CalCEF Innovations

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ENERGY EFFICIENCY PAYING THE WAY: NEW FINANCING STRATEGIES REMOVE FIRST-COST HURDLES

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Section 1
Executive Summary

Over the past year, there has been a sea change in the public recognition of the importance of energy efficiency (EE) for homeowners, corporate leaders, policy-makers, and investors. There is little or no remaining debate that EE is the most cost effective and rapid strategy to accelerate sustainable buildings, businesses, cities, communities, and public policies. However, while the payback periods can be short and total economic benefits clear, EE improvement projects are often not implemented because of high up-front costs.

This paper provides policy-makers, regulators, and private sector firms engaged in the design and implementation of efficiency programs with a series of innovative financing options that can be used to achieve comprehensive energy savings across a broad spectrum of residential, commercial, and industrial market segments. This includes options to augment existing efficiency initiatives at the utility, state, and federal levels by offering energy end-users a set of specific financing solutions that are customized for EE. Further, the detailed description of how efficiency projects are developed in each financing option can provide property owners and decision-makers at commercial and industrial facilities with a blueprint to implement EE retrofit projects.

This paper, the second in a series on EE by CalCEF Innovations, details six existing no-first-cost financing options that enable efficiency projects to be implemented without any initial capital outlay by customers. The financing options highlighted in this paper were selected based upon their ability to: 1) allow a customer to undergo an EE retrofit with no-first-cost, (2) achieve scale by aggregating individual EE projects on either a geographic, financial, or technology basis, (3) be utilized (or replicated) in different geographic areas in the U.S., and (4) demonstrate an innovative financing option that is either emerging or already in existence and is well-positioned to help accelerate the adoption of EE. An emphasis was also placed on financing options that benefit hard-to-reach market segments and end-user groups that currently lack creative financing structures, e.g., residential, small, medium and large commercial and industrial customers, including multi-tenant buildings. Using these criteria, the following six EE financing mechanisms were selected for discussion:

1. *Clean Energy Works Program:* A city-wide initiative in Portland, OR is providing comprehensive financing through long-term loans and technical assistance to local homeowners;
2. *Property Assessed Clean Energy (PACE):* Programs, like the highlighted Palm Desert, CA initiative offer property owners 20-year loans for EE that are repaid through property tax assessments;
3. *On-bill Financing:* SDG&E's program is an example of the 100% financing terms for EE that small and medium-sized customers receive with loan repayments being made on their regular utility bill;
4. *Utility Aggregated EE Deployment:* Ice Energy's program with utilities deploys large numbers of Thermal Energy Storage units under a single financing structure at no cost to customers;
5. *Efficiency Services Agreement:* Metrus Energy offers large industrial and commercial customers a PPA-like solution to implement EE projects using an off-balance sheet structure; and
6. *Managed Energy Services Agreement:* Transcend Equity finances and implements EE upgrades at commercial buildings and takes responsibility for repaying their customers' utility bills.

These financing options encapsulate many of the major trends in the efficiency marketplace today and can be utilized to overcome existing barriers to EE, namely: first-cost impediments to EE investments, reluctance of property-owners to finance projects on-balance sheet, split incentives between building owners and tenants, lack of options to finance integrated EE retrofits, lack of service providers who can conduct whole-building EE retrofits and small-sized projects transactions at disparate facilities.[1] However, although the selected financing options contain key innovations, further adaptations and advancements are needed, including:

- Development of federal and state loan guarantee programs that expand access to debt, thereby lowering the cost of financing and enabling more comprehensive EE project development;
- Engagement of community development financial institutions, as they are able to structure and competitively fund customized EE programs and financing initiatives;
- Upgrading utility IT and billing systems to facilitate on-bill repayment by customers;
- Lengthening on-bill financing loan terms and broadening the scope of utility programs to foster the implementation of multi-measure EE projects;
- Allowing tax-liens under PACE programs to be utilized by outside financing sources, providing an extremely secure loan as it is attached to property taxes;
- Providing EE with tax benefits that are on par with those of renewable energy;
- Developing utility-based aggregation programs that utilize anchor technologies (like thermal energy storage or high efficiency lighting) to foster implementation of more comprehensive EE retrofits; and
- Expanding partnerships between financing sources and utilities, city agencies, and ESCOs / ESPs, who have longstanding relationships with customers, to rapidly identify EE opportunities.

Further, although the focus of this paper is on financing, it is understood that new financing options on their own are not a panacea and that the further adoption of enabling policies is also necessary (including aggressive codes and standards and their enforcement, and revised tax regulations on EE). Lastly, this paper is not intended to be a comprehensive best-practices review but rather is meant to elucidate existing financing options and programs and to provide recommendations for their further advancement. As we continue to explore innovative financing options, business models, and policies for EE, CalCEF Innovations welcomes ongoing discussion and support.

Section 2 Introduction & Working Assumptions

The mission of CalCEF Innovations is to identify and address issues impacting the long-run transformation of the energy economy towards sustainability, including the formation of enterprises, the continued flow of capital into technologies and infrastructure, and the broadening of popular support for the clean energy transition. In this paper, undertaken as part of our Entrepreneurs-In-Residence program, we focus on financing options that can foster the accelerated implementation of energy efficiency (EE) through the aggregation of individual projects, technologies, and service offerings into larger and more attractive investments opportunities. This paper, which builds on the previous entitled *New Business Models for Energy Efficiency (March 2009)*, provides a playbook for energy end-users and policy-makers on how to develop and implement EE measures utilizing six selected "no-first-cost" financing solutions that can enable projects to be implemented without any initial capital outlay.

EE immediately saves money for end-users, improves the bottom line for companies, reduces local exposure to electricity grid outages, and offsets the need for new power plants. EE represents a quick and cost-effective solution to reducing greenhouse gases (GHG), principally, carbon dioxide. Yet, efficiency upgrades and their respective financing options are often out of reach for most end-users, as the initial capital cost exceeds near-term savings.

This paper focuses on options to provide comprehensive financing solutions for EE, reflecting that overcoming first-cost barriers remains a critical roadblock to the implementation of efficiency projects in all market segments. Specifically, end-users lack internal funds to self-finance projects, and are reluctant to utilize outside financing that burdens their future borrowing ability or credit rating. In addition to the these central tenets, the following working assumptions frame our effort in this paper:

A national consensus has emerged that EE is the fastest, least expensive, and lowest risk resource to reduce carbon emissions. Over the last few years, there has been a steadily increasing recognition that EE needs to play a central role in meeting the growing energy demand in the U.S. and in shaping our strategy to address climate change. McKinsey's July 2009 study, entitled *Unlocking Energy Efficiency in the U.S. Economy*, underscores the critical role to be played by EE: the study estimates that by 2020, EE could generate an estimated potential 9.1 quadrillion BTUs of annual end-use energy savings (equivalent to 12.5% of total end-use consumption in 2008) that results in 1.1 gigatons of annual avoided GHG emissions (equivalent to 14% of total 2007 emissions).[2] Moreover, from a clean energy resource cost perspective, EE costs approximately $0.03/per kWh compared to over $0.19/kWh for solar generation.[3, 4]

The development of customized EE financing structures is poised to take-off. For the first time in decades, dating back to the initial use of shared savings contracts in the '80s, new EE financing structures are emerging that allow end-users to avoid the initial capital outlay associated with the installation of EE measures, thereby enabling the completion of efficiency projects that, absent outside funding, would go undone. As detailed in this paper, EE financing activity spans the full spectrum of the EE marketplace, including residential, small commercial, and large commercial and industrial customers.

The selection of the different financing options was guided by CalCEF Innovations' efforts to promote investment in large, underserved markets for efficiency. The creation of new financing options is consistent with CalCEF Innovations's previous call to develop new business models and project development strategies that help overcome key historical barriers to EE implementation. For the purposes of this paper, the following screening criteria were applied to guide the selection of financing options: (1) it provides end-users with a no-first-cost solution to implement EE upgrades, (2) it applies a business strategy that financially, technologically, or geographically aggregates individual EE retrofits into larger investment opportunities, and (3) it has the ability to achieve scale and be implemented anywhere in the country. Further, an effort was made to

select financing options that can cover market segments that are tough to reach or currently lack creative financing solutions. This encompasses residential end-users, small commercial/business property owners, and private sector commercial and industrial (C&I) facilities, including multi-tenant commercial buildings.

Recognition that there is much afoot in the world of EE. Although the selection of the financing options highlighted in this paper was made after the completion of extensive research and discussion with a wide range of industry stakeholders, we realize that there are many other innovative EE programs and initiatives that are under development or are being implemented. The financing options contained in this paper, although illustrative of the major EE market trends throughout the country, are not intended to be a comprehensive, best-practices review.

More enabling policies and regulatory actions are needed. It is understood that financing alone will not lead to the realization of the sizeable energy and environmental goals that are being set for EE at the local and national levels. Key areas of required action include the establishment of aggressive EE codes and standards, revisions to tax regulations that put EE on par with renewable energy (e.g., accelerated depreciation, ITC inclusion, and property tax exemptions), and adoption of "decoupling plus" regulatory regimes for utilities that not only break the link between electricity sales and profits but also set earning incentives and penalties related to meeting EE targets.

Continued implementation of state, utility, and federal EE programs is critical. All of the financing options discussed in this paper assume the existence of state- or federally-funded EE programs. This includes the ability to leverage cash incentives or rebates offered for selected EE measures and technologies as well as the provision of technical assistance to help identify and develop project opportunities. Providers of private capital will need to increasingly work with utilities and policy-makers to meet the country's growing energy and environmental challenges.

It is the best and worst of times for EE. Although the national interest and overall level of awareness of the importance and vast market potential of EE is at an all-time high, the current economic climate creates significant challenges related to the financing options presented in this paper. This includes access to commercial debt, which although potentially easier for EE compared to other business areas, remains challenging due to a reluctance or inability of financial institutions to put capital to work and/or of energy users and their lenders to increase debt and payment obligations.

Section 3 No-First-Cost EE Case Studies

This section provides a description of the six selected no-first-cost financing options and the mechanics associated with the implementation of an EE project under each financing option — starting from initial identification to project construction and commissioning. Although there are numerous existing and emerging EE financing options and programs to consider, the financing options highlighted in this paper were selected using the following four key criteria.

1. First and foremost, the EE financing option must allow a customer to undergo an EE retrofit with no-first-cost. This alleviates one of the largest barriers in EE projects – namely, a lack of upfront capital that deters property owners from investing in EE.
2. It allows for the aggregation of individual EE projects in one or more of the following forms to help attract outside investment and achieve significant scale and level of savings.
   - *Geographic Aggregation:* focuses on a specific region or area in order to access a broad base of customers, engage local support to drive EE retrofits, and develop the workforce and services needed to implement EE projects. This also includes bundling federal, state, utility, or local EE incentives funds that are allocated to a specific geographic area.
   - *Financial Aggregation:* pools monies to finance numerous smaller projects that otherwise would be overlooked by traditional financing sources.
   - *Technology Aggregation:* enables customers to implement comprehensive, multi-measure EE projects in their building or facility.
3. It has the potential to be utilized (or replicated) around the U.S. (i.e., the financing option or program is not tailored for use in a specific geographic region that has sources of capital or stakeholders that are not transferable).
4. It is an innovative financing option that is either emerging or already in existence but is well-positioned to accelerate the adoption of EE within a targeted market segment.

Using these criteria, the following EE financing options summarized in Table 1, shown on the following page, were selected for discussion in this paper. Each of these criteria underscore key recommendations made in CalCEF's previous paper *New Business Models for Energy Efficiency.*

The remainder of this section outlines key project development steps within the framework of each of the selected solutions. By detailing the mechanics of each financing option, policy-makers, regulators, and program designers have a framework from which they can better consider the incorporation of these financing solutions into existing EE initiatives and those currently under development. The detailed description of the key elements of each financing option also sets the stage for subsequent recommendations on how their full potential can be tapped, including: designing federal / state loan guarantee programs for EE retrofits that are specifically aimed at the project level, aggregating large portfolios of individual EE projects under the umbrella of a utility run program, engaging community development financial institutions ("CDFI") in regional EE initiatives, providing EE with tax benefits that are on par with renewable energy, and expanding PACE programs to include the participation of third-party sources of funding.

Table 1 - No-first-cost EE Financing Options

Type of Customer	Financing Option	Description	Source of Funding
Residential (single family homes)	Clean Energy Works program (Portland, OR)	City-wide program which provides comprehensive technical assistance and long-term financing through project loans that are repaid on a customer's regular utility bill.	City budget, Federal Energy Conservation Block Grant, Energy Trust of Oregon
Residential and small commercial	Property Assessed Clean Energy program (Palm Desert, CA)	A tax lien is placed on a property that enables customers to receive long-term financing (up to 20 year loans) to finance EE measures.	Municipal bonds, recent loan from Wells Fargo
Small / medium commercial and municipal facilities	On-bill Financing program (SDG&E)	100% financing for EE measures with customer loan repayments to their utility made via a surcharge on a customer's utility bill.	Historically, Sempra's working capital. Current proposal is a revolving fund using rate-payer money.
Commercial (including small business) and retail	Aggregated Deployment of Thermal Energy Storage (Ice Energy)	Aggregated deployment of individual TES units. The participating utility covers equipment and installation costs. TES units are installed at no cost to selected customers.	Private capital, tax exempt bond, or capital lease. Program costs will likely be rate-based.
Large industrial and commercial facilities	Efficiency Services Agreement (Metrus Energy)	PPA-style product that enables customers to avoid all capital outlay with an EE project. Metrus is repaid on a cost per avoided unit of energy basis ($/avoided kWh of electricity).	Private sources of equity and debt
Large commercial facilities	Managed Energy Services Agreement (Transcend Equity)	Customer pays a sum equal to their historical energy bill. Transcend then pays all utility bills and finances EE upgrades with its repayment being based on resulting energy savings.	Private sources of equity and debt

Clean Energy Works Program (Portland, Oregon)

Program Overview

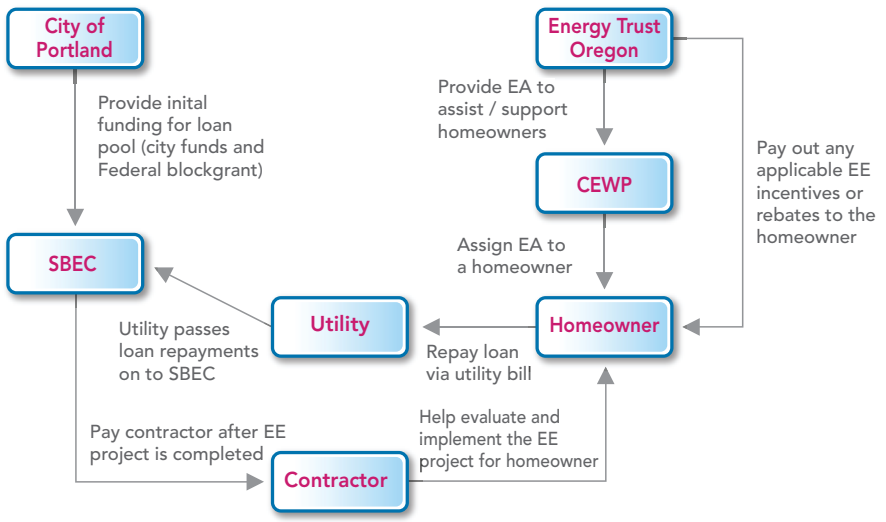
In 2009, the City of Portland established the Clean Energy Works Portland ("CEWP") to help homeowners overcome the high front-end costs and other barriers associated with implementing EE measures.[5] CEWP is a joint venture between the Energy Trust of Oregon ("ETO"), the City of Portland, and Shorebank Enterprise Cascadia ("SBEC"). Under CEWP, single-family residential homeowners can receive 100% financing to implement a wide range of EE measures. Loans are provided at attractive levels of fixed interest rates and are amortized over a 20-year period. Customers repay loans through their regular utility bill. CEWP finances the implementation of a wide range of EE retrofits, including: weatherization (insulation, air sealing, duct sealing), space heating (furnace or heat pump), and hot water (gas, electric, tank-less gas). In the future, CEWP plans to incorporate solar hot water, solar PV, and energy efficient windows. To date, pilot projects have been implemented at 10 homes, with efficiency upgrades planned at an additional 490 homes in 2010.[6]

Figure 1 provides an overview of the roles and responsibilities of key CEWP stakeholders.

CEWP was designed to address several significant barriers to the implementation of residential EE projects, namely: (1) challenges homeowners face in financing the front-end costs of EE, (2) absence of technical assistance programs geared to guide homeowners through the development and implementation of EE projects, (3) lack of contractors who implement whole-building EE retrofits, (4) achieving a sufficient scale of investment in order to cost-effectively access private capital markets, and (5) fragmentation and disaggregation of financial incentives from governments, utilities or entities like ETO that administer state or regional EE programs.

Key drivers behind the creation of CEWP include: (1) the City of Portland's adoption of a resolution to reduce its carbon emissions by 80% by 2050; (2) a strong existing local infrastructure for EE and resources that have been put in place by ETO; and (3) macro-level trends at the federal level, including the passage of the American Reinvestment and Recovery Act (ARRA) of 2009 that provides added funding for state EE initiatives including block grants. CEWP's decision to focus on the residential sector reflects the growing share of carbon emissions from homeowners.[7]

Figure 1 - CEWP Roles and Responsibilities



In addition to the joint venture partners, CEWP is being implemented as a public-private partnership that involves local utilities (Portland General Electric, Pacific Power, and Northwest Natural) and a group of selected EE contractors that meet certification requirements to be considered qualified to perform this type of work. Blue Tree Strategies, a local consulting firm, worked with CEWP to develop the initial program concept and was retained by SBEC to aid its efforts for CEWP.

The ETO plays a pivotal role in CEWP as a provider of both technical assistance and a source of cash incentives that increase the economic attractiveness of EE projects. The ETO provides technical assistance by assigning each approved homeowner under CEWP an Energy Advocate ("EA") who assists with the evaluation and implementation of an EE project. The EA's work includes verification of savings and costs of the efficiency measures

identified in the home energy assessment, quality assurance over the work performed by each certified contractor, and serving as the primary program liaison to the CEWP participant. The EAs are employed by Conservation Services Group ("CSG"), a national non-profit that is under contract by ETO to manage CEWP. The ETO also helps buy-down project costs by providing cash programs for qualifying measures under its standard portfolio of EE incentives.[8] Total project-level incentives can cover up to 25% of the project cost.[9]

Table 2 - CEWP Packages of EE Measures

	Basic Weatherization	Extended Weatherization	Weatherization with Furnace or Hot-Water Heater	Low Income
Project Costs	$3k-$4k	$5k-$8k	$8k-$15k	$3k-$15k
Fixed Interest Rate	7%	5%	3%	2%
Length of Loan	20 years	20 years	20 years	20 years

SBEC is responsible for managing CEWP's funds and issuing loans to customers. SBEC is a CDFI with a charter to expand local access to credit in underserved markets. SBEC's mission is well suited to support CEWP's goals of promoting clean energy, job creation and environmental protection through local investment in EE. As a CDFI, SBEC can provide funding to a broader base of customers at more attractive rates compared to traditional, regulated FDIC-insured banks. SBEC is also currently investing in IT systems for CEWP that will facilitate the collection of loan repayment electronically through a customer's utility bill. Once these IT system investments are made, SBEC will have an enhanced ability to import payment data from multiple utilities and to attach that data to a customer's loan file. SBEC will then be able to provide customers with real-time information regarding their loan payment status and outstanding balance.

Financing Mechanism / Structure

CEWP provides 100% financing for homeowners to implement the following "packages" of EE measures listed in Table 2.

SBEC issues loans to customers at attractive, below market, interest rates that are amortized over a 20-year term. This includes providing customers with loans that have declining rates of interest for projects that take more comprehensive EE action. Customer loan payments are expected to be equal or below the expected level of annual energy savings realized through the implementation of an EE project. Loan payments are made by customers via their regular utility bill.

As part of its underwriting process, SBEC conducts a standard credit check and property title search. The local participating utility also provides SBEC with 12 months of a customer's repayment history, which is weighted as the primary underwriting criteria for program participation. Loans issued under CEWP will be made as a deed of trust filing that has a junior position to a customer's existing mortgage. CEWP loans will be structured such that they are due upon the sale or transfer of a property. Per CEWP guidelines, SBEC will maintain a 10% loan loss reserve at all times but anticipates a much lower actual default rate.

SBEC will manage a revolving loan fund, on behalf of CEWP, which will total $2.5M through funds to be received from both the City of Portland and Federal Energy Conservation Block Grants. SBEC will utilize the revolving fund to make near-term loans to customers as well as to secure additional funding from outside capital markets, thereby leveraging CEWP's initial grant funds to achieve a higher volume of total investment. Further, CEWP's use of standardized EE project packages and loans terms should help SBEC sell portfolios of aggregated residential EE loans into secondary markets that will provide funds to recapitalize CEWP and enable the issuance of additional loans.

Project Development

To apply for a loan under CEWP, a customer must complete an online application that will be reviewed by SBEC and an EA representative from the ETO. Current program marketing and outreach efforts include: (1) word-of-mouth recommendations to homeowners from participating contractors; (2) bill inserts sent out by local utilities to targeted customers (in particular, customers that have electric heating systems); (3) Program advertisements in the local press; and (4) information and promotional materials on CEWP's website. Once started, the development of the project follows a fairly formulaic process, which is guided by SBEC, the EAs, and participating contractors. As illustrated in Figure 2, shown of the following page, the typical timing to develop a project lasts between four to 10 weeks, after which time the homeowner will start to repay the CEWP loan as part of its regular utility bill.[10]

Listed below is a summary of the key actions and milestones associated with the development and financing of an EE project under CEWP. A detailed project development table for CEWP is presented in the Appendix.

Phase 1: Pre-Development

Potential customers submit an online application that includes information on the key characteristics of their home, which is compared to data on the customer's historical energy consumption that is provided to CEWP by participating utilities. SBEC conducts an initial screening of the applicants based on their credit and utility bill repayment history. The ETO also screens applicants for potential energy savings by reviewing the home energy usage data and analyzing historical data on the results of EE measures implemented in similar types of homes. This phase is usually completed in one to two weeks.

Phase 2: Development

In the main development phase, an energy assessment is completed and an appropriate EE package (e.g., Basic Weatherization, Extended Weatherization, etc.) is selected for the property. The energy audit is performed by the contractor with oversight from the EA. Once the assessment is completed, a package of EE measures is presented to the homeowner along with details on the expected loan size and terms. Most EE projects under CEWP are expected to be between $5,000 and $15,000. At the end of this phase, SBEC prepares the loan agreement, which is then signed by the homeowner. The duration of the development phase of an EE project under CEWP is one to three weeks.

Phase 3: Implementation

When implementing the project, the contractor begins constructing the selected measures. There are currently five contractors who have been trained and certified from the Building Performance Institute (BPI) as part of the qualification for participation in CEWP. During the implementation phase, the EA continues to serve as quality control on the project by ensuring that the contractor installs the EE measures properly, on time, and within budget. Once the EE project is constructed, the EA will then complete any forms required to obtain EE incentives from the ETO, removing this burden from the homeowner. Depending on the type of package of EE measures, the implementation phase will last two to five weeks.

Phase 4: Operation

Once the contractor completes the construction of the EE measures, the EA will help the homeowner apply for any additional applicable state or federal tax credits. SBEC will pay the contractor directly after the construction is complete and will collect any incentives from the ETO, which are typically paid out within two months. Over the next 20 years, the homeowner continues to pay his utility bill as before, but with the loan payment included. The surcharge is collected by the participating utility and then forwarded to SBEC (in doing so, the utility takes a fee for service from every bill).[11] If the home is sold during the loan term, any outstanding balance will be due upon sale. However, if desired by the previous and new owner, the loan may be transferred to the new owner for a fee.

Key Areas of Innovation

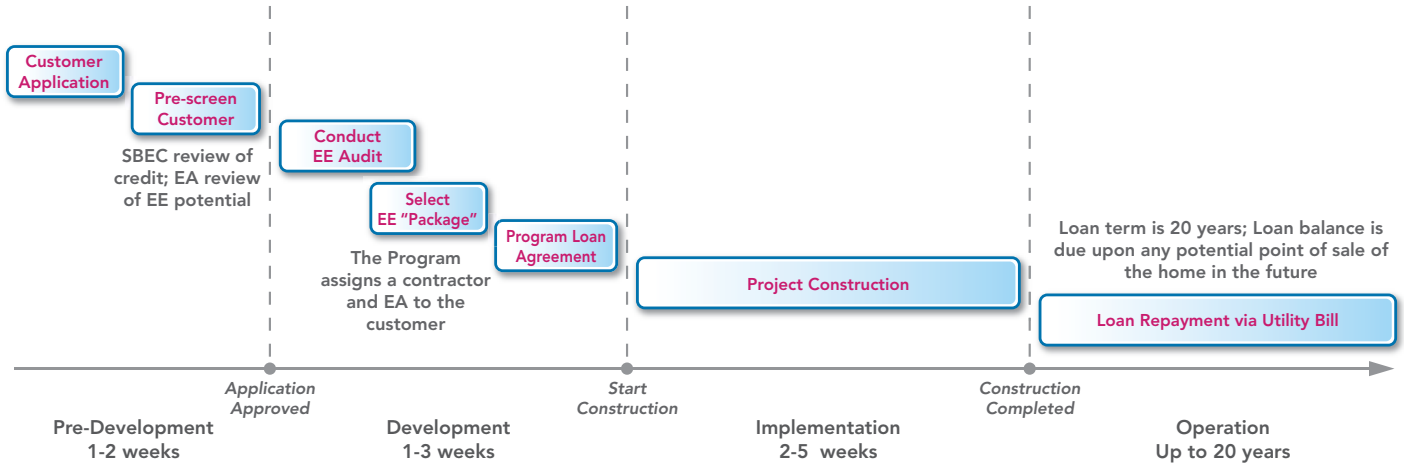
Over the coming years, CEWP will be a proving ground for the following areas of innovation related to both EE program development and project implementation:

- *CDFI Participation*. The participation of SBEC, due to its CDFI status, enables CEWP to offer loans to a broader base of homeowners at more attractive financing terms compared to what traditional financial institutions could provide. SBEC, similar to other CDFIs, has an existing base of expertise in the financing, development, and renovation of local real estate;
- *Project-level Technical Assistance*. CEWP is unique in that it provides each homeowner with an EA to assist in and oversee the development and implementation of an EE project and collection of incentives;
- *Promotion of Integrated EE Project Development*. CEWP offers lowers interest rates for projects when EE measures become more comprehensive and the loan size becomes greater; and
- *On-Bill Repayment*. Repaying CEWP loans via existing utility bills captures the benefits of traditional on-bill financing without having to rely on the use of a utility's working capital or ratepayer funds.

Barriers to the Expansion of CEWP

The growth of CEWP, and its replication to other regions, will rely heavily on the program's ability to access secondary sources of capital (e.g., bank debt, state municipal bond issuances, and foundation investments) that value the risk-return profile of home energy performance improvement projects. Presently, most secondary markets for home loan portfolios place a high value on receiving traditional collateral, including priority liens on properties. Another key barrier for CEWP is the lack of available experienced contractors that can successfully implement whole-building retrofit packages. Further, homeowners have a low level of awareness regarding the value and benefits associated with implementing an EE project through CEWP. The amount of time and resources necessary to conduct EE awareness and capacity-building efforts is a major challenge to the sustainability of programs like CEWP. Finally, as currently designed, CEWP does not address the needs of multi-family homes or rental properties.

Figure 2 - CEWP Timeline



Property-Assessed Clean Energy Programs (Palm Desert, CA)

PACE Overview

Property-assessed clean energy ("PACE") programs provide property owners with a no-first-cost option to finance EE upgrades through long-term loans that are repaid via an annual property tax assessment. Loans under PACE programs are secured by placing an additional lien on a property that is senior to the existing mortgage debt. Although the mortgage industry has expressed some concerns about the placement of a priority tax lien on a property, interest in PACE programs as a vehicle to facilitate community-wide investments in EE has been receiving increased attention. PACE advocates have been working with mortgage industry representatives to provide added assurance that EE retrofits will generate benefits to all parties that lead to increased property values.[12]

PACE financing programs are particularly well suited for residential EE projects but are also applicable to commercial facilities. As of September 2009, 17 states have, or are actively considering the adoption of, a PACE program.[13] Although each program has unique characteristics (e.g., participation of different stakeholder groups and access to regional EE incentive monies), they all use a property tax lien as collateral to ensure loan repayment.

The establishment of a PACE program first requires that a "special assessment district authority" be formed by a local government. To create a special assessment district, state legislation is needed. With state legislation in place, a local city or municipality can then authorize an assessment on the property tax bill of residents within its jurisdiction to finance the cost of EE improvements. The formation of a special assessment authority can also include the right to issue bonds to fund EE improvements. However, the quickest way to establish a PACE program is to use an already existing assessment district authority and amend it specifically for the PACE program.[14]

The largest and most active PACE programs to date are in California. They have been driven by Assembly Bill 811 ("AB811"), which was passed in 2008 to help California achieve its goal of reducing its greenhouse gas emissions to 1990 levels by 2020.[15] AB811 enables municipalities to fund 100% of the front-end cost of an EE project which is paid back over time as a special add-on to a homeowner's existing property tax bill. EE-related property tax payments are assigned to the property, not the owner, for up to 20 years at an interest rate of 7.0%.[16]

There are currently three operational AB811 programs in California, with several additional programs in the development stage. The three active AB811 programs exist in Berkeley (focusing mostly on solar PV), Sonoma County, and the City of Palm Desert. This paper will focus on the City of Palm Desert's Energy Independence Program ("EIP"), as it is arguably the most established AB811 program.[17]

Palm Desert Initiative

Prior to the passage of AB811, the City of Palm Desert had established its community-based *Set-to-Save* EE program, which is a partnership with Southern California Edison ("SCE"), Southern California Gas Company ("SoCalGas"), and the Energy Coalition. The program aims to reduce the city's energy use and peak demand by 30% by the end of 2011. Under the program, local homeowners and businesses receive customized EE incentives to replace inefficient HVAC, lighting, pool pumps, and water heating equipment. The program also provides residents with access to a group of pre-screened and qualified service providers to implement projects. During the period of 2007 to 2008, funding for the citywide program was approximately $14M. An additional $21M was requested by SCE for the *Set-to-Save* program period of 2009 to 2011.[18]

On August 29, 2008, Palm Desert became the first California city to launch an AB811 loan program. Specifically, the city council approved the EIP, which utilizes provisions under AB811 to allow local property owners to apply for loans to install EE and RE measures that are permanently attached to the property. EIP has been actively utilizing this tax lien financing to foster the implementation of EE and RE measures under city-based programs:

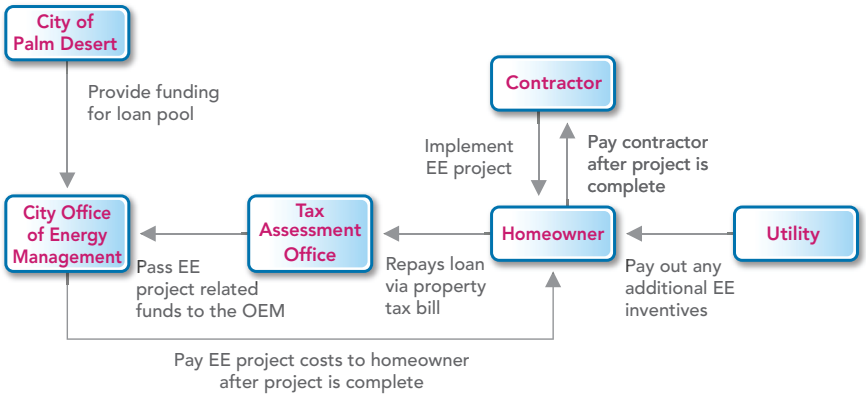
- EIP has received and approved 220 applications for support, of which 110 have been EE-only projects, 90 have been solar-only, and 20 have been combined EE and solar projects.
- EIP has already issued $2.7M in loans.[19]

Going forward, EIP has earmarked half of its available loan funds for EE projects and half for solar projects in order to ensure that there is a balance in the types of projects and measures that are implemented under the program (given the more capital-intensive nature of solar projects, the city wants to ensure that it has funds to support EE).

Financing Mechanism / Structure

The Office of Energy Management ("OEM") within the city government is responsible for managing the EIP and implementing loans. EIP offers property owners 100% financing for approved EE measures. Under the EIP, a property owner can receive up to a 20-year loan (although owners can opt for a shorter repayment period) at 7.0% interest that is paid back through a semiannual property tax assessment. If the property is sold prior to the end of the loan term, the lien remains with the property and is inherited by the new owner. The lien is placed on the property and is senior to the first deed of trust. Figure 3 illustrates the financing structure of the EIP and the actions of key stakeholders.

Figure 3 - EIP Roles & Responsibilities



The initial source of capital (loan funds) for EIP was a $2.5M disbursement from the city's General Fund. Since that initial tranche of funding, an additional $2.5M was secured through a bond issued by the city's Redevelopment Agency.

A second Redevelopment Agency bond was issued for $1.1M in late 2009 to support the growing demand for EIP loans. The city is also working with private funding sources to grow the program, as illustrated by the August 2009 announcement of a lending agreement with Wells Fargo Bank. Specifically, Wells Fargo will loan $5M to the city, half of which will be used to repay the city's initial $2.5M and half will fund future projects. The loan uses the city's lease revenue from city-owned buildings to back the financing, which will provide added security for the Wells Fargo lease.[20]

Through the *Set-to-Save* program, local customers can receive rebates and incentives to implement EE and RE projects that help lower total overall loan requirements for the EIP.[21]

EIP loans are issued directly to the property owner with the property owner or contractor being responsible for collecting any rebates and other incentives. During the initial operation of the EIP program, there were no restrictions regarding the EIP maximum loan amount. However, in 2009, the OEM established the following loan guidelines: (1) for any project greater than $30k, the OEM requires that the property's mortgage lender sign a consent agreement, and (2) the maximum loan size per parcel is $100k. The $30k consent limit was enacted in part to foster a more collaborative process with the existing mortgagee and the $100k cap was established to ensure that loan funds will be available to the community-at-large rather than for a small set of large projects.

Project Development

The development of a project under the EIP typically takes four to nine months, depending on the scope of work. Listed in Figure 4, shown on the following page, is a summary of key activities and EIP project milestones.

Phase 1: Pre-Development

The OEM, as well as other program stakeholders, conducts a variety of marketing and outreach activities to promote EIP as a no-first-cost solution for EE. Local residents learn about EIP through the city's website, *Set-to-Save* marketing materials, the city's monthly *Bright Side* newsletter, inserts in local utility bills, or TV and radio advertisements. The initial scoping and development of a project can be conducted through an OEM- or utility-funded energy audit as well as by engaging a local EE contractor. The OEM provides training for local contractors on the requirements and key guidelines for implementing a project under the EIP. Although an audit is not mandatory, EIP highly recommends that residents take an energy survey to understand their energy usage. The typical timing of this phase is one week.

Phase 2: Development

The formal development of a project commences once the property owner has hired a contractor to conduct a detailed audit that defines the EE measures to be implemented and accordingly, the size of the EIP loan request. The contractor must be a California licensed contractor and be in good standing with the state. The property owner is responsible for submitting an EIP application to the OEM, which details the contractor's information, project cost estimates, and EE measures to be installed. Although the property owner must sign the EIP application, the contractor typically completes the majority of the application information. The OEM responds to all EIP loan applications within 15 days and reviews an application to verify that:

- The property is within city limits and is within OEM guidelines (e.g., loan size, etc.);
- Contractor cost estimates are reasonable (when compared to industry / market standards); and
- The identified EE or RE measures are eligible for support under the EIP.

Once the application is accepted as complete, the OEM will order a title report in preparation for the loan agreement. After receiving the title report, the OEM ensures that the owner is current on their property taxes and verifies that there are no liens or judgments on the property.

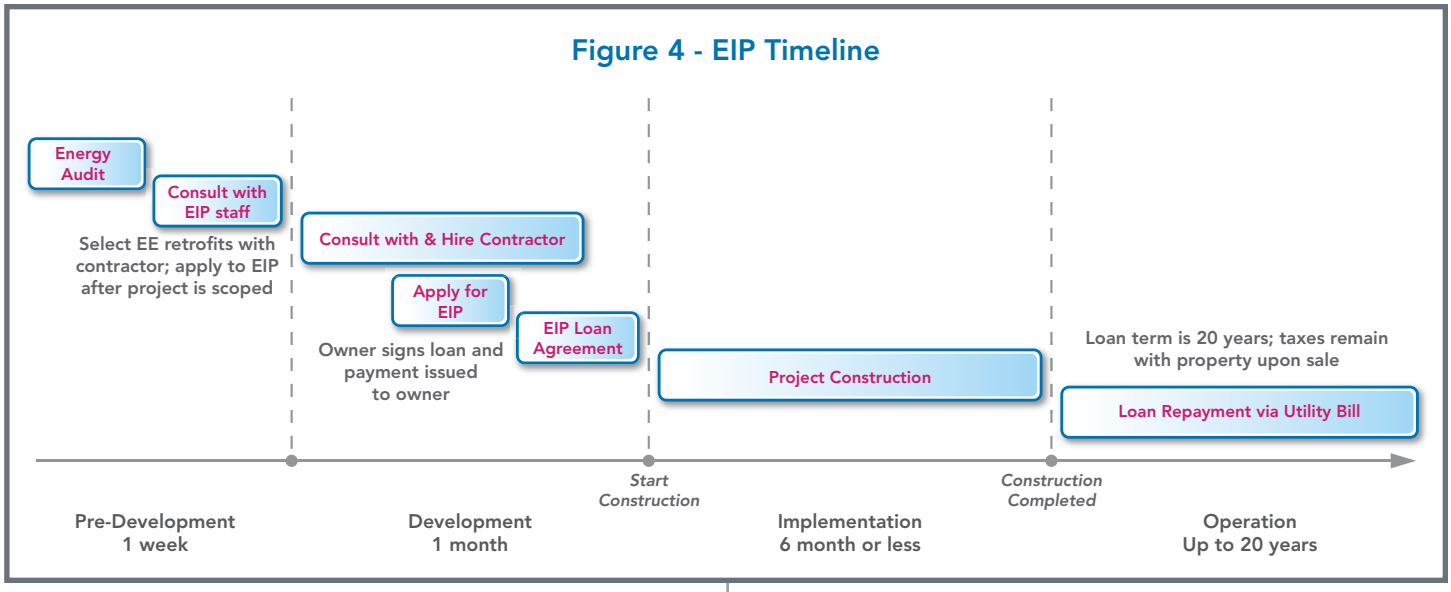
If a project (EIP loan request) is under $60k, the OEM staff will review the application; however, if a project is over $60k, the city manager must approve the loan agreement. Once an application has been approved, the OEM will prepare the loan documents, which are then signed by the property owner. The typical timing of this phase is one month.

Phase 3: Implementation

Prior to the start of construction, the property owner must first obtain all necessary permits. The OEM will contact the tax assessment office to place a lien on the property. The contractor is required to wait at least two weeks prior to starting construction in order to ensure that construction does not conclude before the lien on the property is complete. Once a project is fully constructed, the OEM will inspect it to verify that the completed scope matches what is stated in the loan documents. As is required by EIP, construction must be completed within six months.

Phase 4: Operation

Within one month of the inspection and approval, the OEM will disburse the full (or remaining) loan amount to the property owner. It is the responsibility of the property owner to pay the contractor directly. As previously noted, the EIP loan term can be up to 20 years.



Key Areas of Innovation

PACE programs, including the EIP in Palm Desert, provide property owners with an innovative no-first-cost option to finance EE and RE systems within a defined geographic region. The critical area of innovation shared by all PACE programs is their ability to utilize a tax lien to secure EE investments. Additional key areas of innovation include:

- *Financing is Attached to Property.* Removes hurdles to long-term financing at properties that have the potential for frequent turnover, as the financing terms are attached to the property and not the owner, which allows the tax to be transferred to the new owner upon sale; and
- *Secure Loans.* Provide lenders with the added security needed to offer property owners long repayment terms (up to 20 years) to finance a project.

PACE programs can also utilize a city or a municipality's strong credit to provide property owners with a lower cost of financing than they otherwise might receive.

Barriers to the Expansion of PACE

Although PACE initiatives remove first cost barriers for property owners, they do not address challenges that a local entity faces in securing capital to fund projects and cover program administration expenses. For public bond issuances to be cost effective, a large volume of projects first need to be in place (typically in excess of $10M in projects). This creates a need to secure interim financing that can add to the cost of PACE initiatives as a program works to amass a large number of projects for an initial bond.[22] From a policy perspective, state-enabling legislation allowing for the creation of a financing district is first needed before a city or county can pursue a program. The time, effort, and legal expertise required on the part of a city government to get PACE legislation in place can be significant. Further, PACE programs must also address and overcome concerns currently being raised by the mortgage industry regarding the placement of a priority tax lien on a property. Lastly, although PACE programs cast a broad geographic net in terms of their coverage, the implementation of projects could be a challenge outside of communities having demonstrated a commitment to clean energy and a significant population of middle to upper income households.

On-Bill Financing (San Diego Gas & Electric Program)

Overview

On-bill financing ("OBF") provides customers with a means to finance EE upgrades without incurring any associated up-front costs. Under OBF, a utility provides its customers (typically small- or medium-sized commercial end-users) with an unsecured loan that covers 100% of EE equipment and installation costs. The customer then pays the loan via an OBF surcharge that is added on to the regular utility bill. Energy savings realized from the EE project typically equal or exceed the monthly OBF loan repayment obligation.

OBF is not a new concept for the EE marketplace, with utilities in California, Connecticut, Rhode Island, Massachusetts, and other states having offered different variations of OBF for more than 10 years. However, its application has been limited in its scale and fragmented in its application. The California Public Utilities Commission ("CPUC"), in its September 2009 decision, placed a strong emphasis on the expansion of uniform OBF programs by the state's investor-owned utilities. During the upcoming 2010 to 2012 period, over $41.5M in new lending authorization (excluding funds that will replace the original capital sources used for initial loans during 2006-09) will be allocated to OBF program loan funds in California.[23] This paper will focus on San Diego Gas & Electric's ("SDG&E") OBF program, which has the longest active track record of California utility-run programs.[24]

San Diego Gas & Electric

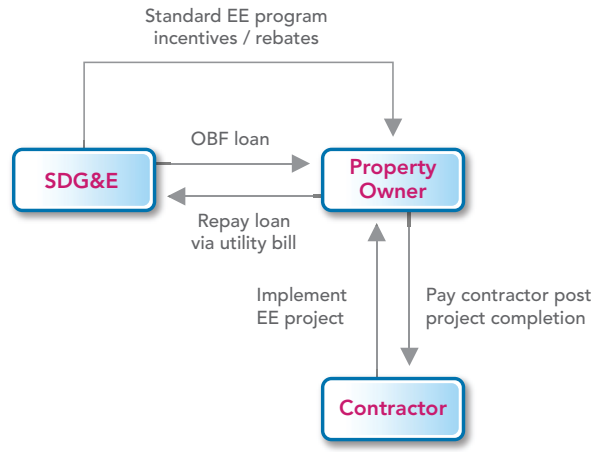
As part of SDG&E's standard portfolio of EE programs, it offers an OBF option that enables commercial property owners to avoid the up-front cost of implementing EE projects. Through SDG&E's OBF option, eligible customers can finance up to 100% of the cost of an EE upgrade through an interest-free loan that is repaid on their regular utility bill. In two years of the program's full operation, SDG&E has implemented more than 180 projects that are now operational; over a hundred more have applied and are currently in project phases from pre-inspection to installation.

For customers to be eligible for OBF, they must first be enrolled in one of the following SDG&E programs that offer either rebates or incentives for comprehensive EE projects: Small Business Super Saver, Express Efficiency, Standard Performance Contract, Energy Savings Bid, Multi-Family Rebate, or Utility Third Party Programs. In this manner, SDG&E's standard EE programs serve as a "gateway" for customers to benefit from OBF, which finances the remainder of the required capital to implement a project after the incentive or rebate amount is excluded.

SDG&E encourages customers to pursue comprehensive EE retrofits under its OBF options. In reviewing an application, if the EE project does not include two or more distinct measures, the rebate an OBF customer receives will be reduced by 10%. However, despite the reduction in the allowed incentive, more than 90% of OBF loans have been for lighting-only projects.

SDG&E works with a wide range of contractors who identify the technical scope of a project, assist customers in securing standard EE incentives and rebates, and prepare OBF application materials. Within SDG&E, there is a three-member staff that administers most of the OBF program, with some additional internal staff help with administering rebates / incentives, engineering, inspections, and billing / IT support. Figure 5 shows the streamlined structure in which loans are made and projects are implemented under the OBF program.

Figure 5 - OBF Roles & Responsibilities



Financing Mechanism / Structure

Under SDG&E's OBF, a customer can receive up to 100% financing that covers all front-end EE equipment and installation costs. Loan repayment terms are individually structured for each project such that the customer can achieve bill neutrality (i.e., a customer's loan repayment will be sized to approximately equal the expected level of realized energy savings). The OBF loan is offered at zero percent interest with the repayment terms and loan size varying based on the type of customer and the estimated simple payback period of the EE project as follows:

- For private commercial customers, the OBF loan minimum is $5,000 per meter and the loan maximum is $100,000 per meter with a maximum loan term of five years or economic useable life, whichever is shorter.
- For taxpayer-funded customers (e.g. schools and government buildings), the maximum loan amount is $250,000 per meter with a maximum loan term of 10 years or economic useable life, whichever is shorter.

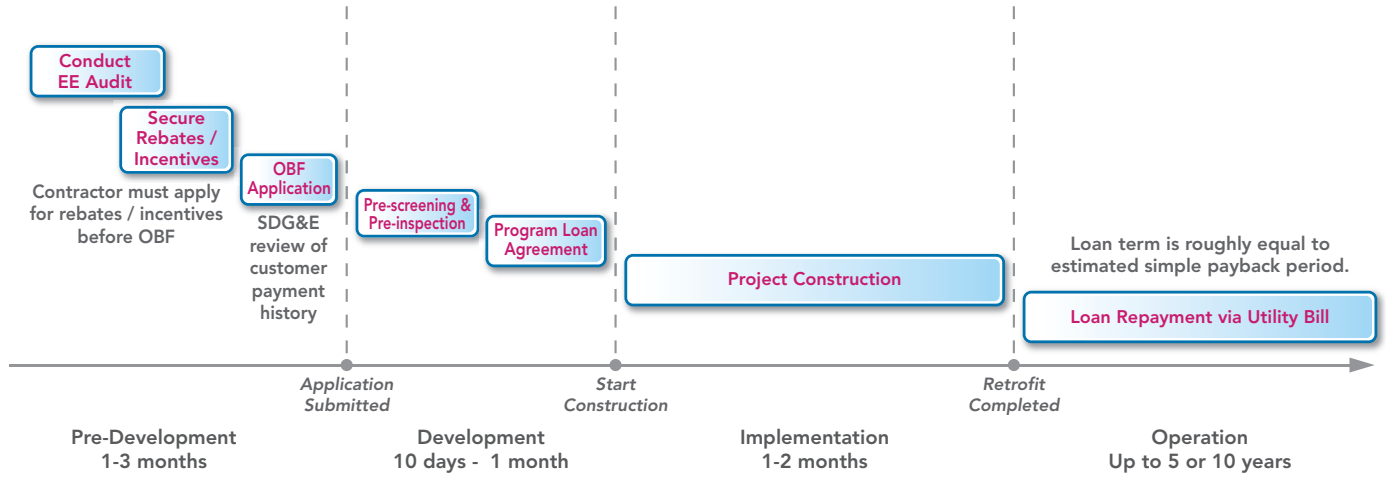
Customers are restricted to one loan per meter but are eligible to receive more than one loan per building. Upon any potential transferring of ownership of the property or closing of utility account, the customer must pay off the remaining balance on the OBF loan. In the almost three years that SDG&E has offered OBF to its customers, the total default rate has been below one percent.[25]

As part of SDG&E's 2006-2009 EE portfolio, Sempra (SDG&E's parent company) provided $5M in working capital to fund OBF loans. For the 2010-2012 EE portfolio, SDG&E is seeking approval from the CPUC to secure a $9M revolving loan pool that would be funded through rate-payer money rather than working capital.[21] This rate-payer funded revolving pool would be replenished by the receipt of loan payments from customers that would then be utilized to make new loans. Loans that go into default would be considered costs to the program and would be an expense that SDG&E would recover from Public Purpose Program funds.[26]

Project Development

The initial marketing and recruitment of customers for SDG&E's OBF program is primarily carried out by local EE contractors who conduct energy audits and enroll customers in one of SDG&E's standard EE incentive and rebate programs. The project development timelines can vary under different programs, with incentive-based programs having a longer and more detailed verification process.[27] Figure 6 shows the typical time period in which initial contact with a customer is made to the ultimate implementation of a project using OBF.

Figure 6 - OBF Timeline



Phase 1: Pre-Development

As part of their interaction with customers, EE contractors present OBF as a financing option for EE projects. The contractor works with the customer to determine which EE measures will be included in the project scope prior to submitting an OBF application. Though not required, SDG&E encourages customers to obtain more than one contractor bid on an EE project to help ensure competitive pricing.

Realizing that contractors are a strong channel for implementing OBF, SDG&E provides training for contractors, covering the following topics: key OBF application steps, customer eligibility criteria, approved types of EE measures, contractor invoicing requirements, and added potential EE rebates/incentives from SDG&E. To date, about 90% of the contractors who have participated in OBF specialize in lighting systems.

As a prerequisite for OBF approval, the customer must first secure a rebate or incentive from one of the previously mentioned standard EE programs (the contractor typically assists the customer in reserving the rebate/incentive money for the project). As a last step in the pre-development, the contractor completes and submits the OBF application, with the assistance of the property owner.

Phase 2: Development

SDG&E conducts an initial screen of an application to ensure that the customer has an account in good standing. Once completed, SDG&E will conduct an on-site pre-inspection to verify that the project scope is technically sound and that EE cost and savings estimates are reasonable. As part of the requirements for the incentive programs, the project may have already undergone a pre-inspection by an SDG&E employee. In that case, OBF staff will not do any additional pre-inspection.

Following the on-site inspection, SDG&E will prepare the loan documents. This includes a calculation of the allowable loan repayment period, which is based on the annual estimated energy savings. Specifically, the loan term will be set equal to the simple payback period (subject to applicable loan length caps) plus one month, which is added to help ensure bill neutrality for the customer. The loan agreement is then sent to the customer for review and signature. Upon the loan closing, SDG&E will add a loan repayment line item on to the customer's bill.

Phase 3: Implementation

Following the signing of the loan agreement, the contractor will begin installation of the EE project. Once installation work activities are complete, the contractor will send final documentation to SDG&E, signifying that the EE project has been fully implemented. SDG&E will then conduct a final post-inspection to verify that the project was implemented according to the terms of the loan agreement. If needed, the loan will be adjusted to reflect any deviations from the original project scope.

Phase 4: Operation

Once construction and post-inspection activities are completed, the EE project moves into the operational phase of OBF. The rebate/incentive and loan checks are issued to either the contractor or customer, whomever is specified in the loan agreement, after the construction is completed. The customer will continue to pay his utility bills as before. However, their bill will have an extra charge reflecting the regular repayment installments for the OBF loan.

In any potential future transfer of property ownership or closing of an SDG&E account, the owner is required to pay off the full balance of the OBF loan. In certain circumstances, it is possible that loan payments could be transferred to a different property location provided that it has the same owner (e.g., an owner moves their business to a new location within SDG&E's service area). SDG&E retains the right and ability to discontinue service to customers who are delinquent on their OBF payments.

Key Areas of Innovation

SDG&E's program offers customers a comprehensive financing solution that contains several areas of innovation that help advance the use of OBF as a means to accelerate the adoption of EE, particularly for small business customers. Key areas of innovation include:

- *Contractor Training and Market Outreach Programs.* SDG&E conducts regular workshops for local contractors to help them understand the mechanics of OBF, which allows contractors to help promote and market the program to customers;
- *Incentivizes Comprehensive Measures.* SDG&E offers increased incentives to participants who implement projects with multiple EE measures. Although added steps need to be taken, this program element helps promote the implementation of whole-building EE retrofits; and
- *Flexible IT/Billing System.* In 2007, SDG&E upgraded its IT/Billing System to enable third-party services that can include a line item for an OBF surcharge or any non-utility charge (e.g., cable TV, etc.). Having a flexible, automated billing system already in place minimizes the expense and time that SDG&E would otherwise face using an internal manual billing arrangement.

Barriers to the Expansion of OBF

The broad-based adoption of OBF is constrained since many utilities are reluctant to perform what are considered traditional banking functions for customers, which can also require actions to comply with state consumer lending laws. Further, utilities (and their regulators) are reluctant to take-on any risks associated with making loans to customers using their own capital or ratepayer funds. Utilities, like SDG&E, that offer OBF limit their risk in part by requiring short repayment periods, typically five years or less which can make comprehensive EE retrofits challenging. Further, depending on a utility's tax treatment, loan funds can be subject to state and federal tax burdens which can increase the cost of an OBF program. Depending on regulatory guidelines, the additional tax burden to the program may reduce the OBF program cost-effectiveness. Finally, with some utilities, the required modifications to internal billings systems can be complex.

Aggregated Deployment of Thermal Energy Storage Systems (Ice Energy)

Program Overview

Ice Energy has developed an approach to selling aggregated blocks of thermal energy storage ("TES"), and the associated load shifting benefits, to utilities that fund the implementation of individual projects at customer facilities within their service territory.[28] Under this model, an electric utility agrees to purchase, own, and operate a large portfolio of thermal energy storage systems. The TES systems are installed at customer facilities that provide the utility (and Ice Energy) with access to their rooftops and allow the systems to be integrated with their existing HVAC system. The utility funds 100% of the installation costs and takes title to the TES assets. The value proposition of this program is diverse:

- Benefits to electric utilities include: (1) reduced on-peak electricity consumption through aggregated deployment of TES assets, (2) avoided transmission & distribution (T&D) losses, (3) rapid, location-specific, deployment that eases bottlenecks in the grid, (4) increase in ratebase that generates a rate-of-return on equity, and (5) potential compliance with local Renewable Portfolio Standards (RPS).
- Benefits to customers / host facilities include: (1) no up-front cost for retrofit, and (2) reduced peak demand (kW) and associated lower utility bill.

Although TES is not always recognized as an efficiency measure, Ice Energy's program is recognized in this paper alongside more traditional forms of EE for a number of reasons.[29] First, a TES project can serve as an anchor measure for additional efficiency improvements, which typically include upgrades to the associated HVAC system. Second, TES enhances the overall efficiency of delivering electricity to energy end-users by generating energy during cooler, nighttime hours and reducing T&D losses. Lastly, the overarching program developed by Ice Energy that deploys large numbers of smaller-sized projects to individual customers (including the often hard to reach small business and small commercial customers) is a replicable model that can be applied to other EE technologies and measures throughout the country.

The TES unit being deployed under this model is called an Ice Bear, which generates ice during off-peak hours (nighttime) and then uses this ice during the afternoons to cool the refrigerant in a customer's HVAC system.[30] Ice Bears can be installed at most customer facilities less than three stories and using a standard packaged rooftop air conditioning unit. A single unit can serve up to five tons of cooling load; multiple units can be configured to meet loads up to 20 tons. While the customer profile under this program varies, it has addressed several hard-to-reach small business and commercial market segments, including: fast food, pharmacies, theaters, and other retailers. Units can be installed either on rooftops of commercial buildings, alongside the HVAC units with which they interface, or on the ground next to the building. Each individual Ice Bear unit can be remotely controlled and dispatched, which could also provide the participating utility with enhanced demand response capabilities on a case-by-case basis.[31]

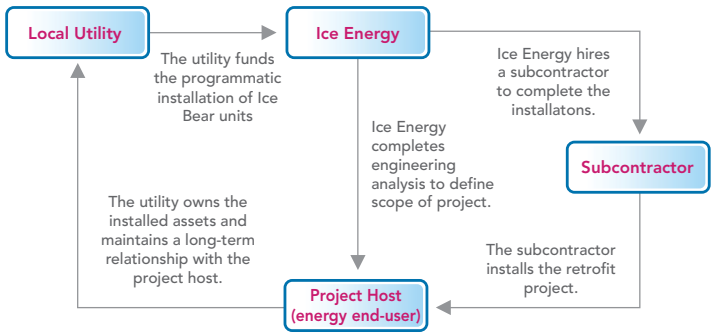
Financing Mechanism / Structure

Under this program, an electric utility is financing an aggregated block of TES units. These programs can be included in the rate base of a utility and therefore represent recoverable costs that will be repaid to the utility over time through regular electricity rates. The financing structure utilized by a participating utility can vary, ranging from private sources of funds to municipal funding via a tax-exempt bond or capital lease, or ARRA grants. In some cases, a utility may prefer to procure the TES resources via a services agreement similar to a Power Purchase Agreement (PPA). Regardless of the utility's procurement strategy, all equipment and associated installation are all completed at no-first-cost to selected customers.

Figure 7 provides an overview of the roles and responsibilities of key stakeholders under the program.

Ice Energy announced the first program with Redding Electric Utility in August of 2009.[32] By purchasing and installing 1,000 units within their service territory, the local utility estimates it can reduce peak load by 7 MW. This reduction exceeds the planned peak load growth and reduces the utility's exposure to higher peak energy pricing. All energy end-users that host an installation for this program are not required to spend any capital, but retain the benefits of reduced on-peak energy consumption. Recently, Ice Energy has continued to roll out this model by announcing a 53 MW program with Southern California Public Power Authority.[33]

Figure 7 - ICE Energy Roles & Responsibilities



Program and Project Development

The remainder of this section provides a summary of (1) the sequencing of key steps to develop the overall programmatic framework with a utility (Figure 8, shown on the following page), and (2) the installation of individual TES units within the context of that program.

Phase 1: Pre-Development

The pre-development phase centers on establishing a programmatic agreement with a local utility to design and roll out TES units to target a pre-defined MW capacity. Depending on the motivating factor for the utility, different departments within the utility may take the lead in pre-development activities. Key utility departments include Integrated Resource Planning, Transmission and Distribution, Generation, Renewables, and Smart Grid. Prior to signing an agreement, the utility will identify the program financing source and obtain any required regulatory approval. Once a program agreement is secured, Ice Energy will work with the participating utility to:

- Conduct preliminary survey project opportunities within a utility's service area;
- Develop and agree upon project-level contracts to be utilized with customers; and
- Identify preferred / qualified contractors.

Phase 2: Development

Under the development phase, a collaborative effort is made by the utility and Ice Energy representatives to identify and engage potential customers and sell the value proposition of hosting a TES system. Once an agreement is made with an individual customer, preliminary engineering activities will commence with a site visit that could include the potential identification of additional HVAC-related EE measures. The identified savings is always site-dependent and varies based on the existing HVAC equipment and configuration as well as the end-use cooling load profile of the customer. After a customer has been engaged and preliminary engineering has commenced, the utility may use this as an opportunity to expand the scope of the project to include other energy efficiency and demand response programs / incentives. On average, development activities will last three months in duration; actual time varies depending upon size of deployment.

Phase 3: Implementation

The implementation phase closely resembles the installation cycle of traditional EE projects, with the exception that individual project construction will be sequenced as part of aggregated avoided capacity blocks, (i.e., combining the avoided demand (kW) from numerous individual projects into one large single block of avoided capacity). Ice Energy will hire a subcontractor to install units at customer facilities. Installations are typically phased in over a 24 to 36 month period with each installation typically requiring two to three working days.

Phase 4: Operation

As part of the initial program sales contract with a customer, Ice Energy will continue to operate and maintain the TES units at no cost to the customer. The costs of providing these ongoing maintenance services are included in the original purchase price paid by the utility. Through the site lease agreement obtained by the utility, the customer will continue to provide site access and maintenance support for the HVAC unit. Once a TES unit is operational, during each night, a self-contained ice charging system freezes 450 gallons of water in the insulated tank, while a small condensing unit pumps refrigerant through a configuration of copper coils within it. The water that surrounds these coils will freeze and turn to ice. Once frozen, the condensing unit of the TES turns off, and ice is stored. During the afternoons, the Ice Bear unit uses the ice to cool the HVAC system's refrigerant. This thermal discharge cycle will last for at least six hours. After the ice has fully melted, the HVAC system's compressor provides cooling, as needed, until the next day.

Key Areas of Innovation

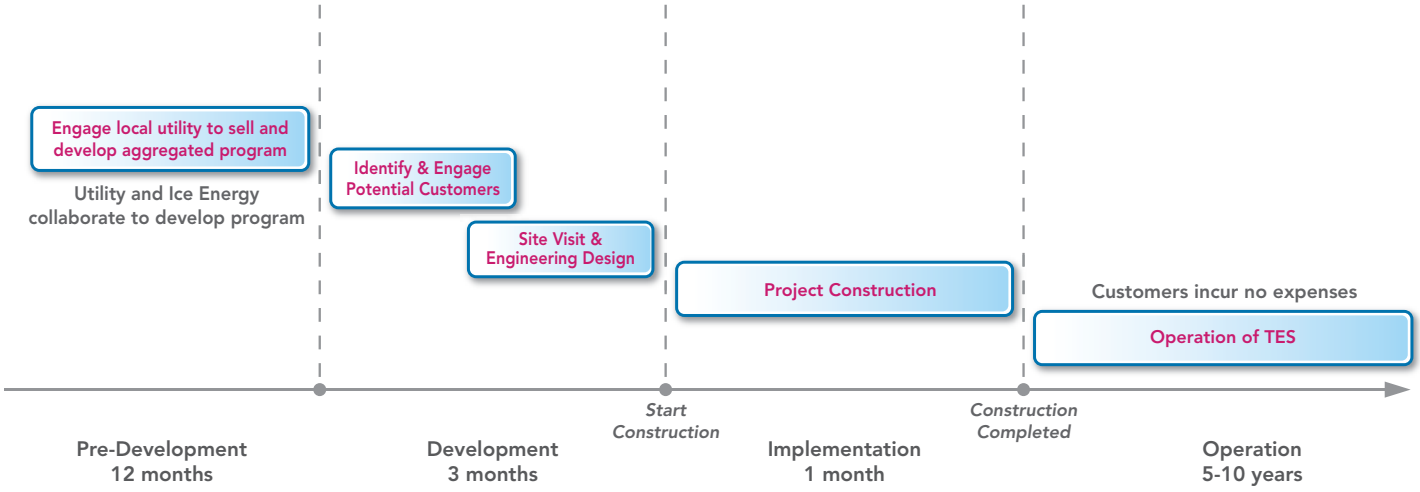
Ice Energy's model of a large scale deployment of individual TES units contains several key areas of innovation, including:

- *Utility Offering to Own Distributed Resources for End-User.* The Ice Energy programmatic approach is built to target utilities as the actual customer of distributed TES assets. Under this program, utilities fund and take title to the TES units that are installed within their service territory at end-user facilities;
- *Expand Market Opportunity for EE.* Installation of the Ice Bear requires integration with the existing HVAC; it often is economical to expand the scope of work, and encourage facility managers to replace older HVAC units with new, high-efficiency models; and
- *Aggregating TES for Grid-Scale Efficiency.* When load is shifted from hotter, on-peak hours to cooler, off-peak hours, losses throughout the entire energy system (generation, transmission, and distribution) are reduced. The net effect allows a 50% increase in the source fuel utilization efficiency.[34]

Barriers to the Expansion of the Aggregated Deployment Model

Several barriers prevent wider scale deployment of TES technology through this business model. As discussed, the model requires the utility to fund the project cost and ultimately own the assets. This requires the utility to solicit the approvals required to both make this funding available and to put the assets on their balance sheets. The longer-term ownership of the assets further requires the utilities to play at least a supervisory role in operations and maintenance. From a regulatory perspective, the value of demand shifting must be quantified and the resource needs to be recognized as a viable alternative to more traditional supply-side resources. In addition to these utility and regulatory hurdles, like any other energy efficiency program, the administrators must identify and secure a scalable number of site hosts to drive the penetration of the installations.

Figure 8 - ICE Energy Timeline



Efficiency Services Agreement (Metrus Energy)

Overview

Metrus Energy ("Metrus") provides capital, project development, and asset management services for EE projects at large industrial, manufacturing, and commercial facilities.[35] Metrus provides 100% financing to implement projects using its Efficiency Services Agreement ("ESA") structure whereby customer repayments are made on a cost per avoided unit of energy basis. ESA contracts are typically less than 10 years in duration with customers having periodic buyout options during the term of the agreement.

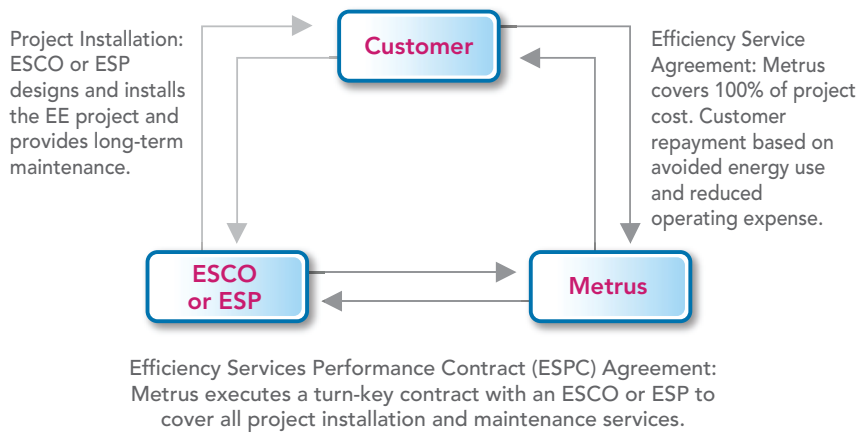
Metrus's ESA builds on the historical utilization of PPAs to finance large-scale private power projects and, more recently, renewable energy projects. Projects implemented under an ESA vary in size and cost, with typical investments ranging from one to 10 million dollars. ESCO and ESP partners help identify project opportunities for Metrus as well as conduct energy audits, construct projects, and provide ongoing maintenance services on EE assets. In early 2010, Metrus closed an EE retrofit project with a large multinational industrial firm under its ESA structure.

Financing Structure

Metrus serves as the financier and owner of EE assets and it partners with ESCOs and ESPs to carry out required project installation and maintenance activities. As illustrated in Figure 9, Metrus finances and develops EE projects via two key contractual agreements that it enters into with a customer and a service provider.

Metrus enters into an ESA with customers to cover all engineering, design, construction, equipment, installation, maintenance, and ongoing monitoring costs associated with an EE project. The ESA is structured to enable customers to avoid all capital outlay associated with the implementation of EE measures. Customer payments are made on a quarterly or semi-annual basis and reflect the energy and operating savings realized by a project. ESA payments are denominated on a cost per avoided energy unit basis (e.g., dollars per avoided kWh of electricity or dollars per avoided therm of natural gas, etc.) and are set below a customer's baseline utility costs. Measurement and verification (M&V) protocols for the calculation of energy savings on each project are codified in an exhibit to the ESA and are agreed upon with customers prior to signing a contract.

Figure 9 - Metrus Energy Roles & Responsibilities



In parallel to signing an ESA with customers, Metrus enters into an Efficiency Services Performance Contract (ESPC) agreement with a service provider. The ESPC covers the engineering, procurement, and construction (EPC) scope of work on a project as well as ongoing maintenance and M&V services that the selected service provider will conduct once an EE project is operational.

Key elements of EE projects financed using Metrus's ESA include:

- *Ownership of Project Assets.* Metrus holds title to EE assets during the ESA contract period. At contract end date, customers have an option to purchase a project's assets at fair market value.

- *Pricing.* The ESA services charge is set as a cost per unit of avoided energy. An escalation schedule for the services charge, based on a constant percentage rate, is defined in the ESA.
- *Contract Length.* ESA contract periods can vary but typically range from five to 10 years.
- *Measurement & Verification.* An M&V plan is set forth in each ESA contract with customers and is typically prepared semi-annually or quarterly. The M&V report is the basis for calculating customer invoices.
- *Performance Guarantees.* To mitigate project performance risks, Metrus works with service providers that offer a performance guarantee on a portion of the expected energy savings.

Project Development Process

Although each individual project contains unique combinations of EE measures for the specific customer and facility, Metrus applies a consistent series of project development activities, ranging from the initial sourcing of qualified leads to the execution of an ESA and ESPC. As illustrated in Figure 10, shown on the following page, the typical timing to develop a project—from the pre-development phase to the start of project implementation / construction—can be up to nine months.

Phase 1: Pre-Development

Metrus sources investment opportunities primarily through partnerships with ESCOs and ESPs but also engages in direct sales efforts that focus on national accounts and business and industrial associations. Investments are pre-screened for type of facility, age of equipment, cost of energy, and customer credit. During this initial phase, a preliminary energy audit will be completed over a four to six week period by the selected service provider that includes a one to two day on-site assessment by a team of EE engineers. The typical timing of pre-development activities is one to three months.

Phase 2: Development

With the results of the preliminary audit in-hand, the engineering team of an ESCO/ESP and Metrus will establish a project development plan to complete a detailed, investment-grade energy audit. This includes identifying the collection of any required facility data, schematic designs, and measuring the performance of key energy consuming equipment. The detailed audit includes comprehensive estimates of the annual energy savings and installation costs for each potential individual EE measure. Prior to finishing the audit, the service provider will also prepare the scope of work and associated cost for any required ongoing maintenance and M&V services. The ESCO/ESP engineering team will work with Metrus and the customer to define the methodology and calculations to regularly measure and verify savings once the project is operational. The typical timing of development activities is three to six months. At the end of this development stage, Metrus will establish a special purpose entity ("Project LLC") for each EE project that, prior to construction, will be funded with equity and debt.

Phase 3: Implementation

Metrus arranges the financing to complete the equipment, procurement, and construction (EPC) of the project. The service provider will construct the identified EE measures over an implementation period that is typically six to nine months depending on the complexity of the project. The construction of the project will be carried out as part of a fixed price, turn-key contract. The service provider will be paid by the Project LLC construction facility on a progress payment basis as individual EE measures are installed.

Phase 4: Operation

Once a project is operational, construction financing within the Project LLC will be replaced by a permanent financing structure that is comprised of term debt and Metrus equity. The Project LLC will receive payments from the customer in return for realized energy and operational savings. The Project Company will utilize these payments to service debt, to pay the ESCO/ESP for ongoing maintenance and M&V services, and to pay remaining available funds as dividends to Metrus and its capital partners.

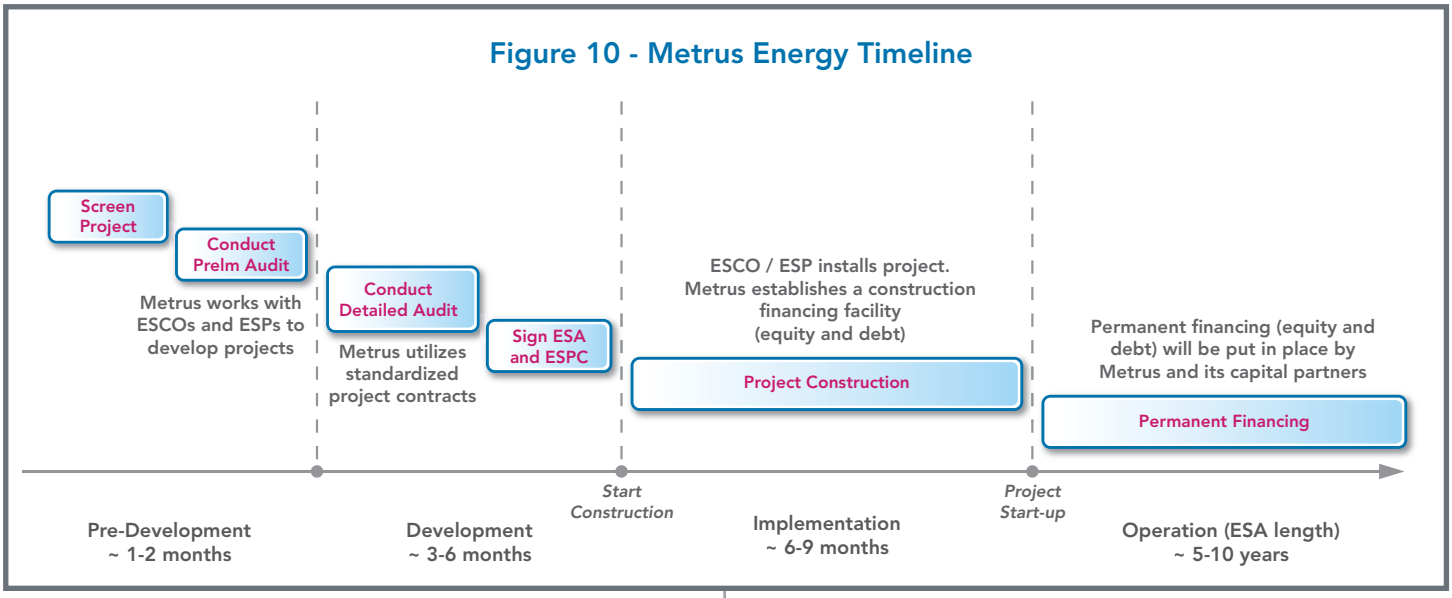


Figure 10 - Metrus Energy Timeline

Key Areas of Innovation

Metrus's ESA contains the following key innovations that remove project development barriers:

- *Contract structure.* Creating a PPA-like structure for efficiency retrofit projects that enables customers to avoid all capital outlay associated with the implementation of EE measures;
- *ESA charges based on savings.* Denominating service charges paid by customers on a cost per avoided unit of realized energy basis that makes ESA payments equivalent to paying a traditional utility bill/operating expense; and
- *Aggregation of multiple measures.* Utilizing a standardized contractual structure that allows for multiple EE measures to be included into a single project and project-level debt to be arranged on a portfolio basis.

Barriers to the Expansion of Metrus' ESA

Although the ESA draws on the well established track record of the PPA structure and performance contracting agreements, it is a relatively new product that requires significant front-end customer and ESCO sales force education. Further, the attractiveness of the ESA is constrained by the poor depreciation treatment of EE assets in commercial facilities, which are typically classified as general building items by the IRS and depreciated on a straight line 39-year property basis. In addition, third-party owners of EE assets like Metrus are not allowed to claim the EPACT tax deduction for EE equipment per Section 179D of the Internal Revenue Code. Lastly, Metrus faces traditional challenges in securing outside sources of debt that are highly risk averse under current market conditions and often are unfamiliar with both the ESA structure and general make-up of EE projects.

Managed Energy Services Agreement (Transcend Equity)

Overview

Transcend Equity ("Transcend") works with large commercial property owners to facilitate the installation of EE improvements that can improve real estate investment yields, increase shareholder dividends, and ensure continuing tenant comfort. Transcend implements EE projects through its Managed Energy Services Agreement ("MESA") program that enables efficiency measures to be installed without using landlord capital or increasing tenant's operating expenses.[36]

Transcend works with a range of ESPs and mechanical, electrical, and plumbing contractors to install EE projects. Although Transcend works with third-party service providers, it often conducts engineering, design, and monitoring services using its own staff. After evaluation and installation, Transcend then assumes the responsibility for paying a property owner's energy expenses for a period up to 10 years.

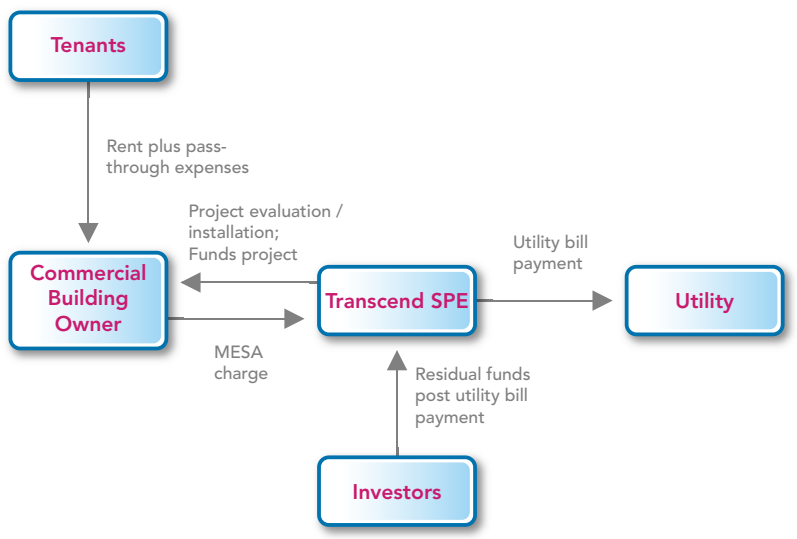
As illustrated in Figure 11, the property owner (the customer) agrees to pay an amount that is equal to the historical costs of the energy services replaced by Transcend during the term of the agreement (e.g., an agreed upon average cost of historical energy bills). Transcend sets its charge at a level that will be expense neutral to the customer. This charge is then utilized by Transcend to pay all future utility bills and to generate a return on the EE investments that it makes at a property. During the contract period, Transcend has the ability and right to adjust the customer's payments to account for potential changes in weather, occupancy, usage, and energy rates.

Transcend has executed projects with one public real estate group – Corporate Office Properties Trust ("COPT") in Columbia, Maryland (NYSE:OFC) which has numerous buildings under MESA.

Financing Structure

The MESA structure overcomes two key barriers: (1) it enables building owners to implement EE projects without any capital expenditure; and (2) it allows building owners to pass through MESA charges to tenants' energy costs as operating expenses.

Figure 11 - Transcend Equity Roles & Responsibilities



Step 1: Transcend forms a special purpose entity ("SPE") to provide energy services to the commercial building owner.

Step 2: The SPE enters into an agreement with the building owner. Pursuant to terms under the agreement, Transcend will facilitate and manage the installation of EE equipment by ESCOs and ESPs.

Step 3: The building owner makes monthly payments to the SPE equivalent to the agreed upon historical energy expenses. The resulting annual energy savings are utilized to pay utility bills and provide investors with a return on their investment.

Project Development Process

EE projects developed under the MESA structure follow a traditional two-stage evaluation/energy audit process. As illustrated in Figure 12, the timing to develop a project (up to the start of construction) can range from six to nine months.

Phase 1: Pre-Development

Transcend typically identifies EE projects through internal business development efforts, including performing preliminary energy audits at customer sites. Preliminary audits are performed at no cost to customers and contain estimates of potential energy savings measures that are utilized to secure a customer's commitment (through a letter of intent) to proceed to a more detailed phase of evaluation. The typical timing of pre-development activities is one to three months.

Phase 2: Development

During the development phase, an investment-grade energy audit will be performed by Transcend in cooperation and with direct input from the selected ESPs. Transcend will model a building's baseline energy use in order to calculate its historical energy expenses and to select the key occupancy and weather-related variables that will be utilized to periodically adjust the customer's charge once a project is operational. The customer charge will be equivalent to the historical energy usage of the building and will be verified by an independent third party prior to entering into the agreement. During this phase, Transcend will also work with outside capital partners to secure and arrange funding. The typical timing of pre-development activities is three to five months.

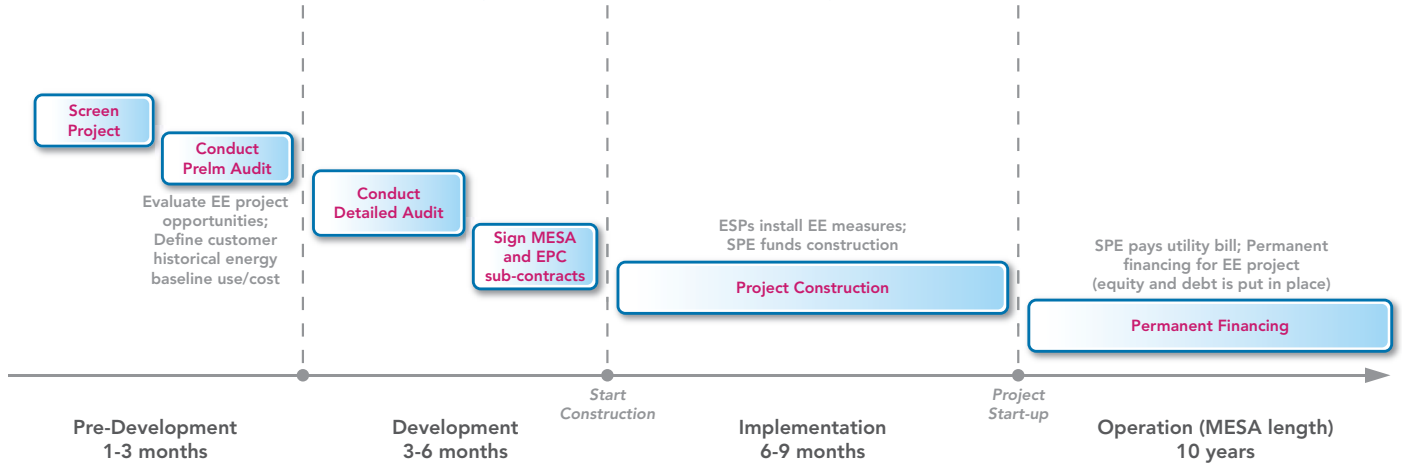
Phase 3: Implementation

Transcend will oversee the construction of an EE project or hire a third-party construction management firm to implement a project on its behalf. The direct implementation of individual measures will be carried out by a series of different EE contractors and equipment providers. Transcend often prefers working with HVAC, ESCO or other service providers that the building owner has utilized to implement previously successful projects (for example, vendors used for repairs or during original construction). Implementation time varies according to the complexity of the project, with construction periods typically ranging from six to nine months.

Phase 4: Operation

Once a project is operational, tenants continue to pay their portion of the energy services to the building owner. Since the MESA payment replaces the building's utility bills, the cost of these energy services continue to be a pass-through to the building owner's tenants. The building owner pays the charge to the SPE in an amount approximately equal to the historical energy expenses for the property. An outside payment collection agent (i.e., an independent bank) will collect the MESA charges and then first pay the local utility company(ies) to cover current energy consumption costs; second, the SPE will be paid any residual funds that result from energy savings which provide a return for the investors. The operational phase of the MESA can last up to 10 years.

Figure 12 - Transcend Equity Timeline



Key Areas of Innovation

The MESA structure being offered by Transcend addresses three key barriers to EE project development at large commercial properties, namely:

- *Split Incentive Barriers*. By enabling building owners to avoid any capital outlay and to pass along charges to occupants (per the standard commercial lease terms), the MESA structure helps remove the split incentive problem that EE investments often face within multi-tenant commercial properties. Split incentives between the economic interests of property owners and tenants are particularly acute in the commercial real estate industry and can prevent a building owner from incurring the front-end costs associated with purchasing EE equipment because they do not bear the burden of paying energy bills for their property;
- *Limits Repayment Risk*. It minimizes risks by securing EE transactions against a customer's utility bill and not EE equipment. In essence, an investor's risk is the same as the utility's risk, and building owners are more likely to pay their utility bill than debt service; and
- *Flexible Offerings that Can be Customized*. Further, Transcend also utilizes a developer model to build EE projects that allows a customer to use as much, or as little, of the developer's services as they feel is required for a project. Specifically, a customer can elect to have Transcend provide a full suite of EPC and maintenance services or it can have Transcend work with an individual contractor or equipment provider that it has utilized in the past.

Barriers to the Expansion of Trancend's MESA

Transcend's MESA structure is new to the EE marketplace and requires significant building owner education, which can lengthen the sales and project development cycle on projects. Challenges associated with front-end education of building owners are also compounded in the multi-tenant facilities that Transcend often targets. Specifically, the education of individual tenants either further delays a project or causes building owners to become reluctant to move forward out of a concern that tenants will not adequately understand or accept the MESA structure. Lastly, the downturn in the financial health of the real estate industry, coupled with the financial instability of many commercial building assets, has made Transcend's efforts to source debt and equity for projects significantly more challenging.

Section 4 Conclusions & Recommendations

The six case studies presented in this paper represent current trends in the marketplace for EE. Table 3 provides a snapshot of their market coverage as well as a categorization of the innovative elements of each financing option related to their ability to achieve scale, put forth new financing structures, and spur project implementation.

Although these financing options provide broad coverage of the efficiency marketplace and contain key areas of innovation, further adaptations and advancements are needed. Listed below is a series of recommendations that can expand the potential benefits associated with the utilization of these EE financing options as well as help guide the development of other yet-to-be-created financing products.

Adjust on-bill financing programs to foster more comprehensive EE projects. The terms and conditions of most utility on-bill financing programs indirectly encourage the implementation of single measure EE projects.

Table 3 - Summary of No-first-cost EE Financing Options

Market Segment	Program / Mechanism	Key Areas of Innovation		
		Scale	Financing	Project Implementation
Residential	Clean Energy Works program (Portland, OR)	✓ Uniform offering within large geographic area ✓ Use of CDFI expands base of homeowners that receive loans	✓ CDFI role helps secure enhanced financing terms ✓ Loans repaid on utility bill	✓ Customized technical assistance to homeowners ✓ Lower interest rates for comprehensive EE projects
	Property Assessed Clean Energy program (Palm Desert, CA)	✓ Uniform financing for all projects within the city limits ✓ Can finance diverse group of EE and RE measures	✓ Tax lien adds security to enable projects to receive attractive long-term financing	✓ Leveraging the existing utility city-wide EE program provides a solid framework for PACE (contractors & incentives)
Small & Medium Commercial	On-bill Financing program (SDG&E)	✓ Contractors are marketing channel to customers ✓ Higher incentives for comprehensive EE projects	✓ Revolving OBF loan pool that utilizes rate-payer funds ✓ OBF loan period calculated to ensure customer bill neutrality	✓ OBF linked to other SDG&E EE incentives/technical assistance ✓ Flexible IT/billing system eases addition of new projects
	Aggregated Deployment of Thermal Energy Storage (Ice Energy)	✓ Utility is a mass distribution channel to customers ✓ Aggregation model can be applied to other EE measures	✓ Financing bundled portfolio of projects enables program to be financed at lower cost of capital	✓ ICE Energy is responsible for implementation of retrofit plus ongoing maintenance
Large Commercial & Industrial	Efficiency Services Agreement (Metrus Energy)	✓ ESA structure can be easily replicated at multiple facilities ✓ Channel partners help source large number of projects	✓ Off-balance sheet transaction ✓ PPA-like pricing structure using a cost per avoided energy unit ✓ Consistent M&V protocols	✓ ESA is agnostic to different EE technologies or service providers ✓ Promotes integrated EE
	Managed Energy Services Agreement (Transcend Equity)	✓ Helps remove split incentives for commercial tenants ✓ Structure can be replicated for multiple buildings	✓ Utility bill, not equipment, is security for EE project financing ✓ Annual payment is adjusted for changes in key variables	✓ Customer can opt-in/out of implementation services ✓ Incorporates both EE and non-energy facility improvements

Specifically, caps on the length of loan repayment periods and maximum project size tend to steer OBF's use to primarily low-cost, quicker payback period measures such as lighting and control systems. Program guidelines that often restrict the use of OBF to projects with a narrower scope are driven in part by the requirements of cost-effectiveness tests that utility EE programs must adhere to as well as reluctance on the part of utilities to put shareholder or rate-payer funds at risk. Adjusting OBF loan terms to be more in sync with the needs and time horizons of more comprehensive EE projects (payback periods greater than five years and in excess of $100k or $250k, for taxpaying customers and non-taxpaying customers, respectively) can be accomplished in part by expanding partnerships with private sources of financing and by providing added credit support to OBF programs when required. Specifically, as is currently being evaluated by California investor-owned utilities, engaging private banks to help assess individual customer credit risks and fund OBF loans will provide programs with a new added source of capital that allows utilities to focus on program marketing, project evaluation and screening, and customer billing mechanics. In addition, the use of public goods charge or state-level funding (perhaps through state energy program conservation block grants or other federal sources of funding) could be utilized to set up a loan loss reserve account that a utility OBF program could draw on in the event of customer default. This added form of credit enhancement could encourage utilities, and any participating private bank, to offer loan terms that extend out beyond the typical five years offered by most OBF programs.

Aggregation programs with utilities represent a major opportunity for multi-measure EE projects. Utilities, given the geographic focus of their business operations, are natural aggregators of customers and EE projects. Ice Energy's TES program effectively harnesses the ability of utilities to rapidly distribute individual efficiency measures en masse and bundle what would otherwise be a large number of small transactions into a sizeable, single, investment. However, to fully capture the economies of scale inherent to this type of aggregated approach, utilities and service providers should design and implement programs such that anchor technologies (like TES) can be leveraged to ensure that more comprehensive EE retrofits are undertaken. For example, contractors who are on-site at a customer's facility to install TES units under Ice Energy's program could make upgrades to the associated HVAC system. To incentivize the implementation of comprehensive EE projects, a participating utility should offer OBF in conjunction with the anchor technology to ensure that there is a no-first cost solution available to customers.

Utility or government action is required to spur EE investment in the residential and small commercial sectors. Given the small transaction size of projects, potential for the high turnover of property owners, and limited availability (and depth) of whole-building EE retrofit services, there is a strong initial need for utility or government-related intervention to jump-start these underserved markets for EE. Many of the financing programs in this paper, including CEWP, PACE programs, OBF, and the aggregated utility deployment model utilized by Ice Energy underscore this need. Utility or government involvement should be designed to stimulate — rather than crowd out — private sector participation.

Allow tax-liens under PACE programs to be utilized by outside financing sources. Under many current PACE programs, municipal bonds are issued to fund pools of aggregated "microloans" to individual property owners. Although this approach works well for smaller projects in single family residential and small commercial buildings, PACE programs could consider giving owners of large buildings (e.g. commercial, multi-tenant housing) the option to arrange their own financing from an outside, third-party source. In this scenario, the designated special tax/assessment district authority could assign the right to directly receive tax-lien payments to an outside financing group that the property owner selects. This would help prevent a single large project from using up a disproportionate amount of tax-lien program. Further, the added flexibility would help property owners receive more competitive and creative financing bids. This type of owner-arranged a tax-lien structure is currently being explored by the Clinton Climate Initiative.

Upgrade utility IT and Billing Systems to facilitate "on-bill repayment". The utility bill has long been recognized as a simple and highly efficient way for customers to repay any loans or costs incurred with the implementation of an EE project at their facility. As illustrated by the CEWP, on-bill repayment does not have to involve a utility putting rate-payer or shareholder money to use and at risk. Utilities and regulators should evaluate the development of IT/Billing System formats that can accommodate the addition of new line items that facilitate the collection of payments to third-party developers and financers of EE. Utilities should be compensated for allowing an outside party to list an EE financing line item on their bill as well as have any expenses the utility incurs associated with collection services be covered. Key items that will need to be addressed include: (1) determination of the cost effectiveness of the required IT upgrades, and (2) consultation with the third-parties who will be receiving (being paid with) funds that flow through the utility collection method (i.e., some service providers have expressed concerns about the repayment time associated with on-bill programs).

Develop loan guarantee programs that expand access to debt for EE projects. Loan guarantee programs have proven to be a highly effective tool to stimulate commercial lending in new or emerging markets, including EE.[37] Given the aggressive national targets for EE, coupled with the currently tight credit markets, the federal government, through the U.S. Department of Energy ("DOE"), should develop loan guarantee programs that provide direct project-level support for EE investments. Specifically, based on discussions with several commercial lenders, a "1705-type" program – in which the federal government guarantees 80% of an outstanding bank loan on an EE project – would help expand access to debt for third-party developers. It would also lower the overall cost of debt and enable project developers to implement larger and more comprehensive EE retrofits.[38] Elements from other programs like the Small Business Administration's 504 program could be utilized, whereby a loan guarantee is structured such that the unguaranteed portion (e.g., 20% of a loan) is paid out first to the commercial lender before the guaranteed portion of the debt is serviced. The recognition of the need for a loan guarantee for EE is gaining traction, as evidenced by the strong support for establishing the Clean Energy Deployment Administration ("CEDA") as laid out in the Waxman / Markey Bill.[39]

Engage Community Development Financial Institutions in EE financing programs. There are over 500 CDFIs throughout the U.S., with at least one in each state.[40] CDFIs are well positioned to support expanded access to EE given that they are specifically chartered to promote local economic development and environmental sustainability. Unlike FDIC-regulated banks, CDFIs have the flexibility to enter into customized financing arrangements that can provide longer term financing at rates below what most traditional financial institutions could offer. Further, CDFIs can potentially play an important role in expanding the reach of regional programs, including PACE initiatives, to under-served areas of a community (e.g., lower to moderate income property owners).

Provide EE with tax benefits that are on par with renewable energy. As noted in New Business Models for Energy Efficiency, federal action is needed to allow EE assets to receive the same depreciation treatment and tax deduction allowances as solar and other sources of renewable energy. Specifically, the following adjustments are required: (1) Section 168 of the Internal Revenue Code should be amended to designate EE property installed in or on a commercial building as five-year depreciation property, and (2) Section 179D of the Internal Revenue Code should be amended to extend the allowance of the EE commercial building property deduction to owners of EE commercial building property who are not owners or lessees of entire buildings. The extension of these tax benefits to EE would increase the attractiveness of projects at non-residential facilities.

Partner with ESCOs, ESPs and local EE contractors to identify EE opportunities. EE service providers can serve as a powerful sales and marketing tool since these firms have an active pipeline of projects and longstanding, existing relationships with customers. Partnerships with service providers can be utilized to ensure large-scale deal flow for a private EE financing company or program since service

providers have a built-in incentive to market different financing solutions given that they provide a means to sell a technology or implement a project that otherwise might go undone. It is important that the timing for structuring and closing the financing of a project be compatible with service provider and customer expectations regarding the timeline for project development and implementation.

As new financing programs establish a track record, their cost-effectiveness should be assessed. For programs that involve the use of federal, state, or utility funds, it is important that they not only address key barriers (i.e., first cost hurdles) but that they also demonstrate their ability for cost effectiveness under a total resource cost (TRC) test basis or other appropriate cost-benefit analysis.[41] Cost effectiveness analyses should include all relevant program overhead, management, and administration-related costs. For purely private sector driven solutions, such as Metrus's ESA and Transcend's MESA, the market dynamics of access to capital and end-user demand for new financing approaches will determine the ultimate value that they provide.

Next Steps

As a follow-up to the development of this paper, CalCEF Innovations will be conducting a series of meetings with targeted stakeholders, including: regulatory groups, policy-makers, investor-owned and municipal utilities, city and municipal agencies, private lenders, and equity investors. The goal of stakeholder meetings will be to: (1) discuss how no-first-cost financing options can further the objectives and support the initiatives of different stakeholder groups; and (2) solicit feedback from stakeholders on further actions that need to be taken to accelerate the implementation of EE projects under the no-first-cost financing options. Linkages will also be established with other ongoing CalCEF Innovations initiatives and programs including *Improving Access to Capital for 'First Commercial' Clean Energy Projects* and policy reforms around *Effectuating the Loading Order in California*.

CalCEF Innovations will continue to sponsor and develop a number of the ideas expressed in this paper including enabling policy reforms that accelerate the development of no-first-cost financing options. As part of our EIR program, we will incubate and potentially invest in business models and technologies that address the core challenges explored in our white paper series, and will advance policy initiatives that support the industry without favoring particular participants within it. We welcome the active collaboration of our colleagues in the clean energy field.

Appendix

Project Development Process: Clean Energy Works (Portland, OR)

Phase	(1) PRE-DEVELOPMENT	(2) DEVELOPMENT	(3) IMPLEMENTATION	(4) OPERATION
Description	After learning of CEWP through utility advertizing, contractor referrals, local press, or ETO, the prospective homeowner completes an online application form. The EA and the ETO screen the potential homeowner for their eligibility. Screening includes an initial review of the homeowner's utility bill repayment history over the last year, owner-reported energy usage, and home size.	A contractor is assigned to conduct an energy audit that identifies savings opportunities. The same contractor will eventually implement any recommended EE measures. An EA is assigned to guide homeowner through key project evaluation and program application steps. Homeowner selects a "package" of EE improvements and signs the program acceptance documents.	The contractor, with quality assurance and oversight support from the EA, procures necessary equipment and constructs all retrofits.	Homeowner repays CEWP, which then enters the SBEC revolving fund, for the EE retrofits as part of a surcharge on utility bill. The surcharge is set to be roughly equal to (or less than) the expected annual energy savings.
Duration	1-2 weeks	1-3 weeks	2-5 weeks	Up to 20 years
Stakeholders	• Customer: Complete Program application form online. • EA/ETO: Review homeowner application based on screening criteria. • Utility: Provide payment history to CEWP. • SBEC: Screen the applicant for credit and utility bill prepayment history.	• Customer: Work with EA and contractor to select EE Package and complete loan application. Sign CEWP EIP acceptance letter and loan agreement. • ETO: Assign contractor and Energy Advocate. • EA: Assist homeowner in preparing program forms. Identify and apply for any applicable EE incentives. Oversee contractor and provide quality assurance to homeowner on key EE technical and economic issues. • Contractor: Conduct energy audit. Design and propose package of EE measures. • Utility: Provide data on customer energy use and billing history. • SBEC: FICO review and income verification.	• Customer: Allow contractor access to home to implement project. Sign actual loan after construction. • EA: Oversee project implementation. • ETO: Aggregate all applicable incentives for homeowner. • Contractor: Implement the selected EE retrofit package. • SBEC: Prepare final loan documentation for homeowner. Pay contractor upon completion. Work with EA to receive any applicable EE incentives. Contact utility to set-up loan repayment on the homeowners bill.	• Customer: Continue paying utility bill. If the home is sold, the homeowner must repay the balance of the loan, or the new owner can request it to continue to appear on the utility bill. • EA: Help homeowner apply for additional tax credits. • Utility: Collect utility bills from homeowners. Distribute surcharge to SBEC. Provide ETO with on-going energy usage. • SBEC: Collect transferred surcharge from utility. • ETO: Pay out incentives shortly after construction ends, to SBEC. Track energy usage of property.
Tasks & Milestones	• Program application form • Screen application	• Detailed energy audit • Selecting EE "package" • Acceptance letter • Loan agreement.	• Sign loan (post-construction) • Apply for EE incentives • Set-up on-bill repayment • Start/complete construction	• Customer repayment to the Program via utility bill • Payment of EE incentives to SBEC.

Project Development Process: Energy Independence Program (City of Palm, CA)

Phase	(1) PRE-DEVELOPMENT	(2) DEVELOPMENT	(3) IMPLEMENTATION	(4) OPERATION
Description	Owner becomes aware of EIP and *Set-to-Save* marketing efforts. Property owner obtains a highly-encouraged energy audit from a local utility or from the OEM which provides assistance and on-site energy audit advice.	Owner consults with a CA State licensed contractor to determine the costs of the improvements. The property owner completes an application from EIP. After the application is approved, the owner can hire the contractor.	Before starting construction, the contractor must wait two weeks so that OEM can request a Notice of Assessment. The owner must apply for a permit. The contractor can complete the work. After the work is complete, a building inspector must sign-off. Property owner submits final documentation to OEM.	The OEM pays the property owner. The owner will start and continue to pay his property taxes with an additional lien for the EE retrofits.
Duration	1 week	1 month	< 6 months	Up to 20 years
Stakeholders	• Customer: Schedule an audit (from "Home Energy Rating System" for example) or complete online audit. • OEM: Provide assistance and energy audit, if requested. • Utility: Provide services to perform online audit, if requested.	• Customer: Consult with contractor who conducts an energy audit to fully develop the technical scope of a project. The customer will sign the EIP application and any loan documents post OEM approval. • OEM: Request title check on property. Review application and discuss project with homeowner. (City Manager approval is required for projects over $60k.) Prepare loan documents. • Contractor: Conduct detailed energy audit and assist homeowner with the EIP application. Assist homeowner in applying for rebates/incentives.	• Customer: Allow contractor access to property. Complete permits. • OEM: Contact tax assessment office to place lien on property. • Contractor: Implement the selected EE retrofit package. • Building Inspector: Inspect project to ensure it meets building codes. • Tax Assessment Office: Place new lien on property.	• Customer: Pay property taxes on semi-annual basis. If home is sold, the lien on the property is transferred to the new owner. Pay contractor after receipt of payment from OEM. • OEM: Pay the owner within a month of final submittal. • Utility/etc: Pay out additional rebates/ incentives.
Tasks & Milestones	• Preliminary audit	• Detailed audit • EIP Application • Title check • Prepare and sign loan	• Apply for incentives • Place lien on property • Start/complete construction	• Customer repayment to the Program via utility bill • Payment for improvements • Payment for additional incentives

Project Development Process: On-bill Financing Program (San Diego Gas & Electric)

Phase	(1) PRE-DEVELOPMENT	(2) DEVELOPMENT	(3) IMPLEMENTATION	(4) OPERATION
Description	Customers typically enter OBF via an EE contractor or an SDG&E account representative. The customer directly hires an independent EE contractor to evaluate (and implement) a project. The customer and contractor determine which retrofits to include and then contact SDG&E to secure any EE applicable rebates or incentives. The owner (with the contractor's support) completes the application for OBF.	SDG&E screens applicants bill repayment history and EE measure eligibility. SDG&E arranges and conducts a pre-inspection to review the EE measures and estimated cost and savings. SDG&E prepares the loan terms and documents based on pre-inspection results. Loans are offered at 0% interest with the loan term set equal to the estimated payback period so as to achieve bill neutrality.	The contractor procures the necessary EE equipment and constructs all retrofits at the customer's facility. SDG&E conducts a post-inspection to ensure that the retrofits were completed as specified. If necessary, the loan term is adjusted to reflect any changes to the original EE project scope.	Once the final inspection is completed, SDG&E issues rebate/incentive and loan project payment to the contractor or owner (depending on payee stated on the rebate application and loan agreement). The loan payments then appear on the customer's next scheduled utility bill, typically 30 days later. If a customer stops paying the OBF installments, SDG&E has the right to discontinue service.
Duration	1-3 months	10 days - 1 month	1-2 months, though this is dependant on the contractor and the project scope	< 5 years for private sector customers and < 10 years for public sector customers
Stakeholders	• Customer: Hire a contractor and determine which retrofits to implement. Work with contractor to submit OBF application. • Contractor: Market OBF to customer. Conduct EE audit and help determine which retrofits to implement. Secure EE rebates/incentives. Help complete and submit OBF application. • SDG&E: Market OBF to customers. Conduct training for contractors.	• Customer: Sign loan. • SDG&E: Pre-screen applications and conduct a pre-inspection visit to verify EE costs and savings for a project. Prepare loan documents.	• Customer: Allow contractor access to property to implement EE measures. • Contractor: Implement EE measures. Send final project specifications to SDG&E with rebate/incentive documentation. • SDG&E: Conduct post-inspection to ensure upgrades were made according to original loan terms. Adjust loan to reflect EE project changes (if necessary).	• Customer: Collect payment from SDG&E (if specified recipient) and pay contractor. Paying utility bill with added OBF surcharge. If the property is sold, customer must repay loan balance. • Contractor: Collect payment from SDG&E (if specified recipient). • SDG&E: Pay contractor or owner. Collect loan installments from utility bills.
Tasks & Milestones	• Hire contractor • Conduct EE audit • Apply for EE rebate/incentive • Submit OBF application	• Pre-screen OBF application • Conduct pre-inspection • Prepare and sign loan documents	• Start/complete construction • Conduct post-inspection	• Customer OBF repayment • SDG&E issues payment to contractor or owner • Receipt of rebate/incentive

Project Development Process: Aggregated Deployment of TES Systems (Ice Energy)

Phase	(1) PRE-DEVELOPMENT	(2) DEVELOPMENT	(3) IMPLEMENTATION	(4) OPERATION
Description	During the pre-development stage, Ice Energy identifies a potential utility customer and negotiates a programmatic development agreement.	During the development stage, Ice Energy and the utility cooperate to (a) identify facilities that are prospective project site hosts and (b) assess the technical feasibility of installation.	During the implementation phase, Ice Energy oversees a subcontractor through the actual installation of the retrofit project.	During the operation phase, Ice Energy continues to provide operation & maintenance services, while the utility continues to provide an asset management role.
Duration	12 months	3 months	1 month	5-10 years
Stakeholders	• Ice Energy: Identify best communication channel with prospective utility, engage utility, secure programmatic development agreement • Utility: Collaborate with Ice Energy to define optimum scope of program, negotiate final terms of development agreement, identify/secure source of funding • Subcontractor: n/a • End-Use Customer: n/a	• Ice Energy: Secure site hosts and perform preliminary engineering analysis to confirm technical feasibility • Utility: Help identify and engage potential site hosts • Subcontractor: n/a • End-Use Customer: Agree to host project installation	• Ice Energy: Supervise subcontractor during installation • Utility: Pay Ice Energy for each completed installation • Subcontractor: Install the TES unit • End-Use Customer: Ensure project site is accessible and installation integrates with existing systems	• Ice Energy: Oversee and manage all ongoing operation and maintenance • Utility: Asset management • Subcontractor: n/a • End-Use Customer: Continue to make project site accessible
Tasks & Milestones	• Ice Energy secures programmatic agreement with utility to deploy Ice Bear TES units within service territory	• Identify end-use customers that will host TES retrofit projects • Customer and utility execute site lease agreement • Complete site-specific preliminary engineering	• Complete retrofit installation	• Operate, maintain, and monitor during operation

Project Development Process: Efficiency Services Agreement (Metrus Energy)

Phase	(1) PRE-DEVELOPMENT	(2) DEVELOPMENT	(3) IMPLEMENTATION	(4) OPERATION
Description	Projects are screened for facility type, age of equipment, energy cost, and customer credit. Key pre-development steps include completion of a preliminary energy audit and a cash flow analysis that provide high-level estimates of front-end investment costs and ongoing project savings and expenses.	Comprehensive engineering analysis conducted as part of an investment-grade energy audit that defines the technical scope, including: all equipment and construction costs and detailed savings calculations. Final project contracts are signed (i.e., ESA and ESPC). Debt financing is secured by Metrus.	ESCO/ESP performs EPC services to install the project. Construction activities will be closely coordinated with the customer to ensure minimal disruption of ongoing facility operations. Metrus/ lender disburse EPC progress payments to the ESCO/ESP.	ESCO/ESP maintains EE assets on behalf of Metrus to ensure long-term performance. Once the project is operational, construction financing is replaced by permanent financing comprised of debt and equity. Customer makes regular ESA payments based on realized energy savings.
Duration	1-3 months, depending on scheduling	3-6 months	6-9 months	Typically 5-10 years
Stakeholders	• Customer: Provide data on facility operations, energy use, and utility billing. Allow access to facility for preliminary audit. • ESCO/ESP: Conduct on-site preliminary energy audit. • Metrus: Screen customer credit in conjunction with lender; Prepare project cash flow based on preliminary audit.	• Customer: Provide technical drawings for the facility and key equipment. Allow access to facility for detailed audit. • ESCO/ESP: Conduct on-site detailed energy audit. • Metrus: Prepare detailed project cash flow. Develop ESA with customer and ESPC with ESCO/ESP. Establish Project LLC. • Lender: Establish construction to permanent debt facility.	• Customer: Allow facility access to ESCO/ESP for construction. • ESCO/ESP: Manage, construct, and commission the project. Submit incentive applications. • Metrus: Invest equity into Project LLC. Oversee project construction efforts. • Lender: Fund Project LLC with construction debt that, in combination with Metrus equity, is disbursed to ESCO/ESP.	• Customer: Make regular ESA payments to Metrus. Provide access to facility as needed. • ESCO/ESP: Provide ongoing project maintenance and measurement & verification services to Metrus. • Metrus: Invoice customer for realized savings. Manage Project LLC cash flow with Lender. • Lender: Provide Project LLC cash management services.
Tasks & Milestones	• Non-disclosure agreements • Letter of intent • Preliminary audit report	• Detailed energy audit • Final project presentation • Establish project LLC • ESA contract signing • ESPC contract signing	• Fund construction project financing facility • Substantial Project Completion • Project Commissioning	• Fund permanent project financing facility • ESA payments made by customer to Metrus Project LLC • Project LLC payments to ESCO/ESP for ongoing services • Fair market value buyout and ESA termination

Project Development Process: Managed Energy Services Agreement (Transcend Equity)

Phase	(1) PRE-DEVELOPMENT	(2) DEVELOPMENT	(3) IMPLEMENTATION	(4) OPERATION
Description	Pre-development activities include completion of a preliminary energy audit that estimates the costs and savings of potential EE measures. Customer credit is screened and review of historical energy use and bills is conducted.	Conduct detailed engineering analyses for the energy audit that defines a project's technical scope. Comprehensive review of historical energy use, facility operations, and utility rates. Customer signs the MESA and Transcend hires sub-contractors to install EE measures. Form SPE.	The selected ESP (typically multiple ESPs) provide EPC services to implement the project. Construction activities will be closely coordinated with Transcend and the customer. The SPE disburses progress payments to the ESPs as key construction milestones for EE measures are achieved.	Transcend, and any selected ESPs, maintain the EE assets on behalf of customer. Once the project is completed, construction financing is replaced by permanent financing. Customer makes regular MESA payments based on historical energy use. SPE pays utility bill and distributes balance to capital partners.
Duration	1-3 months	3-5 months, depending on scope and scheduling	6-9 months	10 years
Stakeholders	• Customer: Provide data on facility operations, energy use, and energy costs. Allow access to facility. • Transcend: Conduct or assist with preliminary energy audit. Review past billing history and energy use profile. • ESP: Perform on-site preliminary audit (as needed).	• Customer: Provide all technical information on key energy consuming equipment and facility characteristics. Allow access to facility for audit. • Transcend: Conduct or assist with on-site detailed energy audit. Analyze project cash flow, secure investors, and form SPE. • Capital Partners: Review project scope and return profile.	• Customer: Allow facility access to Transcend and its selected ESPs for construction. • Transcend: Manage project construction activities. Install monitoring systems. • ESP: Construct and implement the identified EE measures. • Capital Partners: Fund SPE with construction debt/equity.	• Customer: Make set MESA payment to the SPE. Provide access to facility as needed. • Transcend: Monitor customer energy use, occupancy patterns, utility rates, and weather data. • ESP: Provide ongoing maintenance services. • Paying Agent: Provide cash management services for SPE. • Capital Partners: Fund SPE with permanent debt/equity.
Tasks & Milestones	• Non-disclosure agreements • Letter of intent • Preliminary audit report	• Detailed energy audit • Establish the SPE • MESA contract signing • Transcend enters in sub-contracts to install EE measures.	• Fund construction project financing facility • Project Commissioning • Transfer utility bill payment responsibility to Transcend.	• Fund permanent project financing facility • Customer payments to SPE • SPE payments to utility for energy consumed by customer.

Glossary

AB811	Assembly Bill 811
ARRA	American Reinvestment and Recovery Act
C&I	commercial and industrial
CalCEF	California Clean Energy Fund
CDFI	community development financial institution
CEDA	Clean Energy Deployment Administration
CEWP	Clean Energy Works Portland
COPT	Corporate Office Properties Trust in Columbia, Maryland
CPUC	California Public Utilities Commission
CSG	Conservation Services Group
EA	energy advocate
EE	energy efficiency
EIP	Energy Independence Program in Palm Desert, CA
EPACT	Energy Policy Act
EPC	engineer, procure and construct
ESPC	Efficiency Services Performance Contract
ESA	Energy Services Agreement
ESC	energy services company
ESP	energy service provider
ETO	Energy Trust of Oregon
FDIC	Federal Deposit Insurance Corporation
GHG	greenhouse gases
HVAC	heating, ventilation, and air conditioning
IT	information technology
kW	kilowatt
kWh	kilowatt-hour
LLC	limited liability company
M&V	measure and verification
MESA	managed energy services agreement
MW	megawatt
OBF	on-bill financing
OEM	Office of Energy Management for Palm Desert, CA
PACE	property-assessed clean energy
PPA	power purchase agreement
PV	photovoltaic
RE	renewable energy
RPS	renewable portfolio standard
SBEC	Shorebank Cascadia Enterprise
SCE	Southern California Edison
SDG&E	San Diego Gas & Electric
SoCalGas	Southern California Gas Company
T&D	transmission and distribution
TES	thermal energy storage
TRC	total resource cost

Sources/Endnotes

1. A detailed description of barriers to EE market development were discussed in our previous EE white paper. See Hinkle, Bob, Steve Schiller, "New Business Models for Energy Efficiency," CalCEF Innovations, March 2009. http://www.calcef.org/innovations/activities/NewBusModelforEE_CalCEF-March2009.pdf
2. McKinsey & Co., "Unlocking Energy Efficiency in the U.S. Economy," July 2009. http://tinyurl.com/m9ydrd
3. Furrey, Laura, Steven Madel, John A. Laitner, "Laying the Foundation for Implementing a Federal Energy Efficiency Resource Standard." Amercian Council for an Energy-Efficient Economy, Report Number E091, March 2009. http://www.aceee.org/pubs/E091.pdf
4. Solarbuzz, "Solar Electricity Prices," September 2009. http://www.solarbuzz.com/SolarPrices.htm
5. http://www.cleanenergyworksportland.org/
6. Based on discussions with CEWP representatives. August 2009.
7. City of Portland and Multnomah County, "Climate Action Plan 2009, " Draft. http://www.portlandonline.com/bps/index.cfm?c=49989
8. The Energy Trust of Oregon is an independent nonprofit organization that offers local residents and businesses a range of energy efficiency and renewable energy programs that include cash incentives and technical assistance.
9. Ibid., Discussion with CEWP.
10. Ibid.
11. The initial set-up cost for the utilities was paid by the City of Portland. Going forward, servicing fees that the utilities will charge will be paid by SBEC out of its fund revenues.
12. A summary letter that was prepared by Joes Hall that outlines key concerns of the mortgage industry is available at: http://pacenow.org/documents/7a.%20JH%20Lien%20Issue%20Paper%20CLN.pdf
13. Ibid.
14. A memo was prepared for the Vote Solar Initiative by Wilson Sonsini Goodrich and Rosati that describes the assessment district authority in various states and amendments to state law necessary to implement PACE programs. This memo can be found at: http://www.votesolar.org/linked-docs/key_states_memo.pdf
15. The text of AB811 can be found at: http://www.energy.ca.gov/recovery/documents/ab_811_bill_20080721_chaptered.pdf
16. This rate is as of late September 2009. Rates are periodically adjusted by the City of Palm Desert OEM to reflect market conditions.
17. http://www.cityofpalmdesert.org/Index.aspx?page=484
18. http://www.settosave.com/
19. Based on discussions with the Palm Desert OEM. September 2009.
20. Ibid.
21. http://www.settosave.com/
22. Interim financing is needed for early stage PACE programs in order to incentivize local contractors, service providers, and property-owners to move forward with projects (i.e., to assure stakeholders that the funding will be there for the projects they are developing).
23. Public Utilities Commission, "Decision Approving 2010 to 2012 Energy Efficiency Portfolios and Budgets," Draft, August 25, 2009.
24. http://www.sdge.com/business/esc/promo_obf.shtml
25. Based on information provided by SDG&E representatives. October 2009.
26. A separate charge that all electric and gas customers are required to pay that funds various public purpose programs including: (1) renewable resource energy technologies, (2) energy efficiency, (3) research, development and demonstration, and (4) low-income programs.
27. Payments to customers under incentive-based programs are only paid out after an independent engineering firm has conducted a measurement of the actual savings achieved by a project. Typically, savings measures are completed within a six-month period following project installation.

28. http://www.ice-energy.com
29. TES is not always included as a traditional EE measure since its primary benefit comes in the form of avoided electricity demand (measured in kilowatts) rather than avoided consumption (measured in kilowatt-hours).
30. Ice Energy, "ICE BEAR: How it Works." http://www.iceenergy.com/technology/IceBear/howitworks/tabid/163/Default.aspx
31. Demand response involves the temporary reduction in electricity demand by customers over a defined time period in response to a price signal, financial incentive, or system reliability signal sent by a local utility or independent system operator.
32. McDonnell, Whitney Kellogg, "Redding Electric Utility Chooses Ice Energy's Energy Storage Solution to Permanently Reduce Peak Demand," Reuters, August 25, 2009. http://www.reuters.com/article/pressRelease/idUS142702+25-Aug-2009+PRN20090825
33. http://www.ice-energy.com/news/pressreleases/012710.html
34. Based on discussions with Ice Energy representatives. September 2009.
35. http://www.metrusenergy.com
36. http://www.transcendequity.com
37. Numerous donor agencies and export credit agencies have facilitated the sale of EE technologies and implementation of EE projects worldwide.
38. Section 1705 of the 2009 ARRA was adopted to quickly deploy funds to stimulate growth and to retain and create jobs by authorizing the DOE to make loan guarantees for the following types of projects: (1) renewable energy systems, including incremental hydropower, that generate electricity or thermal energy, and facilities that manufacture related components; (2) electric power transmission projects; and (3) leading-edge bio fuel projects that use technologies that are likely to become commercial and produce transportation fuels that substantially reduce greenhouse gas emissions. 1705 projects must commence construction no later than September 30, 2011.
39. For further information on CEDA, go to the website of the Coalition for a Green Bank at http://www.coalitionforthegreenbank.com/about-us.html
40. Community Development Online, "Benefits of CDFI Certification," September 2009. http://comptrollerofthecurrency.gov/cdd/winter06/cd/benefitsofcdfi.html
41. A TRC test is utilized to determine the cost effectiveness (often from a regulatory perspective) of implementing an EE measure or program. TRC tests take into account the net costs and benefits of an EE measure or program from the perspective of both a customer an implementing utility (or agency).

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