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## THE BOTTOM LINE

Electric utilities are key actors in the quest to induce large-scale energy savings among end users. But often it is not enough simply to mandate utilities to achieve a specific target. Three new market-based mechanisms are available for utilities to use in promoting energy efficiency.

# Exploiting Market-Based Mechanisms to Meet Utilities' Energy Efficiency Obligations

### Why is this issue important?

## Electric utilities are well-positioned to help raise energy efficiency

New policies and regulatory practices are reshaping approaches to energy efficiency around the world. Regulations of various kinds that require energy utilities (chiefly electric utilities) to help their customers save energy have been used successfully in many jurisdictions to achieve large-scale improvements in energy efficiency. Alongside the commonly used regulatory approaches, several market-based approaches are now available. These include certified energy savings (so-called white certificates), already being tried in many places; competitive bidding for energy savings, a newer phenomenon; and energy efficiency feed-in tariffs (FITs), a promising model that has yet to be tested. Shaping these mechanisms to elicit energy savings involves a variety of challenges—among them identifying target markets; determining pricing and payment structures (cost recovery); evaluating, measuring, and verifying savings; and administering the programs.

The sections below briefly introduce these mechanisms, with emphasis on the newer market-based approaches, while providing references to a burgeoning literature.

### What has been the conventional practice?

## Utilities have been required to spur their customers to greater energy efficiency

Demand-side management by electric utilities, as used successfully in various forms for decades, is designed to induce customers to act in ways that change the volume or timing of electric loads for the benefit of the electricity service system. Mechanisms of demand-side management may be classified as regulatory, policy-based, market-based, and load-targeting (table 1). All alter electricity demand by raising energy efficiency among end users, managing load, and taking advantage of distributed generation resources, including intermittent renewables like wind and solar.

The oldest energy efficiency mechanisms implemented through utilities are of the regulatory type. Examples include decoupling utility revenue from sales volume, mandating utilities to include "all available" cost-effective demand-side measures when acquiring resources to meet electricity demand, and imposing energy efficiency obligations (EEOs) on the utility or other provider or handler of electricity (Crossley 2013).

An EEO is a requirement that the utility meet a quantitative energy-savings target by delivering or procuring cost-effective end-use energy savings. EEOs are variously termed "energy efficiency resource standards," "energy efficiency portfolio standards," or "energy efficiency commitments." In regulated electricity markets,

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**Table 1.** Four categories of demand-side mechanisms for raising energy efficiency

| | Vertically integrated utilities with regulated markets | Markets with unbundled electricity providers | Competitive wholesale generation markets with regulated retailers | Fully competitive generation and retail markets |
|---|---|---|---|---|
| **Regulatory mechanisms** | | | | |
| Impose obligation to evaluate alternative methods of meeting forecasted system load (integrated resource planning) | E | Y* | Y* | |
| Decouple electricity provider revenue from sales volume | E | E+ | Y+ | Y+ |
| Require published information on opportunities for using demand-side resources to reduce loads | Y | Y | Y | Y |
| Mandate implementation of all cost-effective demand-side measures | Y | Y | Y | Y |
| Impose energy efficiency obligations | E | E | E | E |
| Mandate implementation of time-varied electricity pricing | Y | Y | Y | |
| Policy mechanisms | | | | |
| Establish a public energy-saving fund with which to finance energy efficiency measures | E | E | E | E |
| **Market-based mechanisms** | | | | |
| Enable demand-side bidding in electricity markets (customers offer to modify demand return for payment) | | | E | E |
| Enable bidding of demand-side measures to relieve network constraints | Y | Y | Y | Y |
| Value and provide payments for demand-side measures that provide network benefits and services | Y | Y | Y | Y |
| Establish a white certificates scheme | | | Y | Y |
| Establish energy efficiency auctions | Y | Y | Y | Y |
| Establish energy efficiency feed-in tariffs (conceptual) | Y | Y | Y | Y |
| **Load-targeting mechanisms** | | | | |
| Use load control to address system needs and integrate intermittent generation sources | Y | Y | Y | Y |
| Implement load scheduling to time-target changes in end-user loads | Y | Y | Y | Y |
| Operate energy storage to time-target changes in system load | Y | Y | Y | Y |
| Implement geographic targeting of demand-side measures to address local network constraints | Y | Y | Y | Y |

Y: Mechanism can be applied in this market structure
*: Electricity retailers only
E: Mechanism is particularly effective in this market structure
+: Electricity transmission and distribution service providers only

*Source:* Adapted from Crossley (2013).

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they are typically imposed upon vertically integrated utilities, whereas in competitive markets they may be placed on retailers or on operators of the transmission and distribution system. Existing EEOs typically set annual savings targets over a long time horizon and require the obligated entity to achieve specified annual percentage reductions in energy use. A summary of best practices in designing energy efficiency obligations can be found in Crossley and others (2012).

EEOs have been used successfully in Australia, Brazil, Canada, China, Europe, the Republic of Korea, and the United States. Although all EEOs oblige utilities or other providers of electricity to induce their customers to save energy, how this is to be done—how the efficiencies are to be "procured"—is not always spelled out. For example, the European Union's 2012 Energy Efficiency Directive requires member states to impose EEOs on energy distributors and retailers (or to adopt alternative measures to achieve equivalent energy savings), but the directive leaves it up to each country to choose how to apply the EEOs.

Broadly, utilities can pursue energy savings through a variety of channels, including implementing energy efficiency projects directly or contracting with other entities (such as energy savings companies) to do so. Some utilities contribute to funds that support the implementation of efficiency projects or purchase credits for energy savings that have been achieved by others.

## How is the field evolving?

### Market-based options to implement EEOs are gaining traction

Under the right circumstances, market-oriented approaches to meeting EEOs such as white certificates, energy efficiency auctions, and energy efficiency FITs can help utilities meet their efficiency obligations. Growing interest in the use of such market-based mechanisms has undoubtedly spilled over from the success of counterparts instruments in the renewable energy field: green certificates, renewable energy auctions, and renewable energy FITs. These mechanisms allow markets to determine the price or the quantity of certified energy savings. White certificate and auction schemes fix the quantity of energy savings and allow a market to determine their price, whereas energy efficiency FITs fix the price of a unit of energy savings and leave a market to determine the total quantity purchased. While experience to date shows that market-based approaches can elicit real energy savings, careful design, effective oversight, and adaptation to overcome inevitable challenges in implementation are needed.

**White certificates.** White certificates (sometimes termed "energy savings certificates," "energy efficiency credits," or "white tags") attest that specified reductions in energy use have been attained, with the attestation being made by a body set up and authorized for the purpose. In all applications thus far, white certificate schemes have been combined with EEOs. They track energy savings, monitor compliance with the EEO, and provide for trading of energy savings. With tradable certificates, the certificate is unbundled from the energy savings that it represents and takes on a value that is determined by demand for and supply of certificates. The demanders are the obligated entities, while the suppliers may be other obligated entities, nonobligated entities, or a mix of both. Trade can occur bilaterally or through markets.

Certificate trading can reduce the cost of complying with an EEO where the costs of achieving an equivalent amount of energy saving vary across the entities that are eligible to trade. In practice however, lowering the cost of compliance is subject to several preconditions and challenges. The market for certificates needs to be sufficiently liquid, the EEO needs to be sufficiently binding, and the gains from trading need to be weighed against the administrative and transaction costs of a white certificate scheme.

Among the European governments that are employing white certificates are Denmark, Flanders (Belgium), France, Italy, Poland, and the United Kingdom. As of early 2014, white certificate programs were in the pipeline in Ireland and were being considered in Bulgaria, The Netherlands, Portugal, and Romania. In the United States and Australia, there has been some experience with subnational schemes.

Giraudet, Bodineau, and Finon (2012) summarize the costs and benefits of white certificate schemes. Giraudet and Quirion (2008) compare white certificates to other instruments for increasing

"The key challenges of auctions are reducing the barriers to participation and ensuring that bidders actually compete."

energy efficiency. Oikonomou and others (2008) and Child and others (2008) explore the interaction between white certificates and other energy efficiency instruments. Case studies and cross-country comparisons of white certificate schemes are available in Crossley and others (2012), Bertoldi and others (2010), Lees (2007), Lees (2010), and Heffner and others (2013). MacGill (2013) details pitfalls to be avoided in constructing markets for trading energy-savings certificates.

**Energy efficiency auctions.** Energy efficiency auctions elicit competitive bidding between prequalified bidders to meet energy savings goals at minimum costs. The bidding can focus on one dimension of the proposed projects (such as price per kWh of energy saved) or on several project dimensions, in which case the auction is referred to as multidimensional. The auction typically proceeds as follows: The procurer defines a project, calls for proposals, evaluates the proposals based on single or multiple criteria, and "scores" the proposal by weighting the criteria. In a multidimensional auction one of the criteria is price. All other criteria are often grouped under the term "quality" (everything but price). Bidders have private information about the costs of supplying quality, which they use in combination with the scoring criteria to design a profit-maximizing proposal.

The key challenges of auctions are reducing the barriers to participation and ensuring that bidders actually compete. Additional challenges of multidimensional auctions are that the products are not homogenous, that information asymmetry exists between bidders and the auctioneer on quality, and, typically, that there is a trade-off between price and quality.

Examples of energy efficiency auctions are those run by several power companies in the United States (AEP Ohio 2013; MidAmerican Energy 2013), the ProKilowatt auction in Switzerland launched by the Swiss Federal Office in 2010 (BFE 2013), and the Public Energy Service Company (ESCO) auction in Japan (Iimi 2013).

**Energy efficiency FITs.** An approach that has generated interest but that has yet to be tried is an energy efficiency FIT—that is, a fixed payment per kWh for documented energy savings by customers of energy service companies. The main challenge, as with FITs generally, is determining the right payment amount. Unlike auctions and markets for tradable certificates, a FIT lacks a price-discovery mechanism, so it can easily be set too high or too low.

So-called standard offer programs for energy efficiency (also known as "performance contracting" and "pay-for performance") used in several states in the United States resemble FITs, but they are typically part of a portfolio of programs designed to meet an EEO. Unlike FITs, there is usually no long-term commitment to standard offers, and the prices are at or below the market clearing price for energy (Neme and Cowart 2012). A standard offer program has also been introduced in South Africa (World Bank 2011).

For an introduction to energy efficiency FITs from the perspectives of renewable energy procurement and a discussion of the debate between instruments that focus on price and those that focus on quantity see Bertoldi and Rezessy (2007). For the design, operation, infrastructure, and potential difficulties of an energy efficiency FIT in the household sector, see Bertoldi and others (2009). Neme and Cowart (2012) and Cowart and Neme (2013) summarize policy issues and design options for energy efficiency FITs.

## What have we learned?

### Market-based approaches can be useful additions to a utility's toolbox for procuring energy savings

Electric utilities are key actors in the quest to encourage large-scale energy savings among end users and to make the switch to a low-carbon energy system. But often it is not enough simply to mandate utilities to achieve a given target or to implement "all measures deemed to be cost-effective." At least three new market-based models are available for utilities to use in promoting energy efficiency, in concert with other means of procurement. The choice among them and the details of the chosen approach will depend on the goals to be reached, the consumer groups targeted, administrative requirements, equity, and other factors. Whatever the design, program effectiveness will depend on technically competent and trusted verification of energy savings and their costs, long-term commitment to maintaining the efficiency program, and flexibility in adjusting it over time to ensure that programs keep performing.

"An approach that has generated interest but that has yet to be tried is an energy efficiency FIT—that is, a fixed payment per kWh for documented energy savings by customers of energy service companies."

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