate for capital to improve their building operations and lower utility costs, have access to more capital through the

BlocPower platform. Ultimately, BlocPower's combination of crowdfunding, microfinance, and on-bill recovery provides the financial, social, and environmental results that investors and community members have been seeking.

APPENDIX

BlocPower Marketplace

Discover Projects

Invest in your community and the planet

Click on any of our fully vetted, "shovel ready" retrofit projects, all of which have received thorough analysis, and learn more about their financial, environmental, and social benefits. You can lend or donate money on each project page. Thank you for investing in your community, creating green jobs and combating climate change.



Unitarian Church of Staten Island

The Unitarian Church of Staten Island (UCSI), located in New Brighton, Staten Island, is an inviting spiritual community that is over 150 years old, with services being held in its present building since 1895. The Church is a member of the Unitarian Universalist Association of Congregations.

0.02%

\$20 Pledged
65 Days to go



Fordham United Methodist Church

The Fordham United Methodist Church has been a cornerstone of the Bronx community for over 150 years. With your loan or donation, our church will upgrade our lighting and heating systems. We will save \$24,000 per year on utility bills and avoid 33,000 pounds of CO2 emissions each year.

55%

\$51,160 Pledged
96 Days to go



Church on the Hill A.M.E. Zion

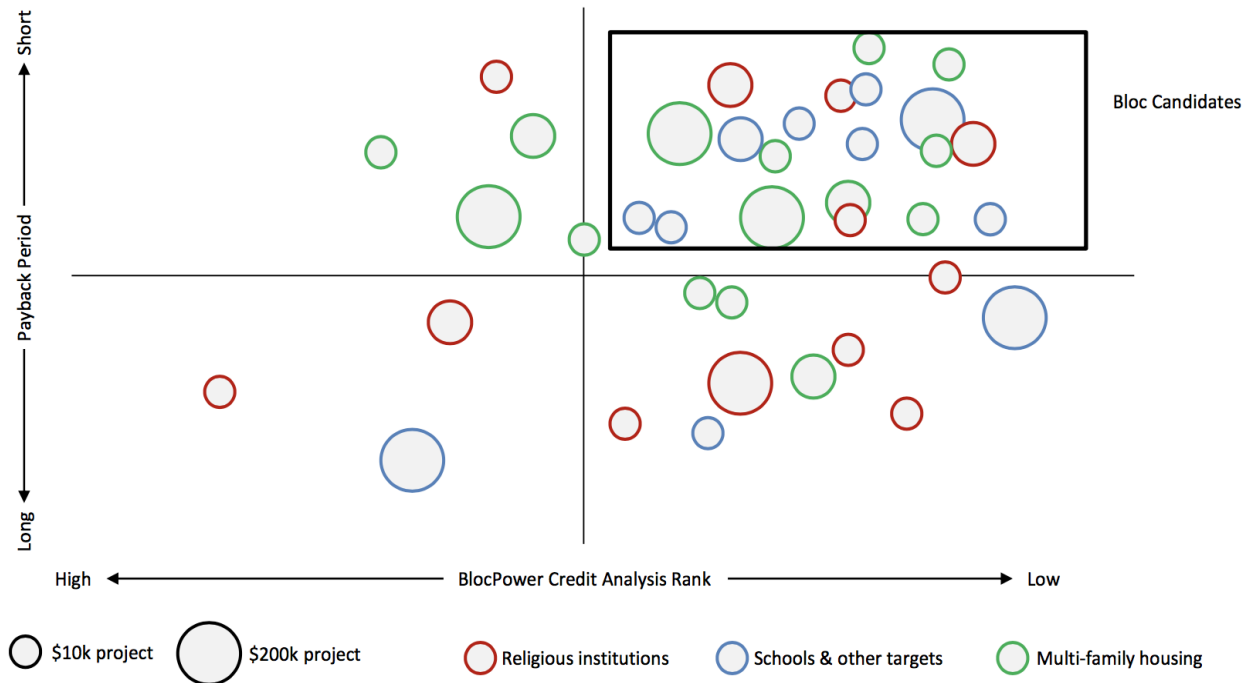
Church on the Hill A.M.E. Zion has been a pillar of the Harlem community since 1910. With your loan or donation, our church will install new lighting and heating systems. We will save \$20,000 per year on utility bills and avoid 125,200 pounds of CO2 emissions each year.

62%

\$119,360 Pledged
96 Days to go

Screenshots of BlocPower's marketplace on www.blocpower.io.

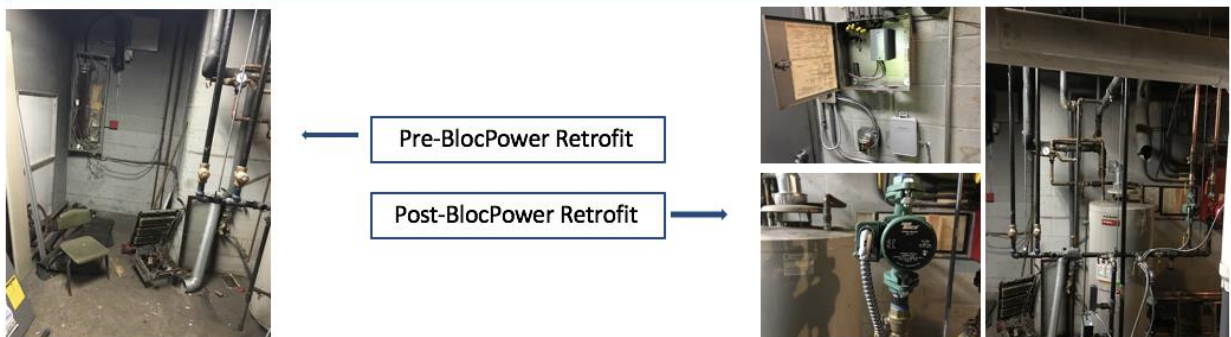
BlocPower Feasibility Assessment



BlocPower feasibility assessment and selection of projects for the Marketplace

Marketplace-financed Energy Installations

Tremont United Methodist Church



Images of energy installations that were financed through capital accessed on the BlocPower Marketplace.