Riding the Financing Wave:
Integrating Financing with Traditional DSM Programming

Karin Corfee, Navigant Consulting, Inc., San Franciso, CA
Jane Pater Salmon, Navigant Consulting, Inc., Boulder, CO
Brad Rogers, Navigant Consulting, Inc., Boulder, CO
Floyd Keneipp, Navigant Consulting, Inc., Walnut Creek, CA

ABSTRACT

Novel financing approaches are expected to play an increasingly large role in promoting adoption of energy-efficient (EE) technologies. Financing pilots are starting to sprout across the country to gauge consumer appeal and efficacy. If these programs can fulfill the promise of reducing market barriers, financing may become a mainstay in the next generation of utility programs and offer a new path toward market transformation. However, financing is not always aligned with the processes and activities of traditional demand side management programming.

This paper focuses specifically on the California investor-owned utility (IOU) market and explores the types of EE financing programs currently being implemented or under development and the challenges experienced in relation to program planning, evaluation, and risk analysis. The paper offers insights based on first-hand experiences to help regulators, utilities, and evaluators make decisions to help fit financing into traditional demand side management processes.

Introduction

Financing has the potential to break through a number of market barriers that have impaired widespread market adoption of cost-effective, energy-efficient (EE) measures. In particular, new financing mechanisms are expected to play an important role in helping to reduce the market barriers associated with larger scale deep EE retrofits in both the residential and nonresidential sectors. EE financing is expected to reduce market barriers associated with first cost, split incentives, liquidity constraints, credibility gap, and savings uncertainty. If financing fulfills the promise of reducing these market barriers, it may become a mainstay in the next generation of utility EE programs and offer a new path toward market transformation. **Figure 1** displays the expected change in market adoption of EE technologies as a result of the availability and uptake of EE financing opportunities in the market.

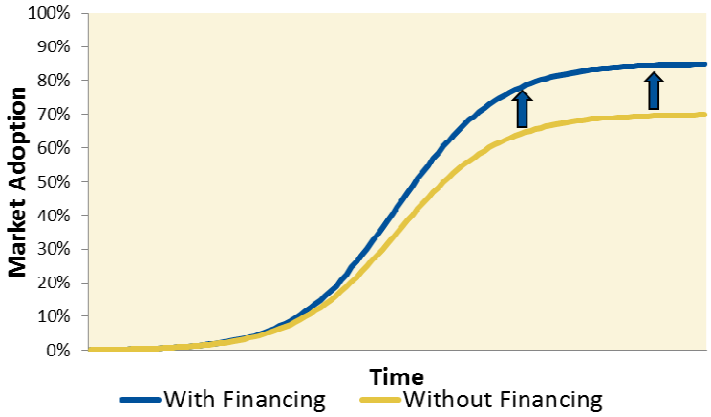

Figure 1. Effect of Introducing EE Financing on Market Adoption[1]

[1]This figure was created in 2012 based on Navigant analysis.

The challenge is that financing programs are somewhat difficult to incorporate into the traditional demand-side management (DSM) planning framework. This paper focuses specifically on early lessons and experiences from the California investor-owned utility (IOU) market. It explores the types of financing programs currently being implemented or under development, as well as the challenges experienced in relation to program planning, evaluation, and risk analysis.

Financing Programs for Energy Efficiency

California will need to spend at least $4 billion annually to meet the ambitious goals set for EE in the state. Currently, the levels of investment appear to be at roughly half that amount (HB&C 2011). The California Public Utilities Commission (CPUC) has recently provided direction to the IOUs on EE financing in various proceedings for the 2013-2014 program cycle (CPUC 2012a; 2012b). The goals of EE financing initiatives include the following (HB&C 2011):

- Overcome the first cost of EE upgrades
- Leverage ratepayer funds by bringing in additional private capital
- Increase sales of EE products and services
- Reach a broader set of customers and market segments
- Encourage customers to invest in projects that will achieve deeper energy savings

The California IOUs have recently offered on-bill financing (OBF) programs to customers in the nonresidential market segment. OBF is a financing mechanism whereby electric utilities offer loan capital at zero percent interest and allow customers to repay the EE loans as a line item on their electric bill. These OBF programs have collectively loaned $16 million since the beginning of the programs. Loans are offered for a term of five years for commercial and industrial customers and up to ten years for institutional customers. Per CPUC requirements, the OBF programs are designed to meet "bill neutrality" objectives.[2] Ratepayer funds are used to provide the loan capital as well as cover any loan defaults. The program has had a loan default rate of less than one percent. Most projects have been heavily focused on lighting efficiency since most participating vendors specialize in lighting retrofits, and because customers have pursued lighting measures more aggressively than other measures.

According to the 2010-2012 California IOU OBF Process Evaluation and Market Assessment, 72 percent of the survey respondents would not have been able to proceed with an EE project in the absence of on-bill financing. Furthermore, 80 percent of respondents indicated they would be more likely to pursue EE investments in the future as a result of their experience with OBF. Over half of the surveyed non-residential customers view financing as more important than rebates and are willing to pay interest on EE loans. The willingness-to-pay indicated from the survey has a mean annual percentage rate of 3.3 percent, with a maximum of 7.4 percent (Kan et al. 2012).

Table 1 summarizes the current plan for IOU EE financing Programs for 2013-2014 in California. A new focus on on-bill repayment (OBR) is emerging due to the CPUC directive to better leverage ratepayer funds. Similar to the OBF program, customers repay EE loans as a line item on their electric bill. OBR will increase the pool of funds available for EE financing by engaging third-party capital. Bill neutrality is not a requirement under the currently planned OBR pilot programs in California, and the customers will pay an interest rate that is determined by the lending institutions. The projected leverage ratios of ratepayer funds to third-party capital are 1-to-4 or higher. That is, for every dollar of ratepayer funds there would be at least four dollars of third-party capital.

[2] Bill neutrality implies that the average monthly value of energy savings meets or exceeds the average monthly loan payment.

Table 1. Summary of recommendations for California IOU EE financing Programs 2013-2014

Sector	Pilot Program	OBR	OBF	LLR	SD	Description	Recommended Funding Level
Single Family	WHEEL	x			x	Unsecured loan product leveraging secondary markets' capital. This program offers mid-interest rate dealer loans, opening capital markets to residential EE financing	**$24 million for both pilot programs**
	Local Lending Products	x		x		Range of loan products leveraging local capital. This program offers low-interest direct loans, ability of local lenders to deliver capital across broad geographies	
	Line Item Billing	x				A sub-pilot program setting up OBR without bill-related loan security. This program tests the attractiveness of repaying loan on bill and its impact on loan performance.	**$ 1 million**
	Middle Income Targeted	x				A sub-pilot program to expand access to capital and EE. This program tests if the expanded access to capital for middle income household could increase EE uptake. Credit enhancement feature to be determined.	**$1 million**
Multi-family	Master-metering	x		x	x	OBR without shut-off for master-metered affordable housing properties.	**$2.9 million**
Non-Residential	On-Bill Financing		x			The continuation of the existing IOU OBF programs, offering 0% interest rates for EE upgrades in the non-residential sector. Lighting measures may not exceed 20% of total project cost except for the Government & Institutional customers.	**$123 million**
	On-bill Repayment	x		x	x	OBR for projects not qualified for OBF in the non-residential sector.	**$21 million**

*This table is modified from "Summary of Recommendations for EE Financing Pilot Programs" of the recommendation report prepared by Harcourt Brown & Carey, submitted to the California Investor-Owned Utilities on October 19th, 2012. Table can be found on page 15 of the report.

The current proposal applies ratepayer funds to provide credit enhancement in the form of loan loss reserves and/or subordinate debt. The subordinated debt credit enhancement is invested in the loan pool and earns a rate of return. It is possible that the subordinated debt could result in a zero net-subsidy over the long term. However, subordinated debt funds part of the loan or loan pool, and these funds are scheduled first to absorb losses in the case of default. Loan loss reserve funds, on the other hand, are placed in an escrow account, and do not earn a rate of return. These funds are utilized only in the case of default. The current proposal recommends a single credit enhancement pool for both subordinate debt and loan loss reserves that should be made available to all pre-qualified financial institutions and finance companies to draw down on a first-come, first-served basis (Brown et al. 2012).

The currently proposed California EE Financing Hub pilot is designed to respond to the CPUC's directive to develop EE financing options. The Hub will be designed to offer a platform for a simple, streamlined structure through which energy users, financial institutions, EE providers, and utilities can participate in a standardized "open market" that facilitates EE financing in the state (Brown et al. 2012). The Hub is intended to facilitate a transparent process for allocating credit enhancements, managing cash flows for OBR, and promoting development of contractor- and customer-facing lease origination processes in certain cases (Brown et al. 2012).

The Warehouse for EE Loans (WHEEL) is currently being developed by a consortium of public, private, and nonprofit organizations to serve the residential sector. The goal of WHEEL is to develop a robust secondary capital market for unsecured residential EE loans (Brown et al. 2012). WHEEL will facilitate financing as one of several key elements to comprise a convenient, one-stop solution for EE implementation. Subordinated debt and loan loss reserve fund credit enhancements are expected to represent roughly 20 percent and 5 to10 percent of the total loan value, respectively (Brown et al. 2012).

Assessing the Savings Potential of Financing

Key challenges associated with forecasting the incremental effects of EE financing on market potential include the following:

- The impacts of EE financing are difficult to predict due to lack of robust historical data and lack of definitive evidence establishing the effects of EE financing programs.
- Wide-scale deployment has not yet occurred in California; it is not clear how pilot program results should be applied.
- Traditional "payback acceptance" approaches for estimating market potential do not capture the full benefits of EE financing (e.g., avoiding upfront costs).
- Currently, there are no established best practices to incorporate financing into EE potential forecasts.

Steps to Modeling Market Potential Associated with EE Financing

The steps summarized in **Figure 2** describe the approach to forecasting the effects of EE financing on market potential for a statewide potential study in California. The approach forecasts market potential both with and without financing to establish the incremental impact of financing. Two mechanisms are used to simulate adoption in the presence of financing:

1. Increased financial attractiveness of a measure when program interest rates are below the customer's risk-adjusted time-value of money (i.e., approximated by market interest rates)
2. Increased willingness to purchase due to reduced market barriers (i.e., approximated as a reduction in the customer's implied discount rate [iDR]).

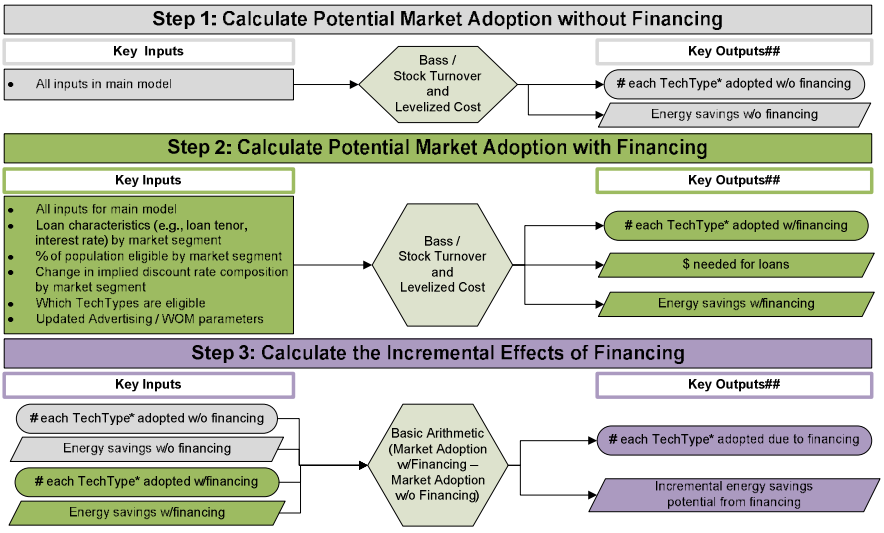

Figure 2. Overview of Navigant's Approach to Modeling EE Financing[3]

Implied Discount Rates

The iDR is the effective discount rate that would describe consumer adoption behavior if their adoption were based solely on the financial characteristics of an EE measure. Market research indicates that the iDR that consumers apply to EE purchases tends to be much higher than market interest rates (Gillingham, Newell & Palmer 2009, 7). The relatively high observed iDR for EE purchases indicates

[3] Navigant utilizes an approach for estimating market potential based on Bass diffusion theory, logit behavioral decision theory, and dynamic turnover of end use building and equipment stocks.

that a range of market barriers and risk factors influence adoption beyond just the consumer time-value of money. Such barriers and risks may include lack of access to capital, liquidity constraints, split incentives, hassle factor, information search costs, and behavioral failures (Dubin 1992; Gillingham, Newell & Palmer 2009, 7). The difference between a the consumer's iDR and their risk-adjusted time-value of money is often referred to as the "e*fficiency gap.*"

The rationale for using reducing iDR values to forecast changing consumer EE adoption behavior includes the following:

- Consumers generally exhibit inconsistent decision making when it comes to valuing the costs and benefits of EE investments versus financial investments unrelated to EE.
- Payback data indicates that residential customers require a simple payback of less than 2 or 3 years, even for measures where savings persist for more than 20 years. A reasonable interpretation of this is that consumers are adopting EE investments in accordance with a high iDR.
- Empirical evidence suggests that consumer iDRs ranges from 20 to 100 percent or higher (Jaffe, Newell & Stavins 2004, 87).[4] Other data indicates that residential consumers on average exhibit behavior that results in an iDR in excess of 40 percent over market rates for the residential sector.
- Research has explained the discrepancy between the iDR and the market rate, or the efficiency gap, as due to market barriers facing the EE industry.

Figure 3 illustrates how iDR influences consumer willingness to purchase efficient measures. A high iDR leads to substantially lower willingness-to-purchase for efficient technologies whose payback period falls between two and eight years. Reducing market barriers has the effect of compelling consumers to adopt efficient measures at rates more consistent with their risk-adjusted time-value of money.

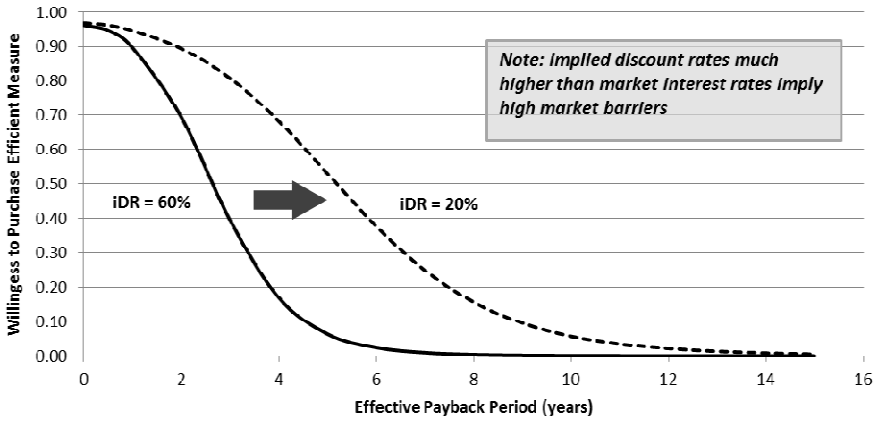

Figure 3. Overview of Navigant's Approach to Modeling EE Financing

The Navigant team modeled the change resulting from reduced market barriers that result from financing programs to calculate a reduced iDR when financing is introduced. **Figure 4** displays how the iDR is expected to decrease as a result of introducing EE financing and reducing market barriers.

[4] A discount rate of 100 percent can be interpreted as a doubling in the time-value of money for each earlier year or a halving for each later year.

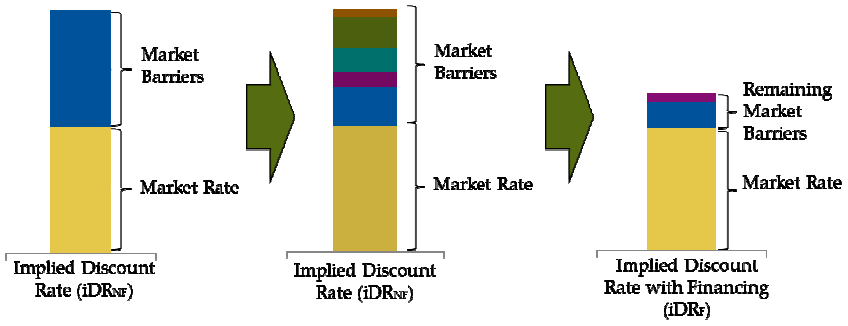

Figure 4. Reduction in iDR Resulting from Introduction of EE Financing

Research has explained the discrepancy between the iDR and the risk-adjusted time-value of money as due to market barriers facing the EE industry (Jaffe 2004). The difference demonstrates that these inefficiencies and market barriers are reflected by consumer adoption behavior consistent with a high iDR. Specifying the contribution of the individual market barriers that make up this difference can lead to an estimate of the impact that financing mechanisms may have on reducing the iDR. The change in iDR is estimated by applying market research on EE financing programs to estimate the degree to which market barriers are likely to be reduced. The impacts of the changing iDR through reduced market barriers or reduced interest rates are used to establish changing willingness factors in the potential analysis, which in turn forecasts higher levels of adoption. Advanced financing mechanisms, such as OBR, that reduces or eliminate specific market barriers would be expected to deliver greater impacts.

Options for Evaluating Impacts of Financing Programs

Utilities and regulators have completed very few impact evaluations that clearly attribute savings directly to EE financing programs. Many financing programs are offered alongside other EE programs that provide rebates for EE products. As such, it is difficult to determine whether the financing or the rebate drove program activity. Evaluations in Colorado (Goldberg, Cliburn & Coughlin 2011) and New York (NYSERDA 2011), for example, have chosen not to separate the savings for the rebate and financing components of the programs available to customers. Further, many financing programs are not considered resource programs. Until the 2012-2013 EE program cycle, financing programs offered by the California IOUs were treated as non-resource programs; energy savings were claimed via the applicable rebate and/or incentive programs (Kan et al. 2012). Similar non-resource regulatory frameworks existed in Connecticut and Massachusetts (O'Connor 2011), New Hampshire (GDS Associates 2003), Kansas and Hawaii (Johnson et al. 2010).

As investment in financing programs increases, however, quantifying the impacts and market effects of the programs also increases in importance. Energy efficiency financing programs can require upwards of two to four times the amount of ratepayer funds as rebate-only programs. OBF programs, for example, use ratepayer funds to pay for the full cost of measures rather than some fraction of the incremental cost, which is covered by rebate-only programs. As such, the stakes are higher for financing programs than for rebate-only programs. Some regulators are requiring impact evaluations; California, for example, has indicated its plans to request proposals for an impact evaluation of the state's pilot EE financing programs (Drew 2012).

Different evaluation frameworks are appropriate for different elements of financing programs. Market transformation evaluation frameworks and resource program evaluation frameworks may be applicable in different circumstances. The following discussion addresses the applicability of each of these evaluation frameworks and the factors that would lead to using each one.

Application of Market Transformation Evaluation Frameworks

Market transformation evaluation frameworks hinge on the development of and tracking of progress toward market transformation indicators (Rosenberg et al. 2009). Evaluators work with the program design team to develop a program logic that details the vision for the program's effect on the market. Within that logic model, the team establishes indicators of the market's progress toward the vision. Over time, program staff and evaluators can collect data and conduct analysis to track progress toward those indicators. The progress over time measures the success of the program.

First, financing programs often include non-financial elements that equate to market transformation rather than resource acquisition. These elements may include standardizing the application process, providing data to the underwriters, building the credibility of financing EE investments, or streamlining the payment system. Individually, none of these elements acquires energy savings, but they are fundamental to reducing the market barrier of imperfect information and contributing to the establishment of an efficient market. At their core, these are intended to transform the market and can be measured as such.

Second, some types of utility programs, such as OBR, intend to transform the market by leveraging private-sector capital and phasing out investment from ratepayers over time. OBR without credit enhancement is essentially a private-sector effort that leverages utility payment systems similar to the way in which some private entities offer home warranty plans through utilities. As the market matures, ratepayer funds would not be required as the private sector would cover the cost of maintaining this function in the utility payment system.

In these situations, it is more relevant to assess the market's progress toward achieving the targeted milestones. Free-ridership and spillover frameworks become less important because the end goal is to achieve high levels of natural adoption, meaning that the practice has become the norm.

Application of Resource Program Evaluation Frameworks

Explicit quantification of energy and demand savings is important for some financing programs. This is particularly relevant when significant levels of ratepayer funds are committed over long periods of time.

Evaluators can build on components of existing resource program evaluation frameworks to evaluate financing programs. Measure-level data created during traditional resource program impact evaluation (including costs, energy and demand savings, operating hours, and persistence) can be directly applied to the evaluation of financing programs. Realization rates identified in traditional resource program evaluation are also directly relevant.

At the same time, evaluators of finance programs must revisit other components of traditional impact evaluation methodology. The main challenge in quantifying energy savings impacts from financing programs is how to attribute savings to financing programs that are offered in concert with rebate programs. Market models can forecast the level of adoption with and without financing based on certain decision-making factors, but evaluation tests these hypotheses in the real world.

It remains to be seen if evaluation can effectively separate the effects of financing and rebate programs using conventional attribution methods. Consumer and business decision makers do not always delineate between the effects of rebates and of financing when making a purchase decision; thus, their attribution to financing and rebate programs will not be as clean as evaluators would prefer. Traditional surveys during periodic evaluation cycles, a common method for assessing attribution, will not adequately capture this nuance. Several practices can enhance the ability to quantify impacts of financing programs:

- Coordinating evaluations of financing programs and the programs that concurrently offer rebates for the same measures can result in a more comprehensive view of program impacts.

- Collecting data at the time of program participation can improve the accuracy of the data used to assess attribution. In the event that evaluators seek to delineate the effects of financing and rebates in the impact evaluation, respondents will have better recall of the factors that influenced their decision at the time of program participation. Evaluators and program implementers can collect data with other application forms or through surveys conducted on a monthly or quarterly basis throughout the program cycle.
- Asking respondents to allocate 100 percent of the credit for their decision between financing and a rebate recognizes the interaction between the two factors. This allows participants to indicate the relative importance of the two incentives and does so more effectively than a Likert scale or other forced-ranking approaches.

Recognizing that perfect attribution of savings is impossible may be a necessary starting point for evaluating financing programs that are offered together with rebates. It is likely that there will be wide error bands around any attribution estimates provided by participants. Attribution in this context may simply need to validate that the financing is positively influencing decision makers. If the demand for financing under given terms is significant enough, the utility program offering may be ready to transition to a market-based system for providing capital.

Determining which Evaluation Framework to Use

Determining the proper evaluation framework relies heavily on the context in which a given program is implemented. Assessing the level of rigor appropriate for a given program context is an important factor in developing an evaluation strategy. Key questions to ask when deciding which program evaluation framework to use include the following:

- Where on the continuum of resource vs. market transformation approaches do the program interventions fall?
- What the intended duration of the program is as designed – as a transitional effort that is phased out within a few years or as a longer-term effort that will continue in its current design for longer?
- To what extent are ratepayer funds committed? What level of accountability does that infer?

Table 2 summarizes these factors and the implications for the selection of a program evaluation framework.

Table 2. Factors Influencing Selection of Evaluation Framework for Financing Programs

	Evaluation Framework	
Decision Factor	**Market Transformation**	**Resource Program**
Program intervention type	Market Transformation	Resource Program
Vision for the program	Transitional effort/Phase out	Maintain over time
Level of ratepayer funds committed	Decreasing level over time or lower level than rebate programs designed to achieve similar savings	Sustained, high level for the duration of the program
Level of quantitative rigor required	Low	High

Two types of evaluations have been used to collect the data needed to assess energy savings from financing programs. Process evaluations collect data that can inform calculations of spillover and free ridership (and the resulting net-to-gross ratio) and program cost effectiveness calculations (e.g., loan default rates and loan amounts) (Kan et al. 2012). In parallel, impact evaluations of the accompanying rebate programs collect data about energy savings of projects that participate in both rebates and financing; this data can inform savings and cost-effectiveness calculations.

Impact evaluations of EE financing programs that are considered "resource" programs (as described in Table 2) will build upon these prior research techniques. Impact evaluations will refine

the collection of data related to the attribution of savings in order to determine magnitude of savings attributed to financing programs. The project-level energy savings data collection and analysis should focus on projects that have taken advantage of EE financing programs. The building blocks for completing this type of impact evaluation is in place, and policy makers and evaluation teams will need to determine the manner in which the methods are best applied to each EE financing program.

Risk Assessment

A key obstacle inhibiting large-scale implementation of EE financing programs is the lack of data with which to predict delinquency and default rates, the small pilot-level stage of most programs, and the lack of uniform loan term underwriting criteria (Byrd 2011). There is a need to understand the securitization transaction process and documentation packages that lending institutions require. EE financing risk is commonly categorized into three broad categories:

- Credit risk
- Asset risk
- Performance risk

For each of these categories, it is important to examine the key factors that are considered when assessing risk, particularly from a program design and evaluation perspective.

Credit Risk

Credit risk refers to the risk of loan default. This is particularly an issue in the nonresidential sector where there are complicated ownership structures. Actuarial data is needed on loan default rates by market sector that span ten years or more. For OBR programs, lending institutions are interested in analyzing utility bill payment history; however, it can be challenging to address the confidentiality issues associated with sharing customer data. The CPUC is now actively trying to identify ways in which this data can be shared in an aggregate manner that does not compromise customer-sensitive information. Key questions include the following:

- What data are the lending institutions most interested in?
- Are there data sources that can be leveraged to inform the markets?
- How to best communicate in financing terms?
- How do EE loan default rates compare to other types of loans (EE vs. solar photovoltaic)?

Asset Risk

Asset risk deals with the key question as to whether the value of the asset, home or business, might change as a result of the EE upgrade. Initiatives designed to reduce asset risk include the following:

- Ratings such as HERS, ASHRAE, COMNET, BEPA
- Benchmarking and disclosure
- Appraisal value tracking and analysis
- Asset labeling.

Providing data that clearly shows the impact and value of building retrofits is a critical step toward stimulating greater retrofit activity and investments. Issues that are important in the asset risk category include developing a better understanding of how the value of the asset can be improved as a result of implementing EE retrofits. What are the appraisal practices (U.S. Department of Housing and Urban Development/Fanny directives, other) and how can they be influenced to the advantage of the EE

industry? There is a recognized need to develop datasets that assess the appraised values of property before and after retrofits. Key questions include the following:

- How will the value of the asset change as a result of the project?
  - Market value should consider three approaches: sales comparison, income, and cost.
- How can energy cost savings be communicated in a manner that translates to reduced asset risk?
- What type of market research would be most valuable to inform assessment of asset risk (e.g., cost vs. value, rental prices, or vacancy rates)?

Performance Risk

Performance risk is characterized by savings uncertainty. Both consumers and lenders have a difficult time assessing performance risk. Lenders want to gain insight on the risk profile for EE financing relative to other types of investments, typically for large pools of projects in a similar category. For lending institutions, the challenges associated with assessing performance risk include the following:

- Lack of standardization of engineering practices increases transaction costs
- Lack of transparency
- Lack of consistency in reporting (ICP 2012).

Customers often require a level of certainty that the measures financed will result in the projected savings. For instance, consumers want to assess with a level of certainty the projected savings resulting from an EE retrofit. Key questions typically include whether the EE retrofit will likely result in a net positive cash flow. Customers are often also interested in metrics such as return on investment or payback period.

One interesting initiative on performance risk is the Investor Confidence Project (ICP) sponsored by the Environmental Defense Fund (ICP 2012). The target market for this framework is large-scale commercial projects representing over a million dollars of investment and 150,000 square feet. The ICP framework addresses the key challenges listed above by laying out a complete process necessary to ensure performance from initial audit through ongoing commissioning and measurement and verification.

The U.S. Department of Energy's (DOE's) Buildings Technologies Program (BTP) Buildings Performance Database is another initiative that addresses performance risk (DOE BT 2013). The Buildings Performance Database is a decision-support platform that enables engineering and financial practitioners to evaluate EE products and services in commercial and residential buildings. Designed to address existing market barriers, the Buildings Performance Database enables analysis of the benefits and risks of EE projects, helping investors to make informed decisions on completing and investing in these improvements. The database contains empirical data on building energy performance that can be used to evaluate the energy savings resulting from implementing various EE projects. DOE also runs the Better Buildings Initiative , which is designed to make commercial and industrial buildings 20 percent more energy efficient by 2020 and to accelerate private-sector investment in EE. Under the Better Buildings Initiative, several efforts are underway to improve the ability to assess the efficiency and energy costs of buildings and the investment opportunities in energy improvements.

Conclusion

Emerging financing mechanisms are expected to enhance delivery and adoption of EE measures. Financing is being demonstrated in California and across the country; however, little data is yet available to determine whether financing will close the efficiency gap, or represent only incremental improvement. The ability for utility programs to integrate financing to reduce or eliminate the most persistent market barriers will ultimately decide the fate of financing. This paper proposes simple frameworks to help

regulators, utilities, and evaluators make decisions to begin fitting financing into traditional DSM processes.

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