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Financing Strategies for Municipal Energy Efficiency

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ARRA	American Reinvestment and Recovery Act
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
CEA	Cambridge Energy Alliance
CEC	Clean Energy Coalition
CEM	Certified Energy Manager
CEP	Community Energy Program
COP	Cities of Promise
CREBs	Clean Renewable Energy Bonds
DELEG	Department of Energy, Labor and Economic Growth
DTE	Detroit Edison
ECM	Energy Conservation Measure
EECBG	Energy Efficiency and Conservation Block Grant
ESC	Energy Services Coalition
ESCO	Energy Service Company
ESOC	Energy Optimization Service Companies
FTE	Full Time Equivalent
IGA	Investment Grade Audit
IPMVP	International Performance Measurement and Verification Protocol
IRS	Internal Revenue Service
L3C	Low-Profit Limited Liability Corporation
LED	Light Emitting Diode
LEED	Leadership in Energy and Environmental Design
LLC	Limited Liability Corporation
MML	Michigan Municipal League
MPSC	Michigan Public Service Commission
NPV	Net Present Value
NWMCOG	Northwest Michigan Council of Governments
PACE	Property Assessed Clean Energy
PE	Professional Engineer
PRI	Program Related Investment
REF	Revolving Energy Fund
REO	Regional Energy Office
RFP	Request for Proposal
SEMCOG	Southeast Michigan Council of Governments
VEIC	Vermont Efficiency Investment Corporation
YES	Your Energy Savings

Abstract

Energy efficiency represents a significant opportunity to reduce energy use, save money and reduce environmental impacts. For municipalities that are facing increasingly tight budgets and have an aging building stock, efficiency represents an especially attractive opportunity. One of the key challenges, however, is how to consistently secure the initial capital necessary to make investments in projects that increase efficiency. Based on a partnership with the Clean Energy Coalition in administering a $4.4 million grant for Michigan's Cities of Promise, this report details how revolving energy funds can assist cities by offering a sustainable source of capital to invest in energy efficiency projects. In addition, this report discusses best practices and lessons learned in implementing the Cities of Promise project. Finally, this report evaluates two different fund structures: a fully grant-based fund, and an L3C-based fund that could combine grants with investor capital.

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Our team is extremely grateful to the many individuals who have supported us throughout the Master's Project process. First, we would like to thank the Clean Energy Coalition - especially Josh Brugeman, Jenny Oorbeck and Sean Reed - for their guidance, patience, and support. Second, thanks are due to our advisor Scott Noesen for his keen insight and ability to highlight areas for improvement throughout the process.

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Authors' Note

This report is the result of an 18 month long partnership with the Clean Energy Coalition (CEC). Where possible, the key conclusions from this partnership have been extrapolated to inform a wider audience. As the work was focused on the CEC, however, some of the findings are very specific to the organization and cannot be generalized. For example, Chapter 4 is focused primarily on how the CEC can take the experience it has gained throughout its work with the Cities of Promise and begin to provide a key service to municipalities in Michigan. However, we hope that the more general guidance regarding revolving energy funds, business structures, and best practices may be useful to any organization seeking to establish an ongoing energy-management and financing program.

For convenience, key conclusions from each section of this report are listed in boxed text at the beginning of the section.

Executive Summary

Introduction

This Master's Project is intended to provide recommendations and tools for our client, the Clean Energy Coalition (CEC), to establish a sustainable financing mechanism for energy-efficiency retrofits in municipal buildings, using a $4.4 million grant from the Michigan Public Service Commission (MPSC). The grant is focused specifically on performing retrofits in eight of Michigan's poorest cities, the Cities of Promise (COP). In addition, thanks to a generous grant from the Ford Motor Company Fund's College Community Challenge program, this report begins to address the ongoing development of a clean-energy revolving loan fund on a larger scale.

Energy efficiency measures can cost-effectively reduce operating expenses in cities and towns nationwide, but the required combination of available capital and staff expertise (both technical and financial) is seldom found. In addition, despite recent federal investment, the lack of long-term capital available for energy-efficiency programs in Michigan and the Midwest indicates a need for a sustainable source of funding for energy retrofits. A revolving energy fund (REF) is one way to provide that stability: an initial pool of capital is loaned to clients – in this case, city governments – for energy retrofits, and a portion of the money saved by reduced energy use replenishes the initial pool, which can then be re-loaned to additional projects and clients.

We focused our research and recommendations in four areas:

- Best practices for establishing municipal energy management programs
- Cities of Promise project pro formas and performance data tracking
- Structure and investment mix of a potential REF
- Lessons learned from implementing the $4.4 million COP pilot project

Methods and Process

Our project began in January 2010, shortly after the CEC secured the initial MPSC grant, which required that funds be distributed within a two-year window. As a result, we conducted much of our research and work in response to the changing reality of program implementation. While one of our initial objectives had been to transform the MPSC grant into a fully-sustainable source of retrofit funding and revenue to the CEC, it became clear as the program developed that the initial model was unlikely to fulfill that goal. Although each of the Cities of Promise agreed to establish an internal REF, a single centralized fund would have made more efficient use of staff time, while allowing money to be loaned to more than just the original eight cities. As a result, we entered the second phase of our project with the intent of helping the CEC transfer its experience with the Cities of Promise into creating a centralized loan fund.

We began the project by seeking to understand the challenges and best practices associated with starting a municipal energy-efficiency organization. We researched existing programs throughout the country, focusing specifically on revolving loan programs and energy management offices at the state, regional, and city level. We interviewed staff and reviewed relevant white papers and research

publications to understand how programs typically begin, how they are typically financed, what types of projects they pursue, and the range of services they typically provide. The results of this research are presented in Chapter 2.

To predict long-term cash flows for the proposed Cities of Promise project, we developed a fund pro forma model in collaboration with the CEC. In addition, to help the CEC predict revenues, select between energy conservation measures, and track energy use in each partner city, we built a prioritization and performance-tracking tool, drawing initial assumptions from energy audits, industry data, and the CEC's own contract experience. Although we developed the tool in response to specific programmatic needs, rather than to answer a given research question, it provided guidance regarding fund structure that has been incorporated in our recommendations to the CEC.

The project highlighted the fact that there are hundreds of organizations, large and small, working to increase energy efficiency in cities and communities nationwide. Aiming to provide general guidance to any organizations looking to implement similar projects, we worked with our CEC partners to develop a list of best practices and lessons learned from the Cities of Promise pilot program. These recommendations are available in Chapter 3.

Next, having recognized the opportunity for a centralized REF to improve on the Cities of Promise project, we developed a financial sensitivity model and researched the legal and financial implications of several different fund structures – specifically, an all-grant fund versus a "hybrid" that could combine grant funding with private investor capital. In order to "street test" the hybrid concept, we surveyed and interviewed staff in a dozen cities and entered the hybrid model in several business plan competitions, with generally positive response. The recommendations we received from potential investors, as well as our sensitivity analysis and legal research, form the bulk of our final recommendations to the CEC and are presented in Chapter 4.

Results

Largely due to the efforts of the CEC's Josh Brugeman and Jenny Oorbeck, the Cities of Promise project is poised for success: all eight target cities agreed to a model that would dedicate 100% of measured project savings to a city-run fund over the first five years, with a portion of the fund paying the salary of a part-time energy manager. Our early research indicated that having a dedicated energy-management professional on staff or consulting closely could help cities to expand energy efficiency programs beyond their own municipal buildings and into residential, commercial, and industrial facilities.

Our initial research also indicated that some of the longest-lasting and most effective energy offices had established REFs, or an equivalent system for distributing a pool of capital among energy-efficiency projects. In addition, while "access to funding" remains the single largest barrier to energy-efficiency investments, significant additional need exists for financial and technical expertise in support of efficiency projects; city staff are generally overworked and under-qualified to manage a complex energy retrofit from audit to construction to measurement and verification.

The potential market for NPV-positive investments in municipal energy efficiency remains large – up to $100 million in Michigan alone – and there are many entities already working in efficiency, from energy

service companies, or ESCOs, to a state-run loan fund and many nonprofit organizations. Differentiation from, and collaboration with, these entities should both be CEC priorities.

Revolving energy funds for energy efficiency are an established concept and have the potential to be an entirely self-sustaining funding source, if projects meet threshold criteria. The primary prerequisite for a revolving fund is sufficient seed capital; our evaluations of two sources of funding – grants and private-market investment – concluded that in the short term, grant capital is a much more immediately viable option for the CEC. Although private-market investors are interested in the possibility of investing in energy-efficiency, a lack of consistent data outlining project risk (and in the CEC's case, a relatively short track record of energy retrofits) makes it unlikely that non-ESCO-related private investment will play an immediate role in a REF. Currently, the additional value of an investor-based fund is not sufficient to outweigh the additional risks associated with for-profit incorporation and over-leveraging. However, the possibility of establishing an investor-based fund should be reviewed again in the near future, as the landscape of efficiency finance changes very quickly.

Key Findings

1. There is significant need for energy efficiency improvement in municipal buildings in Michigan. As much as $100 million in net-present-value positive investments could be made in the short term.
2. "Internal champions" are essential to getting a community's energy strategy off the ground. An internal champion is a person within a city government or department who can spearhead the startup phase of an energy efficiency project.
3. Access to financing is the primary barrier to efficiency retrofits at the city level, but available staff time is a close second and should be carefully considered when establishing any program.
4. The mainstream private investment community is not yet ready for a hybrid loan fund model, although some banks are investigating similar models internally. In particular, the low-profit limited liability corporation (L3C) – while promising – remains untested and faces significant hurdles.
5. The long-term performance of a revolving loan fund is particularly susceptible to several key factors: annual energy savings as a percentage of total costs; percentage of savings repaid to the fund annually; and ongoing overhead costs. Conversely, start-up costs represent a less significant factor, so spending more on a high-quality energy audit and project initiation phase will reduce the variability of expected energy returns and therefore aid in fund management.
6. Depending on per-project fixed costs, average project size can make or break a loan fund's ability to be self-sustaining.
7. Fund size also matters: under our baseline scenario, an initial fund on the order of $10 M would be necessary in order to support a three-to-four person staff while also generating enough revenue to re-invest in projects.

Recommendations

1. *Use a shared savings model.* Allowing the customer to capture a percentage of project savings should generate an immediate improvement to the customer's operating bottom line. In addition, allowing the client to bear both the risk of underperformance and the potential reward of over-performance creates an incentive for a customer to operate its facilities at maximum

efficiency – reducing the CEC's need to continually monitor and maintain equipment and re-train occupants.

2. *Use calculated or "specified" savings rather than measured savings to determine client payback to the fund*. Although ongoing measurement and verification of savings are essential to achieving optimal long-term performance following a retrofit, the accounting and transaction costs of continually adjusting a client's bills to reflect actual performance would be prohibitive; moreover, a measured-performance-based contract would transfer all project performance risk to the CEC. Instead, expected repayment should be conservatively estimated and agreed upon with the client at the beginning of the retrofit. Contractually binding repayments at a pre-specified amount and over a predetermined term would also increase the creditworthiness of a revolving energy fund's cash flows.
3. *Begin with a grant-only centralized fund, track performance data carefully, and continue to evaluate the possibility of a grants-plus-investors hybrid model.* The concept of a grants-plus-private-investors hybrid fund has potential to extend the "leverage" of grant dollars, thereby making the fund more attractive to potential donors. However, based on the complexity of establishing a for-profit subsidiary of a 501(c)(3), the untested status of combined profit-and-mission business models, and the overall sensitivity of an investor-based financial model to various risks, we would recommend revisiting the issue after establishing an initial grant-only centralized fund as a pilot. Potential investors – banks, credit unions, high net worth individuals, etc – are only beginning to understand energy efficiency retrofits as an investment class and would need additional performance data in order to verify whether a fund's track record might merit investment on the basis of low risk and predictable returns. To that end, carefully monitoring savings projections and project performance will be essential to future fund expansion.
4. *Market through partners and regional networks.* City officials have limited time and expertise with which to evaluate energy-efficiency programs. Using "neutral" partners with established environmental and energy programs to market the CEC's revolving fund would help increase interest in the fund and establish the CEC as a trustworthy entity. Piggybacking off the existing relationships between cities and regional programs like the Michigan Municipal League and economic development councils would also help to identify "internal champions" within each city government.
5. *Consider vertical integration of key roles in the value chain.* Almost all of the current Cities of Promise value chain is currently outsourced; the CEC provides financing and has been responsible for developing relationships with each city, but energy bill collection, audits, design, construction, and ongoing energy monitoring have been subcontracted. A review of up-front costs suggests that adding general-contracting or investment-grade energy auditing expertise to the CEC's internal capabilities might significantly increase the amount of time that CEC staff could dedicate to each project during the startup phase – thereby increasing overall revenue to the CEC.

Chapter 1 Energy Efficiency in the Built Environment

> *"The biggest gains, in terms of decreasing the country's energy bill, the amount of carbon dioxide we put into the atmosphere, and our dependency on foreign oil, will come from energy efficiency and conservation in the next 20 years. Make no doubt about it. That's where everybody who has really thought about the problem thinks the biggest gains can be and should be made."*
>
> – Steven Chu, U.S. Secretary of Energy, 2009[1]

Steven Chu is not alone in identifying energy efficiency as a vital first step in our nation's path to a sustainable energy future. One of the most familiar sights in introductory courses on global energy issues these days is McKinsey & Company's greenhouse gas reduction cost curve, which highlights that generating new, low-carbon power and capturing carbon from existing power plants are much more expensive options than investing in products or services that would decrease energy use.[2] Hence the Obama administration's emphasis on the value of "the negawatt" – a watt that no longer needs to be generated because of increased end-use efficiency.

The main reason end-use efficiency can be so cost effective is that many of our current end-uses are so wasteful. Numerous studies have documented the vast amounts of energy wasted every day by inefficient systems in multiple sectors of the economy.[3] Aging building stock is consistently found to be one of the worst offenders – commercial and residential buildings together account for over 1/3 of the country's primary energy consumption.[4] Fortunately, as the McKinsey curve demonstrates, much of the energy waste in buildings can be profitably eliminated using existing technologies (e.g. weatherization, mechanical retrofits, and lighting upgrades).

Building retrofit projects make solid financial sense. They generate attractive, reliable returns on investment. If implemented, they would save billions of dollars in energy costs each year, reduce our society's carbon footprint, and increase our resilience to fuel price volatility.[5] Pike Research forecasts the total amount of *net present value (NPV)-positive* spending on building retrofits through 2020 at $390 billion.[6] McKinsey corroborates this figure, suggesting an aggregate investment opportunity of $400 billion.[7]

Given all of the benefits, the fact that many buildings continue to operate inefficiently represents a market failure. Significant barriers are preventing building owners from making optimal decisions regarding the energy performance of their property.

The Clean Energy Coalition and Michigan's Cities of Promise

This report examines the barriers faced by a specific group of building owners who have been especially challenged by the problem of energy waste: municipal governments. Our team was introduced to the challenge of municipal energy conservation through a partnership with the Clean Energy Coalition (CEC), a non-profit organization based in Ypsilanti, MI. The CEC received a $4.4 million grant from the Michigan Public Service Commission (MPSC) to perform energy efficiency retrofits on public buildings in eight of the poorest cities in the state, called the "Cities of Promise" (COP). This report has been generated after providing support for the CEC in program design, financial modeling and exploration of best practices in municipal energy efficiency. Additionally, a survey regarding energy issues faced by city

managers throughout Michigan generated further insight. This was followed by interviews with stakeholders from cities, state agencies, and regional non-profits.

Barriers to Municipal Efficiency

Most municipal governments own and manage a number of large, aging facilities – e.g. town halls, recreation centers, and water treatment plants – which are prime targets for energy conservation.[8] Until recently, many cities largely ignored or overlooked their energy costs, which constitute up to 5% of total municipal spending.[9] But today, with 100 Michigan cities in financial distress[10] and energy costs forecast to rise 1.2% annually over the next 20 years,[11] cities are beginning to monitor their energy consumption more closely.[12] Furthermore, federal energy-efficiency stimulus spending, primarily through the Energy Efficiency and Conservation Block Grant program (EECBG), recently exposed many cities in Michigan to the value of energy conservation.[13] Two major barriers, however, prevent many of them from initiating NPV positive projects to reduce energy use:

1. **Lack of capital**: EECBG funds have been allocated, and unless we're misreading the congressional tea leaves, additional funding is unlikely. Like many sources of grant funding, federal grants can be intermittent and unpredictable. States are battling their own budget issues. Michigan currently faces a $1.8 billion budget deficit,[14] suggesting that the state government is highly unlikely to allocate new grant dollars to municipal energy projects. Unfortunately, without grant support, most city managers simply do not have the financial resources to invest in even the most financially attractive retrofits at a time when city councils are struggling to avoid cutting essential staff. According to our survey of fifteen cities across the state, over 75% of city managers cite up-front costs as the major barrier to implementing energy-saving retrofits.[15]
2. **Lack of staff time and technical expertise**: Many cities lack the time or expertise necessary to identify energy conservation measures, model energy savings, and calculate financial returns. Our survey data and interviews with city managers suggest that over 50% of cities would have difficulty implementing retrofit projects even if they had the money to do so.[16] Hence, even during the occasional periods when grant funding is available, over half of all cities are not in a position to take advantage of it. Our conversations with municipal-improvement organizations emphasized that due to recent budget cuts, city staffers are already stretched to the limit by their regular responsibilities.[17] They have been exhausted by the additional work of administering EECBG grants and overwhelmed by the flood of contractors and consultants who followed in EECBG's wake. One interviewee expressed a concern among staff that new energy programs will take up more of their time than is advertised.

Financing options

Without sufficient internal funding available, most cities are left with three main financing options:

1. **Bonds**: During more stable economic periods, cities were able to use municipal bonds as a source of financing. A recent Lawrence Berkeley National Labs report concluded, however, that the demand for bond financing across local government operations outstripped many cities' capacity to raise debt.[18] Even if debt financing can be secured, it does not help cities overcome the challenge of limited staff time and technical expertise.

2. **Grants**: Municipalities can use state or federal grant funding as a source of capital. Notwithstanding the costs of seeking and securing it, grant funding is often very attractive from a city's perspective. Grant programs come and go, however, and few cities have the resources to keep programs going during dry spells. The most significant example of grant funding for efficiency is the American Reinvestment and Recovery Act (ARRA), which allocated $3.2 billion for energy efficiency. Of that sum, $77.7 million was distributed to more than 100 communities throughout Michigan.[19] Stimulus funds helped cities to initiate energy-saving programs and invest in a first round of building retrofits. As that money is spent, cities can find themselves without sufficient capital to perform all of the retrofits identified by stimulus-funded energy audits.
3. **Private investment**: Energy service companies (ESCOs), such as Johnson Controls and Siemens, have proven effective at securing financing for large municipal projects, specifically facilities with over $1 million of NPV-positive retrofits to perform. According to research by the Vermont Energy Investment Corporation (VEIC), the vast majority of ESCO work is financed by two national banks, Bank of America and PNC.[20] These financiers' required rates of return make it unlikely for their ESCO partners to guarantee savings in projects smaller than $500,000. (Research by VEIC suggests that few ESCO projects have an initial investment of less than $1 million, but our conversations with ESCOs have yielded numbers between $500,000 and $800,000 as their minimum threshold).[21] [22] Beneath the $500,000 floor, the high relative magnitude of transaction and administrative costs is a strong deterrent to guaranteed-savings arrangements. As the COP program demonstrated, local governments tend to have a long sales cycle and can require significant relationship management irrespective of whether a city has $300,000 worth of projects or $3 million.[23] This may be the reason why only two of the eight Cities of Promise and the fifteen cities responding to our survey have previously contracted with an ESCO.[24] For example, the city of Ann Arbor has a population of 114,000[25] but the city contains only three buildings within the ESCO performance-guarantee target investment range.[26] That means most of the 90 plus cities in Michigan smaller than Ann Arbor have even fewer facilities for which a third-party financing option currently exists.

The performance retrofit process

Energy performance retrofits can vary widely, but most follow the same general process:

1. **Financing:** Retrofit projects often have high up-front costs, which can make financing a necessity. The most likely options for municipalities are described in the previous section of this report, but the existing solutions leave a substantial portion of the municipal market underserved.
2. **Energy baseline:** For a large organization with multiple facilities, an initial energy baseline may be taken to determine which facilities are the best candidates for more detailed audits. Because many organizations pay their energy bills out of separate operating budgets and do not keep careful track of overall energy costs, obtaining an accurate baseline is not as easy as it sounds. The process often requires acquiring historical data from utility companies, followed by a significant amount of time and effort to aggregate and analyze the data. A number of firms have recently emerged that offer this service for a relatively small fee (less than 1% of initial project costs).[27]

3. **Energy Audit:** Once the worst-performing facilities in an organization's portfolio have been identified, energy auditors investigate building energy consumption in greater detail. Auditors identify potential energy conservation measures (ECMs) and model the future energy savings from likely investments. Because facility owners often base their investment decision on the results of an energy audit, it is vital for savings estimates to be both accurate and precise. Early in the COP program, the quality of energy audits varied significantly, prompting the CEC to specify its requirements for audits in greater detail. In Michigan, ARRA funding seems to have fulfilled its purpose of stimulating new business activity around energy efficiency. EECBG fertilized a bumper crop of nascent energy auditors; unfortunately, the result is a jumbled blend of skilled auditors and inexperienced opportunists.
4. **Design:** After the audit has been performed and a portfolio of ECMs has been selected by the building owner, engineers and/or architects create a project design plan, including technical specifications for new equipment and any structural modifications necessary. In the interest of reducing redundant efforts, a high quality energy audit should include many of the recommendations that might otherwise be part of the design phase.
5. **Performance Guarantees:** The term "performance contracting" refers to retrofit projects in which the contractor guarantees a minimal level of energy savings to the facility owner. Approximately 75% of ESCO contracts are currently performance based.[28] Of these projects, 73% generate annual savings that significantly exceed the level of the guarantee.[29] Because actual, realized energy savings are subject to the semi-random effect of the weather, and can be drastically affected by changes in building occupancy patterns, performance contracts must account for these variables in detail. For retrofits that do not involve ESCOs, typically there is no performance guarantee.
6. **Construction:** The scope of the construction phase can vary based on the scale of the retrofit; changing lamps demands a different level of expertise than removing major mechanical equipment, replacing windows, or adding insulation, for example. Successful implementation of the project design is an important factor in eventual performance, and construction-phase contractors and activity should be carefully monitored and recorded for future evaluation.
7. **Measurement & Verification:** Measuring energy savings at the level of the individual ECM is an expensive endeavor, often requiring the installation of meters. Option C of the International Performance Measurement and Verification Protocol allows energy savings to be measured at the level of the building's electricity and gas meters (or sub-meters for larger buildings).[30] For a relatively low cost, the same companies that provide an energy baseline can monitor energy use on a monthly, quarterly, or yearly basis, and adjustments can be made to occupant training, O&M, and system optimization in order to increase savings. Ongoing measurement and verification, or M&V, is commonly cited as one of the most important phases of an energy retrofit.[31]
8. **Maintenance:** In order to achieve the energy savings estimated by an audit, new equipment must be properly maintained. That means more than routine equipment cleaning and adjustment; energy savings are optimized when facilities management and occupant behavior are aligned with the goal of energy conservation.

Historically, the performance retrofit industry has been dominated by ESCOs, whose offerings range from pure "design/build" to encompass the entire value chain described above. Most ESCOs do not

provide financing directly, but instead facilitate bank loans, incentives, or debt issuance by the customer.[32]

The ESCO industry has consolidated significantly over the last twenty years – eight firms over $100 million in revenue account for 79% of total activity. Prior to the current recession, the ESCO industry growth rate was approximately 7% per year. Surprisingly, the recession actually had a strong *positive* impact on industry growth: billions of dollars of stimulus funding through the Energy Efficiency and Conservation Block Grant (EECBG) program have boosted revenues by roughly 25% annually since 2009.[33] With no future grant funding expected to match the level of the EECBG program, the depletion of stimulus funding will leave municipalities looking for additional financing sources and may cause the industry growth rate to return to its historic level.

For the building performance industry, our team observed stimulus dollars fulfilling their intended role: EECBG stimulated the expansion of the number of companies occupying each step in the value chain. Whether these companies are able to keep up the momentum of EECBG, continue to provide quality retrofits, and thrive in the absence of grant funding remains to be seen. Certainly, the existence of programs like the COP grant will help them through the transition.

Chapter 2 Community Energy Program Essentials

In order to smooth the transition to municipal energy efficiency, a growing number of local governments and regional non-profits are attempting to establish energy programs intended to overcome the major barriers to improved energy performance in their communities. Fortunately for these fledgling organizations, there are several successful examples to follow. Community energy programs (CEPs) are not a new idea; a small group of progressive programs can trace their origins back to the late 1970s. A survey of the most prominent examples of long-lived, successful energy programs across the country reveals tremendous diversity in approaches to the challenge of reducing energy consumption. From these examples, a city manager hoping to start a new energy program in his or her community could glean plenty of ideas for beneficial energy-related activities. In addition, the international non-profit ICLEI (Local Government for Sustainability) offers an overwhelming clearinghouse of such ideas on its website.[34]

Yet for all of these examples, there is a distinct lack of information on how a city might establish a new program in the first place. While no two energy programs are alike in organizational structure or development path, the most successful programs do share several key commonalities. Drawing from examples of nine local and regional energy programs, this section presents observations about how several communities have:

- Established an organization that helps a city use energy more effectively, whether as part of a government entity or in partnership with a non-profit
- Secured seed funding for that organization
- Provided ongoing services to expand clean-energy options in the community
- Established partnerships with local organizations that can increase the capacity and scale of a clean-energy program

Energy Office Profiles

Selection and Information Gathering

This research focuses on well-known CEPs serving city or state governments. In order to observe the full range of options available to nascent programs, the CEPs cover a broad cross-section of the field. Hence, the examples presented below represent both city and state level programs, public and non-profit organizations, several regions of the country, a variety of funding mechanisms, and a diversity of activities – all with the shared goal of reducing fossil-fuel energy usage.

This cross-sectional survey approach helped to highlight several common themes across the wide spectrum of CEPs. Given this goal, readers should be aware that the information gathering and analysis consists of considerable informed judgment on the part of the researchers. While the analysis does not constitute a step-by-step approach to "starting your own energy office," it provides a meaningful framework for the initial foundation of a CEP.

Initial research was conducted on a wide range of programs through a review of the relevant literature and program websites (see Appendix A). After selecting CEPs for further study, staff and partners from

each of the CEPs were asked about the following program elements: startup, organizational structure, funding (both initial and ongoing), and strategic relationships.

Below is a summary profile of established and startup CEPs from across the country. They vary in scope from state to municipal and third-party, and address aspects of clean energy in multiple ways.

Statewide CEPs

Many states have energy offices, generally established through legislation, and a full assessment of their services is outside the scope of this report. Instead, we have chosen to profile three state energy offices (Colorado, Texas, and Iowa) for their work on specific CEP-related projects.

Colorado Governor's Energy Office

In operation for over 30 years, but revamped in 2007, the Governor's Energy Office is funded by the State Energy Plan through a tax on gambling. As a state department, the Energy Office primarily works on legislative and policy issues, implementing rebate programs for energy efficiency and renewable generation, as well as maintaining a renewable portfolio standard. The Energy Office also works closely with utilities on transmission, demand-side management, and renewable energy development.

On the project side, the office has four regional representatives to reach out to municipal facilities managers to implement energy-saving projects. Government building retrofits are usually contracted to ESCOs for project financing and implementation.[35]

Texas State Energy Conservation Office

The Texas State Energy Conservation Office is one of the largest energy offices surveyed, with 13 full time staff members working on a wide variety of programs. The office is funded and administered by the state Comptroller's office. Its focus includes education and outreach, alternative transportation fuels, energy efficiency, and renewable energy. One of the office's most well established programs is the Loans to Save Taxes and Resources (LoanSTAR) revolving loan fund, the largest state-run energy conservation fund of its kind. LoanSTAR has been in existence since 1988 and "revolves" its capital by investing in state building retrofits and capturing the savings over time. LoanSTAR was one of the first programs to demonstrate the need for carefully controlled, high-quality energy audits: a performance review of 24 early LoanSTAR projects showed a range of actual savings between 5.5% and 441% of the estimated values, suggesting that audit accuracy needed to improve.[36] So far there has been no shortage of projects that meet the program's criteria.

Iowa Energy Center

Part of Iowa State University, the Energy Center receives its funding from an annual assessment on electric and gas revenues in the state. The center was created through legislation in 1990 to establish an independent organization to research opportunities in energy efficiency and renewable energy generation. The center is also partially devoted to supporting the implementation of energy-saving projects in all sectors within the state. Towards this end, the center performs energy audits on industrial facilities, analyzes renewable resource availability, and funds demonstration projects.

To support renewable energy development, the center manages a $5.9 million "Alternative Energy Revolving Loan Fund." This fund is available to any developer, public or private, within the state and

provides 50% of project capital.[37] All money borrowed from the fund is repaid over a maximum of 20 years (though most projects have a shorter payback).

Municipal CEPs

Ann Arbor Energy Office – Ann Arbor, MI

Established in 1985, the Ann Arbor Energy Office is a municipal department entirely focused on reducing energy use in city buildings.[38] To that end, the office serves three main functions: collecting and analyzing detailed information on the city's energy use; managing projects, programs and grants involving energy-efficiency and renewable energy generation; and sharing energy-related information and best practices with other city officials and the general public. To date, the majority of the office's attention has been focused on the municipal sector.

The Energy Office is funded via savings from three city budgets: 30% from water, 30% from wastewater, and 40% from the city general fund – the areas where the Office focuses its efforts.[39] Each year, the Office has been more than able to pay for itself through energy savings to other departments.

The Ann Arbor Energy Office also manages a dedicated revolving energy fund of $500,000, designed to finance the initial cost of energy-saving projects in municipal operations and capture a portion of the savings until it is replenished.

Dallas Office of Environmental Quality – Dallas, TX

Created in 2005, the Dallas Office of Environmental Quality implements the city's environmental management plan across all categories of environmental impact, from energy use and carbon emissions to air quality and wastewater management. The Office coordinates the activity of 13 departments, each of which devotes half of a full-time equivalent (FTE) staff member to environmental management.

With a goal of reducing energy consumption in municipal operations by 5% annually (which has been consistently met), the Office initially performed a rough energy audit of all of the city's facilities in search of "low-hanging fruit." To finance larger projects, the city often contracts with ESCOs. For smaller projects, the office "finds the money somehow," often capitalizing on energy savings from previous projects.[40]

Tucson Energy Office – Tucson, AZ

The Tucson Energy Office started in 1994 when the city hired an electrical engineer to perform lighting retrofits under the Environmental Protection Agency's Green Lights program, a precursor to Energy Star ratings for buildings. Based on demonstrated savings in municipal energy efficiency projects, the Office's budget grew to $500,000 per year over the next ten years. Each year this growth has been justified and funded through energy savings. Due to budget cutbacks, however, the Tucson Energy Office is now largely funded through a Solar America Cities grant, and the focus of its projects has shifted to accommodate the grant's emphasis on solar projects; two full-time staff plus two interns run the program. Additional solar-project funding has come through the sale of Clean Renewable Energy Bonds (CREBs), with a $7.6M sale in March 2010[41] and additional requests for quotation in process at the time of writing.[42]

Key support during the past decade has come from the Tucson-Pima Metropolitan Energy Commission, a city-designated volunteer board that provides technical and administrative assistance to local sustainable-energy efforts.[43] In addition to working on energy efficiency, the initial staff member of the Tucson Energy Office brought a proposal to the Mayor and City Council to commit Tucson to Leadership in Energy and Environmental Design (LEED) Silver certification and a five percent solar energy commitment on all new municipal buildings, which the city adopted in 2006. [44]

Portland Bureau of Planning and Sustainability: Energy Office – Portland, OR

The City of Portland adopted a City Energy Policy in 1979, out of which emerged the 1991 City Energy Challenge Program, a commitment to cut energy use in internal operations 10% by 2010. The city has already exceeded the goal using (among other measures) methane-burning microturbines and LED traffic signals. The city's goal was to transition to 100% renewable electricity in city operations by 2010.[45]

The city's internal program was initially paid for by the city's general fund with a director, a half-time deputy director, and a secretary. For nearly its first decade, the office focused entirely on the policy aspects of energy efficiency. During this time, utility partners and a local nonprofit, Portland Energy Conservation, Inc., implemented efficiency programs. In 1990, the City of Portland took over implementation of its own internal energy programs. Today, the Energy Office operates as a branch of the city's Bureau of Planning and Sustainability; a $^{7}/_{10}$ FTE energy manager runs the office, with projects funded by a 1% charge on departmental energy bills, capped at $15,000 per year. In addition, the office has received EECBG and Solar America Cities funding.

One of Portland's current community projects is Portland Clean Energy Works, a program to deliver retrofit financing to owner-occupied homes within the city. Loan repayments are attached to utility bills, and the program uses a unique combination of partner organizations – a community bank, a statewide energy nonprofit, and local utilities – to eliminate conflicts of interest and leverage expertise in different aspects of the project.

Palm Desert Office of Energy Management – Palm Desert, CA

In 2005, the Mayor and City Manager of Palm Desert signed an agreement with regional gas and electric utilities to reduce the city's energy use (gas, electric, and peak demand) by 30%.[46] The Office of Energy Management formally started in 2007, with a director, an energy technician, and a secretary.

Following the passage of California's Assembly Bill 811 2998, the Office launched one of the country's first and most successful property-assessed clean energy loan programs. Loans to residential, commercial, and industrial property owners are paid out of the city's general fund and from the city's Redevelopment Agency; as of April 2010, two separate loan offerings have distributed $11 million.[47]

Key stakeholders in the city's energy processes have been Southern California Edison and Southern California Gas – particularly in the Set To Save residential and commercial rebate program. In addition, supportive city council members and the former City Manager, Carlos Ortega, have been strong advocates for the program.[48] Through a partnership with the Energy Coalition, an Irvine-based nonprofit, the Office of Energy Management has also established a local education program, called PEAK, for elementary and middle school students.

Third-party CEPs

Cambridge Energy Alliance – Cambridge, MA

The Cambridge Energy Alliance (CEA) is a non-profit organization founded in 2007, with the mission of reducing energy use and associated carbon emissions throughout all sectors of the city. Funding is largely provided through foundation and other private grants, though the organization does consult on large commercial and industrial projects.

The CEA's activities include monitoring energy consumption within the city, financing energy audits, and reaching out to local businesses, homeowners, and municipal departments. Thus, while CEA is not a municipal entity, it does serve in an energy-advisory role to the city government. Most importantly, the CEA serves as a connector, facilitating relationships between financial institutions, ESCOs, city managers, local utilities, and building owners.

Vermont Energy Investment Corporation

VEIC is a non-profit responsible for "planning, implementation, and financing of energy programs and projects."[49] Since 1999 VEIC has run Efficiency Vermont, a statewide program to consolidate energy efficiency services and programs operated by Vermont's various utilities.

Efficiency Vermont was established largely in response to lobbying from several key individuals on the Vermont Public Services Board, who identified an opportunity in consolidating and standardizing the state's twenty-two utility-run efficiency programs into a single "energy efficiency utility."[50] The existence of VEIC, a nonprofit with the financial, administrative, and technical experience to bid on the project, provided a convenient avenue for the program, which was eventually established by the Vermont legislature; VEIC has been awarded successive three- and two-year contracts to administer the program.

Currently, funding for the Efficiency Vermont program is provided through a statewide utility-bill charge, collected and distributed through a dedicated program administrator. Key stakeholders include the governor, public advocates, the Public Services Board, and Vermont ratepayers themselves. VEIC's internal metrics of success are primarily megawatt-hours saved, but the group acknowledges the need to balance a pure savings-driven approach against a more diverse portfolio of projects – particularly considering that commercial and industrial retrofits have historically had a 1:3.4 cost-benefit ratio, compared to only 1:1.7 for residential work.[51]

Results

Even in a relatively small sample, the diversity of project types, funding mechanisms, partnerships, and operational models among energy offices is a reminder that there is no existing "cookie cutter" model for new programs to follow. Despite widespread interest in a few promising programs to fill particular niches, no single approach has emerged as a panacea; one of the key roles of the CEP appears to be finding the most locally applicable solutions. That said, among the offices surveyed, there are several best practices, opportunities, and potential barriers to the implementation of successful energy-saving programs. Based on these commonalities, below are several suggestions regarding the start-up phase, funding, core services, and likely partnerships for nascent energy programs to consider.

Startup and Administration

The formation of a CEP can take many forms, but among the CEPs surveyed, there were a few key similarities.

Key Conclusions: Energy Office Startup

- Find a "Startup Champion"
- Hire staff to fill three primary roles: administrative, financial, and technical
- Seek out partnerships to fill the gaps in staff expertise
- Identify individuals who can provide political support

Startup Champions

Almost all of the programs had a "startup champion" – an individual or group aware of the need for a CEP, reasonably familiar with the technical, financial, and policy hurdles to overcome, and willing to put effort into developing a program. Generally, these champions were also connected with some aspect of local or regional policy-making – a city or state office, a civic nonprofit, etc. For example, the proposal that consolidated Vermont's utility energy efficiency programs into a single entity, Efficiency Vermont, came from an individual who had worked for years at the Vermont Public Services Board, the state utility regulator. In Michigan, Dave Konkle started the Ann Arbor Energy office largely single-handed with grant funding. The Berkeley FIRST program – the first implementation of Property Assessed Clean Energy (PACE) loans in the country – was created by Francisco DeVries, a former chief of staff for the city mayor, who worked with a local financier to develop a funding model.[52] And Palm Desert's creation of an energy office in 2008 was largely driven by a group of city officials who signed the 2005 Aspen Accord in Estonia, in which they agreed to significantly reduce the city's energy profile.[53]

Staff and Roles

CEPs typically need three types of expertise to function successfully: administrative, financial, and technical. The administrative role, by definition, is almost always within the CEP and needs to be staffed internally. Responsibilities for this role include: strategic program oversight, partnership establishment and management, and assessment of overall program success.

The other two roles can be handled internally or externally, depending on the resources of the CEP and its ability to partner with outside organizations. The technical role requires the ability to identify potential opportunities for energy savings and to quantify those savings. Portland, Tucson, Ann Arbor, and Palm Desert each have a staff member with the technical skills to identify and evaluate projects – either in municipal energy efficiency or in renewables. Based on the findings of the technical expert(s), the financial staff must be able to assess the financial viability of projects through a comparison of investments and savings. Furthermore, financial expertise is helpful in providing long-term program stability and securing sources of funding.

From an organizational perspective, most of the city offices we spoke to started small, although many have since expanded. Tucson and Ann Arbor, for example, began with a single employee; and Palm Desert, whose PACE program was previously one of the most successful in the country, operated it with only a director, a technical advisor, and an administrative assistant on staff. Portland's internal energy-management office was initially staffed by a director, deputy director, and secretary, but is now

run by a single energy manager at seven-tenths of a full-time equivalent, largely due to funding cuts.[54] In addition, the Cambridge Energy Alliance has only four full-time staff.[55]

Partners

If internal CEP staff size is limited, an effective way to increase the CEP's impact is by engaging partner organizations that can fill the roles mentioned above or otherwise augment the CEP. Important players include utilities, nonprofits, and financial institutions.

Depending on the status of electrical deregulation in a given state, utilities and public utility commissions (e.g., utility regulators) can be useful partners in program finance and implementation. In addition to providing property-tied residential loans, for example, Palm Desert's Office of Energy Management works with regional utilities to jointly administer an efficiency rebate program. Similarly, VEIC administers utility rebates for the entire state.

Nonprofits and consultants can provide specific technical and financial assistance – like ShoreBank Cascadia, which designed and administers the loan-origination component of Clean Energy Works Portland – as well as general program support and administration. In some cases, nonprofits like VEIC and CEA and for-profits like Renewable Funding LLC run a particular program, generally on a contractual basis. These partnerships in program administration, technical analysis, and finance offer communities a chance to take advantage of external expertise and resources.

Political Support

In addition to program staff, almost all of the CEPs have supporters in key political roles: city council and city manager in Palm Desert, planning-commission officers and the governor in Vermont, and so on. This may seem like an obvious point, but the lesson is clearly that CEPs don't operate in isolation; governmental support and buy-in are essential. The programs we surveyed were evenly divided between those started to meet a legislative or executive mandate (Portland, Palm Desert, Dallas, and all of the states) and those started in response to interest and/or funding from outside the municipal government (Vermont, Tucson, Cambridge, Ann Arbor). Not surprisingly, those started with outside interest and funding tended to be structured as non-profits rather than government agencies.

Core Services

The CEPs profiled above represent a broad range of geographic, political, and administrative categories, and as such, the services they provide are diverse – from residential solar installations to municipal lighting retrofits and utility rebate programs. While every CEP in the survey justifies its actions through at least one of three core rationales – reduced energy use, reduced greenhouse gas emissions, or increased financial performance – their diversity of approaches is a reminder that opportunities exist across a wide spectrum of potential renewable-energy and efficiency applications. Among the diverse group of services, there are a few important

Key Conclusions: Core Services

- Provide energy audits and technical assistance
- Increase access to capital for up-front project costs
- Assist with contractor screening and project implementation
- Focus on municipal operations first

services that a new CEP might initially offer. These services are often intended to reduce transaction costs and other initial barriers to energy projects.

Energy Audits

One common CEP service is the provision of free or reduced-cost energy audits. The Cambridge Energy Alliance, for example, offers free, comprehensive energy audits for both commercial and residential buildings. Providing free audits eliminates an expensive hurdle for building owners and managers considering whether to perform a retrofit, and audits often reveal attractive potential savings that entice owners and managers to move forward with projects.

Increasing Access to Capital

Another "hurdle-clearing" service offered by some CEPs is enlistment of financial institutions to streamline the process of financing retrofits. Again, the Cambridge program is a leader in reducing costs, negotiating with local banks to obtain special rates for residential loans of up to $25,000; [56] up-front financing programs like Palm Desert's Energy Independence Program and Portland's Clean Energy Works are specifically designed to eliminate first costs. Upfront financing is one of the greatest barriers to energy-saving improvements, so the ability to connect building managers and lenders who understand energy efficiency is a valuable service.

Project Implementation and Assistance

In addition to reducing capital costs, a number of the CEPs also provide technical consulting, project implementation services, and other assistance. In the interest of quality projects, many maintain lists of qualified contractors. To perform this service, CEPs must first evaluate contractors for performance quality and negotiate on pricing. Through this process, CEPs minimize transaction costs for building owners by assessing contractors in advance. A number of CEPs go a step further and contract with ESCOs for all stages of project implementation. While there are mixed reactions concerning the ESCO model, ESCOs do allow CEPs to initiate projects without the need for highly technical staff or a large pool of capital. In this way, judiciously utilizing ESCOs can expand the reach and impact of a small program. This additional reach comes at a cost, however, as ESCOs offer their services in exchange for the majority the financial returns from energy savings. Thus, new CEPs should weigh the costs and benefits of utilizing ESCOs carefully.

Improvement of Municipal Buildings

Most municipalities with an established energy office dedicate at least a portion of their time to improving the performance of their own municipal buildings. This is often attractive for three reasons. First, savings are easier to monitor and capture, and they provide an immediate benefit to the city. Second, buildings are often owned for a long enough time to justify the upfront investment. Third, municipal projects can be easier to set up and implement than programs for residential or commercial clients. In Portland and Ann Arbor, these municipal projects primarily take the form of efficient lighting, mechanical systems upgrades, and building envelope improvements; savings may be either estimated or measured, and fed back into a revolving fund (as in Ann Arbor) or simply used to reduce the city's operating budget.

Funding

Initial Funding

The organizations we surveyed represent a broad spectrum of funding models. For startup funding, the majority of organizations relied on general funds from the city, county, or state. This is particularly true in the case of CEPs established to meet an emissions or energy reduction mandate. Some city offices, however, started with grant funding from an external source (i.e. Ann Arbor and Cambridge). Independent consulting CEPs, like VEIC in Vermont and Renewable Funding in Berkeley, cover some startup costs from their own internal budgets.

Ongoing Funding

Although there is variability among the different CEPs with regard to their strategies for ongoing financing, there are four main ways CEPs support their programs on an ongoing basis:

Key Conclusions: Funding

- Many programs start and/or operate with direct city general fund support
- One-time funding like EECBG or other grant programs can plug gaps
- Common sources of ongoing funding are service charges, performance or use-based fees, and revolving energy funds

- **Budget allocation from the state or municipality** - Most municipal CEPs are under pressure to demonstrate annual savings in excess of their annual budgets; these offices tend to measure performance by the number of kilowatt-hours and dollars saved per year. Tracking energy savings in order to prove their worth seems to be a necessity for many of the CEPs. Through this model, a voluntary commitment to replace city lighting in Tucson under the EPA's Green Lights program grew into a $500,000-per-year office performing solar installations in addition to lighting and mechanical retrofits. In Portland, each city department pays a percentage of its internal energy bill to support the work of the city's energy manager. In Ann Arbor, the Energy Office is financed by the city.

- **Service charge from utility bills** - CEPs that are funded through this mechanism typically have a more stable source of funding. The same legislative bill that created Efficiency Vermont legislated a "systems benefit charge" on statewide utility bills to pay for the program.[57] Similarly, the Energy Trust of Oregon levies a 3% utility charge to administer a wide range of statewide and municipal programs, including Portland's Clean Energy Works residential program.

- **Grants and bonds** - Today's economic climate has made finance a particularly difficult issue for many CEPs, which have seen budgets reduced or eliminated. Many offices currently rely on state and federal grants, like Solar America Cities, to keep programs afloat; in Tucson, at least, the result has been an emphasis on solar projects and a de-emphasis on the lighting projects that gave the office its first work. Interestingly, the programs that appear to have been least affected by budget cuts (anecdotally, at least) are those with a residential component: Palm Desert, Portland's Clean Energy Works program, and the Cambridge Energy Alliance, for example.

- **Revolving Energy Funds** – One fairly common and highly successful alternative to continual grant-seeking or raising taxes is the revolving energy fund model (REF), in which a portion of project savings is returned to a central fund, which refills until it has sufficient capital for additional projects. For many CEPs, this model simply gives a more explicit structure to what

program officers already do: justify the existence of their programs through project performance. While the startup capital, logistics, and administration of a revolving fund can be challenging, successful revolving funds do exist, and they may allow staff to focus less on fundraising and more on seeking out the highest quality projects.

Perhaps the most long-standing, impactful model of such an REF in existence today is the Texas state LoanSTAR fund. With a pool of $98.6 million, the LoanSTAR fund has "revolved" enough times to loan out over $240 million since its inception in 1988,[58] almost two and a half times the initial investment. The fund is still completely solvent today; projects are carefully selected and energy savings are tightly monitored so that payback to the fund is based on real performance. LoanSTAR's leadership has paved the way for states like Iowa, which started up a similar fund focused entirely on renewables, and Colorado, which is working on establishing a similar REF.[59] Other institutions stand to benefit from the model as well: Harvard University operates a $12 million dollar fund dedicated to money-saving conservation of all kinds[60], and the Sustainable Endowments Institute has identified similar programs at more than 50 additional colleges and universities.[61]

A number of cities have established REFs on a smaller scale. Ann Arbor's $500,000 fund has been in operation since 1998 and has consistently been paid back in full through the energy-saving projects it finances. According to Andrew Brix, the Energy Programs Manager, the major barrier to full deployment of the fund is the limited amount of time that city staff is able to spend seeking out projects and measuring energy savings.[62] Though not profiled in this paper, the cities of Falmouth, ME, Nashua, NH, and Toronto, Canada have also experimented with REFs.[63] Less formal versions exist as well: for example, the city of Dallas does not have an explicit fund but frequently makes investments on a "reimbursement model" where energy savings from one project are used to justify the next.[64]

There are certainly logistical and financial barriers to establishing REFs, particularly in measuring savings, covering administrative overhead, and obtaining seed capital. Nevertheless, revolving funds have the potential to create long-term value for CEPs. Many programs are already monitoring and reporting energy savings in order to justify their benefit to the community, which makes the creation of an REF a potential next step. Because the REF model has the potential to help municipalities overcome one of the most vexing barriers to energy efficiency, the remainder of this report details the best practices for developing and structuring a successful REF.

Chapter 3 Revolving Energy Funds: Overview and Best Practices

Introduction

Revolving Energy Fund

Intrigued by the success of many CEPs in implementing REFs in their community, we focused our research efforts on determining whether the REF model would be appropriate for the Cities of Promise. Fundamentally, an energy-efficiency REF employs a simple concept to extend the useful lifetime of limited funds: first, capital is loaned to clients to perform energy-efficiency retrofits. Energy savings provide the basis for repaying the loan, and the repaid funds are then used to fund additional projects. In this way, the original pool of capital can be "revolved" multiple times to fund a larger number of projects (see Figure 1).

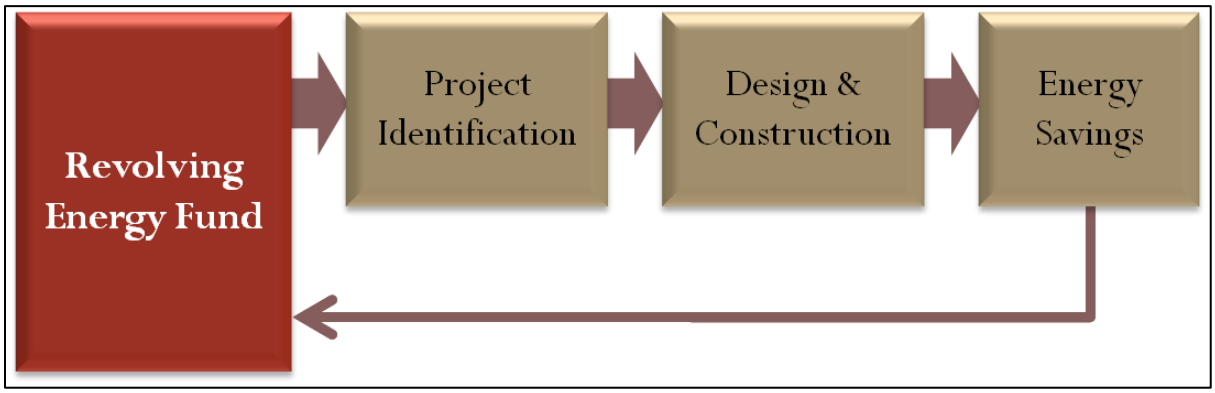

Figure 1. Revolving Energy Fund Diagram

Sources and Uses of Capital	
Inflows	**Outflows**
• Grants, program related investments or other sources of capital • Contractual payments from cities based on projected energy savings	• Energy audits • Building retrofits • Monitoring and verification (i.e. Planet Footprint) • Staff costs

Table 1. Sources and Uses of Capital

Sources and uses of funds are outlined in Table 1. The eight Cities of Promise will use their portion of the $4.4 million MPSC grant to create "localized" REFs within each city, with energy savings from the initial investment returning to each fund to pay for future retrofits. In addition, each city has committed to using its fund to pay for a $^1/_4$ full-time equivalent staff member – in recognition of the value of having dedicated staff working on energy efficiency issues. For the first five years of the program, 100% of savings – measured by an energy-bill analysis performed by Planet Footprint – will accrue to each city's fund; after the fifth year, all savings will accrue to the city.

We performed initial financial projections for the eight cities' REFs - for results, see Appendix B - and demonstrated that the REFs will yield significant ongoing benefits for each city. Additionally, these projections do not account for any additional benefits that a part-time energy manager might generate. However, based on additional financial projections and conversations with the CEC and other managers of REFs, we believe that there may be room to improve the model through consolidation into a single "centralized" REF, managed by the CEC and allowed to invest in any project meeting specific criteria – not just in the eight Cities of Promise. Moreover, the structure leaves the CEC without a viable long-term source of funding.

In recommending that the CEC implement REFs as a mechanism for extending the impact and increasing the leverage of the MPSC's original grant, we also explored how to implement REFs most effectively. Whereas the previous section focused on legal structure, financial sensitivity analysis, and risks, this section establishes best practices and conveys lessons that the CEC learned in its experience related to management of funding sources, clients – municipalities in our case – and other essential partners.

Methodology

To better understand what policies and procedures are essential for establishing a successful REF, we relied on the experience of cities across the country as well as thought leaders in the space. In addition, this project contributed to the knowledge base in two ways. First, a survey of city staff throughout the state of Michigan highlighted key questions, concerns, and considerations that they need to explore when establishing an REF in their communities, or when partnering with an existing REF to retrofit their municipal buildings. Second, the CEC established eight REFs, one for each of the COP, in an 18-month window. That process provided insight into the decision-making process within municipalities and demonstrated common issues that must be accounted for when establishing an REF.

After a review of the existing literature on REFs, the principal methods for data collection were surveys and interviews. The data gathered is largely qualitative, but the research did illuminate a collection of important issues to consider in designing an REF to be sustainable over a long time horizon.

Results

Through the administration of the MPSC grant, the CEC and the SNRE team have gained insight that will provide a significant advantage when establishing an REF. Below is a combination of best practices for establishing an REF and the lessons learned in working with the Cities of Promise. These conclusions are presented as recommendations and divided into four sections: funding, working with municipalities, partner relationships, and internal considerations.

Funding

Actively develop relationships with potential funders

Rather than waiting for grant announcements, a fund should develop relationships with potential sources of funding and advertise the beneficial attributes of the REF before soliciting grant applications. This is the best way to ensure that the REF will be eligible for consideration under the grant and the application will be thoroughly considered.

Solicit funding from multiple sources and continue fundraising after the startup phase

The "blended" nature of a REF could also provide flexibility when soliciting initial capital. Not only can funding come from different types of organizations – e.g. government, foundations and private investors – but it can also be directed to many different uses. For example, a foundation could contribute to the fund with the understanding that investments would be made in a specific geographic area. Once an organization secures funding, it might be tempting to focus solely on implementing energy efficiency projects. Our experience, however, has suggested that there are more projects that capital available to fund them, so ongoing capital infusions can allow an REF to reach a broader audience faster.

Treat all funders like customers

Once funding has been secured from an organization, keeping in contact and providing continual project progress updates can demonstrate that the funder made a wise investment decision. This may raise the possibility of securing additional capital, but perhaps more importantly, many funders are more than willing to provide non-monetary support as well. This access to connections or resources can help make a fledging fund successful.

Municipalities

Partner with interested cities

For cities to be good customers, they must understand the value of an REF and have the capacity to dedicate time to initiating the relationship. While this does not require significant staff effort, someone must provide access to people and facilities in a city at the outset of the relationship. On an ongoing basis, establish a point of contact for financial considerations and any issues related to project performance.

This was a particular challenge with the COPs, who were designated as recipients for the MPSC grant. Without having had to specifically request assistance, the CEC had to allocate significant time and resources to describing the program to interested cities, getting their buy in, and finally gaining approval for a contract from city council.

Identify an internal champion within city government

This was discussed in detail in Chapter 2, but is offered again here to provide a complete list of best practices. The internal champion must be someone who intrinsically supports city energy conservation and is willing to expend the effort necessary to make it a reality. This person can occupy a variety of roles, ranging from public works to economic development, but whatever the role, he or she should be personally motivated – e.g., willing to go beyond specified job duties – to make energy efficiency a priority.

Use estimated savings to provide certainty

By fixing the payments from the city to the REF at a certain amount, both entities can more comfortably create budgets and allocate staff time. To overcome hesitation regarding whether savings will in fact materialize, the REF could be conservative in its projected savings totals.

Split energy savings between the city and REF

Allocating energy savings to both parties serves two purposes. First, cities and facilities managers are more likely to be interested if they realize some immediate financial benefit. Second, if using estimated

savings for calculating payments, this gives cities both the upside and downside of any deviation of actual savings from expected savings. This is especially important because of the role occupant behavior plays in reducing energy consumption.

Focus on the financial benefits and low city staff commitment of the REF

For most cities, cutting costs is the most important priority. Demonstrating how the REF will reduce operating expenses will be more helpful in engaging cities compared with discussing sustainability initiatives or greenhouse gas reduction. Furthermore, many city staff already feel overworked, so demonstrating that this is more than just a financing tool is critical. Third-party management of the retrofit process provides city staff with essential technical support and saves them time to focus on their other responsibilities.

Group all buildings from a city together when contracting for audits and bids

In cities that have smaller facilities, the REF can reduce its auditing, construction, and measurement and verification costs by grouping the projects together when soliciting bids.

Measure the energy savings from all projects

While most organizations agree that energy efficiency measures generate financial savings in principal, many remain skeptical about the true nature of the savings. Thus, it is critically important to measure the performance of buildings over time and compare predicted savings to actual savings. Furthermore, measurement and verification is essential for providing feedback to funders about their returns on investment or leveraging of grant dollars.

Provide proper training for facility managers

This point may seem obvious, but there are enough anecdotes of insufficient training leading to improper equipment usage that we need to emphasize the point. As energy conservation measures are implemented, it is essential to train facility managers in the proper use and maintenance of new building systems. Even the best constructed projects will fail to generate the expected energy savings if facility managers are not properly educated.

Get city employees involved

City staff typically occupy, maintain, and monitor all of the buildings in a city's portfolio. They are often quite knowledgeable about the facilities and have an understanding of where energy performance needs to be improved. They will likely need the assistance of an energy auditor to quantify the energy savings potential of a particular energy efficiency measure, but simply speaking with city staff represents an easy way to identify projects. Furthermore, it creates internal buy-in among employees by creating ownership of energy use reduction in facilities.

Behavior change plays an important role in reducing building energy use

Once an energy efficiency measure has been implemented, building occupants must be educated to properly adjust their behavior. To provide this training effectively, multiple touch points over time achieve better results than a single session.[65]

After educating building occupants, provide feedback on how they're doing

As the performance of building retrofits is tracked and occupant behavior changes, occupants should be informed, about the savings generated by the project. This positive reinforcement is essential for driving long term energy conservation behaviors.[66]

Partners

Require that auditors provide investment grade energy audits

Investment grade audits should provide certainty to the REF and partner cities that the specified energy savings will be realized upon completion of a project. For additional details on energy audits, see Appendix C.

Identify partner organizations in the early stages of fund development

One of the key challenges for the REF in delivering consistent results is its lack of vertical integration throughout the retrofit value chain. Consistently partnering with a small number of auditors and architecture and engineering firms will minimize project risk and increase the energy savings realized.

Internal

Dedicate someone to be responsible for identifying projects in the long term

For at least two revolving loan funds we evaluated, the limiting factor for initiating new projects has been the lack of projects rather than the availability of capital.[67,68] For all but the most efficient cities, there is likely a significant number of worthwhile projects that must be identified. As buildings age and repairs are made, the list of target projects will inevitably change over time, and it is important that someone take on the responsibility of finding new projects in which the REF can invest.

Administering an REF requires a diverse skill set

To be successful, an REF needs staff with the following competencies:

- Finance and accounting: track fund performance, collect and process payments as energy savings occur, and model future fund scenarios.
- Project management: coordinate all parts of the retrofit process, including oversight of energy auditors, contractors and other partners.
- Business development: establish partnerships with municipalities or facilities and navigate the process to engage them formally as customers.
- Fundraising: develop relationships with and secure capital from organizations or individuals interested in funding energy efficiency retrofits.

Single individuals can fill multiple roles, but it is essential that each of these roles is filled for the long-term viability of the fund.

Summary

As with any complex organization, there are many issues to consider when forming a REF. The lessons learned and best practices above form an admittedly lengthy list. The goal, however, is to provide a comprehensive set of guidelines for anyone interested in starting a REF in his or her area. That said, there is also value in highlighting the top five recommendations:

1. Identify an internal champion within city government.
2. Use estimated savings to provide certainty.
3. Focus on the financial benefits and low city staff commitment of the REF.
4. Split energy savings between the city and REF.
5. Measure the energy savings from all projects.

Chapter 4 Looking Forward: A Centralized Revolving Energy Fund

Introduction

Starting an energy office is only the first step to realizing long-term energy savings. Once offices have been established – or, at a minimum, once motivated individuals have been identified within city government – the next question to address is financial: where will the city generate the capital to fund projects?

After gaining an understanding of how revolving funds should be implemented across the COP, our team evaluated how the CEC might most effectively implement a centralized REF. In this phase of our work, we performed a market analysis, developed and refined an initial business-plan, identified and analyzed key risks, and discussed potential options with stakeholders. We aimed to answer a few questions in particular:

- How large is the market for a centralized fund?
- What sources of funding should the CEC consider in addition to grants?
- What are some possible legal structures for the fund?
- What are additional risks and considerations?
- Which variables and expense categories are the most important (and least important) to manage?

Finally, we framed our recommendations around the CEC's goals of leveraging its existing competence in establishing REFs and working with municipal governments, and generating an ongoing source of revenue. The MPSC grant did not allow the CEC to directly capture energy savings from COP facility retrofits to pay for ongoing program administration. In order to serve a significantly larger number of cities, a sustainable mechanism for funding the CEC's administrative role is essential. As an organization, the CEC has a statewide reach. Thus, our analysis focused on the needs of the Michigan market and the CEC's ability to meet those needs. Although our recommendations are specific to the CEC and Michigan, many of our findings regarding fund structure and key risks can be applied to any REF in a startup phase.

Profile of Michigan Municipalities

Key Conclusions: Market & Customers

1. Focus on low-to-middle income cities in Michigan with population of approximately 10,000 – 100,000. These cities are generally large enough to incur significant energy costs, while remaining too small to be fully served by existing entities (ESCOs and city energy offices).
2. Within this target market there is roughly an $80 – $100 million NPV-positive investment opportunity (i.e. plenty of projects to fund).
3. Emphasize turn-key project management, technical assistance, and low staff-time requirements on an equal basis with financing assistance.
4. Reach out to cities through existing networks, county governments, and "umbrella" municipal organizations in order to build credibility and gain access to the maximum number of clients.
5. Connect with other regional non-profits and state agencies in order to present cities with a coordinated message from multiple trusted organizations.

The financial and technical challenges of energy efficiency are particularly burdensome for mid-sized cities (with populations roughly between 10,000 and 100,000). Larger cities typically have enough facilities to justify devoting internal resources to energy conservation. For example, both Ann Arbor and Grand Rapids have full-time staff dedicated to managing the city's energy use. Detroit and Flint do not have the same internal resources, but their large size and high visibility make them much more likely to partner foundations or ESCOs who have the capacity to help these cities overcome financing challenges.

Cities with populations below 20,000 present an entirely different set of challenges. Most of these cities have few professional staff; on the smaller end (less than 2,000 residents) some towns are run entirely by volunteers. Additionally, many small, rural communities lack sufficient investment opportunities to qualify for the minimum loan amount of $100,000 from the Michigan Department of Energy, Labor and Economic Growth's (DELEG) revolving loan fund.[69] In these communities, the fixed costs of client acquisition, administration, energy auditing and performance tracking can make the overall economics of a project much less attractive to a third-party financier.[70] On the other hand, there are certainly benefits to working with very small cities: less bureaucracy can mean a less cumbersome negotiation process. Perhaps more importantly, small cities' lack of staff capacity and less attractive project economics both mean that they are the cities with the fewest existing options and the greatest need for a new solution.

Michigan has 62 cities with populations between 10,000 and 100,000.[71] These small to mid-sized cities are large enough to have annual energy bills greater than $100,000, but they are generally too small to have anyone on staff specifically dedicated to energy management. Our survey data and analysis suggest that, in aggregate, the group spends roughly $80 million on electricity, gas, and heating oil each year.[72]

As the Cities of Promise indicate, cities that occupy the lower and middle areas of the socioeconomic spectrum also have the greatest need. Cities with access to capital and sufficient operating funding generally prefer to use their own capital rather than take on debt. For example, Traverse City "doesn't

like to borrow money" and is "developing energy expertise in house."[73] Both of these traits mean that Traverse City, along with others in similar situations, is unlikely to require the services of a third-party REF.

Forty-one cities in Michigan own their own electric utilities. These municipally-owned suppliers provide eight percent of the state's electric power.[74] Most are quite small: over 70% of the cities with their own electric utilities have fewer than 10,000 people and about 50% have fewer than 5,000. For some of these cities, financing for energy-related projects is available from local utility-governing bodies via surcharges on electricity bills. For example, the city of Coldwater generally pays for its own energy efficiency projects and has electrical engineers available to design and manage building retrofits.[75] Not all cities with public utilities have it so easy, however, as Detroit and Lansing can attest. Hence, while municipal utilities may unburden a number of cities from the need for outside assistance, they do not guarantee that a city will not need additional aid.

In general, the cities with the greatest demonstrated interest in energy conservation are mid-sized and suburban. Of the 20 cities in the Midwest Regional Sustainability Network (based in Ann Arbor), 15 fit that description – cities like Farmington Hills, Southfield, and others in Oakland and Washtenaw Counties (see Appendix D for a full list of members). According to MRSN staff, most of its members joined because of energy enthusiasts on staff ("internal champions") with a desire to "keep up the momentum" begun with EECBG funds.[76]

Example city: Harper Woods, MI

Harper Woods is a city of 12,000 located in Wayne County, just east of Detroit. Per capita income is slightly above the state average at about $25,000 per person.

According to city manager James Leidlein, Harper Woods used to maintain a community development director who made an effort to monitor energy use, but his job was lost to budget cuts several years back. Managing energy in the city could not be a full-time job; the city has only five buildings, plus streetlights. Still, those facilities are expensive. Street-lighting alone costs roughly $500,000 per year. Leidlein laments that "city hall's HVAC system is as old as city hall." He claims that the city's engineers "try to keep abreast of grant programs that are available" for performance retrofits, but hunting for grants is certainly not in their job description. In addition, Leidlein admits that he is overwhelmed by mailings with offers from contractors and often throws marketing pamphlets away without opening them. The city does not have the money to pay for these services; financing is definitely the major barrier to performance retrofits. If financing became available, Leidlein says the city would "absolutely" take advantage of it to invest in its facilities.

Harper Woods is an example of the kind of city for which the current options for financing and managing performance retrofits are simply not working. The staff is stretched thin due to recent budget cuts and has no time to devote to energy management. There is no room in the budget to pay for performance retrofits. However, there are plenty of aging facilities with energy savings to capture, and at least one staff member with an interest in energy issues. With an internal advocate for energy conservation and a strong demand for financing and project management, Harper Woods is an ideal candidate for external assistance.

Description of Harper Woods drawn from interview with James Leidlein.[77]

Support Networks

There are a number of organizations in Michigan – spanning the full spectrum of non-profits, government agencies, and for-profit companies – that have resources dedicated to municipal energy efficiency (see Appendix E for a complete list). Although these organizations have limited funding to offer for actual project implementation, they are able to provide substantial education, technical assistance and project coordination. For the CEC, or other organizations attempting to start a new energy program for municipalities, these organizations would make valuable partners. Their trusted relationships with city governments are vital for building credibility; their existing connections with energy conservation "champions" among city staff are necessary to move an energy program through city bureaucracy as quickly as possible.

Unfortunately, the surplus of "advisory" services offered by these organizations may currently be having a somewhat perverse effect on the market. According to Luke Forrest, energy program manager for the non-profit Michigan Municipal League, the current lack of coordination among Michigan's various energy-efficiency organizations may be leading a portion of municipal staff to become overwhelmed by the volume of information and number of options – from ESCOs to nonprofits.[78] Organizations pursuing the

same basic goals would almost certainly benefit from increased collaboration and coordination. Minimizing competition between energy-focused organizations might also facilitate grant fundraising efforts by presenting potential funders with a plan supported by multiple organizations, rather than multiple plans competing for the same limited funds.

Revolving Energy Fund Structure Recommendations

Having established the need, best practices, and potential market for a full-service revolving energy fund, our final task was evaluation of options: what are possible corporate structures for a fund? What are its key risks and opportunities? Where could it secure capital?

This section of the report provides initial guidance for establishing a centralized, CEC-administered REF and a comparative analysis of two different models for capitalizing the fund. The first option would be to establish a revolving energy fund within the CEC as the organization currently exists, i.e. as a 501(c)(3) nonprofit. Alternatively, the CEC could establish a for-profit subsidiary that would provide access to additional sources of capital, but would also require more administrative resources. Based on our team's research into different options for structuring for-profit organizations, the Low Profit Limited Liability Corporation (L3C) is likely to be the legal entity with which the CEC finds greatest alignment in terms of mission and access to capital.

In looking at the formation of a REF under either scenario, the CEC must be aware of several important factors. First, the best practices and lessons learned in working with the COP, discussed in Revolving Energy Funds: Overview and Best Practices should be incorporated in any new fund. Second, because the fund structure is purely a financial decision, the target market and customer will be the same under either option. Similarly, the value chain for energy efficiency retrofits is also independent of the CEC's decision for legal structure, as are the entities that operate in this space.

Comparison of Nonprofit and L3C Fund Models

A centralized fund will improve on the Cities of Promise model (in which each city will establish its own "decentralized" fund with that city's energy savings) in several key ways.

First, a central fund would allow the CEC greater flexibility in working with additional cities, since subsequent loans do not have to be made within the same city. Although larger cities like Detroit and Flint may in fact have enough available projects to justify having a dedicated fund for themselves, smaller cities with fewer facilities may not need additional investment.

Second, a single central fund will allow more efficient concentration of technical expertise, fundraising, project identification and management, and energy-performance data tracking. For the purposes of our analysis, we have assumed that three to four CEC staff members could raise, deploy, and manage between $2 and $4 million per year, or an initial fund of up to $10 million.[79]

Third, a central fund will reduce overall administrative and managerial costs by aggregating them in a single location, thereby freeing up additional money to be loaned to cities.

Fund Structure and Key Services

For the purpose of comparison, we have assumed that a central REF would offer services similar to those provided to the Cities of Promise:

1. Connect with key partners within city management: facilities staff, city managers, etc
2. Perform initial walk-throughs of municipal facilities to identify retrofit candidates
3. Contract for an investment-grade energy audit – ideally performed by an engineering firm that can provide subsequent design specs without needing to re-visit the site. Although anecdotal evidence suggests that the fund should fully subsidize the energy audit in order to eliminate cost as a barrier, a common practice in the ESCO industry involves signing a contract specifying that a client must reimburse the audit cost if the client chooses *not* to pursue energy retrofits meeting minimum standards for size and payback.
4. Concurrent with the audit, CEC should conduct a review of the facility's energy performance over at least one previous year.[80] While partnering with a third-party energy bill monitoring service like Planet Footprint will reduce the amount of work performed by the CEC, the relatively high cost of data collection and monitoring suggests that the CEC should at least consider adding internal energy-monitoring ability.
5. Design and contract the retrofit. Although the CEC does not currently have general contracting experience, the construction phase of retrofit projects is a significant source of revenue for ESCOs, since typical general-contracting agreements allow a 15-20% profit margin in addition to the total cost of the project.
6. Measure savings and work with partner cities on an ongoing basis to make sure that energy systems are optimally calibrated and occupant behavior is consistent with the project design. Again, working with a third party like Planet Footprint has the advantage of providing immediate expertise, but we recommend evaluating CEC's internal ability to provide monitoring services.

A contractual agreement with each municipal customer, approved by city council or equivalent, would essentially make the Clean Energy Coalition a holder of municipal debt, with little or no easily accessed collateral – certainly a risk, given cities' current financial stress, but one that we feel can be justified via the Fund's public-benefit mission. Monthly or quarterly repayments from a city's or department's operating budget would return to the fund.

One important issue that remains to be addressed is that of remedy for late payment, default, and impairment (in the case of a dramatically underperforming facility). While we cannot provide legal counsel, we recommend that the fund maintain a significant cash balance to cover any legal or other fees associated with collections. Anticipated lifetime is an additional issue: although a well-executed fund could theoretically last indefinitely, for the sake of more realistic analysis we have assumed that it would last between 10 and 20 years, after which any remaining cash and contracted cashflows could be transferred to a subsequent fund.

Our conversations with energy-efficiency professionals and loan-fund managers have suggested a few other important attributes of a centrally-managed loan fund. First, calculated (or "specified") savings, not measured savings, should be used to determine repayment to the fund.[81] Using calculated savings will reduce the cost of accounting for energy savings and transfer the risk of project underperformance, as well as the upside from possible over-performance, to municipal customers. This is important for two primary reasons: first, to create an incentive for cities to maintain the behavioral and operational changes necessary to realize savings; second, to minimize impact on the fund if a building's use patterns change significantly (e.g., if more employees are added).

Second, energy audits should be of the highest quality possible. Although the definition of an "investment grade" energy audit is somewhat ambiguous, in order to reduce the risk of project underperformance, energy audits should:

- Incorporate occupant behavior and use patterns in addition to physical characteristics of the facility.
- Target a prediction of savings within +/- 10% (See Appendix C).

Finally, for whole-building projects similar to those pursued in the Cities of Promise model, whole-building energy monitoring (Option C in the International Performance Measurement and Verification Protocol, or IPMVP) is the least-cost and least-complex method to confirm that savings are within a reasonable range of predictions.[82]

Nonprofit REF status and challenges

Because revolving loan funds are a relatively well-understood concept, the primary challenges to a central fund would be financial – securing enough seed funding to make the fund viable over the long term – and technical, particularly given the apparent scarcity of non-ESCO investment-grade auditors (for example, the MPSC's year-old list of Energy Optimization Service Companies in Michigan, or EOSCs, lists a total of zero firms). [83]

Funding from the private sector: L3C Overview

The financial question is particularly interesting: how can a revolving energy fund expand its access to capital without securing additional grants? One possible solution would be a fund that could combine grants with private investment or debt. Several corporate structures could allow the combination of grants ("mission-first" funding) with private-market capital: most notably, B-Corps ("Benefit Corporation")[84] and L3Cs ("low-profit limited liability company").[85] We focused our analysis on the L3C, which is most specifically targeted at raising grant-supported capital. Incorporation as an L3C places a "social benefit" mission *ahead* of profit.[86] To date, L3Cs can only incorporate in eight states, including Michigan;[87] for a full discussion of the requirements of incorporating as an L3C, see *Tax and Legal Considerations* below.

L3Cs are in their infancy as a legal entity. Vermont was the first state to legalize L3Cs in April 2008. Michigan passed its enabling legislation in January 2009.[88] In fact, as of February 25, 2011, there were only 340 L3Cs nationwide.[89] This poses potential challenges for the CEC. The Internal Revenue Service (IRS) has yet to determine how it will treat L3Cs from a tax perspective and foundations have been hesitant to provide L3Cs with either grant funding or Program Related Investments (PRIs).[90]

Financial Projections

Key Conclusions: Financial Projections

1. To maximize overall fund performance, maximize the following key variables:
    a. Average project size (larger is better); $280,000 is a good target*
    b. Average project return (more is better); 15% is a good target*
    c. Percentage of savings returned to fund (more is better); 80% is a good target*

    * Assumes baseline values and a target leverage factor of 2.0x on total grant funds

2. Manage key variables to avoid "death by multiplication:" a situation in which several negative values (e.g., a simultaneous decline in project returns and average project size) could combine to produce a much more negative overall outcome than they might have otherwise.
3. Fund size matters: under our baseline assumptions, an $11M total fund would be necessary in order to be fully self-sustaining.
4. Consider developing in-house general contracting expertise. Reducing average project costs by 10% increases total fund value by 30%.
5. Consider developing in-house energy-bill monitoring capacity. Overall project performance is somewhat sensitive to annual monitoring cost, and better control of inputs will lead to better performance data.
6. Focus on reducing annual costs per project (e.g., ongoing staff time), which have a much more significant impact on total Fund value than project startup costs (e.g., staff time and audit costs).

In order to understand the differences between a "grant-only" fund and a "hybrid" fund, the team assembled a basic pro forma of future revenues. Several calculated values are of particular interest:

- *Total amount of money invested in projects* over the life of the fund.
- *Future value of remaining cashflows* at the fund's "closing" year. For example, if the fund "closes" in a given year but still expects to receive payment from cities in subsequent years, the "future value" is the discounted value of those future payments in the fund's final year.
- *Total fund value*, a sum of the total amount invested in projects, the cash-on-hand at the fund's closing, and the future value of remaining cashflows.
- *Leverage factor*, a ratio of total grant investment to total project value (an indicator to grantmakers of the potential efficacy of their grants). Simply put, leverage indicates the number of times that each grant dollar would be invested in energy projects over the fund's lifetime – so 3x leverage under baseline conditions means that each grant dollar would be used three times over fifteen years. We recommend targeting at least 2x leverage in order to maintain a sustainable fund with a reasonable margin for error.

- *Annual income to CEC*, a measure of the average annual income that could be sustainably returned to the Clean Energy Coalition, using per-hour billable cost and average staff time per project.

Sensitivity analysis

By holding all of the model's assumptions at their "baseline" or expected values while changing just one assumption at a time, the team evaluated the overall sensitivity of several key metrics to changes in each variable. This analysis is far from conclusive (among other potential errata, the probability distribution of each variable's range of values is only approximate), but instead it provides a rough indicator of the factors that are most critical to the overall success of the revolving loan program. For a more detailed list of assumptions, and the range of values used for each variable, see Appendix F. For the financial calculations themselves, see Appendix G.

As shown in Figure 2, each variable was assigned three values, or scenarios: Baseline, Upside, and Downside. Holding all the other variables at Baseline, we changed each variable individually and measured the impact on the fund's total value. We used "Total Fund Value" as the key indicator because a higher fund value indicates both more successful "revolution" of funds and (presumably) a more attractive opportunity for grantmakers.

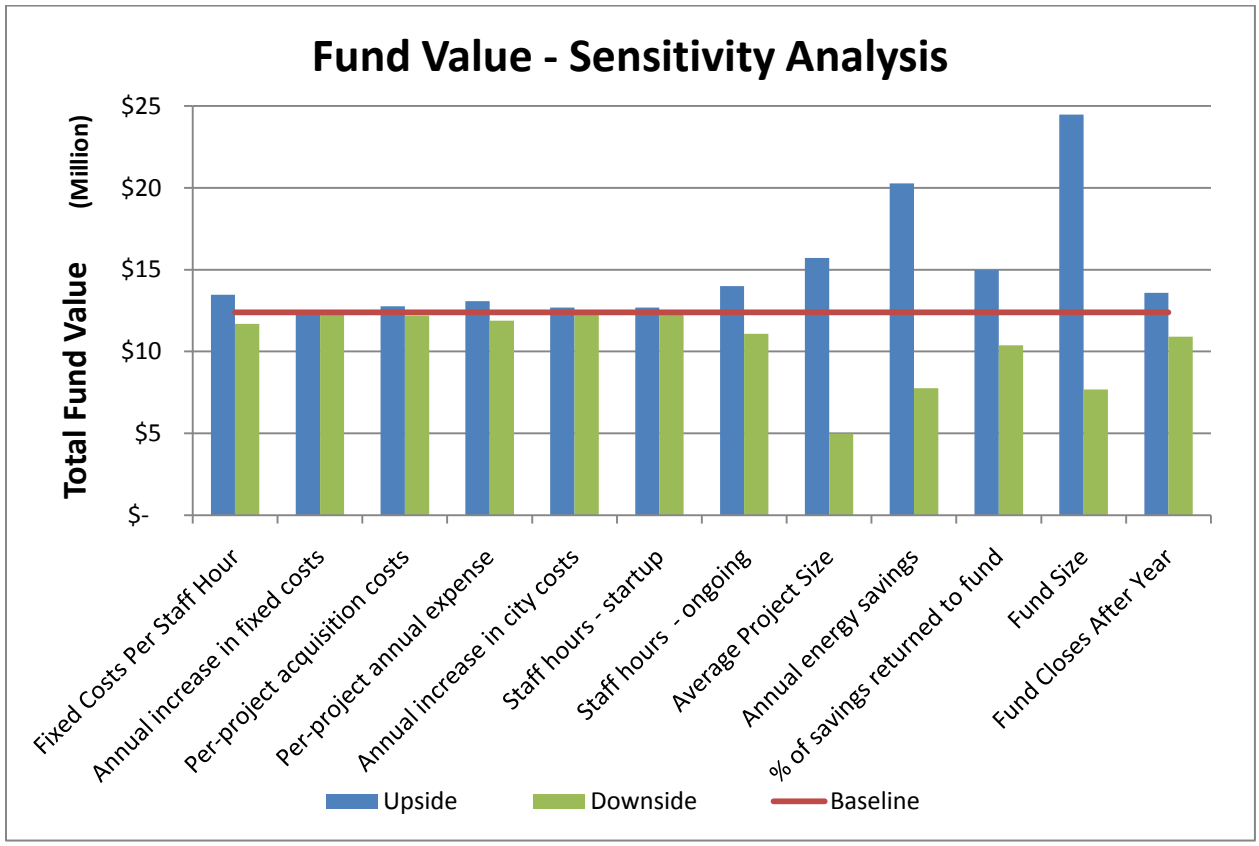

Figure 2. Fund Value Sensitivity Analysis

From the sensitivity analysis, we can draw several preliminary conclusions.

1. Minimum average project size has the largest potential negative impact. There is a minimum average project size below which the fund is not sustainable and total investments equal the initial fund balance of $5 million (indicating that no "revolving" took place; presumably, this occurs because per-project costs are "fixed" in the financial model, so more projects mean higher costs and less available cash to reinvest). At Baseline assumptions, this "minimum size" is approximately $280,000 (see Multi-Variable Analysis, below).
2. Average energy savings is the next most important factor, with potential to nearly double or halve the overall value of the fund with just a 5% change in average savings.
3. Annual increase in costs – the model's incorporation of inflation – has negligible impact.
4. Similarly, variation in per-project acquisition costs and project startup costs proved insignificant. The sensitivity of the model to project savings and size, as well as ongoing staff time, suggests that a significant amount of staff startup time should be dedicated to quality control at every stage of the value chain, from audit to implementation to the plan for measurement and verification, in order to maximize savings and minimize the need for additional CEC staff time on an ongoing basis.

Two factors had a strong impact on revenues to the CEC: fund size (which affects the total number of projects invested) and average project size (which increases the number of projects and therefore the number of billable hours). Generally, factors that increased the overall grant leverage showed a *decrease* in average annual administrative expense, for the simple reason that lower administrative expense allows more money to be invested in projects, resulting in higher leverage. For more information, see Appendix F, and Appendix J.

Break-even analysis

Once the sensitivity analysis had identified key variables, the team performed a series of evaluations in order to better answer questions about optimal fund size and savings rates. Several of the most relevant observations follow.

What is a minimum efficient fund scale?

Although leverage actually declines slightly as the initial fund increases in size, a more important factor to assess is average CEC revenue. Under Baseline conditions, in order to sustainably support the $308,000 annual cost of a three-person staff, a total of approximately $11M must be under management. For additional information, see Appendix J.

What is a minimum level of energy savings in order to achieve 2x leverage?

Energy savings have a significant impact on leverage. From a baseline of 15% annual energy savings and 2.5x leverage factor, a 5% decrease in annual savings (to 10% annually) drops leverage to 1.5x, and a 5% savings increase (to 20%) increases leverage to approximately 4x. For additional information, see Appendix G.

How does project size impact leverage?

Average size of each project has a direct relationship with leverage and an inverse relationship with average revenue to the CEC. $100,000 is the "break-even" average contract size (e.g., leverage of 1.0x on grant dollars); average contracts at $280,000 yield 2.0x leverage; and at $500,000, the approximate point where the CEC might be competing with guaranteed-savings

ESCOs, leverage is 2.6x. Based on the Cities of Promise experience and estimates of project availability, this is a significant challenge: many of the CEC's potential fund client cities will have projects of $200,000 or less. Several options to make smaller projects viable would include extending the length of the contract, increasing the percentage of savings returned to the fund, or securing additional grants on a per-project basis. For additional information, see Appendix G.

How would general contracting impact fund performance?

If the CEC were able to capture general-contracting fees rather than paying them to general contractors, the impact is significant. A 5% decrease in construction costs increases total fund value by 8.5%, and a 10% decrease in construction costs increases total fund value by more than 30%. Alternately, a 5% decrease in construction costs would allow an additional 500 hours of CEC staff time during project startup; a 10% decrease in construction costs would allow more than 1800 additional hours (see Appendix M).

Hybrid Grant/Investor Fund Model (L3C)

In order to evaluate a fund that could combine both grant and investor funds, we added tax and depreciation to the basic pro forma (since a hybrid fund would likely need to be a taxable entity). In addition, we assumed that the fund would terminate after ten years – assuming that 10 years was the longest feasible time during which investors would allow their capital to be tied up – and that baseline project returns would be 20% (rather than 15%), primarily to account for a hybrid fund's potential to capture additional tax credits.

Under baseline conditions:

- At a fund size of approximately $10M, a minimum 19% average project return would be required in order to fully repay investors 8% annually.
- Generally, leverage was approximately 0.5x higher for a hybrid fund than for an equivalent all-grant fund (3.3x on an initial $10M fund versus 2.8x for an all-grant fund).
- In order to repay investors at an 8% annual growth rate, a $10M fund could be at most 53% market-rate investment.
- Primarily due to its leveraged structure, the hybrid model is extremely sensitive to changes in annual average energy savings, average project size, and percentage of savings returned to the fund. Since only the latter is contractually controllable, this raises significant questions about the risk of the hybrid model.
- Interestingly, the percentage of investment that is depreciable has a significant impact on overall fund value – increasing depreciable investments from 50% to 75% results in a 56% increase in total fund value.

The hybrid model offers slightly higher grant leverage than an equivalently sized 501(c)(3) fund, in exchange for greater sensitivity to changes in key variables. In a scenario where grant funds are subject to an absolute limit, the hybrid model would allow more project investments from the same quantity of grant funds. If, however, the constraint is not the availability of funds but rather market size or staff availability, the volatility of the hybrid model might make it a less attractive choice.

Initial projections suggest that an L3C or hybrid investment model becomes particularly difficult to sustain at private-market investment levels of 50% and above (see Appendix H). More research is required to confirm this point, but our initial recommendation would be to start a 100% grant-based initial fund and incorporate private-market investment as market size and project risk become more clearly understood.

Funding Sources

The primary hurdle for the CEC's revolving energy fund will be generating enough capital to 1) invest in a significant number of projects, and 2) remain self-sustaining over time. Although a full analysis of future federal funding programs is outside the scope of this report, we think it is safe to say that the American Recovery and Reinvestment Act funding will not be repeated soon; primary non-foundation funding sources will be state agencies and regulatory bodies (DELEG, MPSC), economic development agencies, and possibly the Department of Energy or Environmental Protection Agency on an ad-hoc basis.

Key Conclusions: Funding Sources

1. Build strong relationships with state and federal agencies to secure sufficient startup funding – MPSC, DOE, and DELEG are primary candidates.
2. Develop relationships with Kresge, Mott, and the Energy Trust – all large foundations with relevant funding focus areas (community development, renewable energy, efficiency, and environment). Smaller foundations like DTE and Consumers Energy may be able to provide additional project support and technical resources.
3. Consider working with community foundations and economic-development agencies on a per-city basis, since many have interests that are well-aligned with energy efficiency and may be able to provide additional funding or points of contact within city governments.
4. Track project performance data carefully in order to secure future funding. Specifically, potential investors would want to see: a demonstrated track record of project savings; clearly-managed borrower risk (e.g., binding repayment contracts); and sound management of additional risks (e.g., contractor failure, cost overruns.

Foundations

In addition to public agencies, private and community foundations are a potential source of capital for the fund. Michigan-based foundations gave $1.4 billion in 2008.[91] Obviously only a fraction of this spending was directed toward energy efficiency, environmental causes, or community development – three potential target areas for the REF – but there is reason to believe that the philanthropic sector, in addition to government granting agencies, could provide significant startup capital.

Community Foundations

As of 2008, Michigan had 65 community foundations with approximately $2 billion in assets and annual giving of $137 million.[92] Community foundations present a specific opportunity (i.e., an emphasis on local investment in many of the cities that a REF would serve) but could potentially "tie" the Fund's capital to a given municipality or region. In addition, much of the money placed in community foundations is

designated for very specific purposes. Grants from community foundations might be most appropriate in the case of marginal projects, in which the savings do not quite justify investment by the Fund; a relatively small investment from a local foundation might make the difference between a non-starter and a viable project.

Independent Foundations

In addition to community foundations, Michigan has more than 1,800 independent foundations, which gave $1.1 billion in 2008.[93] Several independent foundations and related organizations of note:

- *The Kresge and Mott Foundations* are two of Michigan's largest and most active in local and regional development. Both have an "Environment" focus area; Kresge's Detroit focus and Mott's emphasis on Flint could also be drivers. Mott's "Exploratory and Special Projects" area may also be a candidate for Clean Energy Fund startup capital.[94]
- *The WK Kellogg Foundation*, the state's largest with $7 billion in assets, typically funds programs targeted towards children and education – but it also provided a $400,000 grant to the Council of Michigan Foundations in order to help DELEG prepare for federal energy-efficiency stimulus funding.[95] Kellogg might be a candidate to support the educational and training component of a Clean Energy Fund.
- *The DTE Energy Foundation* and *Consumers Energy Foundation* are also candidates, based on their utility origins and focus areas like "Michigan Growth and Environmental Enhancement."[96] Both foundations are much smaller than the others mentioned here, but both could contribute as part of a coalition.
- *RE-AMP* is a clean-energy collaboration between a number of Midwest nonprofits and foundations, funded primarily by the Garfield Foundation.[97] Given the number of local and regional energy-efficiency programs in Michigan (e.g., the Regional Energy Office, the DELEG Loan Fund, and city-by-city initiatives), RE-AMP may be a useful partner in promoting and funding collaborative efforts.

Lastly, the *National Energy Foundation,* a collaboration between many foundations (Kresge, Packard, Doris Duke, Hewlett, McKnight, Sea Change, and others)[98] should be included in the conversation.

Tax and Legal Considerations

Key Conclusions: Legal Considerations

1. L3Cs are in their infancy as legal entities and have not yet found a consistent source of funding from government grants, foundation grants or PRIs, or private investors.
2. There are significant transaction costs associated with starting an L3C, and the CEC would need to follow strict rules in order to not jeopardize its tax-exempt status.
3. The main risks to the success of the fund are the identification and implementation of energy conservation measures and cities' payments of energy savings to the CEC.

Nonprofit Fund

From a taxation and legal perspective, continuing to operate an REF under a non-profit model would be relatively straightforward. The fund should be housed in a separate account for purposes of

transparency. With a nonprofit REF, taxation and legal considerations should remain unchanged from the CEC's current 501(c)(3) status.[99]

Low-Profit Limited Liability Corporation Fund

The state of Michigan requires an L3C to meet the following criteria:

1. It must further the accomplishment of charitable or educational aims.
2. Generating profit must not be a significant purpose of the entity, although generating a profit is acceptable.
3. The organization cannot engage in lobbying or other politically focused activity.[100]

Tax and legal considerations are more complicated with an L3C model. First and foremost, CEC would need to establish the L3C as a subsidiary organization. The steps necessary to establish an L3C are detailed in : Minimum Efficient Fund Scale

In order to be self-sustaining, a fund would need to be able to cover its overhead costs without diminishing its ability to make further project investments. An initial (and very rough) analysis of the possible revenue which the CEC could allocate to staff and overhead without limiting the fund's size is illustrated in the table below. In order to sustainably support a three-person staff – estimated to cost $308,800 over the course of a year – an initial fund of approximately $11 million would be required.

Fund Initial Size	Total Investments	Leverage[i]	CEC revenue
2000000	4100000	1.73	97750
3000000	6300000	1.92	123750
4000000	8200000	2.01	148625
5000000	10100000	2.06	172000
6000000	12300000	2.13	198750
7000000	14200000	2.16	224000
8000000	16100000	2.18	247375
9000000	18300000	2.21	274125
10000000	20200000	2.23	297875
11000000	22100000	2.24	322750

Table 9. Minimum Efficient Fund Scale

[i]*Calculated leverage includes the estimated $1M startup grant.*

: Establishing an L3C in Michigan. Once an L3C is established, the CEC will need to ensure that the two organizations are independent. This will enable the CEC to retain its tax-exempt status. According to Dostart and Hansen[101] and Berg,[102] there are three principles relevant to the CEC that the IRS will use to determine whether the L3C is a separate legal entity:

1. There should not be excessive overlap in board members, directors, and employees. As a rule of thumb, the majority of board members should serve on the board of only one of the entities.
2. Any transactions that occur between the CEC and the L3C must be conducted on an arm's length basis. The entities can share office space, equipment, and staff, but costs must be allocated on a fair market basis to each of the two entities.
3. The CEC should not be involved in the day-to-day operation of the subsidiary, which means that it is important to have unique management.

Funding Considerations

Program-Related Investing and L3Cs

PRIs allow foundations to make investments (rather than grants) in organizations that serve a socially beneficial purpose. PRIs, however, have not been widely employed, for a variety of reasons.[103] PRIs enable foundations to make an investment in a charitable organization that counts toward their IRS-mandated annual distribution requirement, but unlike grants, PRIs provide the potential of future repayment.[104] When considering a PRI, foundations must ensure that it furthers their charitable aims. If not, they may lose their tax-exempt status. This has made foundations very cautious with respect to PRIs. Often, they will seek both a private letter ruling from the IRS and an opinion letter from their legal counsel prior to making an investment. Thus, transaction costs for individual PRIs can be upwards of $10,000.[105]

L3Cs were designed to be able to meet the IRS's requirements for PRIs by definition, thus eliminating up-front costs. Unfortunately, this is difficult because of the requirement that the PRI further the foundation's mission; since missions vary widely, the appropriateness of any PRI is dependent on the alignment of investment and mission.[106] For example, a foundation focused on sustainable agriculture would not be pursuing a PRI consistent with its mission by investing in an REF, whereas a foundation whose mission incorporates energy efficiency or economic development could be. As such, L3Cs may not have any more success than non-profits in unlocking the significant capital that could be available via PRI. Given that one of the driving forces behind the creation of the L3C was the ability to tap into PRIs,[107] L3Cs may not prove as useful as the creators intended.

Giving money to a for-profit organization, whether in the form of grants or PRI, poses an additional requirement for foundations. They must exercise an "expenditure responsibility" over any money given to a for-profit organization, which typically involves a contract detailing the terms of the agreement and how the money will be used. Like a private letter ruling, this agreement protects a foundation's tax-exempt status with the IRS.[108] This adds another transaction cost to providing money to a for-profit organization.

To summarize, a foundation that wishes to make a PRI in an L3C would have to obtain both a private letter ruling and exercise expenditure responsibility over the funds. The transaction costs for this type of investment are quite high, and perhaps as a result, no PRIs have been made as of yet in an L3C.[109] To

date, L3Cs have also had limited success securing grants from foundations – only two have done so.[110] Therefore, it appears that foundations have not yet become sufficiently comfortable with L3Cs to provide adequate funding.

Government Funding

In the MPSC's newest grant-making announcement, eligible entities included non-profits and public organizations (i.e. schools and governments). Our team contacted the MPSC to determine their willingness to make grants to L3Cs in the present or future. Their response indicated that L3Cs are not presently eligible to receive these grants, and their future status remains uncertain.[111]

This presents a significant challenge for L3Cs. Public grant makers may not consider L3Cs as eligible entities for many years, and there is no guarantee they will be recognized as worthy recipients of grant funding in the future.

Additional Considerations

Fund Application

In designing the application process for city partners, it is important to recognize two competing interests. The REF will benefit from using the application process to filter out cities that are not committed to a partnership and willing to work with the fund. From a city's perspective, however, the more staff time required to fill out an application decreases the fund's ability to attract partners. Therefore, the fund will have to balance its desire for obtaining the right partners and crucial information with the heavy workload city employees' face. An application should request the following data from potential partners:

- Point of contact (and alternate) who will act as a liaison between the REF and the city.
- Utility data for the past year for city facilities.
- Size of city buildings.
- A statement of interest in working with the REF.
- A letter of support from the mayor/city council.[112]

Contracts with Municipalities

There are several measures the CEC can take to formally establish partnerships with municipalities that will help make the relationship function as smoothly as possible.

- Propose a master contract that can be approved by city council, which outlines the general nature of the relationship, stipulates that details regarding individual projects will be contained within subcontracts, and then designates a city employee who can sign subcontracts without requiring additional approval by city council.
- Stipulate contractually how much the city will pay annually, and the budget notes for that contract will state that this agreement is based on a specified amount of energy savings.
- Design the master contract to achieve the following:
    - Commit the city to have facility managers engage in training to run the retrofitted facilities efficiently.
    - Incorporate a Project Development Agreement into the master contract with each city, stipulating that the city will pay for an energy audit in the event that an audit

demonstrates significant potential energy savings and the city opts not to continue with a project.[113]

- Commit the city to constructing new buildings in an energy efficient manner.[114]

Fund management

All-Grant Fund

To manage a centralized, nonprofit fund, the CEC will need a program manager with financial savvy and relationship-building capabilities. In addition to current responsibilities that CEC staff currently performs for the Cities of Promise project, staff will need to perform the following tasks:

- Help cities prepare applications and subsequently review them.
- Invoice and process payments.
- Collect late payments.
- Perform modeling to assess future viability of the fund.
- Create reports for CEC executives, board members, and funders regarding fund performance.

Hybrid / L3C Fund

In addition to the skills necessary to manage a nonprofit fund, an L3C fund carries additional requirements. These are primarily related to the organization's ability to work with private investors who are focused primarily on returns. These skills include:

- Fundraising from foundations, banks, high net worth individuals, pension funds and socially responsible investors.
- Advanced knowledge of structured finance to create appropriate tranches and investment vehicles that will meet the risk and return criteria of market-rate investors.
- Demonstrated risk management and clear data reporting to investors.

Risks

Starting a centralized fund will expose the CEC to some level of risk. By understanding the likely risks upfront, however, CEC should be in a position to mitigate them before they materialize. The most likely risks are detailed inTable 2. Risks Associated with a Revolving Energy Fund.

Risk	Effect	Mitigation Strategy
Implementation	Low quality energy audits or construction	• Conduct investment-grade audits • Measure auditor performance over time and use top-performing auditors • Use bonded contractors and track performance
Performance	Energy savings targets not achieved	• Conduct investment-grade audits • By using 80% of expected savings as loan repayment amount, the city will bear any risk for energy savings, but will also realize savings if performance is above expected

Credit	Cities cannot make payments	• Basing the contract on shared savings decreases the likelihood of default • Investments across a range of projects and cities will keep overall fund performance strong
Contract	Cities do not honor contract	• Ensure contract language is specific and enforceable • Upon staff turnover, work with new employees from outset to get their buy-in, especially as the contract nears completion
Competition	Cities have multiple options for energy efficiency retrofits	• Emphasize CEC's expertise and track record in working with municipalities • Differentiate CEC's offering from other options by highlighting unique values to municipalities
Market	Cities lack interest in offering	• Increase sales and marketing efforts • Engage supporters from Cities of Promise project to highlight the value that CEC offers

Table 2. Risks Associated with a Revolving Energy Fund.[115]

In addition to the risks above, an L3C would carry at least one significant additional risk:

Risk	Effect	Mitigation Strategy
Fundraising	Insufficient investor interest	• Demonstrate returns from pilot projects and emphasize data that supports likelihood of future financial returns • Use grant funding as a buffer to shield private investors from losses

Table 3. Additional Risk Associated with an L3C Revolving Energy Fund.

Conclusions and Recommendations

Overall Recommendation: Fund Structure

After multiple layers of review, from analysis of spreadsheets to interviews with experts in law, banking, and venture capital investment, our primary conclusion is that the CEC should not pursue a hybrid grant-and-private-investment fund at this time. While a hybrid model could offer the greatest overall leverage on grant dollars, it would also expose the fund to significant risk based on project underperformance and other difficult-to-control factors. Due to these risks and legal complications, we would recommend against the hybrid model, at least until more data are available.

In particular, L3Cs are still in their infancy as legal entities and have not yet found a consistent source of funding from government grants, foundation grants or PRIs, or private investors. In addition, we would strongly recommend that the CEC consult further with legal and tax advisors prior to forming a for-profit subsidiary. There are significant transaction costs associated with starting an L3C, and the CEC would need to follow strict rules in order to not jeopardize its tax exempt status.

While we still believe that the private-investment model may eventually become a viable (and potentially necessary) path to directing additional capital towards energy upgrades, at present the model is too risky to justify. Instead, we recommend starting a grant-only loan fund with the goal of eventually adding a for-profit component. Careful measurement and verification as well as detailed project performance tracking will be essential to prove the Fund's risk profile clearly enough to attract private-market investors and lenders.

Chapter 5 Next Steps and Further research

Cities of Promise Status

Unfortunately, the timelines of this Master's Project and the MPSC grant are offset to some extent. Therefore, this report was written prior to the conclusion of the MPSC grant and thus provides an incomplete picture of the overall success of the grant and new REFs in the Cities of Promise. As of April 2011, all eight of the COPs were involved in the initial stages of the project identification process. Baseline energy data has been compiled and energy audits have been completed for all but two cities. Detroit, the city that is furthest along in the process, is close to finishing the contractor selection process to perform the first retrofit of a city facility. Construction is scheduled to begin in the second half of 2011. By early 2012, most of the COPs should begin to realize energy savings from the initial round of projects and recapitalize their REFs. The energy performance tracking model projects that the REF will be able to provide capital in for a subsequent round of retrofits in 2014-16, depending on the city.

That timeline, however, could be accelerated depending on the success of the part-time Energy Manager positions that the retrofits will fund. Municipalities will be able to pay for the Energy Manager – who could be an internal staff member or outside consultant – shortly after the initial projects are complete (see Appendix N). Each Energy Manager will have a significant impact on the overall success of the REF. For example, Ann Arbor's Energy Managers have allocated a portion of their time to securing additional funding for the city's energy office, with considerable success.[116] If Energy Managers throughout the COP are able to replicate that, the REF will be able to use that funding to invest in additional projects at an earlier date. Furthermore, as REFs increase their pool of capital, the leverage ratio increases, which can serve to make the REF more attractive to funders who closely track how effectively their investments are leveraged.

Next Steps

Thanks to very generous support from the Ford Motor Company Fund, our team's work will not end with the implementation of the Cities of Promise grant. We are planning a second phase of the project that will extend beyond the Master's Project requirements of the University of Michigan's School of Natural Resources and Environment. This summer (2011), two interns will assist the CEC with the development and launch of the centralized REF described in Chapter 4 of this report. The new REF will serve many more cities and towns throughout the state of Michigan – potentially expanding into the commercial market, and out into other states in the region. The interns' work will encompass the following tasks:

1. *Fundraising* – The interns will comprehensively explore the options for capitalizing a centralized REF. After identifying the options available to the CEC, the interns will work with CEC staff to secure funding by developing proposals, meeting with prospective donors, and writing grants.
2. *Client Development* – The CEC will be much more convincing to a range of funders if it has a group of willing clients ready to participate in the REF. The interns will develop marketing materials to build municipal interest in the program. They will cooperate with local and regional

non-profits and councils of government in order to secure channels through which they can market the program to cities and towns.

3. *Legal / Administrative* – The interns will perform preliminary research and consult with legal experts in order to inform the CEC about the legal requirements for establishing a large fund and making loans to cities.
4. *Financial* – As more data becomes available, the interns will continue to fine-tune the model we have developed to predict the cash-flows in and out of a centralized REF.

Further Research

As the Cities of Promise begin to send out requests for proposals (RFPs) for their building retrofits and the CEC embarks on the second phase of this project, several key areas require additional research:

1. *Additional financing mechanisms:* Rather than aiming to provide comprehensive research and analysis of all financing options available for energy efficiency in every market, this project focused somewhat narrowly on the practical goal of assisting the CEC with the MPSC grant for the Cities of Promise. Given that constraint, establishing REFs in each city proved to be the best option. That said, it is important to recognize that a plethora of mechanisms for financing energy efficiency retrofits exists, and the municipal market is only one of many sectors that requires serious investment. From PACE financing to loan-loss reserve funds, there are many options that need to be explored in greater detail.
2. *Energy Audits:* Our research and experience with the Cities of Promise demonstrated that energy audits are perhaps the most pivotal point in the performance retrofit value chain. The accuracy with which energy audits estimate the cost of retrofits and the quantity of future energy savings is a key risk factor for both an REF and its clients. Given substantial variance in the quality of energy auditors and the lack of regulation in the industry, further research is needed to standardize the auditor selection process. On a macro level, standardizing this process will serve to improve the quality of the industry, thereby leading to the mitigation of one of the key risks preventing private lenders from diving into the market headfirst.
3. *ESCO practices:* Most of the information currently available on ESCOs comes from the industry itself: Much of our knowledge came from studies commissioned by the National Association for Energy Service Companies. Given their long record of success, years of performance data, and relationships with large private lenders, ESCOs have enormous potential to unlock the private market for investment in energy efficiency in every sector. While our research led us to several basic conclusions about why they have yet to address a large portion of the municipal market, much more research is needed to clarify the industry's incentives, standards, and norms. Particularly valuable would be a study on the policy drivers that might lead ESCOs to service smaller municipal, commercial, and even residential customers.
4. *L3Cs and other innovative business structures:* While our research suggested that the L3C model is too young to be the best model for the CEC's centralized REF, the concept of a hybrid pool of capital is a good one for financing energy efficiency retrofits in projects that would be marginally unprofitable for private investors alone. Much more research is needed to fully understand the opportunity represented by L3Cs and other "mission-first" businesses.
5. *Centralized REF sensitivity analysis:* Our sensitivity analysis of a centralized REF is required the use of many assumptions; this initial assessment provided the CEC with a rough guide to the most

sensitive variables. Still, the model's predictive power can be significantly improved as key parameters and probabilities are entered with greater certainty. In the coming months, our interns will help the CEC begin this task.

Energy efficiency remains a critical issue from environmental, economic, and national-security perspectives. While the solutions to inefficiency are inherently local – e.g., it is difficult to outsource the replacement of a light bulb – we believe that further knowledge-sharing and collaboration between national and regional organizations like the Clean Energy Coalition will be essential in bringing efficiency to the areas of the market not currently being served. We salute the Clean Energy Coalition staff for their vision and ambition in changing the energy landscape, and we hope that the lessons learned and best practices from the Cities of Promise and subsequent revolving funds can provide insight and clarity for similar programs nationwide.

Appendices

Appendix A: Additional Resources

In preparing this paper, we discovered a number of resources that were valuable in helping us understand the challenging and opportunities for CEPs. Prior to starting a CEP, we recommend reviewing the following articles:

- *Overview of the energy-efficiency landscape*
  McKinsey & Co. "Unlocking Energy Efficiency in the U.S. Economy."
  http://tinyurl.com/m9ydrd

- *Review of energy efficiency financing programs*
  Merrian Fuller. "Enabling Investments in Energy Efficiency: A Study of Programs that Eliminate First Cost Barriers in the Residential Sector"
  http://uc-ciee.org/energyeff/documents/resfinancing.pdf

- *Removal of upfront capital hurdles*
  Bob Hinkle and David Kenney. "Removing First-Cost Hurdles for Energy Efficiency."
  http://www.calcef.org/innovations/activities/CALCEF-WP-EE-2010.pdf

- *Guide to revolving energy funds*
  ICLEI Local Governments for Sustainability. "ICLEI Resource Guide: Revolving Energy Funds"
  http://www.clinton-county.org/GreenInitiative/Newsletters/ICLEI_Revolving_Energy_Fund_guide.pdf

- *Property Assessed Clean Energy Financing*
  Merrian C. Fuller, Cathy Kunkel and Daniel M. Kammen . "Guide to Energy Efficiency and Renewable Energy Financing Districts."
  http://rael.berkeley.edu/sites/default/files/old-site-files/2009/FullerKunkelKammen-MunicipalEnergyFinancing2009.pdf

Appendix B: Revolving Energy Fund Projections – Cities of Promise

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Funding												
MPSC Investment	463,000	-	-	-	-	-	-	-	-	-	-	-
Fund Balance (beginning of year)	-	66,672	171,485	223,517	127,019	218,332	155,142	198,664	232,087	109,643	155,997	191,425
Total Available for Investment	**463,000**	**16,672**	**121,485**	**173,517**	**77,019**	**168,332**	**105,142**	**148,664**	**182,087**	**59,643**	**105,997**	**141,425**
Staff/Administrative												
Admin / employment costs			(25,000)	(25,000)	(25,000)	(25,000)	(25,000)	(25,000)	(25,000)	(25,000)	(25,000)	(25,000)
Staff-originated Savings												
Investment Summary												
Total Investment	(463,000)	-	-	(173,517)	-	(168,332)	-	-	(182,087)	-	-	-
One-time rebates	66,672	-	-	24,987	-	24,240	-	-	26,221	-	-	-
Recurring rebates	-	1,547	1,547	1,547	2,126	2,126	2,689	2,689	2,689	3,297	3,297	3,297
Recurring Cash In-Flows	-	75,486	75,486	75,486	103,776	103,776	131,220	131,220	131,220	160,907	160,907	160,907
Net Cash Flows	(396,328)	77,033	77,033	(71,498)	105,902	(38,190)	133,909	133,909	(21,958)	164,204	164,204	164,204
City + Fund Benefits												
City Benefit												
Annual - City	-	-	-	-	-	-	75,486	75,486	75,486	103,776	103,776	131,220
Cumulative - City	**-**	**-**	**-**	**-**	**-**	**-**	**75,486**	**150,972**	**226,458**	**330,234**	**434,010**	**565,230**
Fund Benefit												
Annual - Fund	66,672	104,813	52,033	77,019	91,313	105,142	43,523	33,423	59,643	46,353	35,428	7,984
Cumulative - Fund	**66,672**	**171,485**	**223,517**	**300,537**	**391,850**	**496,991**	**540,514**	**573,937**	**633,580**	**679,933**	**715,361**	**723,345**
Overall Benefit												
Annual - Overall	66,672	104,813	52,033	77,019	91,313	105,142	119,009	108,909	135,129	150,129	139,204	139,204
Cumulative - Overall	**66,672**	**171,485**	**223,517**	**300,537**	**391,850**	**496,991**	**616,000**	**724,909**	**860,038**	**1,010,167**	**1,149,371**	**1,288,575**
Fund Balance (End of year)	**66,672**	**171,485**	**223,517**	**127,019**	**218,332**	**155,142**	**198,664**	**232,087**	**109,643**	**155,997**	**191,425**	**199,408**

Table 4. Financial Projections for Sample Revolving Energy Fund in the Cities of Promise

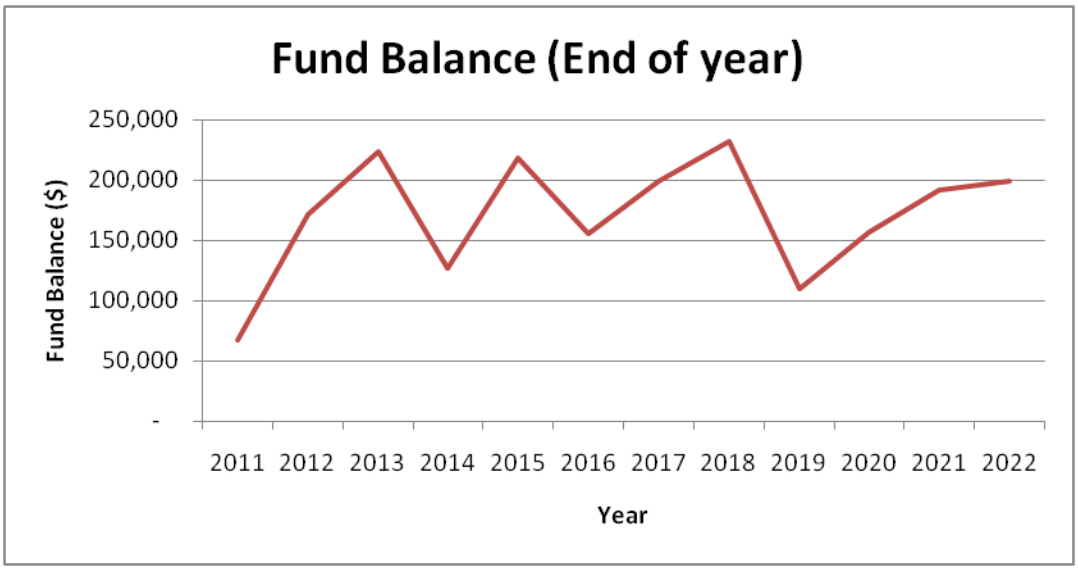

Figure 3. Revolving Energy Fund – Annual Balance

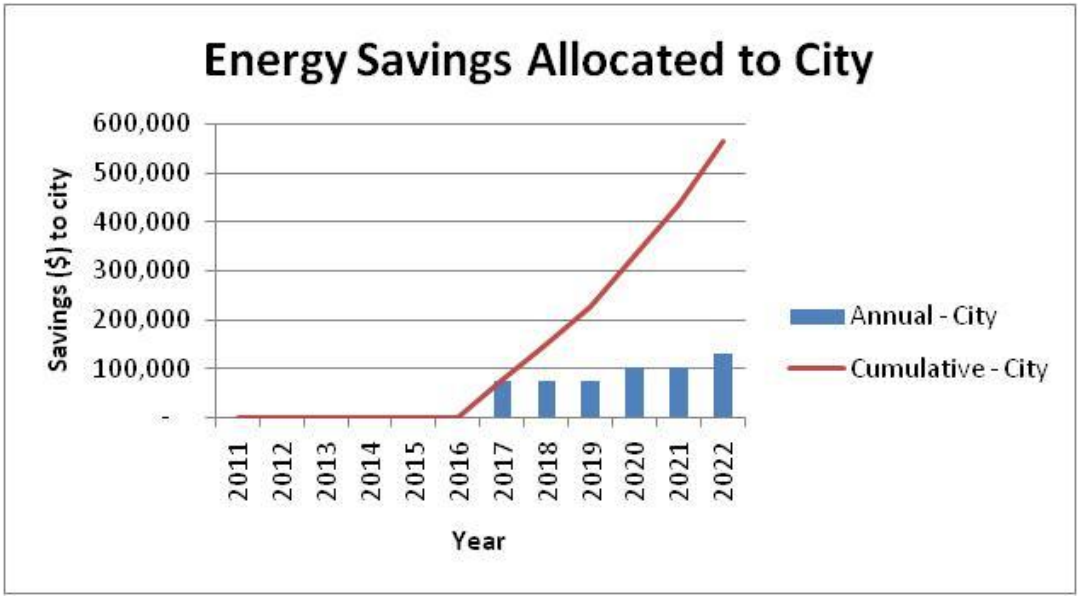

Figure 4. Energy Savings Allocated to City from Revolving Energy Fund

Appendix C: Selecting an Energy Auditor

The energy audit is one of the most critical steps in an energy retrofit, because it simultaneously provides design specs for the retrofit and determines the savings upon which the project contract will be based. In addition, an energy audit can serve as a risk-mitigation tool, either through explicit performance guarantees (through which the auditing firm guarantees project performance under a set range of conditions), or through careful tracking of each auditing firm's historical performance. Anecdotally, the first question asked by funders – particularly banks – is "what is the risk of project underperformance?"

An Investment-Grade Audit, or IGA, is not a clearly-defined term, but with the overall intent of predicting project performance within a range of +/- 10%, an IGA should follow some basic guidelines:[117]

- Incorporates at least one base-year of historical energy performance data.
- Incorporates observations and predictions regarding building occupant load and behavior, including maintenance and operations schedules.
- Includes a plan for measurement and verification (M&V) that is consistent with ASHRAE Guideline 14 or the International Performance Measurement and Verification Protocol (IPMVP).

Although there is no official certification process for identifying auditors or firms capable of delivering an IGA, some screening questions for potential auditors include:

- What percentage of the firm's audits clearly demonstrate the firm's predictive abilities?
- How does the firm's process or data analysis distinguish it from its competitors?
- How have the firm's processes changed over the last decade?
- Has the firm tracked performance of its projects, and if so, how have the projects performed, on average?

(This list has been adapted from Hansen & Brown, *Investment Grade Energy Audit*, p. 133.)

Appendix D: Midwest Regional Sustainability Network membership

- Ypsilanti
- Eastern Michigan University
- Monroe County
- East Lansing
- Kalamazoo
- Saline
- Brownstown Township
- Wayne County
- Superior Charter Township
  Oakland County
- Northfield Township
- Auburn Hills Charter Township
- Bloomfield
- Southeast Michigan Council of Governments
- Southfield
- Washtenaw County
- Farmington Hills
- Huntington Woods
- Portage
- Saginaw
- Dearborn
- Grand Rapids
- WARM Training Center
- Clean Energy Coalition
- Michigan Suburbs Alliance
- Holland
- Northwest Michigan Council of Governments
- Charter Township of Union
- Ann Arbor
- University of Michigan
- Meridian Township
- Genoa Township
- Central Michigan University
- Michigan State University
- Macomb County
- Macomb County Community College

Appendix E: Other Regional Players

Listed below are a few of the most significant players and potential competitors in the energy-efficiency and economic-development space:

1. ***Michigan Municipal League:*** With over 500 members, the Michigan Municipal League (MML) is the largest non-profit organization in the state dedicated to economic development. The group strives to maintain its position as a "neutral broker" of information, providing objective analysis to its members.[118] As such, MML is unlikely to be an explicit advocate or active partner for a CEC loan fund, but the group's stamp of approval is vital for establishing trust with its vast network. The group's main foray into energy work has been through its "Green Communities Challenge" program, which assisted many cities with the EECBG grant-writing process. MML was also a founding partner of the Southeast Michigan Regional Energy Office, but is no longer active in the organization today.
2. ***Southeast Michigan Regional Energy Office (REO):*** This organization was established in 2009 through a partnership between the Michigan Suburbs Alliance, MML, WARM Training Center, and the Southeast Michigan Council of Governments. Today, the only founding partners who remain active in the administration of the REO are the Suburbs Alliance and WARM.[119] The REO's territory spans the roughly 32 communities surrounding Detroit, many of whom could also be prime clients for an REF operated by the CEC. The REO has positioned itself mainly as a provider of "regional capacity" – e.g. technical assistance, program planning, and community education – to be shared among its member communities.[120] The REO has engaged with nine cities in the Detroit region, providing retrofit management services and project finance out of an MPSC grant. In return, the cities have agreed to return energy savings into an endowment for the office's administrative costs. Subsequent project finance will be raised from additional grants; while the office's administrative costs are largely covered, the REO's ability to perform retrofits will depend on the ongoing availability of additional grants.[121]

   Although the Regional Energy Office could easily be seen as a competitor to the proposed Clean Energy Fund, we believe that both organizations would be better served by collaborating to develop relationships with cities, share performance data, and compete against ESCOs and other private-market players.
3. ***WARM Training Center:*** WARM is an energy-efficiency technical resource to a variety of customers, including municipalities. It has close ties with the Regional Energy Office (above) and provides technical assistance to the REO's members.
4. ***SEEDS:*** Similar to the CEC in many respects, SEEDS provides technical assistance, grant-funded energy programs, and professional services to the communities in Grand Traverse County. According to Mike Powers, Energy and Environmental Analyst, SEEDS' staff have good existing relationships with municipalities throughout the region; that would make them excellent partners for the CEC loan fund's early marketing efforts.
5. ***Michigan Saves:*** Established in 2009 by Public Sector Consultants and the non-profit Delta Institute with a grant from the MPSC, MI Saves is a nonprofit organization devoted to connecting energy consumers with all of the services they need to make facilities more efficient – e.g. qualified energy auditors, contractors, and financing.[122] The program provides access to private investment via a loan-loss reserve for energy-efficiency loans; ideally, this "default

support" will lower interest rates and spur investment. Initially, MI Saves targeted financing for residential homeowners, but the program is currently planning to expand to commercial, non-profit, and municipal customers as well. There is already a program available for businesses and non-profits in Detroit.

MI Saves has significant potential as a source of funding, albeit at rates close to 8%.[123] CEC should determine if the loan-loss program could be applied to a new municipal loan fund. This "default support" would serve as valuable risk mitigation for any fund, but it would be particularly useful to an enterprise seeking return-oriented investment (like an L3C).

6. ***Councils of government:*** These organizations provide planning and policy analysis on a regional scale. Their relationships with numerous cities and status as trusted advisors make them valuable allies during the marketing stage of the CEC loan fund. The four most active councils in Michigan are:
    - *Southeast Michigan Council of Governments (SEMCOG):* Supporting six counties covering over almost 150 municipalities, SEMCOG was a key partner in the foundation of the SE Regional Energy Office (described above).
    - *Northwest Michigan Council of Governments (NWMCOG):* Staff members have demonstrated an interest in energy issues. Working with SEEDS, they helped Grand Traverse County write a successful EECBG grant to establish a revolving energy fund for the county. Given the high percentage of small, rural communities in the region, NWMCOG is especially interested in a solution that can serve cities with very few staff and small facilities (less than $100,000 in retrofit investment opportunities).
    - *Northeast Michigan Council of Governments:* Covers four mostly rural counties.
    - *Tri-county Regional Planning Commission:* Covers three counties in mid-Michigan, plus the city of Lansing.
7. ***The Delta Institute:*** A large environmental conservation organization covering the entire Great Lakes region. Part of the team that created MI Saves, Delta has since developed several energy-efficiency programs in the greater Chicago area. For example, it administers Cook County's EECBG funds, advises the LEED certification process for commercial buildings in the city, and organizes workshops and training seminars for "the energy efficiency workforce." Delta also provides guidance and connects customers and clients with financing opportunities and programs. Delta staff can provide useful advice and perspective from their own experiences with energy efficiency financing.
8. ***Energy Services Coalition (ESC), Michigan Chapter:*** ESC is a national organization dedicated to promoting energy performance contracting. Its Michigan chapter may be a good resource for identifying qualified energy auditors and contractors.
9. ***DTE Energy:*** DTE Energy is primarily a source of rebates and incentives for an REF. However, as part of the Your Energy Savings (YES) program, DTE has included an Energy Efficiency Directory that lists contact information and descriptions of several types of service providers in the EE value chain. This might also be a space to list the REF for commercial and municipal customers to find the fund if they are searching independently. DTE's Business Customer page has a great list of incentives for municipalities and commercial customers that will make many of the projects the REF invests in more financially feasible. In the future, it might be worth reaching out to DTE to improve their municipality page and include a feature specifically for the REF, or

pursue a partnership. No direct contact has been made with DTE, but it might be worth reaching out to the DTE Energy Foundation whose goal it is to improve the financial condition of the communities the utility serves - a goal directly in line with the CEC Loan Fund.

10. ***Consumers Energy:*** Like DTE, Consumers Energy is a great source of rebates. However, Consumers also has a foundation which provides grants in five areas: Social Welfare, Michigan Growth and Environmental Enhancement, Education, Community and Civic, and Culture and the Arts. There is a chance a partnership could be developed, especially since Michigan's utilities have an efficiency mandate under MPSC's Energy Optimization initiative.
11. ***Department of Energy, Labor and Economic Development (DELEG):*** Since December 2010, DELEG has been struggling to get a stimulus-funded, municipally-focused REF off the ground, despite having $8 million to loan to cities. So far, the fund has been severely under-utilized. Based on our conversations with MML and NWMCOG, there appear to be two main reasons for DELEG's current difficulties: First, the department does not provide any technical assistance or project management, which most cities in need of financing cannot do without. Second, the fund does not currently pay for the full up-front costs of a retrofit. Instead, it reimburses cities for money they spend on their own, which does not solve the financing problem for the vast majority of cities.
    - The DELEG fund is obligated to spend its money before September 2011, or return it to the federal government. Unfortunately, it looks unlikely that the fund will have a significant impact before that date.

Appendix F: Assumptions in Financial Projections

Calculations assumed an initial "startup" grant of $1,000,000 in order to establish a working capital reserve (which was not used in calculations of overall leverage).

Table 5 shows the range of financial outcomes, which was calculated by changing variables to reflect three different scenarios: Upside, Baseline, and Downside.

Table 5. Financial Outcome Analysis

	Upside	Baseline	Downside
Fixed costs per staff hour	**50**	**60**	**70**
Annual increase in fixed costs	**1.50%**	**2.25%**	**3.00%**
Per-project acquisition costs	**10,000**	**15000**	**20,000**
Per-project annual expense	**3000**	**4000**	**5000**
Annual increase in city costs	**1.50%**	**2.25%**	**3.00%**
Staff hours per project - startup	**300**	**400**	**500**
Staff hours per project - management	**50**	**100**	**150**
Average project size	**100000**	**300000**	**500000**
Annual energy savings (% of investment)	**20%**	**15%**	**10%**
% of savings returned to fund	**90%**	**80%**	**70%**
Fund size	**10000000**	**5000000**	**3000000**
Fund closes after year	**20**	**15**	**10**

In addition, all calculations made several additional assumptions:

- Investment / construction for any project takes 1 year
- No decline in project availability
- Every project takes place in a different city / with a different client
- Working capital does not earn a return
- Depreciation (if any) occurs over the 10-year contract lifetime

Appendix G: Financial Calculations and Sensitivity Analysis

Sensitivity analysis

By holding all of the model's assumptions at their "baseline" or expected values while changing just one assumption at a time, the team evaluated the overall sensitivity of several key metrics to changes in each variable. This analysis is far from definitive (among other errata, the probability distribution of each variable's range of values is only approximate), but instead it provides a rough indicator of the factors which are most critical to the overall success of the revolving loan program.

(For a more detailed discussion of baseline assumptions and the range of values used for each variable, see Appendix F).

Each variable was assigned three values, or scenarios: Baseline, Better, and Worse. Holding all the other variables at Baseline, we changed each variable individually and measured the impact on the Fund's overall Leverage Factor. We used "Leverage Factor" as the key indicator because a higher leverage factor indicates both an increased total value to the Fund and (presumably) a more attractive opportunity for grantmakers.

All-Grant Fund

Ranges of values:

Total Amount of Money Invested ranged between $3M and $75M:

Variable	Upside scenario	Middle range	Downside scenario
Total Project Investments	$75M	$8M - $14M	$3M
Total Fund Value	$121M	$10M - $20M	($380k)
Leverage Factor	12.14	2.5 – 4.0	-0.13
Annual Income to CEC (average)	$264k	$200k – 300k	$334k*

Table 6. Sensitivity Analysis Based on Initial Fund Side

* Income to the CEC appears higher in the "downside" scenario because it only reflects administrative costs – which are higher in the downside scenario due to increased per-hour cost assumptions *and* increased hours-per-project.

For Better scenario values, variables with the strongest impact on Leverage Factor were as follows:

Variable	Baseline value	"Better" value	% Change in Leverage
Annual Energy Savings	15%	20%	64%

Average Project Size	$300,000	$500,000	27%
% of Savings Returned to Fund	80%	90%	21%
Annual Staff Hours – Manage[1]	100	50	13%
Fixed Costs per Staff Hour	$60	$50	9%

Table 7. Sensitivity Analysis Based on Annual Energy Savings

[1] "Annual Staff Hours – Manage" indicates the annual number of staff hours required to manage a project once it has been brought on-line; e.g., after startup and construction have been completed.

For Worse scenario values, variables with the strongest impact on Leverage Factor were similar:

Variable	**Baseline value**	**"Worse" value**	**% Change in Leverage**
Average Project Size	$300,000	$100,000	-60%
Annual Energy Savings	15%	10%	-37%
% of Savings Returned to Fund	80%	70%	-16%
Annual Staff Hours – Manage[1]	100	150	-10%
Fixed Costs per Staff Hour	$60	$50	-6%

Table 8. Sensitivity Analysis Based on Average Project Size

Removing 5 years from the Fund's lifetime slightly decreased the Fund's overall leverage. However, because the leverage factor does not take time into account, and because the lifetime of a grant-based fund is somewhat arbitrary (e.g., there are no investors to repay, so the fund could continue indefinitely), the terminal year was not considered as a key factor in subsequent analysis.

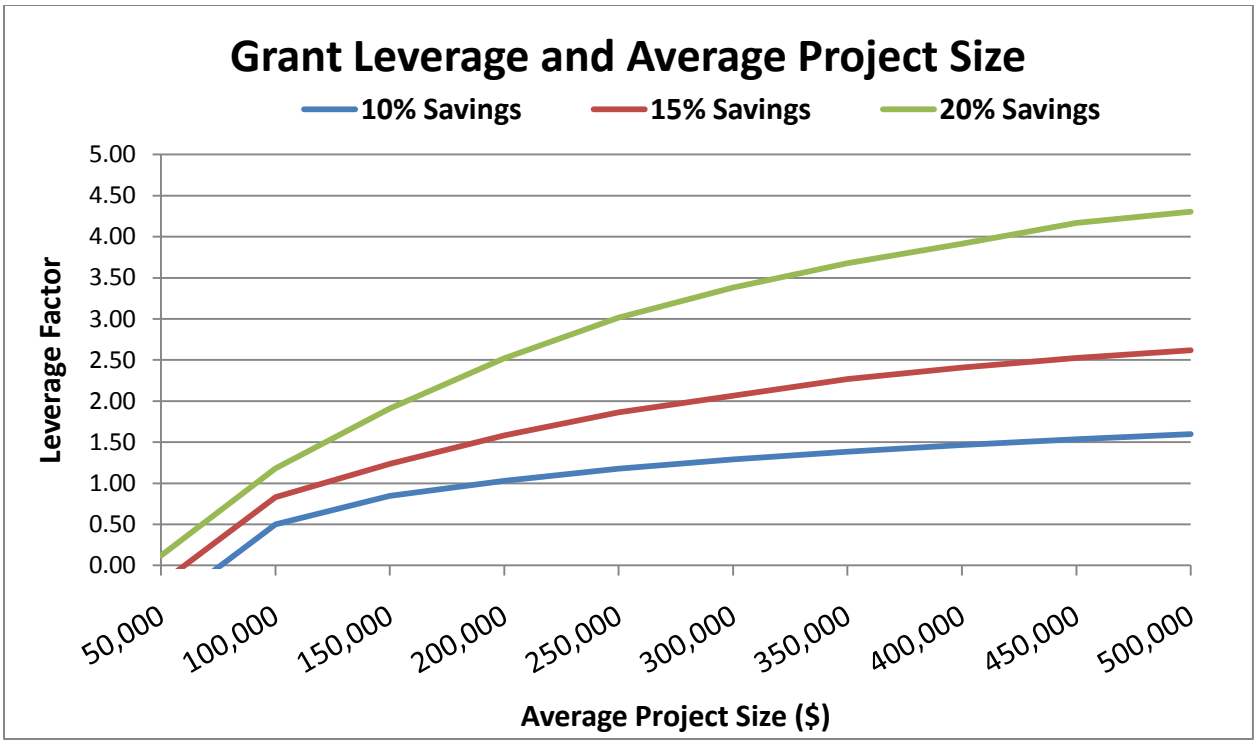

Figure 5. Impact on overall grant leverage by varying average project size.

At 1x leverage, grant dollars will be used just once over the 15-year fund lifetime.

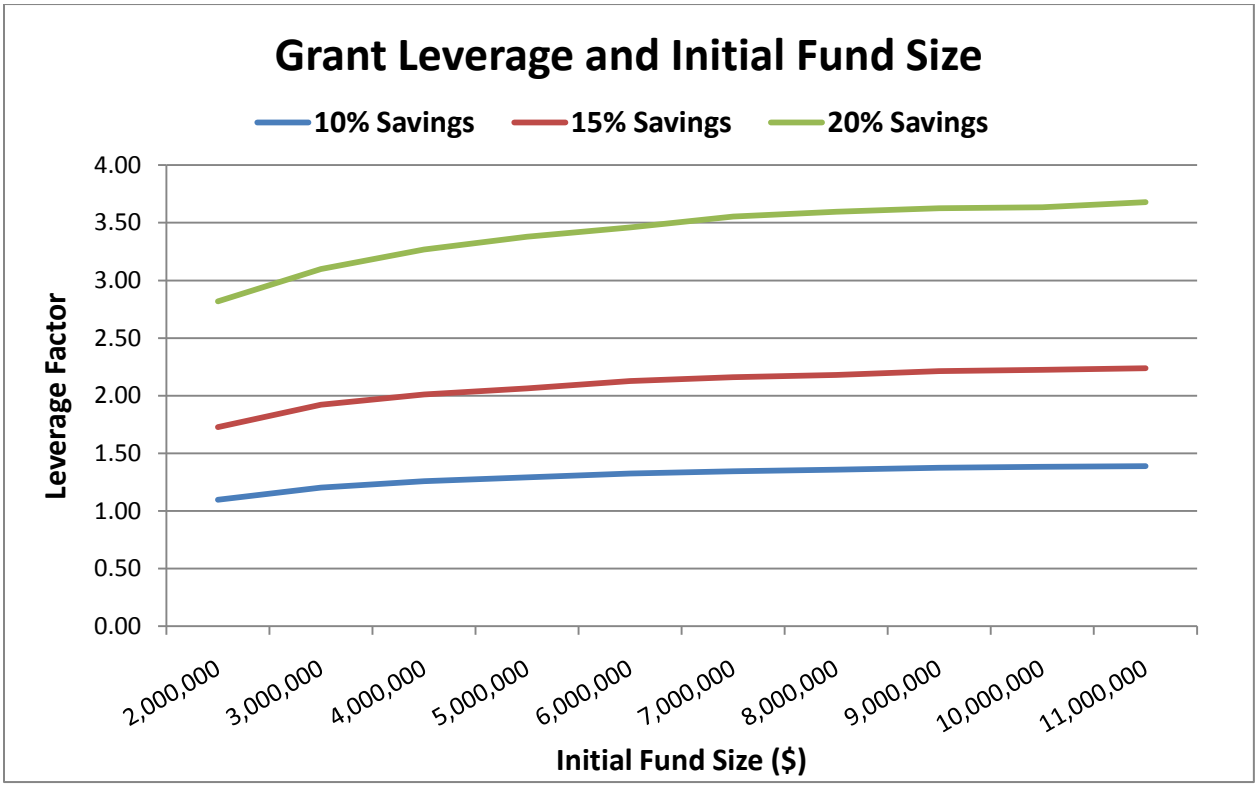

Figure 6, Impact of Fund Size and Project Size on Grant Leverage Factor

Appendix H: Hybrid Fund Leverage and Ability to Repay Investors

One important consideration for a hybrid fund is the maximum percentage of initial fund capital that could be raised from private investors before compromising the fund's ability to repay those investors at the end of the fund cycle. The following table shows total remaining cash (present value of all future cashflows, minus money owed to investors) at the baseline 8% investor return and over a 15-year and 10-year term; positive values are highlighted. Simply put, positive numbers mean that the fund would be able to repay its debts at the end of its term; negative numbers mean that it would not.

Although this analysis only reviews a single investor repayment option – return of all principal plus interest at the end of the fund term – it highlights the relationship between investor capital and required fund returns. As the fund is currently structured, exceeding 50% investor capital would be difficult to support from average energy savings of 20% or below.

Annual Energy Savings	Investor Capital as a Percentage of Total Fund Capital – 15 year fund						
	--	10%	20%	30%	40%	50%	60%
	15%	$469,531	($999,066)	($2,467,663)	($3,936,260)	($5,404,857)	($6,873,453)
	16%	$791,272	($677,324)	($2,145,921)	($3,614,518)	($5,083,115)	($6,551,712)
	17%	$1,273,181	($195,416)	($1,664,013)	($3,132,610)	($4,601,206)	($6,069,803)
	18%	$1,715,850	$247,253	($1,221,344)	($2,689,941)	($4,158,537)	($5,627,134)
	19%	$2,198,291	$729,695	($738,902)	($2,207,499)	($3,676,096)	($5,144,693)
	20%	$2,764,297	$1,295,701	($172,896)	($1,641,493)	($3,110,090)	($4,578,687)
	21%	$3,406,947	$1,938,350	$469,754	($998,843)	($2,467,440)	($3,936,037)
	22%	$4,106,434	$2,637,837	$1,169,241	($299,356)	($1,767,953)	($3,236,550)
	23%	$4,880,735	$3,412,139	$1,943,542	$474,945	($993,652)	($2,462,249)
	24%	$5,736,208	$4,267,611	$2,799,014	$1,330,417	($138,180)	($1,606,777)
Annual Energy Savings	Investor Capital as a Percentage of Total Fund Capital – 10 year fund						
	--	10%	20%	30%	40%	50%	60%
	15%	$1,774,786	$775,283	($224,219)	($1,223,721)	($2,223,223)	($3,222,726)
	16%	$2,082,527	$1,083,024	$83,522	($915,980)	($1,915,482)	($2,914,985)
	17%	$2,431,657	$1,432,155	$432,653	($566,850)	($1,566,352)	($2,565,854)
	18%	$2,816,478	$1,816,975	$817,473	($182,029)	($1,181,532)	($2,181,034)
	19%	$3,298,015	$2,298,513	$1,299,010	$299,508	($699,994)	($1,699,497)
	20%	$3,741,832	$2,742,329	$1,742,827	$743,325	($256,178)	($1,255,680)
	21%	$4,203,457	$3,203,955	$2,204,453	$1,204,950	$205,448	($794,054)
	22%	$4,708,669	$3,709,167	$2,709,664	$1,710,162	$710,660	($288,843)
	23%	$5,243,772	$4,244,270	$3,244,768	$2,245,266	$1,245,763	$246,261

	24%	$5,816,976	$4,817,474	$3,817,971	$2,818,469	$1,818,967	$819,464

Appendix I: Supportable Return to Investors

The following chart outlines the fund's supportable return to investors over 10 years under baseline conditions.

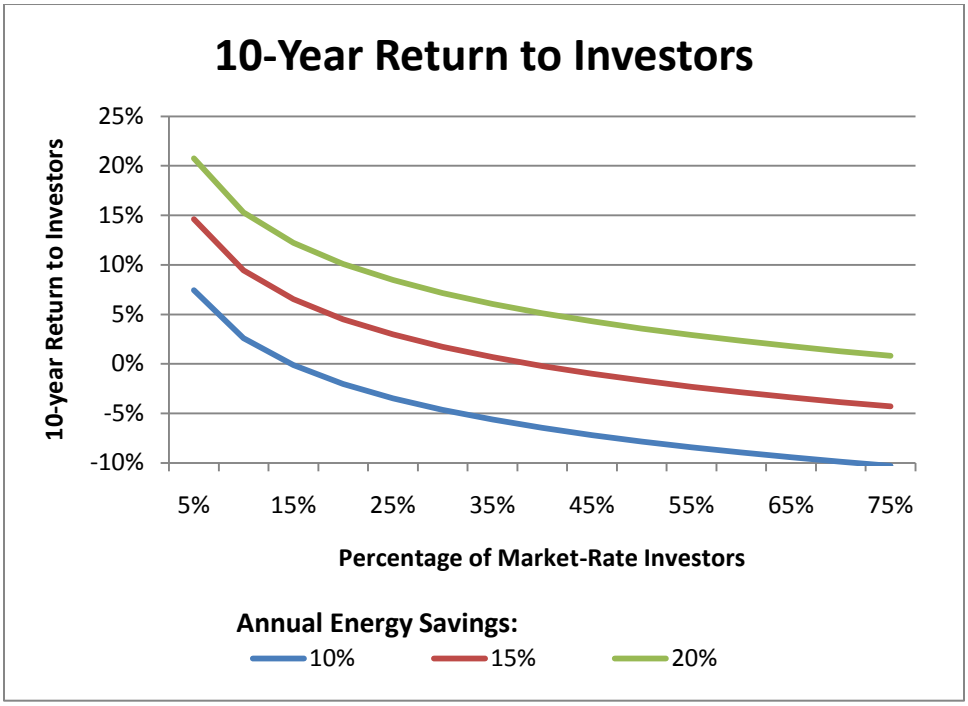

Figure 7. Supportable Return to Investors

Appendix J: Minimum Efficient Fund Scale

In order to be self-sustaining, a fund would need to be able to cover its overhead costs without diminishing its ability to make further project investments. An initial (and very rough) analysis of the possible revenue which the CEC could allocate to staff and overhead without limiting the fund's size is illustrated in the table below. In order to sustainably support a three-person staff – estimated to cost $308,800 over the course of a year – an initial fund of approximately $11 million would be required.

Fund Initial Size	Total Investments	Leverage[i]	CEC revenue
2000000	4100000	1.73	97750
3000000	6300000	1.92	123750
4000000	8200000	2.01	148625
5000000	10100000	2.06	172000
6000000	12300000	2.13	198750
7000000	14200000	2.16	224000
8000000	16100000	2.18	247375
9000000	18300000	2.21	274125
10000000	20200000	2.23	297875
11000000	22100000	2.24	322750

Table 9. Minimum Efficient Fund Scale

[i] *Calculated leverage includes the estimated $1M startup grant.*

Appendix K: Establishing an L3C in Michigan

The following are the steps necessary to establish an L3C in Michigan:

1. Choose a business name for the L3C and check for availability.
2. Prepare and file articles of domestic organization with the Secretary of State.
3. Negotiate and execute an operating agreement.
4. File an annual statement with the Department of Energy, Labor & Economic Growth.
5. Obtain any required local licenses.
6. Determine what tax and other regulatory obligations the L3C has, and take care of any necessary registrations.
7. Open a bank account for your business. [124]

Appendix L: The Clean Energy Value Chain and L3C Investment Model

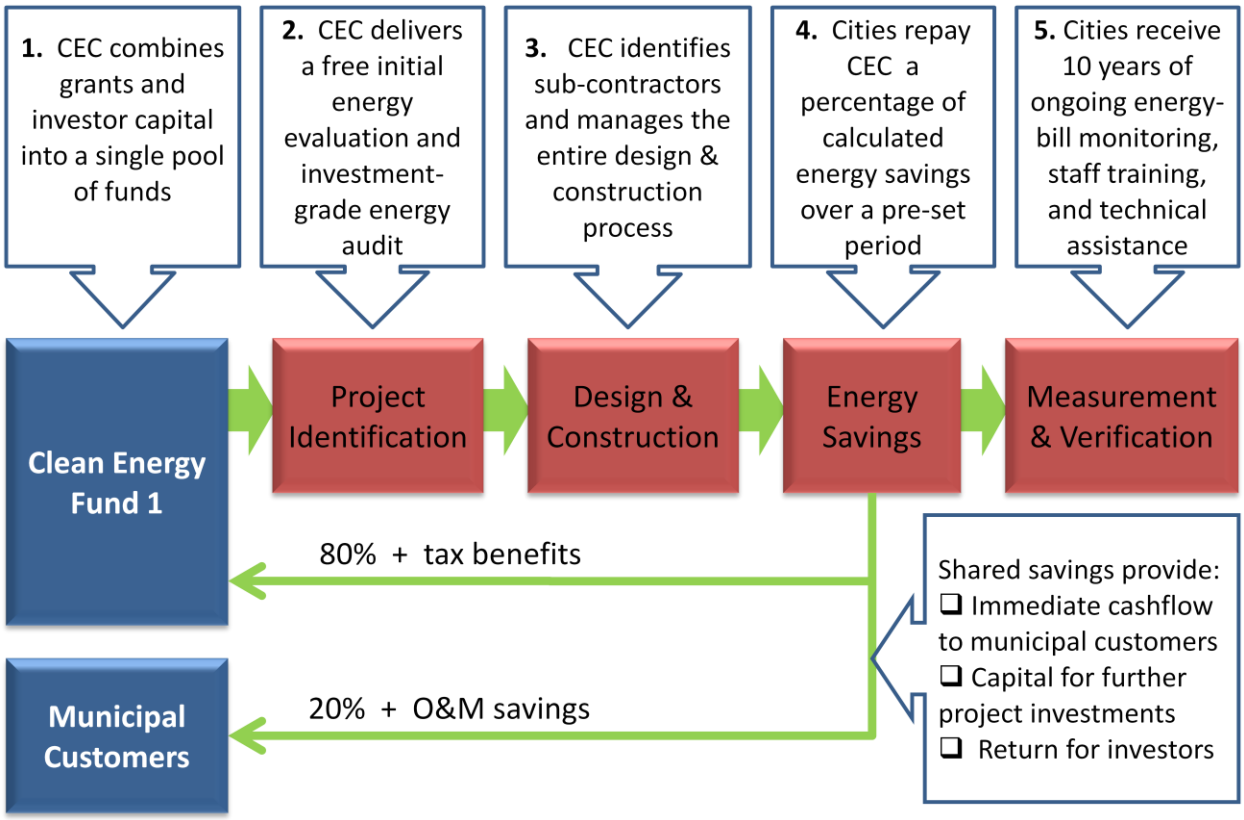

Figure 8. The Clean Energy Value Chain and L3C Investment Model

Appendix M: Value of Vertical Integration

An additional consideration for the CEC is whether to vertically integrate by acquiring or developing additional functional abilities in the energy-retrofit supply chain. At present, the energy audit, energy bill analysis, design, construction, and ongoing energy bill monitoring are all subcontracted to third parties.

We modeled the potential benefits of vertical integration in two ways: by reducing total project costs by a set percentage (5%, 10%, and 15%), and by evaluating the model with reduced annual energy monitoring costs ($4,000, $2,000, and $0). In both cases, we calculated the amount of labor that the CEC would then be able to "allocate" to the additional task without negatively impacting the total value of the fund.

Reducing up-front project costs significantly impacted overall fund value and labor that could potentially be reallocated, as illustrated in the table below. A 5% decrease in up-front costs would allow the CEC to dedicate an additional 581 staff-hours at project startup to each project. A 10% decrease in up-front costs would allow more than 1,800 additional hours to be dedicated to each project. Given that general-contracting fees typically range from 12% to 17%, the potential savings to the CEC of adding general-contracting abilities are significant.

Reduction In Initial Cost	Effective Energy Savings Rate	CEC hours allowable per new project
0%	15.00%	400
5%	15.79%	981
10%	16.67%	2285

Table 10. Impact of Reducing Up-Front Project

Reducing ongoing monitoring costs, on the other hand, had a limited impact on overall fund value: each $1,000 of reduced monitoring cost would translate to approximately 20 additional hours of free CEC staff time. A complete CEC takeover of energy bill monitoring, which would reduce subcontracting expense from $4,000 to zero, would therefore allow the CEC to spend approximately 80 additional hours of staff time per project on annual energy bill monitoring.

In short, if up-front costs could be reduced by 10% through the input of 1,800 or fewer CEC staff hours, it would be worth pursuing. Similarly, if ongoing energy bill monitoring could be achieved for fewer than 80 additional CEC staff hours per year, vertical integration should also be considered.

Appendix N: Energy Manager Job Description

Summary of Position

The Energy Manager is responsible for developing and achieving municipal and community-wide energy reduction and renewable energy goals. To attain this, the Energy Manager develops, implements, and manages comprehensive energy efficiency and renewable energy projects, programs, and policies. The Energy Manager performs work including analyzing residential, commercial and municipal energy use patterns and savings potentials, recommending strategies to effectively reduce energy use or to increase renewable energy supply, providing outreach, education and training to residents, businesses, and city employees, preparing reports, and monitoring results.

Responsibilities

Program Development and Coordination

- Establish residential, commercial and municipal energy reduction and renewable energy goals and develop, implement, and monitor programs to achieve these goals
- Coordinate community energy efficiency and renewable energy programs to enhance current programs provided by _____ County, DTE and other utilities, local non-profits, etc. to promote citizen participation and positive public relations for and programs
- Oversee the work of various contractors implementing energy projects
- Assist building managers in the monitoring, maintenance, and specification of energy using equipment, heating, cooling, ventilation, and lighting
- Ensure compliance with applicable federal, state, regional and local environmental laws

Technical

- Monitor energy use and trends in the residential, commercial and municipal sectors, and benchmark energy consumptions against best practice guidelines
- Provide technical support to mechanical and electrical design engineers on new and refurbishment projects regarding sustainability, energy and water conservation

Energy Purchase and Financial Management

- Compile utility budgets and energy conservation measure cost estimates based upon documented program needs
- Review and negotiate energy purchase agreements and make recommendations regarding energy fuel selection
- Pursue grant opportunities and other outside funding sources for equipment retrofits.

Qualifications

Thorough knowledge of:

- Principles, practices, and strategies to reduce energy consumption and increase renewable energy supply
- Energy monitoring systems, methods and techniques

- Grant writing and grant management, delivery and closure
- Energy audits
- Utility rate schedules
- Principles and practices of program development and implementation including outreach and education strategies
- Current Federal, State, regional, and local energy programs and activities
- Current environmental laws, rules, ordinances and regulations as they pertain to energy efficiency and renewable energy
- Computer applications essential for work completion (for example: MS Office Suite and Utility Manager)

Training and Experience

- Bachelor's degree required in one or more of the following areas; science, engineering, environment, planning or public policy (Master's degree preferred)
- Experience in energy management, mechanical systems design, construction, and/or maintenance, or closely related field
- Project management experience desired

Licensing Requirements

- Professional Engineer (PE) or Certified Energy Manager (CEM) desired
- Valid driver's license

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