CalCEF Innovations

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NEW BUSINESS MODELS FOR ENERGY EFFICIENCY

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Executive Summary

Energy efficiency (EE) is recognized as the simplest, fastest, least expensive and lowest risk resource to meet growing energy demand. EE measures improve a firm or household's financial position by reducing expenses and enhancing reliability and performance of key energy consuming equipment, while also reducing all consumers' exposure to grid outages. Prudent investment in EE measures in existing buildings can save end-users money and earn investors an attractive return. Further, the environmental benefits of EE are significant, well documented, and widely recognized as the lowest-cost approach to achieving large-scale greenhouse gas (GHG) reductions.

Over the last 30 years, per capita electricity consumption in the United States has grown over 45%, while California's per capita usage has remained flat.[1] This divergence began in the 1970s when California first implemented large-scale EE programs. Although these efficiency programs have generated considerable economic and environmental benefits, there remains a large amount of untapped energy savings.[2] This paper outlines innovative concepts for how California & the U.S. can overcome key barriers to the broad-based implementation of EE retrofits at residential, commercial, and industrial facilities.

The central framing concept this paper advances is the need for **aggregation** to unlock the potential of EE: *financial aggregation* of projects to improve investor returns; *technological aggregation* to address multiple retrofit opportunities at once; and *geographic aggregation* to access the broadest possible range of buildings, engage local support to drive retrofits aggressively, and develop the workforce to make retrofits possible at the scale contemplated here.

Recommended solutions to advance aggregation and achieve maximum energy savings in retrofit markets include new financial products, new business models, and supporting public policy efforts.

Financial Products

- Enhanced utility on-bill EE financing options that include the delivery of technical services by third parties;
- Financing large-scale EE projects at commercial and industrial facilities using power purchase agreement (PPA)-style efficiency services agreements (ESA);
- Funding EE improvements through contractual assessments (property taxes) that remain with a property until they are paid off, regardless of changes in ownership;
- EARN equity notes that finance EE transactions in owner-occupied residential real estate.

Business Models

- Portfolio development and implementation of EE projects by building profile or geographic area;
- Comprehensive, whole-building retrofits;
- Expansion of the availability of EE services and the pool of qualified contractors through green jobs and community-based capacity building initiatives.

Supportive Public Policies

- Increasing the availability of on-bill financing options across customer classes and technology types;
- Directing public funds for EE projects, including new federal stimulus money, towards revolving loan pools accessible at the municipal level;
- Strengthening requirements under the California Solar Initiative to directly link the receipt of solar incentives to the implementation of comprehensive EE measures;
- Promotion of green leasing structures that align the interests of building owners and tenants;
- Guarantee of energy savings by utilities to stimulate EE investment within selected customer groups;
- Requirement of energy audits and disclosure of results concurrent with the refinancing or sale of homes;
- Developing transparent market mechanisms and procedures that allow investors to monetize the environmental attributes from EE projects.

The solutions discussed herein emphasize a set of selected financial products and emerging business models and do not address issues such as consumer behavior, energy infrastructure, and utility rate design. Our colleagues at the American Council for an Energy-Efficient Economy, National Action Plan for Energy Efficiency Leadership Group, the Clinton Climate Initiative, the Federation of American Scientists, the Energy Programs Consortium, the Center on Wisconsin Strategy, and other organizations are putting forth potential answers to these and other key EE issues.

While this white paper stands on its own, a draft version of it also served as a discussion guide for the December 2, 2008 "Energy Efficiency Technology Impact Summit 2.0," hosted in San Diego by the California Clean Energy Fund in conjunction with the UC Davis Energy Efficiency Center, Sempra Energy, CleanTech San Diego, and the UC Davis Center for Entrepreneurship. The objective of the session was to explore potential business and policy solutions discussed in the white paper, develop further innovative approaches to addressing the efficiency challenge, and form consensus around which actions hold the most promise. CalCEF Innovations and its partners in this effort continue to explore ways to deploy these ideas in pilot form throughout California, and welcome ongoing comments and support from interested stakeholders.

I. Introduction and 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 examine and posit novel financial tools, business models, industry partnerships, and public policies to achieve unrealized EE gains.

Energy efficiency is a relatively low-cost, high-value opportunity that has been extensively exploited to the benefit of California ratepayers and the environment. Lower transaction costs and economies of scale, however, tend to drive most activity toward large-scale projects in the MUSH (municipalities, universities, schools, and hospitals) markets. Disparate and fragmented markets, such as residential, small commercial and small industrial opportunities, although representing large potential savings in aggregate, have proven more difficult to access. However, potential savings must be achieved in all market segments if California is to meet its energy and climate goals.

Efficiency measures in existing buildings, if implemented aggressively, can have an outsized impact on greenhouse gas emissions as compared to a focus on new construction. In addition to this key working assumption, the following components frame our effort:

The large potential for expanded EE in California, and throughout the U.S., is undisputed. In this paper, we rely heavily on the extensive work done by national groups like the American Council for an Energy Efficient Economy (ACEEE), California energy agencies, and local electric and gas utilities to clearly identify remaining opportunities to expand EE deployment. These analyses have been subjected to rigorous multi-party assessment, and while certain details may be disputed, we take their high-level conclusions as given: the potential for further efficiency gains is substantial, despite California's and other leading states' records of aggressive efficiency deployment.

A significant gap exists between the estimated market potential of energy savings and what business-as-usual would yield. To capture the large volume of energy savings projected in market studies, and to meet the increasingly aggressive efficiency targets being put forth at the state and federal levels, a variety of new business solutions and financing options need to be developed and implemented to overcome key financial, market, policy, and technical barriers.

The technology exists today to meet the need for greatly expanded EE. While continued innovation in efficiency is essential to the sustainable energy future, the analysis that follows assumes that the suite of proven, readily-available efficiency technologies is sufficient to address the majority of the remaining savings potential in California.

Certain markets for EE remain under-served, for reasons that are well known. Entities promoting and implementing EE understandably emphasize markets and customer classes that are most readily accessible, have well-established procurement procedures, and offer opportunities for large blocks of energy savings. Other, smaller opportunities, while in aggregate offering large savings potential, are under-addressed, for reasons such as dispersed decision making, intolerance to payback periods, and high customer acquisition costs per unit of energy saved and revenue generated. These markets, in general, include retrofit opportunities in the residential, commercial and small industrial contexts.

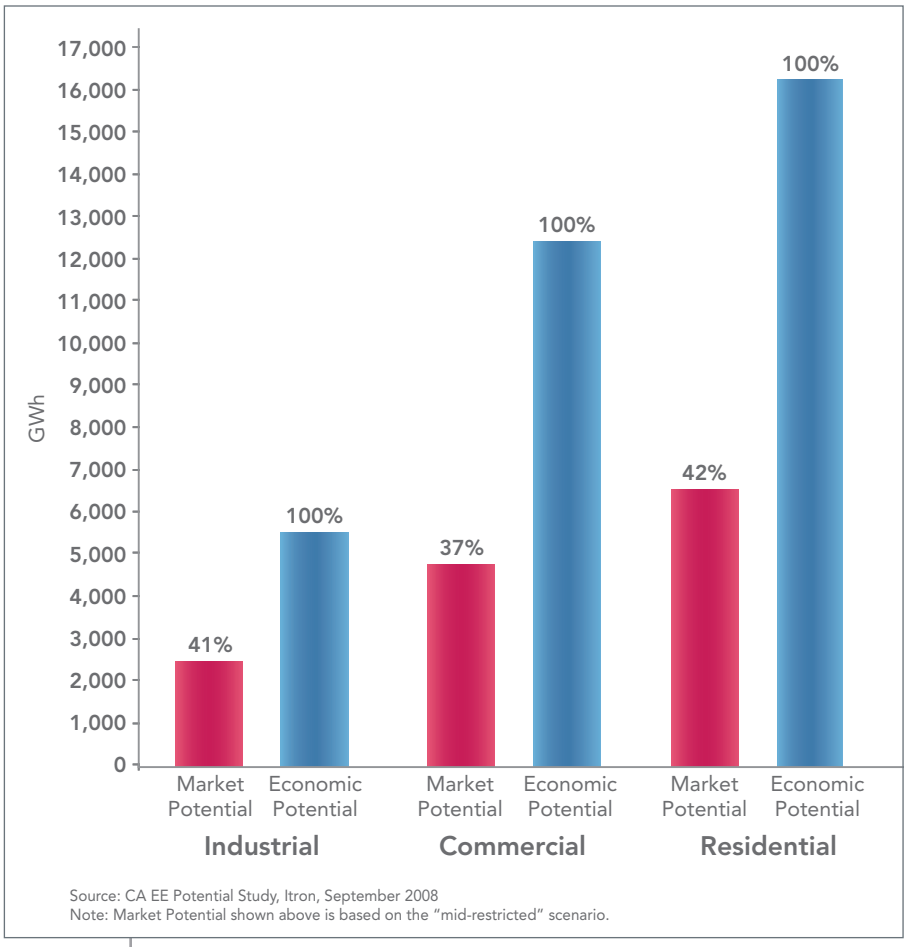
Successful aggregation strategies can help overcome many of these key historical barriers. Achieving scale is a critical issue for any new business but is particularly acute in the EE marketplace, which is characterized by a large number of small projects that involve the installation of numerous types of equipment at facilities with differing operational parameters and energy demand profiles. To achieve sufficient scale in the EE industry, a strategy is required that allows for the aggregation of individual projects, technologies, service offerings, and investments into a larger and more cohesive combination of opportunities.

Support from policy-makers for innovative methods to address these challenges is robust. The commitment to California's loading order of preferred energy resources continues to manifest itself across the spectrum of resource

planning, legislation and regulatory decision making.[3] Increasingly, California's model is considered an example for the nation. In light of this, we expect that solutions addressing under-served but high-value efficiency opportunities, if properly constructed, will find support in the policy context.

The new California regime of "decoupling plus" is sufficiently flexible to allow enhanced third-party participation in efficiency programs. California's recent move to establish earnings incentives for out-performance against savings targets promises to raise the importance of efficiency deployment as a key utility strategy.[4] The structure of this incentive program, however, appears sufficiently flexible to allow for enhanced third-party participation in the areas of finance and service delivery, while still allowing investor-owned utilities (IOUs) to book performance against regulatory benchmarks. While further rule development may be needed, and careful crediting across a range of benefits will be required, we believe the proposals for third-party participation described here are consistent with this new incentive structure.

Continued large-scale implementation of rate-payer and publicly funded EE programs is critical. The significant level of energy savings achieved through utility programs in California across the entire spectrum of customers is well documented, including the strong performance of the 2006-08 program portfolio of California IOUs. Going forward, investor- and publicly-owned utilities need to continue their aggressive development and deployment of efficiency programs. Private service providers, financers, equipment manufacturers, trade associations, contractors, and other EE industry stakeholders will increasingly need to work in concert with utilities and policymakers to meet the state's growing energy challenges.



Source: CA EE Potential Study, Itron, September 2008
Note: Market Potential shown above is based on the "mid-restricted" scenario.

Figure 1 Electricity Savings Potential (GWh) for California Investor Owned Utilities 2007 – 2016

II. The Marketplace for EE in California

The environmental benefits of EE are significant, as noted by the McKinsey Global Institute,[5] which singles out EE as the lowest-cost measures to achieving large-scale greenhouse gas (GHG) reductions.

A variety of new business solutions and financing options can bridge the large gap between achievable energy savings under market current conditions (i.e., market potential) and the theoretical or economic potential for total savings. This gap was identified as part of recent updates to the California Energy Efficiency Potential Study[6] and are illustrated in Figures 1 and 2.

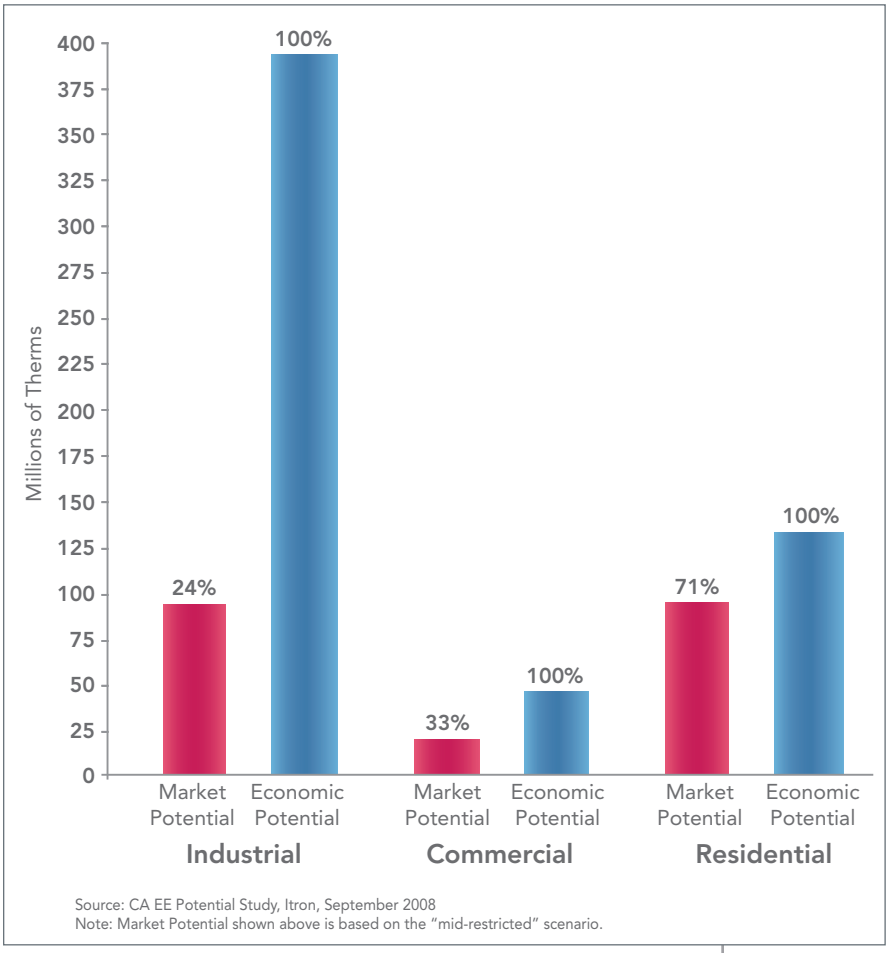


Figure 2 Natural Gas Savings Potential (Millions of Therms) for California Investor Owned Utilities 2007 – 2016

The existence of a considerably large gap between the economic potential for energy savings and what is being achieved in California is due in part to the focus of the ESCO (energy service company) industry on a narrow slice of the EE market at tax exempt (TE) / municipal sector facilities. In other market segments, particularly the residential sector, opportunities for additional energy savings have been forfeited due to a historical focus on utility programs and technical services that implement individual EE measures rather than integrated solutions.

IIa. Overview of the Savings Potential in California

Industrial: The industrial sector represents almost 20% of total electricity use and over 30% of natural gas use in California.[7] The industrial sector has a market potential for 2,276 GWh per year of energy savings which is equivalent to approximately 4.5% of total annual industrial electricity consumption.[8] By 2016, industrial end-users also have the market potential to save 92 million Therms of natural gas, which is equivalent to 3% of annual industrial natural gas use.[9] Key end-user segments include manufacturing, food & beverage, hi-tech electronics, chemicals, and pharmaceuticals.

Commercial: Commercial end-users account for 38% of total electricity use and 25% of natural gas use in California.[10] The market potential for electricity savings in the commercial sector is 4,700 GWh, which is equivalent to approximately 4% of total annual commercial electricity consumption in California.[11] By 2016 the commercial sector has the market potential to save 15 million Therms of natural gas, which is equivalent to less than 1% of annual statewide commercial natural gas use.[12] Key customer segments include office buildings, reail, warehouses, health care facilities, and schools.

Residential: In 2008, residential end-users accounted for 32% of California's electricity use and 36% of natural gas consumption.[13] The statewide market potential for residential electricity savings by 2016 exceeds 6,000 GWh/year and 93 million Therms, which is equivalent to 6.5% of total annual residential electricity consumption and 2% of annual residential gas use.[14]

Note that the savings potentials described above are expressed in terms of market potential, consistent with state planning standards, rather than the larger economic potential;note also the wide gap between these two measures, particularly in the Industrial and Commercial sectors.This further illustrates the importance of new business models and policy strategies, such as those described below, that will shrink the gap between these two methods of assessing the potential for expanded EE. For more detail on the EE savings potential in California, see Appendix A.

IIb. Market Participants

Service Providers

The successful implementation of EE projects and programs requires the integrated delivery of numerous services and products from private and public sector stakeholders and non-governmental organizations. Below is an overview of the key players who are currently engaged in the development of efficiency programs and the provision of technical and financial services to the EE marketplace.

Electric and gas utilities in California offer a diverse portfolio of EE programs for residential, commercial, and industrial end-users that include providing energy audits, financial incentives and rebates to install EE equipment, as well as conducting outreach and capacity-building activities that raise awareness regarding the economic and environmental benefits of EE. Over the three year cycle from 2006 through 2008, California IOUs spent $2.2 billion on EE programs. In July 2008, the IOUs filed their EE program applications with the CPUC for the 2009 to 2011 period that totaled $3.7 billion. In October 2008, the CPUC asked the IOUs to revise their program applications to be more aggressive and better aligned with the California long term EE strategy. Revised applications were filed in March 2009 and in their final approved form could total in excess of $4 billion. Although utility EE programs in California are among the most comprehensive and well funded in the nation, to achieve the bold targets set forth by the CPUC, programs will need to be augmented by an increased level of participation by local service providers.

Energy service companies (ESCOs) are large energy services firms that provide turnkey engineering, procurement, and construction solutions to implement EE projects. ESCOs offer performance contracts, primarily long-term guaranteed energy savings agreements, and have the technical and financial resources to carry out complex design / build EE projects as well as the ability to provide ongoing maintenance and monitoring services. The vast majority of projects implemented by ESCOs are in the municipal or TE markets, including public entities and private, not for profit groups. Data from a Lawrence Berkeley National Laboratory (LBNL) study reveals that the TE muni market accounts for more than 80% of total ESCO investment activity.[15] This focus is driven in part by the large transaction size of investments in the TE muni sector (often greater than $5 million) and standardized procurement procedures that have been in place for decades, which helps streamline ESCO project development efforts. A byproduct of this narrow business focus is that ESCO sales and business development practices are designed to meet the needs of public sector customers and are not easily adapted to meet the longer project development cycle and more business process-driven needs of private-sector clients. Although ESCOs provide a performance contract that guarantees a portion of a project's annual energy savings output, they rarely finance deals using their own funds. The majority of ESCO-implemented projects are financed using a capital lease[16] or are self-funded by customers.

Energy Service Providers (ESPs) consist of small-and medium-sized firms that offer a range of technical and engineering services to identify and implement EE projects. ESPs are differentiated from ESCOs in that they are independent firms not associated with a specific technology and typically do not provide long term performance guarantees due to a limited tolerance for risk exposure and small balance sheet. ESPs that serve the commercial and industrial markets typically structure their business offerings around an individual EE measure and cover a limited geographic area. In many instances, ESPs act as subcontractors on ESCO-implemented projects and accordingly have a similar geographic footprint to ESCOs themselves. Lighting contractors are a subset of ESPs that have a strong presence in the commercial sector as well as the TE muni market. There are few dedicated ESPs that focus on the residential EE market. In general, technical services provided by residential contractors focus on individual efficiency measures, often foregoing the added energy savings that would be achieved by integrating multiple EE measures.

Financiers and Project Developers

There are a number of financial institutions providing capital to the EE market, primarily as part of projects at TE / municipal facilities that support the market focus of ESCOs. Financial institutions have offered little more than capital leases, in part because of a reluctance to carry any risk associated with recovering the residual value of EE equipment, which are fixtures of customers' facilities and

have a limited or non-existent secondary resale market. In addition, very few financial institutions have specialized capabilities and core competencies in the EE market. As such, the majority of traditional financial institutions are unable to fully support the underlying structuring and development of EE projects.

Trained Workforce

One of the limitations to increased EE activity is a shortage of human resources, both in the private sector (engineering, construction, maintenance, financial analysis, and program design and implementation) and in the public sector (measurement and verification, project assessment, permitting, research, development, and deployment). To grow the pool of people and EE-related capabilities requires collaborative efforts of government entities, employers and unions, technical societies, and both conventional and non-conventional members of the education community. This implies training people who are just entering the workforce, and retraining people who shift careers, and expanding the perspective, trade skills, and service offerings of existing EE professionals. Current relevant examples include the PG&E Power Pathways[17] training and apprenticeship program and the Laney College Green Jobs Corps partnership with the City of Oakland. To stay competitive and relevant, trade unions and individual firms are training their members and employees.

III. Barriers to Market Development

Despite the broad array of market participants in the California EE marketplace, their activities have been largely confined to a relatively narrow band of services that are tailored to the needs of public sector, tax exempt, municipal customers. While it is true that local utilities and state agencies offer programs that serve industrial and large commercial customers, large portions of the market remain underserved. Limited financial products and business solutions are available to meet the needs of key small commercial and residential customers, groups that represent a significant portion of the EE savings potential in California. Although this disconnect between market segments with the largest EE potential and the foci of the market participants described above is a hurdle in and of itself, numerous sector-specific barriers also limit the widespread adoption of EE.

Industrial Sector: Despite having significant EE potential, there are several hurdles that hinder the ability to achieve energy savings at industrial facilities, including:

- **Budget Priorities:** Corporate capital budgeting processes place EE in direct competition with other core priorities, such as investments that expand production, increase throughput, and or maintain overall plant reliability. End-users often lack the budget to self-finance EE investments and, aside from traditional capital leasing options, have limited outside financing solutions available to them.
- **Business Interruption:** Industrial facilities place heavy emphasis on optimizing manufacturing processes and ensuring continuous operation of plant assets, thereby posing a challenge to efficiency project implementation.
- **Cost-Benefit Analysis:** The ratio of upfront costs (conducting an energy audit, establishing M&V protocols, arranging financing) to the total cost of implementing EE measures is high versus short-term savings.
- **Extended Payback Periods:** Industrial firms have a short-term horizon for investments and typically require projects to have rapid positive return on investment. A recent survey conducted by Johnson Controls revealed that more than half of the industrial executives and managers that they interviewed would require an EE project to have a payback period of less than three years, which most do not.[18]

Commercial Sector: Barriers to the adoption of EE equipment and practices at commercial facilities include:

- **Split Incentives:** Split incentives between the economic interests of property owners, franchises, facility managers, and tenants—particularly acute in the commercial real estate industry—prevent a building owner or landlord 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.

- **Hurdle Rates:** Similar to industrial end-users, large commercial customers often have limited internal funds to implement facility upgrades and therefore require a high rate of return to proceed with any EE investments.
- **Financing Up-Front Costs:** Limited financial products and providers exist that reduce the first cost of commercial EE projects.

Residential Sector: Existing barriers that limit the implementation of efficiency measures in residential buildings include:

- **Long Payback Periods:** There is a reluctance of homeowners and renters to invest in EE measures that may not match up with their known time horizon for remaining at a property.
- **Lack of Residential Contractors:** Few vendors have the ability to identify and implement multiple EE measures, often resulting in missed opportunities to increase the level of savings and cost effectiveness associated with taking a more integrated approach.
- **Small Project Size:** The large number of low-dollar value projects distributed amongst a massive market of individual residential customers makes transaction costs a significant fraction of any single job, thereby reducing its profitability for financiers and contractors.
- **Lack of Support for Whole Envelope Retrofits:** Utility incentive programs typically focus on single EE measures, failing to capture benefits of multiple integrated upgrades.
- **Lack of Information and 'Efficiency Ethic':** While a vast majority of Americans express a desire for investment in efficiency,[19] beyond early adopters, those who take concrete action to use EE is relatively small.

IV. Emerging Financial Products, Business Solutions, and Market-Enabling Public Policies

What follows is an overview of the selected financing products and business solutions, a summary of existing barriers to their implementation, and a review of strategies and actions that can lead to their widespread utilization.

As illustrated in Figure 6 below, although each solution is designed to cover different individual customer segments, as a whole, they span the entire spectrum of energy savings opportunities.

The selection of these business solutions was driven by their abilities to: a) address the underserved market segments; b) achieve scale in a timely manner; c) immediately deploy existing EE technologies; d) bolster existing ESCOs and ESPs to enter new markets; and e) help lead to the creation of new service providers who can fill existing voids in the EE marketplace.

In order for these business solutions to meet California's energy savings targets, a series of supporting market-based public policy initiatives must be implemented that provide the capacity to achieve EE on a massive scale.

IVa. Innovative Financial Products

Financial and Geographic Aggregation: Contractual Assessments – Residential & Small Commercial

Overview: Passed in July 2008, California Assembly Bill (AB) 811 allows efficiency improvements to be financed from contractual assessments on existing properties (i.e., property taxes). Specifically, local cities and municipalities can finance EE projects by issuing a bond (or raising funds through other means) to pay for initial installation costs with repayment made through tax rolls.[20] Despite its recent enactment, several cities are already incorporating AB 811 contractual assessments into their EE and renewable energy initiatives, such as Chula Vista, Palm Desert, Santa Monica, and Berkeley.

Under AB 811, a local agency within a city or county can form an assessment district that has the authority to levy property to finance EE or renewable energy-related improvements. Loans under AB 811 are secured by a property tax that remains with a property until paid off, regardless of changes in ownership.[21] A key element of AB 811 is that it can be utilized only for existing properties.

Barriers to Contractual Assessments: Although AB 811 can help remove first cost hurdles to EE investments, it does not address the challenges that a local entity faces in raising capital to fund projects and cover administrative costs. Recent recommendations made by officials in Sonoma County to take a phased approach to implementing an AB 811 initiative highlight the uncertainties surrounding the availability of county-based sources of funding. Further, public bonds which are utilized for AB 811-type activities would not be tax exempt.[22]

Expansion Strategies and Areas of Support: City and municipal agencies, in cooperation with local utilities, should work to **formally integrate property tax-based and other contractual assessments as a financing option** under any public, private, and utility EE and renewable energy program. To the extent possible, any best practices that emerge from the Palm Desert and City of Berkeley[23] programs, and other ongoing AB 811 motivated initiatives, should be replicated statewide.

Use alternative sources of funds to finance projects Federal stimulus funds for EE would be an ideal source of capital for programs to create **revolving loan funds**, as they would achieve shared federal and state objectives, would be quickly deployed, and would return to the local agencies for use in subsequent rounds of EE financing.

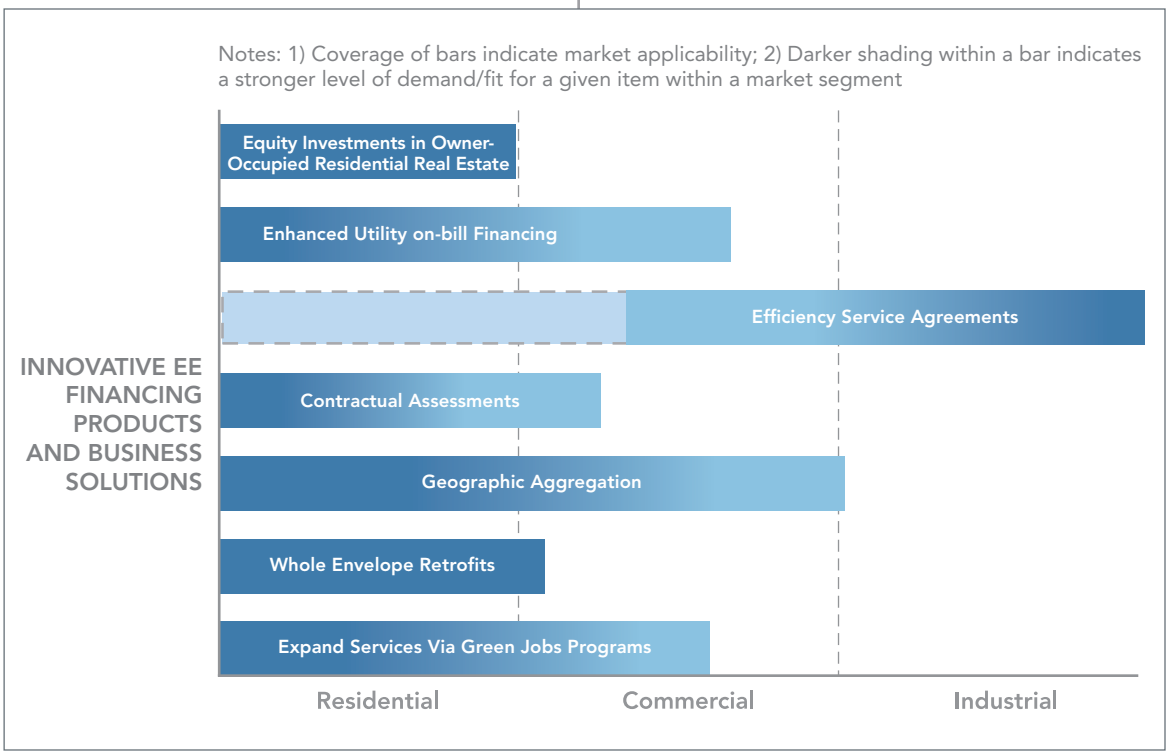
Financial Aggregation: On-Bill Financing (OBF) – Residential & Small Commercial

Overview: Utilities' OBF programs have proven successful for residential and small business facilities in New England, California, and some Midwestern markets. The majority of existing programs allow customers to finance efficiency projects through payments on their monthly utility bill and typically include the following elements:

- No capital outlay to purchase and install equipment and implement EE measures through the receipt of an interest-free, or low-interest loan;
- Customer repayments are based on estimated energy savings and are set to at a "cash flow neutral" level compared to their previous energy bills; and
- Ability to receive a cash rebate or incentive that can be utilized to lower the required loan amount.

A variation of OBF known as a tariffed installation program (TIP) uses a utility's bill collection system to collect a charge that has been attached to the meter as a special tariff. TIPs may offer a mechanism for rented premises where the split incentives between landlords and tenants chronically lead to under-investment in EE. With a TIP, the obligation is borne by the meter customer, not necessarily the building owner, and current residents

Figure 3 - Innovative Business Solution Coverage of Key Customer Segments



can feel comfortable that they will only have to pay for improvements from which they directly benefit. Likewise, TIPs provide a mechanism for building owners to install measures in their property that may outlast the tenure of any particular tenant. Because the payment is tied to the meter, not the homeowner, TIPs allow for the current occupant to move, with the next occupant responsible for repayment. As a tariff, TIPs require the support of implementing utilities and approval from the utility regulators.[24]

OBF initiatives have typically been funded through a combination of sources including internal utility funds, incentive monies from system benefits charges, or state-funded programs. Funding for the improvements can also come from the issuance of bonds, public funds, or private sources of capital.[25] The total cost of EE installations implemented through OBF programs in the U.S. ranges from an average of $50,000 up to a total allowed project size of $250,000.[26] Program requirements vary according to available collateral or recourse to customers. For example, SDG&E and SoCalGas offer unsecured loans, while others, such as First Electric Cooperative, require an equipment or property mortgage lien. SCE, SoCalGas, and SDG&E offered OBF as part of their 2006-2008 programs to multi-family units, small businesses, and local governments. These utilities and PG&E have proposed including OBF as part of their 2009-2011 program portfolio, however, they do not contemplate any residential on-bill solutions.[27]

Barriers to OBF: Utilities are generally reluctant to perform what are considered traditional banking functions for their customers, which can force compliance with state consumer lending laws, and see a risk in making loans to customers using their own capital or ratepayer funds. Utilities that offer on-bill financing limit their risk by requiring short repayment periods, typically five years or less—too short for most residential projects, which have typical payback periods of ten years or more. OBF programs in the residential sector also face the added challenge of having to comply with CPUC cost-effectiveness tests.

Expansion Strategies and Areas of Support: Areas of adaptation and expansion to the plans currently being developed by the IOUs, or future iterations of on-bill financing, include:

- **Develop Customized EE Utility Programs Integrated With OBF** designed to provide residential and small commercial customers with the turnkey solutions (financial and technical) that are often required to implement efficiency measures. Existing on-bill financing initiatives in California are typically treated in isolation from the range of EE measures available to consumers, supporting only a small subset of possible regimens and technologies. Developing a specialized program that offers OBF as a centerpiece alongside a suite of technical assistance would streamline the project development process for customers and could potentially be managed by private firms that are active in small commercial market segments.
- **Establish partnerships between local utilities and ESPs** that can deliver engineering and technical services to small commercial customers. Partnering with a group of pre-screened firms would provide utilities with multiple channels to access new program participants. Private services providers would benefit from being able to offer customers an OBF option, and local utilities would benefit from having the sales and business development teams of partner firms identify and bring customers into utility programs.
- **Limit Downside Risk:** utilize system benefit monies to create a **loan guarantee program** that can attract private lenders as a source of funds for on-bill financing programs for small commercial and residential customers.
- **Adjust cost-effectiveness requirements** for residential EE programs that include OBF, so that repayment periods offered to customers are consistent with the time horizons required by the full range of customer classes that might benefit from the service.
- **Partner With Consumer Finance Institutions:** One of the barriers to OBF is that utilities are not in the business of loaning money to their customers, nor do they want to be. Therefore, one option is for utilities to partner with banks that are in the business of making loans and can manage the consumer credit evaluation and lending portions of OBF. With such an arrangement, banks maintain the loans and liabilities on their balance sheets and utilities arrange the payment mechanism, project evaluation, and marketing.

Financial and Technological Aggregation: Efficiency Services Agreement (ESA) – Large Commercial & Industrial

Following the recent trend of the increased utilization of power purchase agreements (PPAs) as a vehicle to finance renewable energy projects, efficiency services agreements (ESAs) are starting to emerge as an attractive structure to provide comprehensive financing solutions that enable end-users to avoid the capital outlay associated with the implementation of EE measures. Via an ESA, customers can receive 100% financing for engineering, design, construction, equipment, installation, maintenance and ongoing monitoring of EE projects. Project financing is structured as a services agreement whereby customer repayment is based on an agreed-upon cost of avoided energy (e.g., $/avoided kWh of electricity) or share of energy savings. As illustrated in Figure 7, the ESA provider finances and develops projects via contractual agreements with a customer and an ESCO or ESP.

Under this model, an ESA provider serves as financier and owner of EE assets and partners with service providers to carry out required project installation and maintenance activities. Customers make regular payments (e.g., semi-annually) that are based on the energy and operating savings realized by a project. ESA payments are structured to be less than the customer's baseline utility costs and escalate at a fixed rate. While the characteristics of individual deals vary, the fundamental framework of the ESA is consistently applied across all projects to help minimize transaction costs. Key elements of projects financed using an ESA include:

- **Ownership of Project Assets**: The ESA provider holds title to project-related assets during the contract period. At contract end date, customers have an option to purchase a project's assets at fair market value.
- **Pricing**: Set as a services charge based on a cost per unit of avoided energy or share of energy savings. An escalation schedule, based on a constant percentage rate, is defined in the ESA.
- **Contract Length**: ESA contract periods can vary but typically range from five to 12 years.
- **Measurement & Verification**: An M&V plan is set forth in each ESA contract with customers and is typically prepared semi-annually or quarterly.
- **Performance Guarantees**: To mitigate project performance risks, the ESA provider typically obtains a performance guarantee from an ESCO or ESP.

The ESA product is well suited for end-users in the commercial, industrial, manufacturing, private higher education and health care sectors. Typical project sizes for ESAs exceed $1M and include a variety of commercially proven EE technologies: heating, ventilation, and air conditioning (HVAC), building and equipment controls, motors, pumps, process equipment, and lighting.

Barriers to Expansion of Energy Services Agreements: The ESA is a relatively new product and requires significant front-end customer and ESCO and ESP education. 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 that are depreciated on a straight line 39-year property basis. In addition, third-party owners of EE assets are not allowed to claim the EPACT[28] tax deduction for EE equipment in commercial buildings per §179D of the Internal Revenue Code.

Expansion Strategies and Areas of Support:

- **Integrate the ESA offering into third-party-run utility programs** that would provide large commercial and industrial end-users with a comprehensive set of technical assistance and financial services.
- **Allow investors that hold title to EE equipment installed at 501(c)(3) or state / municipal facilities under an ESA to be exempt from paying state income tax on EE property.** Third-party owners of solar PV are exempt from any property tax payments on such equipment. However, even though EE is a higher loading order priority in California, currently, even if EE property is being installed at a tax exempt facility under an ESA, state property taxes are still levied since an outside investor owns the EE assets. This tax burden adds an average annual expense that is equivalent to one to two percent of the total project cost and limits the applicability of the ESA in tax exempt and municipal markets.

- **Foster federal action to allow EE assets to receive the same depreciation treatment and tax deduction allowances as solar and other sources of renewable energy**. Specifically, in order to encourage installation of energy efficient technologies in commercial buildings:
  a. Section 168 of the Internal Revenue Code should be amended to designate EE property installed in or on a commercial building as 5-year depreciation property; and
  b. 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.
- **Conduct marketing and outreach** activities to California industry groups and business associations to promote the ESA structure as an alternative source of financing efficiency improvements.

Financial Aggregation: EARN Notes – Residential Sector

Overview: The EARN Group developed and offers EARN Equity Certificates (EARNs) for the bulk purchase of lender-owned or REO (real estate owned) homes and the restructuring of existing pre-foreclosure and troubled mortgage obligations. EARN-financed REO homes can be refurbished and made energy efficient to add value to the property, the community, and the environment.

Unlike a traditional mortgage lender, an EARN investor participates in the future growth of a home's value. Unlike shared appreciation loans, the EARNs represent a pure equity investment in a fraction of a home's value. With an EARN, there is no lender but rather an investor who is entitled to a fixed percentage of the value of the home when the EARN matures, generally upon sale or refinancing of the home. If the home price increases, the investor will share in the appreciation of the home. If the home price decreases, the investor may absorb a share of the loss depending on when they exit. All EARNs are secured by a deed of trust and a perfected lien on the home in second position after the mortgage(s). There are no monthly payments, and accordingly, no risk to the owner of losing their home to the investor for failing to make such payments.

EARNs can lower the monthly payment or cash out of pocket for EE installation when all or part of the installed cost of retrofits is financed through an EARN instead of a conventional mortgage or home equity loan. With EE improvements financed by an EARN, the value of a home increases and the owner's default risk decreases due to energy cost savings and a reduction in the amount of cash the homeowner would otherwise have expended.

For example, suppose owners of a home valued at $500,000 wish to install EE measures at a cost of $25,000 or 5% of the home value. The EARN investor funds this amount and in exchange receives an EARN, which grants the right to receive a percentage of the home's value at the time it is sold. That percentage is fixed at the time the EARN transaction closes.

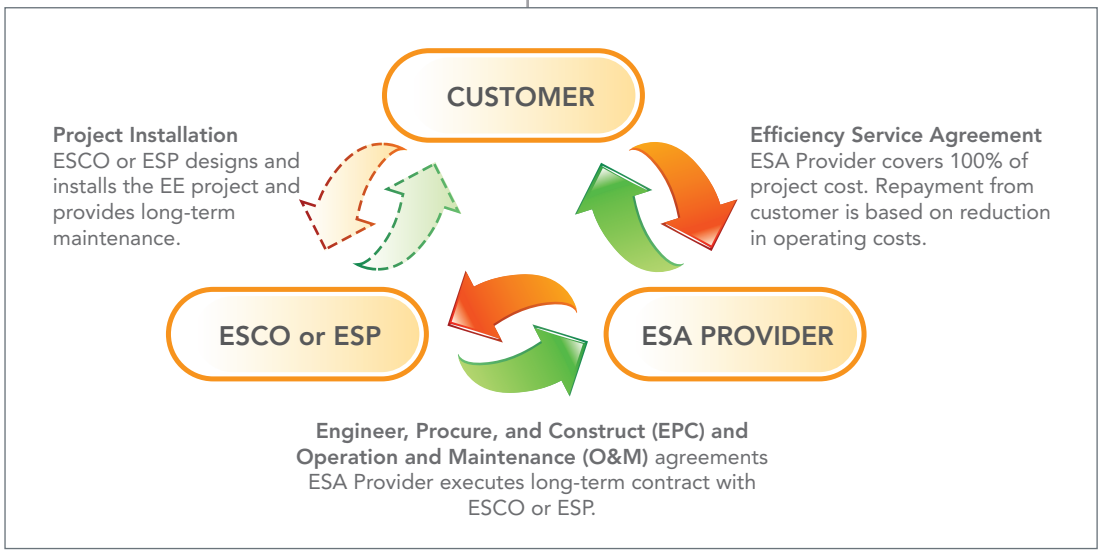


Figure 4 – ESA Contractual Structure and Key Stakeholder Roles

The investor's rate of return and other EARN terms may be pre-packaged to facilitate marketing and for acceptability to homeowners. EARNs are originated through the existing mortgage supply chain and once issued, individual Certificates may be pooled. Certificates are now available in northern California on a limited basis and the EARN Group with Prager, Sealy & Co. are developing a secondary market for EARN pools.

Barriers to Expansion of EARNs: EARNs are a new financing instrument with which investors and home owners are not yet familiar. There is no history of purchase or sales performance of EARNs. Significant industry and consumer education is required. Channels are not yet well established, although EARN Group has had extensive discussions with multiple financiers and municipalities in California.

Expansion Strategies and Areas of Support:

- **Work with utilities, financial institutions, and municipalities to seed the market:** EARN Group believes that cities which are likely to have 1) a high number of REO or near-foreclosure properties, 2) high energy costs, 3) less efficient buildings, and 4) communities already showing interest in sustainability would be the best places to enter the market.
- **Increase self-service options and information for homeowners:** For example, EARN pricing and education tools could be created and embedded into EE equipment distributors' websites. Providing homeowners with the ability to learn about EARN financing and compare EARN financing to other funding options for EE and renewable energy could accelerate market adoption.
- **Creation of secondary market for trading EARNs:** Foundations and companies interested in promoting EE can allocate a portion of their capital to purchases of EARN Certificates in the secondary market. This would enable EE equipment distributors, manufacturers and utilities to offer EARN financing, knowing that they could readily sell EARNs once installation was completed and savings were achieved.

IVb. Business Model Innovations

Community-based Geographic Aggregation

Overview: A wave of new EE business structures are emerging that recognize two key elements: 1) aggregating individual EE projects into a single portfolio expands opportunities for creative financing solutions to overcome historical barriers associated with small transaction size, and 2) cities (and other densely populated geographic areas) that consume large amounts of energy resources offer significant business opportunities for locally motivated stakeholders. City-based initiatives are well-suited for small- to mid-sized efficiency projects at residential (both single and multi-family), small commercial, and municipal facilities. Listed below is a sample of selected initiatives.

- In 2007, a program was established in Cambridge, Massachusetts to invest $100 million in efficiency projects at residential, municipal, and commercial facilities with the goal of achieving a 10% reduction in city-wide energy use, a 15% drop in electricity demand, and over 150,000 tons of avoided CO2 emissions. A non-profit organization, the **Cambridge Energy Alliance (CEA)**, was formed to administer the program and provide local residents with loans to implement projects. CEA has pre-selected a group of ESCOs to implement projects for local residents and has a strong, community-based approach to originating efficiency opportunities. A key innovation by CEA is its regulatory approval to participate in regional environmental and capacity markets that generate added monetary benefits from efficiency projects implemented under the program. Specifically, CEA can receive payments for demand reductions that it bids into the New England ISO Forward Capacity Market[29] as well as receive proceeds from the sale of environmental commodities into the Regional Greenhouse Gas Initiative.[30] Part of CEA's mission is to monetize its participation in these regional markets (which are generally inaccessible to individual end-users) and then use the proceeds to provide local residents with low-cost loans and free technical assistance to implement EE projects.
- **The Clinton Foundation's Climate Change Initiative (CCI)** is working with 40 cities around the world to develop and implement large-scale efficiency projects. CCI, established in August 2006, provides customers in selected cities with technical assistance to

identify and develop projects, including the ability to receive services from major ESCOs and several large financial institutions that are CCI partners. A unique feature of the CCI is its ability to provide residents of participating cities with discounted pricing arrangements that CCI has pre-negotiated with leading manufacturers and suppliers of energy-efficient products.[31] CCI has developed a large pipeline of efficiency retrofit projects at municipal and commercial facilities and currently has at least four projects under construction.[32] CCI is also starting to work with alternative financing sources that can provide customized solutions to fund EE and renewable energy projects. This includes the development of a pilot project for several large office buildings that will utilize a new transaction structure that has the potential to eliminate barriers associated with split incentives between property owners and tenants.[33] It combines elements of a triple-net lease,[34] which obligates the tenant or lessee to cover pro-rata expenses such as insurance, taxes and maintenance on the full property, with a standardized energy performance contract (EPC) to help overcome barriers associated with split incentives between property owners and tenants.

CCI is also advancing an initiative in a Midwestern city to implement EE projects at privately-owned affordable housing facilities using a loan guarantee structure. Specifically, participating banks will receive a guarantee on the repayment of 50% of the annual principal and interest payments on EE projects that are implemented under the initiative. The funds to provide the guarantee come from a combination of state-level EE incentive monies and outside capital from a national affordable housing association.

- **The Palm Desert Energy Partnership program**[35] is a community-based initiative that involves the city of Palm Desert, SCE, and SoCalGas. The program is targeting the reduction of the city's energy use and peak demand by 30%. Under the program, local residents and businesses receive customized utility incentives to replace inefficient HVAC, lighting, refrigeration, and pool pumping equipment.[36] The program provides end-users with education on energy savings opportunities and access to a group of pre-screened energy services firms that implement efficiency projects. The city council also recently approved the Energy Independence Program (EIP) which allows local property owners to apply for loans to install EE and RE measures that are permanently attached to the property. This new loan program is a direct result of the passage of AB 811 and will make Palm Desert a proving ground for utilizing contractual assessments to foster the implementation of EE and renewable energy measures under city-based programs. To date, the Palm Desert program has implemented a wide range of efficiency retrofit projects, predominantly in the residential sector, that have generated more than 22 million KWh of electricity savings, seven megawatts of avoided demand, and a half-million Therms of natural gas savings.[37]

Barriers to Community-based Aggregation: Aggregation initiatives encounter the panoply of traditional barriers to implementing EE retrofit projects, including limited interest from financial institutions in funding projects that are considered to have too small of a transaction size. As an example, the financial institutions that signed on as CCI partners back in 2007 have disbursed only a small fraction of the $5 billion that they initially pledged to support EE. Further, aggregation initiatives that bundle numerous small projects into a large portfolio often face challenges in raising private capital because outside investors often lack direct recourse to the revenue streams, assets, and underlying end-users that host EE projects.

Expansion Strategies and Areas of Support:

- **Offer Commercially Available Consumer Financing:** Alternative financing products should be formally integrated into aggregation programs. This includes utility on-bill financing options, contractual assessments under AB 811, loan funds like EIP, and emerging financing structures such as the ESA.
- **Enable Aggregation Financing Through Legislative Initiatives:** Ongoing legislative efforts in California, such as AB 1709[38], should be monitored for their potential to support city-based aggregation initiatives. If passed, AB 1709 would allow a local agency to levy special taxes to fund EE and renewable energy projects. This legislation is modeled on a tax ordinance enacted in Berkeley to finance solar installations.[39] It differs from AB 811 in that it can be utilized by any local agency (not just a city or country organization)

and can fund EE and renewable energy measures for new construction projects.

- **Ensure California's Loading Order Is Reflected in Renewable Energy Programs:** Many existing city initiatives and aggregation programs were launched with an original emphasis on encouraging solar PV installations. In order to maximize the economic and environmental benefits of these initiatives, local authorities should require that EE is formally embedded into any solar program. For example, the Berkeley initiative should require that EE be implemented either ahead of, or alongside, any solar installation in the city. A similar requirement should be in place for programs like Palm Desert's utilizing AB 811 or AB 1709 to fund local clean energy investments.
- **Account for Environmental Attributes:** Aggregation programs in California should be structured to ensure that rights to all environmental attributes generated through the implementation of EE projects are clearly assigned under a program. The pooling of environmental attributes and their subsequent valuation may generate added revenue for a program that can be utilized to increase the cost effectiveness and total amount of EE investments that are implemented. As demonstrated in the Cambridge initiative, the monetization of environmental attributes from efficiency projects—particularly from projects at residential and small commercial facilities—can capture marginal revenue that would otherwise be lost.

Technological Aggregation: Encourage Whole-Envelope Retrofits

Overview: It is frequently the case that beneficial savings opportunities are missed during the course of single-technology efficiency improvements. For any given building it is likely that a number of efficiency-related improvements are possible, in areas such as lighting, HVAC, insulation, and water heating. Efficiency deployment strategies that focus on specific technologies, to the exclusion of a whole-systems approach, may leave substantial savings opportunities untouched. Moreover, transaction costs associated with making the efficiency sale are often high as a share of total project costs, particularly for smaller customers. Positioning these customers to pursue the maximum feasible amount of efficiency improvements can therefore substantially improve the aggregate economics of these projects, in comparison to the serial pursuit of technology-specific enhancements, opening the door to more cost-effective retrofits.

Barriers to Expansion of Comprehensive Retrofits: A number of barriers to whole-envelope or integrated retrofits are evident in the present marketplace, including:

- **Skills Training & Education:** Specialization within the trades and contractor community results in unfamiliarity with the full potential of EE technologies and the extent to which project economics improve when technologies are integrated.
- **High Upfront Costs:** Inability to finance the full set of efficiency upgrades all at once forces customers to choose a smaller set of upgrades than is economic over the long-run, or optimal from a policy perspective.
- **Principal / Agent Issues:** The classic split incentives problem, in which a customer (tenant) does not fully receive or benefit from the implementation of EE upgrades.
- **Poor Program and Subsidy Coordination:** Uncertain or uncoordinated subsidy streams results in burdensome paperwork or unpredictable timing of rebates to cover portions of an integrated upgrade.

Expansion Strategies and Areas of Support: The concept of integrated EE retrofits for smaller customer classes, while new, is gaining currency in California. The majority of them will likely need assistance in overcoming the barriers identified above. Strategies to provide assistance include:

- As a priority for EE workforce development and "green jobs" policy (see below), ensure that efficiency providers are trained to assess the entire building envelope and **present an integrated set of upgrades to customers** in the retrofit market.
- To further ensure that efficiency providers are skilled at integrated assessment, **require that service providers possess the necessary skills** to pursue multi-retrofit opportunities, in order to receive a "seal of approval" from the utility and the ability to tap ratepayers incentives.
- Within the context of on-bill financing and the other

innovative financial approaches described above, **ensure that the ability to cover up-front costs includes all economic efficiency upgrades in a given project.**

- As a corollary to providing utility subsidy payments and other monies funded by system benefits charges to efficiency providers who pursue integrated upgrades, **incentive programs should be streamlined** to encourage multi-retrofit projects. An integrated audit should start the process, followed by a list of approved technologies, vendors and service provideres, with subsidies accessible via a simple, all-in-one rebate form.

Trained Workforce

Overview: In order to give entrepreneurs, financiers, policymakers and program managers confidence that the workforce needs of a large-scale efficiency strategy will be met, skills training and education must be coordinated with the other programmatic aspects of an aggressive new push towards EE. Training programs should impart skills specific to the market in which graduates will operate; should provide linkages directly into apprenticeship and employment with local efficiency service providers; and should also meet the need for skills in the public sector, such as program design, project evaluation, performance measurement and verification standards, and incentives allocation.

EE program managers should spend significant time and effort training contractors so that they fully understand the programs available to each customer set. Contractors constitute a potential sales force for energy improvement projects that use a financing product. The programs with the highest volume of financing assistance have strong contractor networks and regular program communication with the providers.[40] For example, Manitoba Hydro has 1,100 contractors and 200 retailers in their program; Viewtech Financial Services has 600 contractors in Southern California; SMUD has 180 contractors in the Sacramento region; and NYSERDA[41] has 147 contractors in New York. AFC[42] has 700 approved contractors in Pennsylvania and dedicates staff to travel around the state offering contractors training in marketing techniques and in the mechanics of the financing product.[43]

Barriers to Workforce Development: The barriers to workforce development can be grouped into two broad categories. First, EE faces the same issues that education as a whole faces, particularly for technical positions. These are a lack of student interest in the sciences and engineering, and weaknesses in trades training in the secondary and college / university systems. Second, interest in EE tends to rise and fall with concerns about energy prices. Career interests can be dependent on expectations for the longevity of the demand for skills in the field; without a sustained societal commitment to clean energy paths, therefore, convincing people and institutions to invest in EE careers could be problematic. Workers considering EE careers are also unfamiliar with the skills demanded by these new careers, as well as the training resources available to acquire them.

Expansion Strategies and Areas of Support: As identified in the California Energy Efficiency Strategic Plan (CEESP),[44] workforce education and training (WE&T) is a long-term, cross-cutting activity with important intersections throughout all EE segments. WE&T needs can be best addressed by **imparting appropriate skills at each educational level.** A comprehensive WE&T approach includes the following:

- **Technical Training:** Technicians and contractors should be certified in EE technologies and techniques. EE courses should be a requirement for contractor licensing and for license renewal, and city, state and utility EE programs should require expertise-based certification. The California Building Performance Contractors Association (CBPCA) and NYSERDA require that their contractors be certified by the Building Performance Institute (BPI), a diagnostics-based training program endorsed by the U.S. EPA's Home Performance with ENERGY STAR program.[45] Vermont Gas performs an initial audit, and then usually assigns a qualified contractor to do the work. Midwest Energy creates a detailed conservation plan for the customer. Efficiency Vermont trains and mentors its contractors, and provides quality checks and customer information.[46] Pennsylvania Home Energy provides financial incentives to Pennsylvania contractors and consultants who wish to obtain certification to service the PA Home Energy program, including residential

retrofit and new-building efficiency strategies. Financial incentives are provided by the West Penn Power Sustainable Energy Fund (WPPSEF), and include $200 payments to contractors and consultants that undertake an approved training course, and $500 to service providers that perform five home energy audits within an approved time period.[47]

- **Four-Year and Graduate Colleges and Universities:** Relevant university and college degree programs, such as construction management and real estate facilities management, should offer relevant curricula that incorporate financing and energy economics, energy management, and electrical and mechanical engineering tracks.
- **Adult Education and Community Colleges:** All California community colleges and adult education organizations should offer certification and degree programs that focus on EE and demand side management (DSM) across multiple market sectors. In January 2009, the U.S. Department of Labor awarded nearly $123 million to 68 community colleges and community-based institutions that competed successfully under the Community-based Job Training Grants Initiative. The grant will expand enrollment in education and training programs such as the San Francisco Bay Area Clean Energy Career Project (BayCEC), which aims to provide training and career pathways in selected clean energy careers. The BayCEC job training program will be led by Skyline College in partnership with Laney College, College of Marin, the Workforce Investment Boards of San Mateo and Alameda Counties, and the San Mateo Regional Occupation Program, with Solar City, PG&E, Siemens and Controlco as program partners.[48]
- **Minority, Low Income and Disadvantaged Communities:** Individuals from low-income backgrounds should take advantage of apprenticeship programs that specialize in energy disciplines. For example, the Oakland, California Green Jobs Corp, developed by the Ella Baker Center for Human Rights, is operating with a seed grant of $250,000 from the City of Oakland to provide "green jobs" opportunities in disadvantaged communities.[49] As part of a broad coalition of stakeholders, the program will provide the skills and training needed to pursue clean energy jobs; support apprenticeships in city-funded clean energy projects; and support the transition from apprenticeships to independent employment in the clean energy sector.

In addition to the needs and market assessments proposed in the CEESP, we recommend the following entities provide additional support and coordination:

- **IOUs & Publicly Owned Utilities:** Provide input for WE&T programs to address the technical and professional skills necessary to achieve the economic potential of EE in California. Utilities should be catalysts to bring efficiency into education and help provide specific training courses associated with implementing their programs, relevant curriculum and course materials, and on-the-job training for third-party program implementers.
- **Industry and Labor Organizations** should co-fund with educational institutions, training centers, and community-based organizations the recruiting and training of workforce candidates for technical and professional careers. These could include groups such as trade associations, standards-making bodies, and rating organizations. In early 2008, leadership of the National Electrical Contractors Association (NECA) met with UC Davis' California Lighting Technology Center (CLTC) to explore how contractors might accelerate the implementation of advanced control lighting technologies to meet EE goals across California. The California Advanced Lighting Controls Training Program emerged and course curriculum and materials were jointly developed in conjunction with Southern California Edison, with major support by NECA.[50] Supported by the IOUs, this program will provide fundamental training to ensure quality installation and system performance of advanced lighting control technologies. The training program is now entering the "train the trainer" phase, to be offered in 2009 through California Community Colleges and the 24 IBEW (International Brotherhood of Electrical Workers) Joint Apprentice Training Centers throughout California.[51]
- **Government:** Federal (e.g., Department of Labor), state (e.g., California Department of Education and CalWIB) and local governments (e.g., building departments) should fund recruiting and training programs that prepare workforce candidates for technical

and professional careers and mandate integration of EE curriculum.

- **Community-based and non-profit organizations:** Leverage programs and organizations funded to provide education, career development and workforce training programs (e.g., Greenlining Institute, Apollo Alliance).

IVc. Public Policies to Support Aggregation in Efficiency Financing and Business Models

Listed below are a series of cross-cutting polices and actions that can support the accelerated adoption and utilization of the financial products and business models outlined above. These items require a coordinated approach to implement EE projects, including actions to be taken by policy-makers, regulators, utilities, service providers, financiers, and project developers.

- **Assertively address issues of measurement, verification and ownership of savings reductions.** This would enable investors to embed durable assumptions about the carbon value of efficiency projects in their project modeling and maximize the role of efficiency in climate protection programs. Although EE is featured prominently in AB 32 and is viewed as an essential tool to achieving statewide emission reduction targets, there are no transparent market mechanisms or sets of procedures to monetize environmental attributes from efficiency projects. Investments in EE could benefit greatly from the receipt of an added revenue stream generated by the sale of environmental benefits. However, there exist numerous uncertainties surrounding fundamental aspects of monetizing environmental benefits from EE, including who can own the carbon reductions from EE projects, what are the associated M&V reporting standards, and what is the ability to "grandfather" existing (or soon-to-be implemented) projects into any future market mechanism. Treatment of these issues will help efficiency become a core climate protection strategy. Cap-and-trade auction funds could, for example, be used for supporting efficiency programs, codes and standards updates, and technology RD&D.[52]

- **Require EE upgrades as a condition of California Solar Initiative funding.** The draft guidelines established for the California Solar Inititiatve (CSI, also known as SB 1) state that to receive ratepayer-funded solar incentives, appropriate EE improvements must be made in new and existing homes or commercial structures. CSI contains requirements related to both the need for customers to be informed of potential efficiency opportunities as well as for facilities greater than 100,000 sq. ft. to have an energy audit conducted. CSI also places a heavy emphasis on retro-commissioning (RCx).[53] Specifically, any building that is greater than 100,000 sq. ft. and that has an energy use intensity (kWh/sq ft) benchmark of less than 75, must implement a RCx program within one year of solar system installation. Although all of these actions are beneficial, required customer actions under CSI are not commensurate with the aggressiveness of statewide targets for EE. Specifically, the current draft guidelines do not contain any direct link between the actual implementation of efficiency improvements and the receipt of solar incentives. Although CSI requires audits at large facilities, it does not specify the type of audit to be conducted nor does it require any customer actions related to the implementation of identified efficiency measures. The bill also relies heavily on RCx activities, which, in isolation, can result in "cream skimming" that leaves large amounts of energy savings on the table. Further, the EUI benchmark of 75 is not an aggressive cut-off point for action. As the draft guidelines for SB1 are refined over the coming months, requirements regarding the level of detail in energy audits and the necessary follow-up actions by customers should be strengthened. Improved cost-effectiveness benchmarks should also be developed, potentially including new TRC tests to determine the economic feasibility of efficiency measures required to receive solar incentives.
- **IOUs should consider extending long-term (i.e., five to ten years) performance guarantees to selected customers (potentially small commercial and residential customers) that implement EE measures.** The provision of utility guarantees on energy savings will expand the access of customers to sources of third-party financing and expand business opportunities for small and mid-sized ESPs that could compete more effectively with ESCOs. Key issues to address include establishing use cases for building types

and climate zones, setting M&V standards, assessing the tolerance of IOUs, regulators, and rate payers for the provision of long-term performance guarantees, and establishing responsibility for their associated costs.

- **As part of the Governor's Green Building Initiative, local representatives from the Building Owners and Managers Association (BOMA), California Business Properties Association (CBPA), and the CCI should collaborate on the development of a contractual structure that facilitates EE investment** by combining key features of triple-net leases, EPCs, and Title 24 operating guidelines for existing buildings.[54] Integrating these elements into leasing arrangements can align the economic interests of building owners and tenants, help owners secure outside financing to fund EE retrofits, and mitigate project performance risks to all parties.
- **The state government in California should consider the adoption of a mandatory home energy rating system.** Although HUD issues guidelines for energy audits under select programs, California should consider issuing a single uniform system for all energy audits completed in the state. Such a mandate would boost participation in energy efficient mortgages by providing prospective homeowners with a concrete and uniform system for evaluating the energy performance of their homes. A uniform rating system would facilitate accurate house pricing that includes energy performance, reinforcing efforts in the GREEN Act of 2008[55] to include EE in appraisals. This would promote financial incentives to consumers for completing EE improvement projects and reduce risk to both lenders and borrowers.
- **The state government in California should consider requiring energy audits and disclosure of results concurrent with home sales and refinancings.** This would enable buyers to account for energy use and lifecycle costs in their financial decisions, removing the barriers of unfamiliarity, inadequate initiative, and lack of resources. The positive correlation between EE and higher home values is well documented, thus providing an incentive for both property owners and realtors alike. Monetary incentives could reduce the financial burden of home energy audits. For instance, California could follow states such as New Jersey, New York, and Connecticut by directly subsidizing energy audits.[56]

Next Steps

For advocates of EE, the current surge in public interest has been a long time coming. Even as the economy has been weakened, private and public-sector support for efficiency is stronger than ever, reflecting an increased recognition of the cost savings, technological innovation, and environmental protection that are inherent to EE. But goodwill and capital are not enough to make a significant, lasting impact. To deliver on the promise of efficiency, new funding strategies, business models, policies, and educational tools will be required. This paper has suggested a range of strategies and programs to address the known and emerging challenges facing serious expansion of EE. The list is long, which suggests both the scope of the opportunity and the creativity required to address it.

Although each idea discussed in this paper has merit on its own, linked together these ideas can exert even greater force in the marketplace, overcoming the fundamentally disaggregated and inefficient nature of our energy system. Stopping waste in energy is fundamentally different than supplying more of it—power plants are concentrated and conspicuous, whereas inefficient energy technologies and systems are subtly distributed everywhere in our economy. Aggregation is therefore the concept that links the ideas in this paper—financial, technological and geographic aggregation of savings opportunities to attract investors' attention and address a range of inefficient practices and technologies at once.

Aggregation can take many forms, utilizing some or all of the tools identified in this paper. As an example of aggregation in practice, consider the following: to truly implement California's Loading Order of preferred energy resources, the state might require an efficiency audit and upgrade every time a property changes hands, or solar PV is placed on a rooftop. Such pairing would showcase a large set of investment opportunities for efficiency financiers that would be more compelling than a series of discrete transactions over an unspecified period.

Policy makers could offer financing tools to homeowners that reduce the up front cost of efficiency upgrades to zero, such as on-bill financing or a lien against property tax payments. Private financiers could step forward to

supply capital to utility on-bill programs, thereby keeping the utilities out of the banking business, or to communities with a property tax or shared equity strategy. Commercial and industrial customers could receive similar offerings from power purchase agreement-style efficiency services agreements that reduce upfront costs, and provide new sources of revenue with predictable, consistent returns to financial sponsors.

At the same time, large pools of retrofit opportunities can be identified and bundled together at state and community levels, utilizing green jobs corps and traditional utility programs to address split incentives that separate building owners from the energy consumers within them. Facility owners would bear the responsibility of optimizing efficiency, but this responsibility would be matched with the tools to reduce these upfront costs to zero. Cost savings can be shared between owners and tenants.

Crucially, whenever an efficiency retrofit is attempted, programs would address all savings opportunities at once —an example of technological aggregation in practice. Green jobs training and utility programs should therefore impart the full range of skills needed to make meeting these comprehensive retrofits possible. For leased property, unpredictable tenancy patterns could be treated with a set of policy and market options. Depending on the context, the responsibility for the efficiency upgrades would stay with the building, to be paid off by the next tenant or remain the property of the efficiency investor as an asset on its balance sheet.

Large pools of public and private capital would be incentivized to partner with these business model and policy innovations. Public funds that are designated for efficiency deployment, including the substantial sums deriving from the American Recovery and Reinvestment Act of 2009, could be structured as revolving funds, establishing a base of capital that states and communities can use to fund on-bill financing and tax assessment-based programs. These funds would be repaid via shared savings in the reduced energy bills that result, and could then be redirected to new efforts, rather than simply depleted after their first use.

Other public funds could train the workforce needed to sell efficiency to various end-users, and to assess disaggregated savings opportunities inside diverse facilities. Private capital could be deployed behind the highly predictable earnings of energy services agreements, the more variable shared equity instruments with their potential for appreciation, and to support on-bill financing and property-tax strategies with the backing of utility and government partnerships.
The model of aggregation in practice requires the combined forces of policy, technology and finance to work in close coordination. Policies can require that efficiency happen, as in the mandatory audit example above, but progress will stall if up front financing barriers are not addressed. Similarly, progress can be made in advancing discrete technologies, such as lighting, but vast savings potential will be missed if the workforce trained via green jobs programs cannot assess multiple technical opportunities at once. And investors may be motivated by the obvious potential returns from energy savings initiatives, but they will remain on the sidelines if barriers such as misaligned incentives keep them from reaching the customer.

The challenge therefore has less to do with technological innovation and more to do with structures of business and policy coordination. We hope that the ideas developed in this paper are beneficial to that important effort.

CalCEF is proud to continue to sponsor and develop a number of the ideas expressed in this paper, in particular the business models of the Efficiency Services Agreement and EARN Certificates, and the policy reforms around accelerating the California Loading Order, the last in partnership with our colleagues at UC Davis. As part of our EIR program we will incubate and (through the California Clean Energy Fund) 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.

About CalCEF Innovations

The mission of CalCEF Innovations is to address issues impacting the long-run transformation of the energy system towards sustainability, including the formation of enterprises, the continued flow of capital into technologies and infrastructure, and the design of markets and policy strategies for the sustainable energy transition. CalCEF Innovations leads the California Clean Energy Fund's development of novel finance, policy, and technology mechanisms to accelerate the growth of clean energy markets through a variety of programs and activities. These include our Entrepreneurs-in-Residence program developing solutions to key market and policy issues, academic and industry affiliations such as the UC Davis Energy Efficiency Center, the California CleanTech Open Alumni Program, and our innovation partnerships with university, national and private research labs.

On a regular basis, CalCEF Innovations invite leaders of extraordinary vision, capacity and experience to contribute to the industry's knowledge base by focusing on a topic of critical importance to the advancement of the clean energy economy. In addition to progressing important solutions, the EIR program identifies, develops and networks current and future industry leaders. The range of EIR topics pertains to gaps and barriers plaguing a specific aspect of clean energy finance, technology, policy, or market behavior.

Through our ongoing Convening Series, our Annual Conference, Executive Education for Policy Makers, and the CalCEF Angel Network, CalCEF Innovations also initiates timely conversations across policy, technology and finance that are absent in the evolving debate around clean energy and climate change.

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15. Lawrence Berkeley National Lab, "Survey of the U.S. ESCO Industry: Market Growth and Development from 2000 to 2006." http://eetd.lbl.gov/ea/EMS/reports/62679.pdf LBNL, May 2007. Survey results indicate the breakout of ESCO investment is: municipal/state government, universities, colleges, schools, hospitals (58%), federal government (22%), commercial (9%), industrial (6%), residential (3%), public housing (2%).
16. Under US accounting standards, a capital lease is a lease which meets at least one of the following criteria: ownership of the asset is transferred to the lessee at the end of the lease term; the lease contains a bargain purchase option to buy the equipment at less than fair market value; the lease term equals or exceeds 75% of the asset's estimated useful life; the present value of the lease payments equals or exceeds 90% of the total original cost of the equipment. Following the GAAP accounting point of view, such a lease is classified as essentially equivalent to a purchase by the lessee and is capitalized on the lessee's balance sheet. http://en.wikipedia.org/wiki/Capital_lease
17. http://www.pge.com/careers/powerpathway/
18. Johnson Controls, "Johnson Controls Energy Efficiency Indicator," March 2008. http://yourenergyforum.com/blog-mt/pdf/FinalReportNorthAmerica.pdf
19. American Climate Values Survey, ecoAmerica, October 2008
20. Fuller, Marrian, Stephen Compani Portis, and Daniel M. Kammen, "Toward a Low-Carbon Economy: Municipal Financing for Energy Efficiency and Solar Power," Environment Magazine, January 2009.
21. Ibid.
22. Sonoma County AB 811 Feasibility Analysis and Business Plan Working Draft, January 2009. http://www.countygsa.com/images/AB_811_Business_Plan_Final_Draft_ad-hoc_comments.pdf
23. http://www.berkeleyfirst.renewfund.com/
24. Fuller, Merrian, "Enabling Investments In Energy Efficiency," California Institute for Energy and Environment, September 2008.
25. Ibid.
26. CalCEF analysis and conversation with SDG&E
27. CPUC filings and discussion wiht SDG&E
28. http://www.efficientbuildings.org/about_the_provision.html
29. http://www.iso-ne.com/markets/othrmkts_data/fcm/index.html
30. http://www.rggi.org/home
31. http://www.clintonfoundation.org/explore-our-work/#/clinton-climate-initiative
32. Interview with Clinton Climate Initiative personnel, 5 November 2008
33. Ibid.
34. Net leases require the tenant to pay, in addition to the fixed rent, some or all of the property expenses which normally would be paid by the property owner. These include expenses such as real estate taxes, insurance, maintenance, repairs, utilities and other items. The precise items that are to be paid by the tenant are usually specified in a written lease. For properties that are leased by more than one tenant, such as a shopping center, the expenses that are "passed through" to the tenants are usually prorated among the tenants based on the size (square footage) of the area occupied by each tenant. The term "Net Lease" is distinguished from the term "Gross Lease". In a net lease, the property owner receives the rent "net" after the expenses that are to be passed through to tenants are paid. A triple net lease is a lease agreement on a property where the tenant or lessee agrees to pay all real estate taxes, building insurance, and maintenance on the property in addition to any normal fees that are expected under the agreement (rent, etc.). In such a lease, the tenant or lessee is responsible for all costs associated with repairs or replacement of the structural building elements of the property. http://en.wikipedia.org/wiki/Net_lease
35. http://www.settosave.com/
36. Selected utility incentives offered via the Palm Desert program have been set at higher levels than in other locations in SCE's and SoCal Gas' service areas.

37. Data provided by the Energy Coalition, a group that helps manage the Palm Desert program.
38. Seufert, Tim, "Financin the Green," NBS, August 2008 http://www.nbsgov.com/PUBLICATION_Finacing_Green.pdf and http://www.californiataxdata.com/A_Mello_Roos/index.asp
39. http://www.berkeleyfirst.renewfund.com/
40. Fuller, Merrian, "Enabling Investments In Energy Efficiency," California Institute for Energy and Environment, September 2008.
41. New York State Energy Research and Development Authority
42. AFC is a EE loan administrator for NYSERDA, as is Energy Finance Solutions (EFS). http://www.getenergysmart.org/
43. Fuller, Merrian, "Enabling Investments In Energy Efficiency," California Institute for Energy and Environment, September 2008.
44. http://www.energystart.gov/index.cfm?fuseaction=new_homes_partners.showHomesSearch
45. Fuller, Merrian, "Enabling Investments In Energy Efficiency," California Institute for Energy and Environment, September 2008.
46. Ibid.
47. http://www.pahomeenergy.com/
48. Community-Based Job Training Grants, http://www.doleta.gov/Business/Community-BasedJobTrainingGrants.cfm. Laney College, in partnership with Lawrence Berkeley National Laboratory, is broadening and deepening its curriculum for building science and engineering technicians in the commercial building sector. A new two-year program emphasizes energy-efficient and high-performance building operations, building automation systems, energy management, and sustainability practices. It was supported by a State Chancellor's Office Economic Workforce Development (EWD) Industry Driven Regional Collaboratives grant and a National Science Foundation Advanced Technology Education renewal grant. http://www.laney.peralta.edu/apps/comm.asp?$1=30151
49. http://www.ellabakercenter.org/index.php?p=gcjc_green_jobs_corps_press_conf
50. http://aboutlightingcontrols.org/Education_Express/accr_orgs.php
51. Jim Filanc, Southern Contracting
52. Schiller, Steve, et. al. "Energy Efficiency and Climate Change Mitigation Policy", ACEEE Summer Study on Energy Efficiency in Buildings, Asilomar Conference Center, Pacific Grove, CA, August 17–22, 2008.
53. RCx activites focus on low-cost energy savings opportunities typically involving enhancements to the operation and maintenance of existing mechanical equipment, lighting, and control systems. RCx services are intended not only to optimize how existing equipment and systems operate, but also to optimize how these systems function together.
54. Penafiel, Karen "BOMA 'greens' lease guidelines," Sustainable Industries, April 2008. http://www.sustainableindustries.com/commentary/17369284.html
55. The GREEN Act of 2008, H.R. 6078, sponsored by Rep. Ed Perlmutter [D-CO]. http://www.govtrack.us/congress/bill.xpd?bill=h110-6078
56. Wald, M. L., "Energy efficiency: how to gauge it," New York Times, May 1982. Retrieved February 2009. http://tinyurl.com/cbvxjj
57. Incremental cost is defined as the difference between the cost of standard equipment and energy efficient equipment (e.g., cost of a standard electric motor and a DOE certified premium motor).
58. 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 and the implementing utility.
59. California Energy Commission, "California Commercial End-Use Survey" (CEUS), March 2006. http://www.energy.ca.gov/ceus/
60. In a "gross lease," the tenant pays a gross amount of rent, which the landlord can use to pay expenses normally associated with ownership, such as utilities, repairs, insurance, and (sometimes) taxes or in any other way as the landlord sees fit.
61. California Energy Commission, "California Commercial End-Use Survey" (CEUS), March 2006. http://www.energy.ca.gov/ceus/
62. Ibid.
63. Health Facilities Management and American Society for Healthcare Engineering. http://www.hfmmagazine.com/hfmmagazine_app/jsp/articledisplay.jsp?dcrpath=HFMMAGAZINE/Article/data/07JUL2008/0807HFM_FEA_CoverStory&domain=HFMMAGAZINE
64. Itron, "California Energy Efficiency Potential Study," September 2008. http://www.itron.com/pages/news_articles_individual.asp?nID=itr_008890.xml
65. Ibid.
66. CPUC Rule D.07-10-032. Zero net energy is defined as a building that uses no more energy over the course of a year than its produces through solar power or other renewable sources of energy production.
67. Xenergy, Inc., "California's Secret Energy Surplus: The Potential for Energy Efficiency," The Energy Foundation and the Hewlett Foundation, September 2002. http://www.ef.org/documents/Secret_Surplus.pdf
68. California Public Utilities Commission, "2009 – 2020 California Statewide Energy Efficiency Strategic Plan," January 2008. http://www.californiaenergyefficiency.com/docs/plancomments/DRAFT%20CEESP--FOR%20SERVING%2002-08-08.pdf

Appendix A

II. The Marketplace for EE in California

Energy efficiency, particularly in California, is recognized as the simplest, fastest, least expensive and lowest risk resource to meet growing energy demand. EE measures improve a company's profitability by reducing expenses, enhancing reliability of key energy consuming equipment, and reducing exposure to grid outages. Further, the environmental benefits of EE are significant as noted by the McKinsey Global Institute[5] which singles out EE as the lowest cost solution to achieving large-scale greenhouse gas (GHG) reduction. With the aggressive statewide EE targets that have recently been set, California is making a heavy bet on the ability to capture increasingly large amounts of energy savings as listed below.

- California Air Resources Board's goal to reduce statewide GHG emissions by 25 million tons by 2020 through the reduction of 32,000 GWh and 800 million therms through EE;
- California Pubic Utilities Commission's energy savings target for IOUs for 2012 through 2020 of 16,000 GWh and 620 million therms from EE programs.

In order to achieve the large energy savings targets being increasingly put forth in California, a variety of new business solutions and financing options need to be developed. These solutions can bridge the large gap between achievable energy savings under market current conditions in (i.e., market potential) and the economic potential for savings identified as part of recent updates to the California Energy Efficiency Potential Study[6] and illustrated in Figures 1 and 2.

IIa. Overview of the Savings Potential in California

In Figures 1 and 2, Economic Potential is defined as the total energy savings associated with the assumed adoption by end-users of all cost effective efficiency measures subject

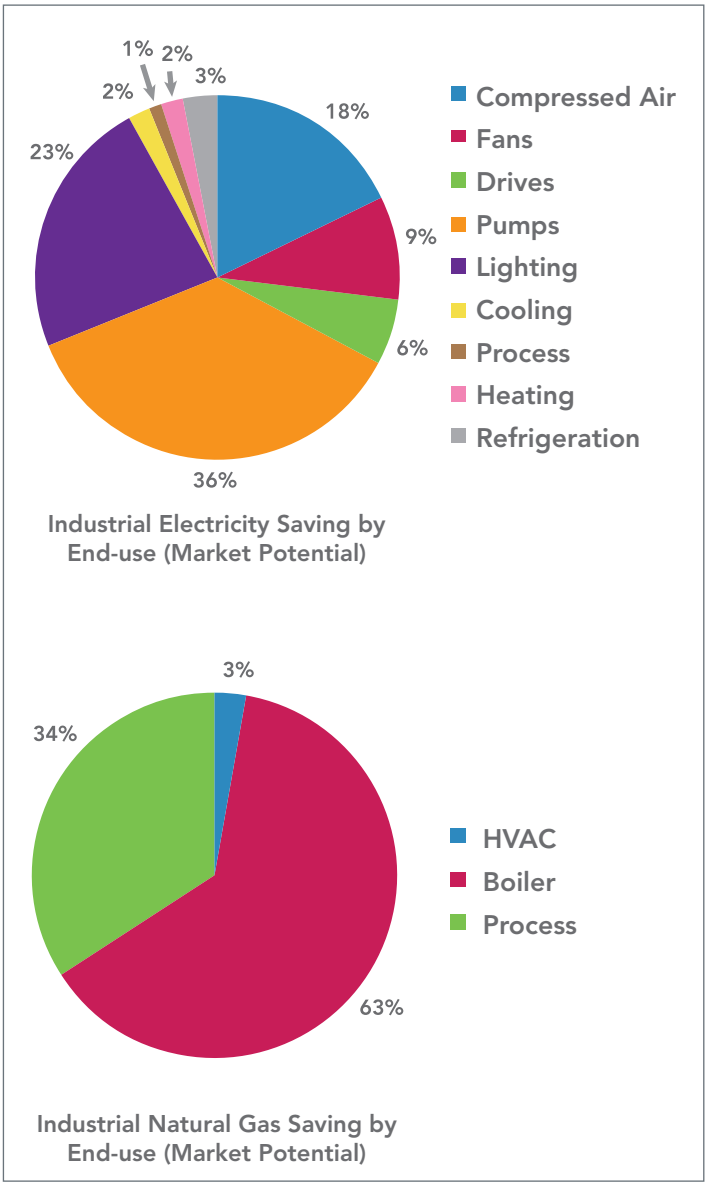

Figure A1 Market Potential for Electricity and Natural Gas Savings by Industrial End-use for California IOUs 2007 – 2016

to applicability, feasibility, and availability. This estimated economic potential is independent of efforts necessary to capture this level of savings, including the removal of any associated market barriers. The Market Potential is based on the "Mid Incentive Restricted" case developed by Itron in the California EE Potential Study and reflects the total energy savings that reflect an achievable "business as now" scenario. This market potential scenario was developed to reflect a scenario in which incentives are set equal to the average level offered by utilities in 2006 and the full incremental cost of purchasing energy efficient

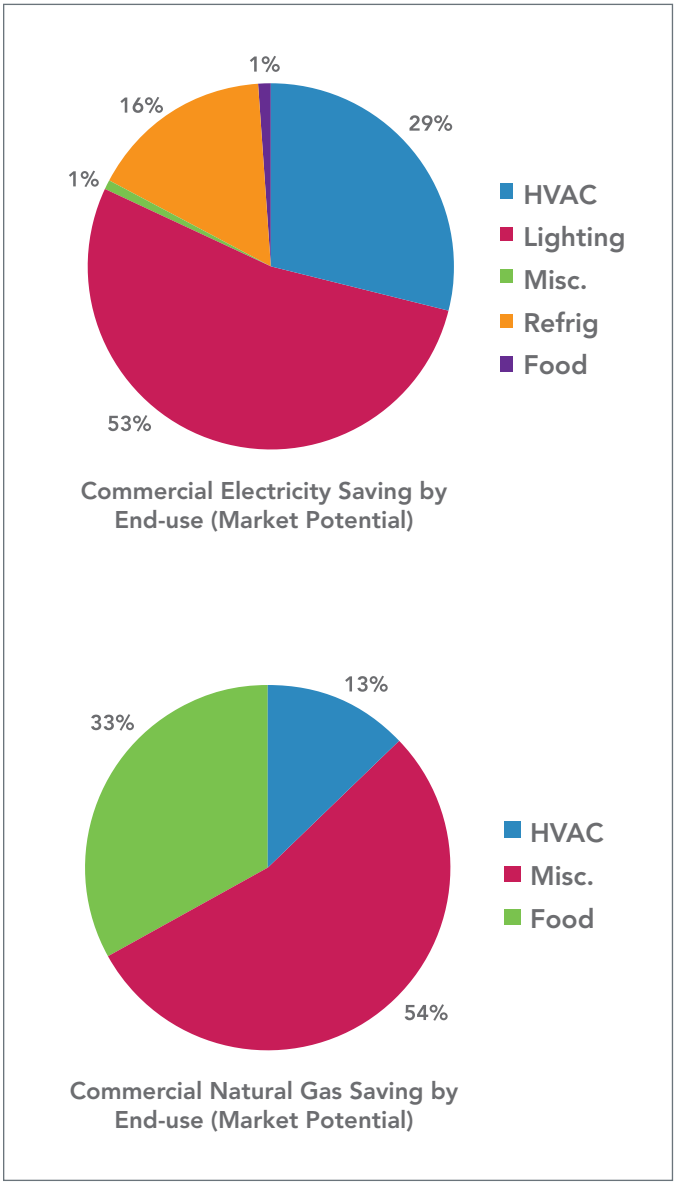

Figure A2 Market Potential for Electricity and Natural Gas Savings by Commercial End-use for California IOUs 2007 – 2016

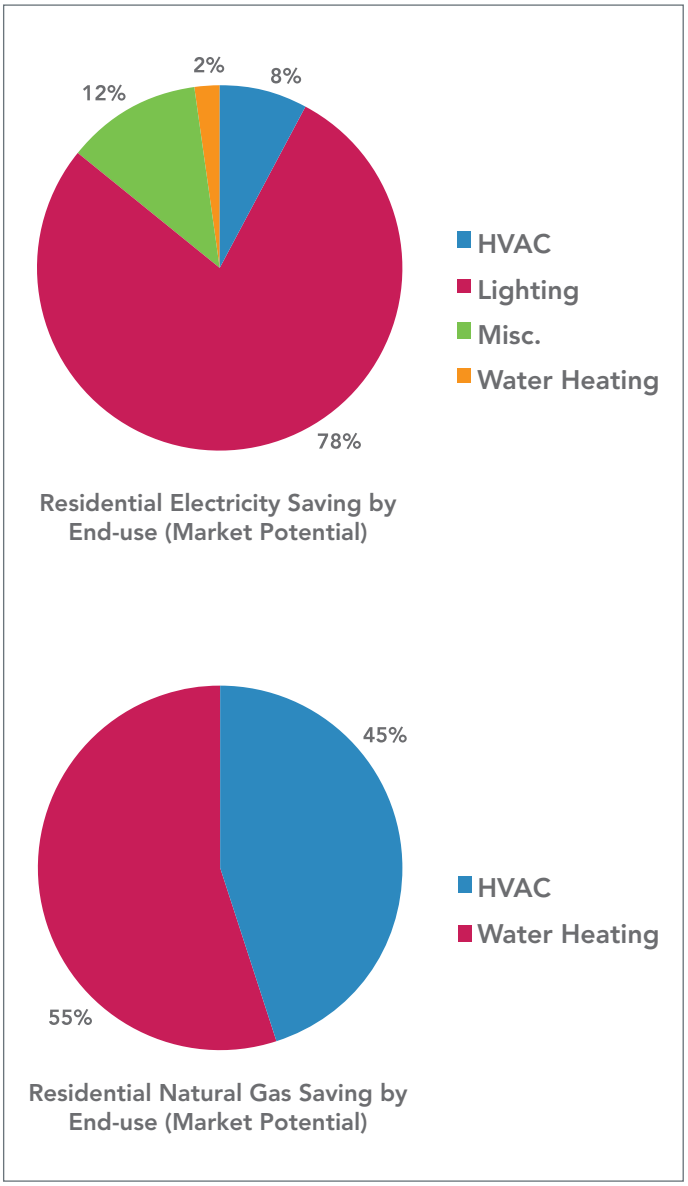

Figure A3 Market Potential for Electricity and Natural Gas Savings by Residential End-use for California IOUs 2007 – 2016

equipment.[57] A further economic constraint was placed on this market potential by assuming that only EE measures with a total resource cost (TRC) of 0.85 or greater are implemented.[58]

The results of the statewide market potential study underscore that, even by continuing aggressive utility incentive programs in California, a large number of customers will not implement economically viable efficiency projects due to the prevalence of numerous market and financial barriers. The existence of a considerably large gap between the economic potential for energy savings and what is being achieved in California is due in part to the focus of the ESCO (energy service company) industry on a narrow slice of the energy efficiency market at tax exempt (TE) / municipal sector facilities. In other market segments, particularly the residential sector, opportunities for additional energy savings have been forfeited due to a historical focus on utility programs and technical services that focus on individual EE measures rather than the implementation of integrated EE solutions.

To capture the significant remaining level of potential efficiency savings in California, barriers related to financing, existing business models, policies at the state and federal level, as well as customer understanding of EE

opportunities need to be addressed. Below is a summary of the residential, commercial, and industrial market segments that are the focus of this paper. Each segment contains its own unique set of opportunities and constraints that need to be considered when developing new EE business solutions, strategies, and policies.

Industrial: The industrial sector represents almost 20% of total electricity use and over 30% of natural gas use in California.[9] Key end-user segments include manufacturing, food & beverage, hi-tech / electronics, chemicals, and pharmaceuticals. Volatile energy prices and increasing global competition have heightened interest in EE, but investment considerations relating to production in core business areas often trump making any potential efficiency improvements. The California EE potential Study estimates that the industrial sector has a market potential for 2,276 GWh/year of energy savings which is equivalent to approximately 4.5% of total annual industrial electricity consumption.[10] By 2016, industrial end-users also have the market potential to save 92 million Therms of natural gas which is equivalent to 3% of annual industrial natural gas use.[11] These results illustrate EE's ability to limit annual growth in energy consumption, which is a highly significant accomplishment given increased production and growing energy demand over time. As illustrated in Figure A1, pumps and motors are a key end use area for energy savings with a large potential for added savings from lighting, compressed air, heating, cooling, and energy management & control systems. Natural gas savings center primarily on boiler optimization, controls, sizing, and maintenance as well as process burners and process related heat recovery measures.

Commercial: Commercial end-users account for 38% of total electricity use and 25% of natural gas use in California.[12] Listed below is a summary of key selected customer groups that represent a major portion of electricity consumption in the commercial sector:

- Office buildings account for almost 25% of total electricity use and 13% of total natural gas use in the commercial sector and have widespread potential for high efficiency lighting and HVAC upgrades.[59] Optimal energy efficiency projects are at owner-occupied buildings, facilities in which a single tenant leases a lot of space, or building tenants under a gross lease;[60]
- Retail customers account for approximately 32% of total electricity consumption and 37% of natural gas use in the commercial sector in California[51] and encompass a wide range of end-users, such as lodging, pharmacy chains, warehouses, grocery stores, restaurants, and big box retail facilities that are typically larger that 50,000 square feet. Key efficiency measures include lighting upgrades, HVAC improvements, refrigeration projects, and control systems.
- Hospitals and healthcare facilities account for approximately 7% of electricity use and 14% of natural gas use in the commercial sector.[62] End-users in this customer group are also facing rising energy costs as evidenced by an American Society for Healthcare Engineering survey that found more than 90 percent of healthcare facilities nationwide reported higher energy costs over the previous year, and more than fifteen percent saw a jump in energy costs of more than 25 percent.[63] Energy efficiency opportunities at hospitals and healthcare facilities include upgrades to HVAC systems, waste heat recovery, control systems, high efficiency lighting, and bio-waste management.

Other major commercial end-user groups include secondary schools, colleges, universities and refrigerated warehouses, which account for a majority of the remaining statewide energy consumption California. The market potential for electricity savings in the commercial sector is 4,700 GWh, which is equivalent to approximately 4% of total annual commercial electricity consumption in California.[18] The California EE Potential Study also estimates that by 2016 the commercial sector has the market potential to save 15 million Therms of natural gas which is equivalent to less than 1% of annual statewide commercial natural gas use.[19] As illustrated in Figure A2, lighting represents the largest end-use savings potential in absolute terms. HVAC potential represents a significant portion of the total savings as does refrigeration and food end use measures.[64] Large areas of savings for natural gas involve HVAC and food end uses such as ovens and fryers.

Residential: In 2008, residential end-users accounted for 32% of California's electricity use and 36% of natural gas consumption.[21] The statewide market potential for residential electricity savings by 2016 exceeds 6,000 GWh/year and 93 million Therms which is equivalent to 6.5% of

total annual residential electricity consumption and 2% of annual residential gas use.[22] The realization of this level of energy savings potential will play a major role in achieving California's goal of keeping the growth rate of per capita energy consumption flat between now and 2018. As illustrated in Figure A3, lighting efficiency accounts for the majority of energy savings, while HVAC and water heating measures account for other potential natural gas savings.[65]

Going forward, residential energy efficiency initiatives in California will be developed with the aim of achieving the CPUC's recently established goal of "Zero Net Energy."[66] That ruling seeks to combine the implementation of EE measures and design features with clean on-site distributed generation, resulting in residences that have zero net purchases of energy from the local utility grid. New construction represents roughly 10 to 15 percent of the estimated achievable energy savings potential in California.[67] For existing residential buildings, the CPUC is targeting a 40% reduction in energy use by 2020.[68]

Glossary

AB – Assembly Bill

ACEEE – American Council for an Energy Efficient Economy

AFC – AFC First Financial Corporation, a provider of the EnergyLoan program, a residential financing program for energy related home improvements.

AMI – Area Median Income

Berkeley FIRST – Berkeley Financing Initiative for Renewable and Sustainable Technology

BPI – Building Performance Institute

BOMA – Building Owners and Managers Association

CalWIB – California Workforce Investment Board

CBPA – California Business Properties Association

CBPCA – California Building Performance Contractors Association

CEA – Cambridge Energy Alliance

CEESP – California Energy Efficiency Strategic Plan

CEELF – California Energy Efficiency Loan Fund

CEMF – Clean Energy Municipal Financing

CIEE – California Institute for Energy and Environment

CPUC – California Public Utilities Commission

DSIRE – Database of State Incentives for Renewables & Efficiency

DSM – Demand Side Management

EEM – Energy Efficient Mortgage

EFS – Energy Finance Solutions

EIM – Energy Improvement Mortgage

EIP – Energy Independence Program

EPACT – Energy Policy Act of 2005

EPC – Energy Procurement Contract

EPC – Energy Programs Consortium

ESA – Energy Services Agreement

ESCO – Energy Service Company

EUI – Energy Use Intensity

FEC – First Electric Coop

FICO – Fair Isaac Corporation

GHG – Greenhouse Gas

GW – GigaWatt

GWh – GigaWatt hours

IBEW – International Brotherhood of Electrical Workers

IOU – Investor Owned Utility

ISO – Independent System Operator

HPwES – Home Performance with Energy Star

HVAC – Heating, Ventilation, and Air Conditioning

kW – KiloWatt

kWh – KiloWatt Hour

LBNL – Lawrence Berkeley National Laboratory

LCC – Life Cycle Cost

MMARV – MuniMae Renewable Venture

NPV – Net Present Value

M&V – Measurement and Verification

MECO – Maui Electric Company

MUSH – Municipalities, Universities, Schools, and Hospitals

MW – MegaWatt

MWh – MegaWaatt Hour

NYSERDA – New York State Energy Research and Development Authority

OBF – On-Bill Financing

PAYS(R) – Pay As You Save Program

PG&E – Pacific Gas & Electric

PPA - Power Purchase Agreement

RCx – Retro-Commissioning

REO – Real Estate Owned

RD&D – Research, Development & Deployment

RIC – Retail Installment Contract

SMUD – Sacramento Municipal Utility District

TE – Tax Exempt

TIP – Tariffed Installation Program

TRC – Total Resource Cost

VEIC – Vermont Energy Investment Corporation

VGS – Vermont Gas Systems

VSECU – Vermont State Employees Credit Union

WE&T – Workforce Education and Training

WPPSEF – West Penn Power Sustainable Energy Fund