12. Foster New Markets for Energy Efficiency

1. Profile

"Energy efficiency" refers to technologies, equipment, operational changes, and in some cases behavioral changes that enable our society to enjoy equal or better levels of energy services while reducing energy consumption.[1] Efforts to improve efficiency in the generation, transmission, or distribution of electricity were covered in Chapters 1 through 5 and in Chapter 10. In contrast, Chapters 11 through 15 address different policy options for making the end-user's consumption of electricity more efficient. Chapter 11 focuses on policies that establish mandatory energy savings targets for electric utilities, the achievement of which is generally funded through revenues collected from customers themselves. This chapter, Chapter 12, focuses on policies that create or expand the opportunities for voluntary, market-based transactions that promote energy efficiency as an alternative or supplement to government-mandated programs or regulatory requirements. Chapter 13 focuses on an emerging type of energy efficiency program, behavioral energy efficiency, that is worthy of separate treatment because it is sometimes included within the mandated programs described in Chapter 11 and sometimes implemented as a voluntary effort outside of those programs. Chapter 14 covers mandatory appliance efficiency standards that are imposed on manufacturers, and Chapter 15 covers mandatory building energy codes that are imposed on builders and developers.

As explained in Chapter 11, investments in end-use energy efficiency have proven to be a low-cost option for states to achieve carbon reduction, and this option provides the longest and most robust list of co-benefits of all the options described in this document.[2] But despite the fact that energy efficiency provides numerous benefits to utilities, their customers, and society,[3] this option is frequently undervalued and underused. Indeed, the level of investment in the energy efficiency of the buildings in which we live and work is well below economically optimal levels, given current energy prices.

One reason for the persistent underinvestment in efficiency is that the markets in which families and businesses make efficiency investments are separate and fundamentally different from the markets in which power suppliers make investment decisions for power plants, transmission lines, and distribution substations. For building owners and occupants, energy needs are just one — and usually not the most important — of the many concerns in their daily lives. Moreover, efficiency is just one — and often not the most important — of the many attributes of the energy-consuming products that they buy. This complicated comingling of features, with

1 In contrast, some people use the term "energy conservation" to refer to actions that reduce energy consumption but at some loss of service. Neither term has a universally accepted definition, and the two are sometimes used interchangeably.

2 McKinsey & Company prepared a series of reports and carbon abatement cost curves for various nations around the world, including the United States. Energy efficiency initiatives have consistently been revealed to be the lowest cost path toward carbon abatement, and are generally associated with creating a net benefit. See: http://www.mckinsey.com/client_service/sustainability/latest_thinking/greenhouse_gas_abatement_cost_curves. As noted in the House of Representatives testimony of the American Council for an Energy-Efficient Economy's (ACEEE) Steve Nadel, energy efficiency investments typically provide a 25-percent return on investments, well above the returns of any other category of investment, and are associated with job creation and economic development. Nadel, S. (2014, July 24). *Economic Impacts of State Energy Policy.* Available at: http://www.aceee.org/files/pdf/testimony/nadel-house-072414.pdf

3 For more information on the full benefits of energy efficiency, see: Lazar, J., & Colburn, K. (2013). *Recognizing the Full Value of Energy Efficiency.* Montpelier, VT: The Regulatory Assistance Project. Available at: www.raponline.org/document/download/id/6739

efficiency usually being the least "visible" feature, also leads lenders, appraisers, and prospective buyers and renters of buildings to undervalue efficiency. As a result, building owners and consumers typically have much less information about, and much less focus on, the energy implications of their investment decisions than do those who make investments in the energy supply infrastructure.[4]

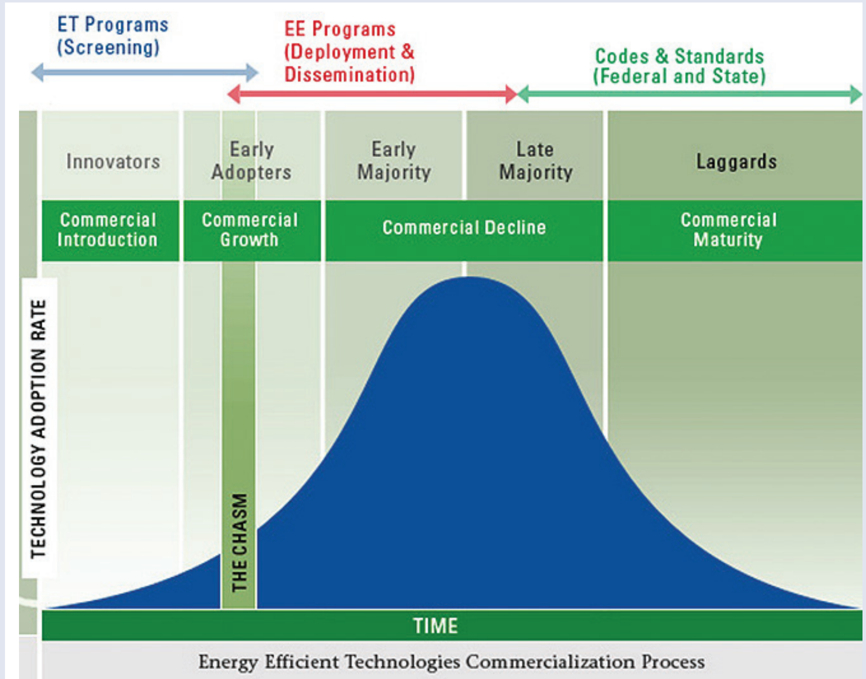
Government mandates, such as those described in Chapters 11, 14, and 15, offer one option for overcoming informational, motivational, and financial barriers and for increasing investment in energy efficiency toward more economically optimal levels. However, these kinds of mandates typically represent only part of a broader "market transformation" strategy.[5] As indicated in Figure 12-1, market transformation initiatives often begin with research and development focused on emerging technologies and early adopters. As a technology begins to mature, additional adoption can be motivated through formal energy efficiency programs like those described in Chapter 11, complete with incentives. Then, as the technology becomes more mainstream, incentives may be reduced or eliminated and efforts may focus more on growing its market share. Finally, once acceptance of the technology becomes more widespread, this evolution usually ends with some sort of mandatory building energy code or appliance efficiency standard, as described in Chapters 14 and 15, respectively

Regardless of the stage of commercialization, the very fact that investments in efficiency are suboptimal means by definition that there is untapped potential for customers to save money through energy efficiency, and for companies to *make* money by providing energy efficiency products and services, with or without government mandates. Indeed, there is a wide range of policies and activities that states can initiate to help foster new voluntary markets and expand existing voluntary markets for energy efficiency services and investments. Each of the following options will be described in more detail in this chapter:

- Encouraging or facilitating the use of energy auditing and energy savings contracts between consumers and third-party energy service companies (ESCOs);
- Improving consumer access to affordable private financing or providing tax incentives for energy efficiency improvements;
- Creating voluntary energy consumption labeling and benchmarking programs for appliances and buildings; and
- Allowing energy efficiency to compete for compensation in wholesale electricity markets.

Figure 12-1

Market Transformation Process for Efficient Technologies[6]



4 Neme, C., & Cowart, R. (2012). *Energy Efficiency Feed-in-Tariffs: Key Policy and Design Considerations.* Montpelier, VT: The Regulatory Assistance Project. Available at: www.raponline.org/document/download/id/4908

5 ACEEE defines market transformation as "… the strategic process of intervening in a market to create lasting change in market behavior by removing identified barriers or exploiting opportunities to accelerate the adoption of all cost-effective energy efficiency as a matter of standard practice." See: ACEEE. (2013). *Market Transformation.* Available at: http://www.aceee.org/portal/market-transformation

6 Supra footnote 5.

ESCOs and Third-Party Energy Efficiency Delivery Models

Third-party businesses — whether they are retailers, community action agencies, ESCOs, or engineering firms — typically play an integral role in the delivery of energy efficiency programs. This is true even for the mandated energy efficiency programs described in Chapter 11. But in this chapter we focus instead on a type of third-party business called an ESCO, which exists for the purpose of capturing value from energy efficiency.

As used in this chapter, ESCOs refer to organizations that engage in some form of performance-based contracting for energy efficiency services. The ESCO business model is a framework in which specialized construction companies deliver services through performance-based contracts, usually guaranteed savings projects. The delivery of services generally begins with an energy audit to identify energy efficiency opportunities, followed by two contracts: the first is with a financial institution supporting the capital investments; the second is a performance contract between the client and the ESCO that typically guarantees the energy savings.[7] The ESCO then installs the energy-saving equipment and both parties share in the long-term savings from reduced energy bills. The ESCO model typically involves the installation of comprehensive solutions across many categories of end-use devices (including lighting, HVAC, and the building envelope).

Historically, the ESCO industry has focused on customers who have longer investment horizons, including institutional customers and government agencies. The average ESCO contract with a public sector client has exceeded ten years. ESCOs are currently most active in the "MUSH" sectors: municipal governments, universities, schools, and hospitals. The military services are also significant customers. Roughly 85 percent of ESCO contracts are with these kinds of public and institutional customers.

More recently, the opportunities for ESCOs and energy efficiency performance contracts have expanded greatly to include more privately owned buildings.[8] Private buildings are significantly more numerous than public buildings, and offer a potentially large market for ESCOs. However, the challenges for ESCOs in penetrating this market segment include: (1) the short payback horizon required by most private building owners; (2) high costs of capital for energy efficiency investments; and (3) a lack of motivation on the part of building owners to address energy inefficiency. Whereas the ESCO may be satisfied with making investments that earn money over a long time period, most private building owners require an investment payback of three years or less. Thus, the contracts between ESCOs and private building owners tend to be much shorter than for public and institutional customers, averaging only 3.5 years.[9]

Private Financing and Tax Incentives for Energy Efficiency

Another avenue for fostering or encouraging new markets for energy efficiency services is through mechanisms designed to increase consumer access to inexpensive private sector financing.[10] Most energy efficiency measures require an upfront investment of capital that slowly pays off over a long period of reduced energy bills. For example, a residential customer might pay $2000 for an attic insulation project that reduces their energy bill by $50 per month and pays for itself over the course of several years. However, customers who, for whatever reason, cannot afford or obtain financing for the upfront investment cannot capture the potential bill savings. Thus, policies that create opportunities for more customers to obtain affordable financing, although never a sufficient solution alone, can increase markets for voluntary energy efficiency and lead to greenhouse gas (GHG) emissions reductions.[11]

7 Performance contracts are critically important to the success of ESCOs because they serve to reassure the customer, who may know little or nothing about their own energy use or about efficient alternatives, that the benefits of efficiency are real and attainable. Rather than taking the assertions of the ESCO on faith, the customer has a contractual guarantee of a certain level of savings. Accreditation programs, such as those offered by the National Association of Energy Service Companies, may offer further reassurances to customers that accredited ESCOs are capable of delivering promised savings.

8 For more information, see: ACEEE. (2013). *Energy Efficiency Financing*. Available at: http://www.aceee.org/topics/energy-efficiency-financing.

9 Performance contracts become even more necessary and important as ESCOs expand their focus to include more and more privately owned, smaller buildings.

10 Supra footnote 8.

11 Borgeson, M., Zimring, M., & Goldman, C. (2012, August). *The Limits of Financing for Energy Efficiency.* LBNL. Available at: http://emp.lbl.gov/publications/limits-financing-energy-efficiency

One way to facilitate affordable financing that is beginning to gain some traction is on-bill financing. On-bill financing allows utility customers to invest in energy efficiency and repay the upfront costs through additional charges on their utility bills. Financing is provided by the utility or through a third-party lender such as a Community Development Financial Institution, and can sometimes be provided at a lower interest rate because credit losses on utility bills tend to be far lower than for other financial obligations. If structured properly, on-bill financing can reduce the customer's bills and allow the lender to earn a return.

Another relatively new financing option comes in the form of Property-Assessed Clean Energy (PACE) financing. PACE financing programs enable property owners to pay back energy efficiency financing costs (or renewable energy investment costs) via long-term property tax payments. The improvements and the loan attach to the property itself, rather than the initial borrower, and would pass on to a future purchaser of the property. Here again, lenders have a greater level of certainty that future property tax bills will be paid than for normal loans, and thus it is possible to offer better financing terms through a PACE program.

An Energy Efficient Mortgage (EEM) can also be used to finance energy efficiency improvements or increase the borrowing ability of consumers. With an EEM, a person buying or refinancing a home can include the cost of energy efficiency improvements in their mortgage or (as is more often the case) qualify for a larger loan amount when purchasing an efficient building, on the premise that reduced future energy bill payments will allow for increased mortgage payments without adding risk for default.

State government funding of energy efficiency through revolving loan funds is a third financing option. Revolving loan funds can be managed either by state institutions or existing financial institutions. As described in Chapter 24, a big source of financing in the Eastern states participating in the Regional Greenhouse Gas Initiative (RGGI) is through carbon market allowance auction revenues. Other sources of finance at the state level include tax-exempt bonds, typically backed by the state, potentially in conjunction with some form of financial backing (e.g., a letter of credit) from larger commercial banks. Government-backed loans can usually be offered at lower interest rates to consumers than purely private financing.

The federal government, as well as state and local governments, can also expand opportunities for voluntary investment in energy efficiency by providing tax incentives.

Voluntary Energy Efficiency Labeling and Benchmarking

Other avenues for fostering or encouraging new markets for energy efficiency services are through mechanisms that are designed to elevate consumer and public awareness of opportunities for energy efficiency. Important here are efforts to promote customer and public awareness of energy use through energy audits, appliance labeling programs (e.g., Energy Star®), building certification and labeling programs (e.g., Energy Star® or Leadership in Energy and Environmental Design [LEED]), building benchmarking programs (comparisons of the energy use between similar buildings), and time-of-sale disclosures for homes and commercial buildings. Some of these mechanisms can be implemented either as a voluntary measure, which is the focus of this chapter, or as a mandatory measure.[12] When implemented as voluntary measures, labeling, benchmarking, and disclosure of efficient products and buildings can help buyers overcome information barriers while providing product differentiation for sellers. Both parties can benefit from the purchase of voluntarily labeled products, and a market for efficient alternatives can thus be fostered.

Compensation for Energy Efficiency in Wholesale Electricity Markets

There are a variety of ways to treat energy efficiency as an electricity system resource and enable it to compete in wholesale electricity markets. Laws, regulations, and tariffs may be established to support market-based mechanisms to allow energy efficiency (and other demand-side resources) to compete with generators, transmission providers, and other traditional supply-side resources. Whenever energy efficiency resources bid lower prices than supply alternatives, they are selected. For example, energy efficiency and demand-side resources are allowed to participate in the forward capacity markets organized by two regional transmission organizations, ISO-New England (ISO-NE) and PJM. Doing so fosters new avenues for utilities to lower the costs of complying with energy efficiency mandates, but also offers ESCOs and other parties a greater opportunity to make money by offering voluntary energy efficiency services to paying customers.

12 Mandatory appliance efficiency standards are described in Chapter 14, and mandatory building energy codes are described in Chapter 15.

This chapter provides a cursory treatment of the potential to foster new energy efficiency markets through wholesale electricity market rules, because the opportunity this creates to increase energy efficiency without government mandates is significant. However, because there are several aspects of forward capacity markets that can help or hinder efforts to reduce GHG emissions, that topic is treated more broadly and deeply in Chapter 19.

2. Regulatory Backdrop

This chapter focuses primarily on voluntary, market-based approaches to increasing energy efficiency investment and thereby reducing GHG emissions. Because the emphasis is on voluntary programs, laws and regulations are generally only significant to the extent that they facilitate or impede opportunities to expand market-based energy efficiency.

Energy efficiency plays a prominent role in the emissions guidelines for carbon dioxide (CO_2) emissions from existing power plants that the US Environmental Protection Agency (EPA) proposed in June 2014, citing its authority under section 111(d) of the Clean Air Act, as part of its "Clean Power Plan."[13] The EPA determined that the "best system of emission reduction" for existing power plants under the Clean Air Act consists of four "building blocks," one of which is end-use energy efficiency. Although states will not be required to include energy efficiency in their 111(d) compliance plans, the emissions rate goals for each state are based on an assumption that a certain level of energy savings (and thus, emissions reduction) is achievable. The level of savings that the EPA used to set each state's emissions rate goals is based on the demonstrated performance of leading states with respect to the kinds of ratepayer-funded energy efficiency programs described in Chapter 11 and a meta-analysis of energy efficiency potential studies. The EPA did not separately consider market-based energy efficiency potential as a component of the "best system of emission reduction," and the goals proposed for each state do not presume that states will implement any market-driven programs in addition to mandated programs. It appears likely that the final rules will allow market-driven efficiency programs to be included in state compliance plans. However, as with other types of efficiency programs, states would need to have a solid plan for tracking and evaluating energy savings and avoided emissions if complying with a rate-based approach. This issue could be mitigated if a state chooses a mass-based approach to demonstrate CO_2 emissions reductions.

The following discussion provides further description of the regulatory backdrop for the various approaches to fostering and expanding market-driven energy efficiency.

ESCOs and Third-Party Energy Efficiency Delivery Models

The federal Energy Policy Act of 1992 provided an early stimulus for third-party energy efficiency delivery models by authorizing federal agencies to enter into Energy Savings Performance Contracts (ESPCs) for periods of up to 25 years, provided that annual payments by an agency to both utilities and energy savings performance contractors will not exceed the amount that the agency would have paid for utilities in the absence of the ESPC. The US Department of Energy promulgated the original implementing regulations in 1995. The use of ESPCs by federal agencies was permanently reauthorized in the Energy Independence and Security Act of 2007.

Energy Performance Contracts (EPCs) are also used extensively in the US Department of Housing & Urban Development's Public Housing Program as a means of reducing utility costs. Unlike federal ESPCs, Public Housing EPCs are projects approved by the Department of Housing & Urban Development and implemented by state-chartered Public Housing Authorities with or without the assistance of an ESCO. Because Public Housing Authorities are legally authorized to carry debt, ESCOs involved in the Public Housing sector typically do not need to provide financing to the project, but rather are simply providers of architectural/engineering services.

Some state and local governments have adopted equivalent laws and regulations regarding the ability of state agencies to enter into long-term performance contracts with ESCOs.

Some of the energy efficiency programs that utilities or third-party energy efficiency program administrators implement to comply with state-mandated energy efficiency savings targets (described in Chapter 11) may be implemented by ESCOs. The services provided by an ESCO, for example energy auditing services, may be exactly the same regardless of whether the customer is responding

13 Refer to: US EPA. (2014, June). *40 CFR Part 60 – Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units; Proposed Rule.* Federal Register Vol. 79, No. 117. Available at: http://www.gpo.gov/fdsys/pkg/FR-2014-06-18/pdf/2014-13726.pdf

to a mandated utility program or hoping to get a rebate. However, if a mandated program is the impetus, the ESCO may be subject to rules that are imposed by a public utility commission (PUC) to ensure that ratepayer-funded energy efficiency programs are prudently administered. Similar rules may not apply when the ESCO is working for a customer acting outside of the mandated utility programs.

Private Financing and Tax Incentives for Energy Efficiency

All of the financing and tax incentive options described previously require legislation, administrative rules, or a PUC order to implement. PUCs in some jurisdictions may already have authority to adopt on-bill financing programs for the utilities they regulate; in other jurisdictions, current law prevents such programs. Even if they have the authority to take this step, PUCs have generally been hesitant to add all of the complexity of loans and loan payments for individual properties to the already complex realm of rate design and billing systems. They may be especially reluctant if they perceive on-bill financing programs as increasing the risk that a utility will accumulate unpaid debt.

PACE programs face similar challenges. In most states, property taxes are implemented by local jurisdictions based on authority granted by the state. Many state laws are very specific about the scope of costs that local jurisdictions may include on property tax bills. Thus, to adopt a PACE program, it may be necessary to change property tax policy first at the state level to authorize it, and then one local jurisdiction at a time to implement it. Further complicating matters is the fact that in the summer of 2010 the Federal Housing Finance Agency advised Fannie Mae and Freddie Mac to avoid buying or holding mortgages with PACE assessments, and hinted that a property's participation in a PACE program could default the mortgage. This was a very consequential decision, as more than 90 percent of mortgages written in recent years have been backed by Fannie Mae or Freddie Mac. As a result, most of the nascent PACE programs in the United States quickly subsided.[14] Some states, for example Vermont, have taken steps to address these concerns by passing legislation that creates a PACE mechanism, but in a form that subordinates the recovery of invested funds to the mortgage itself.[15]

EEMs are viewed less skeptically by federal authorities than PACE programs. The Federal Housing Administration and the Veterans Administration both offer EEMs to eligible buyers. Fannie Mae and Freddie Mac do not offer EEMs, but allow underwriters to consider future energy costs when approving mortgages.

The creation of a state-backed revolving loan fund for energy efficiency, or tax incentives for energy efficiency investments, obviously requires government actions through legislation or regulations.

Voluntary Energy Efficiency Labeling and Benchmarking

Voluntary labeling and benchmarking programs generally do not require authorizing legislation or regulations. Mandatory programs are addressed in other chapters.

Compensation for Energy Efficiency in Wholesale Electricity Markets

Wholesale electricity markets are regulated by the Federal Energy Regulatory Commission (FERC) based on a variety of federal energy laws. The creation of a forward capacity market, and the rules that determine whether energy efficiency can or cannot compete in the market, are subject to FERC approval. FERC does not initiate this process and thus does not prescribe the creation of such markets. However, FERC could condition the approval of a forward capacity market on rules that allow fair market competition between energy efficiency, other demand-side resources, and traditional supply-side resources.

Changes in state law or regulations, as well as a PUC order, may be necessary in order for utilities and third-party energy efficiency providers to participate in these wholesale

14 On November 7, 2014, Asset-Backed Alert, a trade publication for the securities industry, reported that the Federal Housing Finance Agency "reached an agreement with several mid-size lenders that will allow Fannie and Freddie to buy mortgages on homes encumbered by liens booked under the property-assessed clean energy (PACE) program, so long as the mortgage lenders agree to repurchase any of the home loans that default. The FHFA, which declined to comment, has yet to officially adopt the policy." Refer to: www.ABAlert.com

15 Vermont Legislation passed in May 2011 made some key changes to earlier PACE legislation. The more recent legislation establishes that PACE liens are subordinate to existing liens and first mortgages but superior to any other liens on the property recorded after the PACE lien is recorded (except for municipal liens, which also take precedence over the PACE lien). See: Database of State Incentives for Renewables and Efficiency. DSIRE. (May 20, 2013). Vermont. Available at: http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=VT38F&re=0&ee=1

energy market programs. If a state-regulated utility receives revenues from those markets, it will also be necessary to establish rules for the use of those revenues and their treatment in ratemaking processes. Utilities that deliver energy efficiency programs as part of organized markets for capacity may in some cases treat such revenues as another source of revenue to cover costs of service, or in other cases they may dedicate some portion of those revenues for special purposes, including further investments in clean energy initiatives and energy efficiency.

Details concerning forward capacity market regulation are provided in Chapter 19.

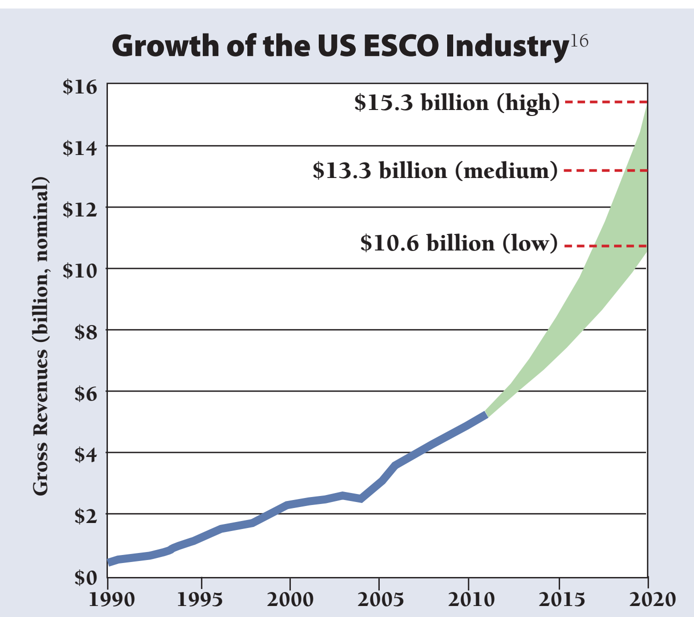
3. State and Local Implementation Experiences

All of the states, and in addition many local governments, have had experience with one or more of the market-based energy efficiency policies and programs described in this chapter. An overview of those experiences is presented below.

ESCOs and Third-Party Energy Efficiency Delivery Models

In the United States, the ESCO industry reported revenues exceeding \$5 billion in 2011, and the Lawrence Berkeley National Laboratory (LBNL) projects that the industry will grow to over \$13 billion in revenues by the year 2020, as shown in Figure 12-2.

Figure 12-2



As noted previously, most ESCO activity in the United States is focused on government and institutional customers, including public sector clients, schools, universities, and hospitals. Commercial, residential, and industrial clients account for only about 11 percent of revenues. Within the residential sector, ESCO activities center on condominiums and apartment buildings. Opportunities may exist for expanding the reach of ESCOs to other customer segments, especially commercial buildings and large residential complexes. There is a wide gap between the requirements of public and private building owners with respect to payback requirements.[17] Yet there is also tremendous potential. LBNL estimates that the remaining investment potential for all of these market segments ranges from \$71 billion to \$133 billion.[18]

Historically, the industrial sector has not been a focus of ESCO activities in the United States. ESCOs prefer standard and replicable measures and arrangements that can be recovered, typically over long-term contract arrangements. Industrial facilities typically require nonstandard and fairly complex improvements that may be sector-specific. Also, industrial customers typically are reluctant to enter into long-term contracts with ESCOs for energy efficiency improvements because they tend to have short payback requirements for capital investments. However, there are some states where mandatory energy efficiency resource standards like those described in Chapter 11 have fostered a market for ESCO activity in the industrial sector. The most notable example is Texas, where, although the energy efficiency obligation is placed on utilities, utilities are required to contract with energy service providers to implement energy savings measures. All of the state's utilities offer a Commercial and Industrial Standard

16 Stuart, E., Larsen, P. H., & Goldman, C. A. (2013, September). *Current Size and Remaining Market Potential of US ESCO Industry.* LBNL. Available at: http://emp.lbl.gov/sites/all/files/lbnl-6300e-ppt.pdf

17 An indicator of this is the considerable difference in the payback between commercial building projects and public projects found by LBNL. LBNL found that although the payback from publicly owned properties was 10.5 years, it was only 3.5 for private projects. Larsen, P., Goldman, C., & Satchwell, A. (2012). *Evolution of the US Energy Service Company Industry: Market Size and Project Performance from 1990– 2008.* Berkeley: Ernest Orland Lawrence Berkeley National Laboratory. Available at: http://emp.lbl.gov/sites/all/files/lbnl-5447e.pdf

18 Supra footnote 16.

Offer Program, which pays energy service providers for implementing energy and summer peak demand savings.[19] Although these are mandated energy efficiency programs rather than voluntary programs, they demonstrate that there is potential for ESCOs to find cost-effective energy efficiency at industrial sites, if given the opportunity.

Private Financing and Tax Incentives for Energy Efficiency

A wide array of financing initiatives have been implemented across the United States that serve to increase energy efficiency and reduce GHG emissions by lowering financing costs and increasing access to capital.[20]

In a 2011 report, the American Council for an Energy-Efficient Economy (ACEEE) found that utilities in at least 20 states were offering or were about to offer on-bill energy efficiency financing programs.[21] With only one exception, the default rate for these programs was just two percent or less. ACEEE featured on-bill finance programs from Connecticut, Oregon, and South Carolina that had supported more than 11,000 loans with more than $30 million of financing.[22]

The PACE financing idea was first tested in 2008 with small pilot programs in California, Colorado, and New York that focused primarily on energy efficiency and renewable energy upgrades to single-family residential homes.[23] The

Figure 12-3

**The Federal Housing Finance Agency (FHFA) issued a statement in July 2010 concerning the senior lien status associated with most PACE programs. In response to the FHFA statement, most local programs have been suspended until further clarification is provided.*

19 For a brief summary of the Texas program, see: US Department of Energy, Energy Efficiency Programs, Texas.

20 Freehling, J. (2011, August). *Energy Efficiency Finance 101: Understanding the Marketplace.* Washington, DC: ACEEE. Available at: http://aceee.org/white-paper/energy-efficiency-finance-101

21 Bell, C. J., Nadel, S., & Hayes, S. (2011). *On-Bill Financing for Energy Efficiency Improvements: A Review of Current Program Challenges, Opportunities, and Best Practices.* ACEEE report number E118. Washington, DC: ACEEE. Available at: http://www.aceee.org/research-report/e118

22 Supra footnote 21.

23 PACENow Annual Report. (2013, June). Available at: http://pacenow.org/wp-content/uploads/2013/06/Annual-report-6.18.13.pdf

24 See: Database of State Incentives for Renewables and Efficiency. Available at: http://www.dsireusa.org/documents/summarymaps/PACE_Financing_Map.pdf

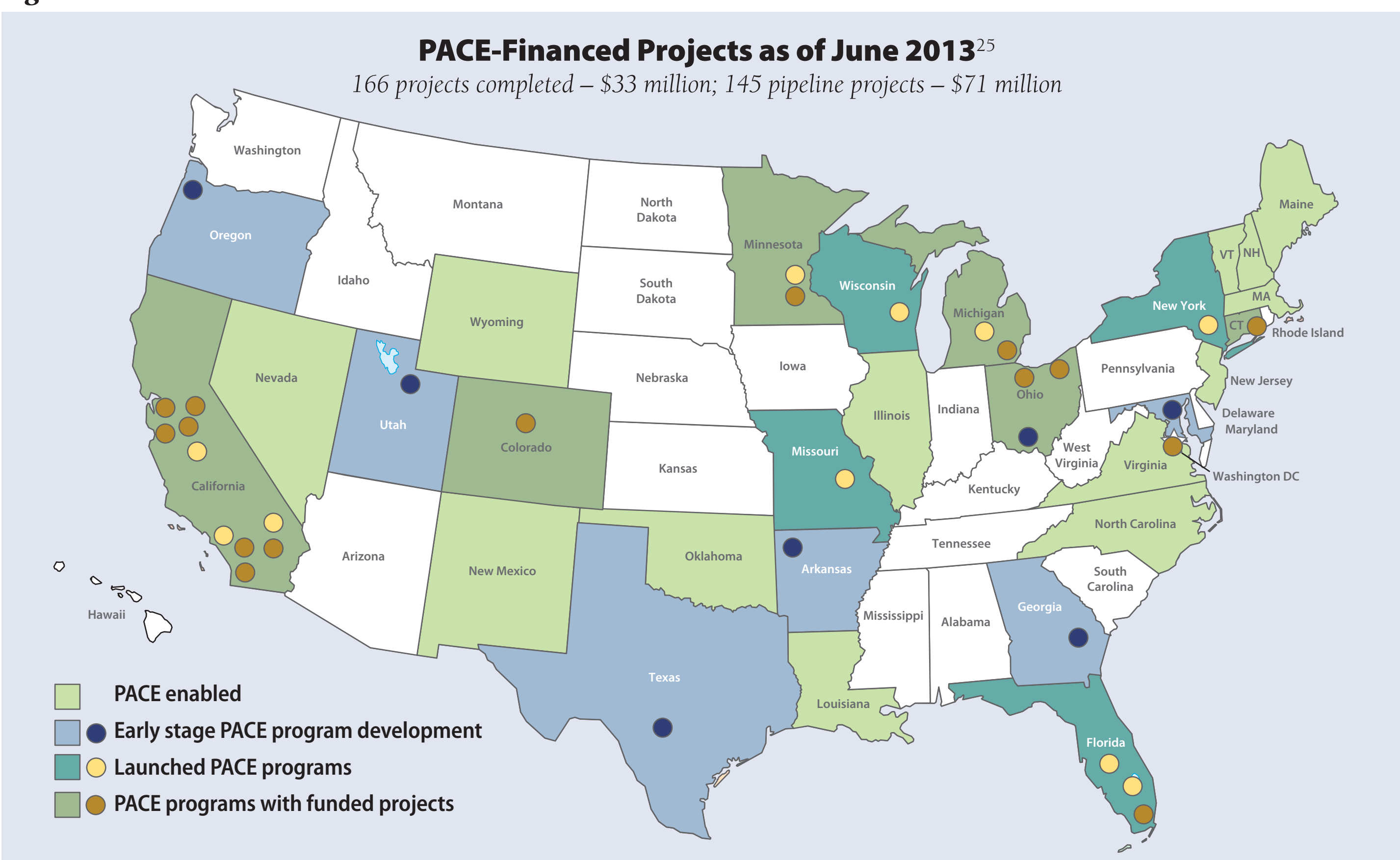
policy mechanism itself quickly attracted attention, to the point where more than 27 states have now authorized local tax authorities to offer PACE financing programs, as shown in Figure 12-3.

However, as noted earlier, the Federal Housing Finance Agency advised Fannie Mae and Freddie Mac in 2010 not to buy or hold mortgages with a PACE assessment. Because most residential mortgages are bought or held by these institutions, this severely stifled the actual use of PACE financing by tax authorities. In many of the states that authorized PACE, no projects have been financed with PACE to date. Nevertheless, the non-profit organization PACENow reported that as of June 2013, PACE financing had been used to support $33 million worth of projects in seven states and the District of Columbia, and an additional $71 million worth of projects had applied for PACE funding and were "in the pipeline," as shown in Figure 12-4. Some of these projects were energy efficiency projects, but others were renewable energy projects.

Although the Federal Housing Administration and the Veterans Administration both offer EEMs to eligible buyers, there are few publicly available data on how often those options are used by customers and to what extent it provides financing for energy efficiency. Data on EEMs issued by private lenders are not publicly available.

State government funding of energy efficiency through revolving loan funds has increased precipitously in recent years. This is largely the result of State Energy Program funding provided through the American Recovery and Reinvestment Act of 2009 and RGGI allowance auction revenues. States have allocated $650 million in State Energy Program funds for revolving loan funds.[26] Revolving loan funds can be managed either by state institutions or by existing financial institutions. RGGI allowance auctions, described in more detail in Chapter 24, have provided the participating states with nearly $1 billion in additional revenues, the vast major-

Figure 12-4



25 Supra footnote 23.

26 See: Goldman, C. A., Stuart, E., Hoffman, I. M., Fuller, M. C., & Billingsley, M. A. (2011, March). *Interactions between Energy Efficiency Programs funded under the Recovery Act and Utility Customer-Funded Energy Efficiency Programs.* LBNL. Report #4322E. Available at: http://emp.lbl.gov/publications/interactions-between-energy-efficiency-programs-funded-under-recovery-act-and-utility-c

ity of which has been directed toward state energy efficiency programs and other clean energy programs. Other sources of finance at the state level include tax-exempt bonds, typically backed by the state, potentially in conjunction with some form of financial backing (e.g., a letter of credit) from larger commercial banks.

Other instruments for financing energy efficiency at the state and local level include Community Development Financial Institutions, credit unions, and commercial banks. The main connection between commercial banks to energy efficiency is through the financing of energy service performance contracting arrangements from traditional ESCOs.[27]

Other categories of lending bodies providing private financing for energy efficiency include socially responsible investment managers and other institutional money managers. Institutional managers that have financed energy efficiency projects include insurance companies like MetLife, John Hancock, and Prudential. Philanthropy represents another category of financing, primarily through program-related investments. Program-related investment issuers include the Ford Foundation, the MacArthur Foundation, and the F.B. Heron Foundation. Private equity and venture capital firms constitute yet another category of financing. Large firms working in this space include RNG, Goldman Sachs, and Kleiner Perkins.

The federal government offered a residential energy efficiency tax credit for purchases of qualifying equipment between 2006 and 2013, with a cap on the amount of credit that each taxpayer could claim. That program has expired. Comprehensive data on the value of state energy efficiency tax incentives are not readily available.

Voluntary Energy Efficiency Labeling and Benchmarking

There are several programs for voluntarily certifying and labeling new buildings that are more efficient than required under typical mandatory building codes. The two best known are the EPA's Energy Star® program and the LEED program operated by the US Green Building Council.[28]

The Energy Policy Act of 1992 authorized the federal government to develop voluntary testing and consumer information programs for energy efficiency. Since that year, the EPA and the US Department of Energy have managed the federal Energy Star® program, a voluntary endorsement labeling program covering more than 60 product categories, including home and office electronic equipment and household appliances. The Energy Star® program also created an online building efficiency benchmarking tool called Portfolio Manager that is widely used (voluntarily) by owners of residential and commercial buildings.[29]

Energy Star® has separate certification programs for newly constructed residential and commercial buildings. In the past, the EPA estimated that participating buildings would use 15 to 30 percent less energy than standard buildings. The level of incremental energy savings from this voluntary program will of course depend on the stringency of local mandatory building energy codes. In addition, Energy Star® has programs for retrofit and operation of commercial buildings. According to the EPA website, nearly 25,000 US buildings have been certified to the Energy Star® standard as of October 2014. Examples can be found in every state.[30]

The LEED program offers four levels of certification for new commercial buildings, based on a point system. In most states, a building constructed to meet current model building energy codes could qualify for some level of certification, but only a portion of building developers choose to pay the fees required for LEED certification.[31] As of October 2014, more than 50,000 buildings in the United States were LEED-certified, including numerous examples in every state. At least seven states have more than 1000 LEED-certified buildings.[32]

Because LEED allows compliance on a "point" system,

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27 Supra footnote 20 at p. 3.

28 See: https://www.energystar.gov/index.cfm?c=new_homes.hm_index&s=mega and http://www.usgbc.org/leed#overview

29 Individual states generally don't adopt their own voluntary appliance labeling programs, but some have adopted mandatory appliance efficiency standards (see Chapter 14). California, Washington, and some large cities in other states also use Portfolio Manager as the basis for mandatory building benchmarking and disclosure policies (see Chapter 15).

30 Energy Star® Certified Buildings and Plants database. Accessed on October 24, 2014. Available at: http://www.energystar.gov/buildings?s=mega

31 Avsatthi, B. (2014, August 11.) How Energy Efficient are LEED-Certified Buildings? [Web log post]. Retrieved from: http://www.energyblogs.com/buildingenergymodeling/index.cfm/2014/8/11/How-Energy-Efficient-are-LEED-Certified-Buildings

32 LEED Project database. Accessed on October 24, 2014. Available at: http://www.usgbc.org/leed. Many records in the database do not identify the state where the building is located; thus, the numbers cited are conservative estimates.

with provision of bicycle parking and recycling systems (for example) given credit in the same manner as energy efficiency, LEED does not define a specific level of energy efficiency. In some jurisdictions with aggressive mandatory building energy codes, compliance with code will generally result in buildings that meet the LEED Silver standard with respect to energy efficiency. The LEED Platinum standard effectively requires installation of solar photovoltaics or other onsite renewable energy supply options and, in that sense, goes well beyond energy efficiency alone.

In addition to Energy Star® and LEED certification, there are some local residential construction certification programs, such as "Good Cents" and "Super Good Cents," but in most areas these have given way to the Energy Star® program standards.[33]

An analysis by the EPA of 35,000 benchmarked buildings found that those buildings reduced consumption by an average of seven percent over three years.[34] A report commissioned by the California PUC found that benchmarking strongly correlated with building energy improvements and management actions, and was a strong catalyst for customer participation in utility rebate and incentive programs.[35] In addition, work by the Institute for Market Transformation on markets with existing benchmarking laws found that local businesses were experiencing significant new demand for energy efficiency services.

Compensation for Energy Efficiency in Wholesale Electricity Markets

Two organized wholesale electricity markets in the United States — PJM and ISO-NE — conduct forward capacity auctions that permit a wide range of demand-side resources to compete with supply-side resources in meeting the resource adequacy requirements of the region. Energy efficiency and demand response (including distributed generation) can compete on a level playing field with generation to provide capacity in future years. If an energy efficiency provider's bid to provide forward capacity is accepted, it means they will receive payments from the market organizer (ISO-NE or PJM) that will provide additional revenue or profit to support energy efficiency.

Like generating resources, demand-side resources must meet market rules for eligibility and availability, including demonstrating they will be available at the start of the proposed delivery year. Each type of demand-side resource has a specific set of performance hours across which load reductions are required. To be eligible for the auction, service providers must demonstrate in advance their ability to perform during those hours. Like other resources, demand-side resources are subject to penalties if there is a mismatch between their capacity commitment and their performance. These mechanisms are formalized in FERC-approved tariffs and rules.[36]

PJM and ISO-NE currently serve electricity customers in parts or all of 19 states and the District of Columbia. More details on their forward capacity markets are available in Chapter 19.

4. GHG Emissions Reductions

As explained in Chapter 11, the magnitude of emissions reductions attributable to energy efficiency measures depends first and foremost on the amount of energy that was (or will be) saved. However, the emissions reductions that result from those energy savings also depend upon when energy was (or will be) saved, and which marginal electric generating units (EGUs) reduced (or will reduce) their output at those times.[37] Over the longer term, the

33 International Institute for Energy Conservation. Profiles by Program, Bonneville Power Administration, Super Good Cents (residential-new construction), Profile #7. http://www.iiec.org/index.php?option=com_content&view=article&id=379&Itemid=178

34 Institute for Market Transformation (2012, October 11). EPA Analysis Shows Big Benchmarking Savings. [Press release]. Retrieved from: http://www.imt.org/news/the-current/epa-analysis-shows-big-benchmarking-savings

35 NMR Group, Inc. (2012, April). *Statewide Benchmarking Process Evaluation.* Volume 1: Report. Available at: http://www.calmac.org/publications/Statewide_Benchmarking_Process_Evaluation_Report_CPU0055.pdf

36 For example, ISO-NE Market Rule 1 addresses the market rules within ISO-NE. Rule III.13 addresses the capacity markets and III.13.1.4 addresses the rules related to demand-side resources, including energy efficiency's participation in the forward capacity market. Market Rule 1, Section III.13 is available at: http://www.iso-ne.com/regulatory/tariff/sect_3/index.html

37 For example, the average CO_2 emissions rate from natural gas power generation in the United States is about 1100 lb per MWh, whereas the average emissions rate from coal power plants is twice as much as this rate. See: http://www.epa.gov/cleanenergy/energy-and-you/affect/air-emissions.html

more significant impact of energy efficiency programs and policies is that they can defer or avoid the deployment of new EGUs. Over that longer term, the avoided emissions will thus depend not so much on the characteristics of existing EGUs, but on the costs and development potential for new EGUs.[38]

In either the near term or the longer term, GHG emissions reductions are proportional to energy savings, but not necessarily on a one-to-one basis (i.e., a one-percent reduction in energy consumption could reduce emissions by more or less than one percent, depending on how the emissions rates of the marginal or deferred EGUs compare to the system average emissions rates). Chapter 11 describes three methods for quantifying the short-term emissions impacts of energy efficiency programs: the average emissions method, the marginal emissions method, and the dispatch modeling method. Over a longer time period, the emissions rates of new natural gas-fired EGUs may represent a better proxy for avoided emissions.

Data from voluntary and market-driven energy efficiency programs are often proprietary, so less information about the energy savings and emissions avoided through these programs is publicly available. One exception is the EPA's 2010 report on building benchmarking results from over 35,000 buildings enrolled in the Energy Star® Portfolio Manager program, which found that the average participant reduced its energy consumption (normalized for weather and business activity) by 2.4 percent each year and 7.0 percent cumulatively over the three-year analysis period. The EPA projected that if every building in the United States followed such a trend through 2020, more than 18 million metric tons of CO_2 emissions equivalents could be avoided each year.[39]

5. Co-Benefits

In addition to GHG emissions reductions, energy efficiency initiatives can provide a wide range of co-benefits, including cost savings and reductions in other air pollutant emissions. The air emissions co-benefits depend on the same factors that were discussed with respect to GHG emissions reductions.

The full range of co-benefits that can be realized through deployment of energy efficiency technologies is summarized in Chapter 11, and need not be repeated here. The only difference between mandated programs, such as those described in Chapter 11, and voluntary programs, such as those described in this chapter, is in the impetus for change. The co-benefits, as listed in Table 12-1, are the same. Although not shown in the table, voluntary, market-based energy efficiency programs can also produce substantial benefits for the participants (i.e., the customers who improve their efficiency), including reduced future energy bills, other resource savings (e.g., septic, well pumping), reduced operations and maintenance costs, positive health impacts, increased employee productivity, higher property values, and more comfortable indoor environments.

6. Costs and Cost-Effectiveness

The costs and cost-effectiveness of implementing energy efficiency measures are described generally in Chapter 11 with an emphasis on mandatory energy efficiency savings targets imposed on utilities and the costs *to the utilities* of implementing those programs. This chapter focuses instead on voluntary energy efficiency programs.

38 The fact that energy efficiency programs can defer the need for new generating capacity means that they can also potentially extend the life of existing EGUs. New EGUs will tend to be lower emitting than the existing EGUs most prone to retirement, and the developers of new EGUs often size the units not only to meet load growth but also to replace an existing EGU. For example, they might develop a 200-MW EGU in anticipation of 150 MW of load growth, and thus some of the existing EGUs would run less or might choose to retire. Air regulators should be cognizant of this possibility, but not view it as a certainty or as an argument against using energy efficiency to reduce emissions. Older, less efficient, higher emitting EGUs will generally be dispatched less often (not more often) as a result of demand reductions, and the economic pressures that lead to a retirement decision will generally arise sooner (rather than later) as a result of energy efficiency programs.

39 US EPA. (2012, October). *Benchmarking and Energy Savings.* Available at: http://www.energystar.gov/ia/business/downloads/datatrends/DataTrends_Savings_20121002.pdf?3d9b-91a5

Table 12-1

Types of Co-Benefits Potentially Associated with Fostering New Markets for Energy Efficiency

Type of Co-Benefit	Provided by This Policy or Technology?
Benefits to Society	
Non-GHG Air Quality Impacts	Yes
Nitrogen Oxides	Yes
Sulfur Dioxide	Yes
Particulate Matter	Yes
Mercury	Yes
Other	Yes
Water Quantity and Quality Impacts	Yes
Coal Ash Ponds and Coal Combustion Residuals	Yes
Employment Impacts	Yes
Economic Development	Yes
Other Economic Considerations	Yes
Societal Risk and Energy Security	Yes
Reduction of Effects of Termination of Service	Yes
Avoidance of Uncollectible Bills for Utilities	Yes
Benefits to the Utility System	
Avoided Production Capacity Costs	Yes
Avoided Production Energy Costs	Yes
Avoided Costs of Existing Environmental Regulations	Yes
Avoided Costs of Future Environmental Regulations	Yes
Avoided Transmission Capacity Costs	Yes
Avoided Distribution Capacity Costs	Yes
Avoided Line Losses	Yes
Avoided Reserves	Yes
Avoided Risk	Yes
Increased Reliability	Yes
Displacement of Renewable Resource Obligation	Yes
Reduced Credit and Collection Costs	Yes
Demand Response-Induced Price Effect	Yes
Other	Yes

In terms of the costs of implementing voluntary energy efficiency measures, and thus the associated costs of reducing GHG emissions, the emphasis in the present case should be on the cost to the end-user and, where appropriate, the third-party service provider. But although there is clearly a difference in who pays the costs of implementing voluntary energy efficiency measures, it is not at all clear that there is a significant difference in the total costs of mandated energy efficiency and voluntary energy efficiency. However, far fewer data are available for voluntary energy efficiency programs than for mandated programs to verify that assertion, in part because the vehicle used to deliver most of the voluntary energy efficiency covered in this chapter is a contract between an ESCO and its client. Although some of the contractual details may be publicly available in some cases, such as the amount paid by a government client to an ESCO, the ESCOs' cost of saved energy is not known. And for private sector clients, there will normally be no publicly available information on the costs of saving energy and reducing emissions.

In any event, the presumption for voluntary energy efficiency programs should be that participants only volunteer on the expectation that energy efficiency is indeed cost-effective for them, and ESCOs will only offer their services if they expect to be able to profit from the venture. This is a distinctly different cost-effectiveness test than the tests generally applied to the mandatory programs described in Chapter 11.[40]

The costs and cost-effectiveness of allowing energy efficiency to compete in forward capacity markets is covered in more detail in Chapter 19, but it is worth noting here that the response of demand-side resources in the PJM and ISO-NE auctions has been substantial, and their participation is clearly demonstrating that reducing consumer demand for electricity is functionally equivalent to — and cheaper than — procuring capacity commitments from new generating resources. One study suggests that participation of these resources in the first New England auction potentially saved customers as much as $280 million by lowering the price paid to all capacity resources in the market. In a recent PJM auction, demand-side resources were credited with reducing the unit clearing price from $178.78 to $16.46 in unconstrained zones — a savings of $162.32/MW-day.[41]

40 Using standard industry terminology explained in Chapter 11, voluntary programs can succeed if they pass the Participant Test, whereas most ratepayer-funded mandatory programs must pass a Utility Cost Test or Total Resource Cost Test that also considers costs and benefits to nonparticipants.

41 Gottstein, M. & Schwartz, L. (2010, May). *The Role of Forward Capacity Markets in Increasing Demand-Side and Other Low-Carbon Resources: Experience and Prospects.* Montpelier, VT: Regulatory Assistance Project; p 3. Available at: http://www.raponline.org/document/download/id/91

7. Other Considerations

States that are considering their options for reducing GHG emissions will see much to like in voluntary energy efficiency programs, but may also struggle to determine the extent to which they can rely on this strategy. This is a normal limitation for any voluntary emissions reduction strategy.

On the plus side, voluntary energy efficiency policies and programs avoid much of the criticism that is often leveled against mandatory energy efficiency policies and programs. Voluntary efforts are not funded by nonparticipating utility customers, yet nonparticipants enjoy some of the societal and utility system benefits.

One reason ESCOs have been so successful in the government sector is that local government officials can reduce their energy bills and thus their overall operating budget (all else being equal). This can be an effective response to known budget reductions, or a strategy to save taxpayers money in the future.

The participation of energy efficiency in forward capacity markets raises a number of issues, detailed in Chapter 19. One concern frequently cited is whether the energy efficiency that is bidding into forward capacity markets will truly materialize and will result in the expected reduction in the resources needed to meet future electricity demand. Many observers consider this less certain (and thus riskier) than the expectation that an EGU with a known rated capacity can deliver that level of energy in a future year.

8. For More Information

Interested readers may wish to consult the following sources and reference documents for more information on fostering new markets for energy efficiency:

- ACEEE. Available at: http://www.aceee.org
- Institute for Market Transformation. Available at: http://www.imt.org
- McEwen, B., & Miller, J. *Local Governments' Role in Energy Project Financing: A Guide to Financing Tools for the Commercial Real Estate Sector.* IMT. Available at: http://www.imt.org/uploads/resources/files/energy_finance_06.pdf
- Larsen, P. H., Goldman, C. A., & Satchwell, A. (2012). *Evolution of the US Energy Service Company Industry: Market Size and Project Performance from 1990–2008.* Berkeley, CA: Ernest Orland Lawrence Berkeley National Laboratory. Available at: http://emp.lbl.gov/sites/all/files/lbnl-5447e.pdf
- Freehling, J. (2011, August). *Energy Efficiency Finance 101: Understanding the Marketplace.* ACEEE. Available at: http://aceee.org/files/pdf/white-paper/Energy%20Efficiency%20Finance%20Overview.pdf
- Wasserman, N. & Neme, C. *Policies to Achieve Greater Energy Efficiency.* Montpelier, VT: The Regulatory Assistance Project. Available at: http://www.raponline.org/document/download/id/6161
- Gottstein, M., & Schwartz, L. (2010, May). *The Role of Forward Capacity Markets in Increasing Demand-Side and Other Low-Carbon Resources: Experience and Prospects.* Montpelier, VT: The Regulatory Assistance Project. Available at: http://www.raponline.org/document/download/id/91
- Stoddard, R., & Adamson, S. (2009). *Comparing Capacity Market and Payment Designs for Ensuring Supply Adequacy.* International Proceedings of the 42nd Hawaii International Conference on System Sciences. Available at: http://www.computer.org/csdl/proceedings/hicss/2009/3450/00/04-02-06.pdf

9. Summary

There are a range of activities that states and their utilities can initiate directly or through organized regional markets to promote voluntary investments in energy efficiency. New markets for energy efficiency services can be spurred by encouraging the development of third-party partners, like ESCOs. These markets can be encouraged through enabling mechanisms that motivate end-users to improve their energy performance, while enabling third-party providers to effectively target and monitor and verify performance. State policies can influence whether affordable private financing is available, and can create favorable tax treatment for voluntary energy efficiency measures. States can also foster the expansion of energy efficiency markets by increasing public awareness through voluntary efforts, such as auditing, labeling, and benchmarking programs. Finally, energy efficiency markets can be expanded by allowing energy efficiency to compete with traditional central station generation in organized wholesale energy markets. Efforts to do so will require the approval of grid operator tariffs, and will likely involve some level of state approval for the use of funds and regulatory approvals.