INTERNATIONAL ENERGY AGENCY
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Energy Provider-Delivered Energy Efficiency

A global stock-taking based on case studies

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INTERNATIONAL ENERGY AGENCY

The International Energy Agency (IEA), an autonomous agency, was established in November 1974. Its primary mandate was – and is – two-fold: to promote energy security amongst its member countries through collective response to physical disruptions in oil supply, and provide authoritative research and analysis on ways to ensure reliable, affordable and clean energy for its 28 member countries and beyond. The IEA carries out a comprehensive programme of energy co-operation among its member countries, each of which is obliged to hold oil stocks equivalent to 90 days of its net imports. The Agency's aims include the following objectives:

- Secure member countries' access to reliable and ample supplies of all forms of energy; in particular, through maintaining effective emergency response capabilities in case of oil supply disruptions.
- Promote sustainable energy policies that spur economic growth and environmental protection in a global context – particularly in terms of reducing greenhouse-gas emissions that contribute to climate change.
- Improve transparency of international markets through collection and analysis of energy data.
- Support global collaboration on energy technology to secure future energy supplies and mitigate their environmental impact, including through improved energy efficiency and development and deployment of low-carbon technologies.
- Find solutions to global energy challenges through engagement and dialogue with non-member countries, industry, international organisations and other stakeholders.

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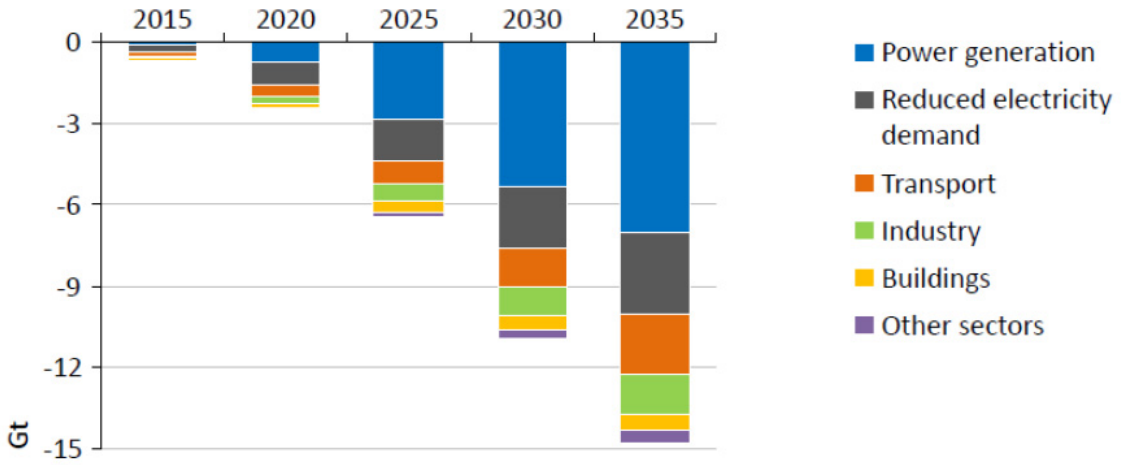
Executive Summary

Energy providers will play a pivotal role over the coming decades in managing energy demand growth and reducing greenhouse gas (GHG) emissions. The IEA projects that the power sector will deliver up to two-thirds of cumulative emissions reductions under the climate-stabilizing 450 ppm scenario, by switching to less carbon-intensive generation, improving operational efficiency, and reducing demand (IEA 2011a). Reducing electricity end-use demand by itself is expected to account for 1/3 of the GHG emissions reductions through 2025 (See Figure 1).

Figure 1 • World energy-related CO2 abatement by sector in the 450 Scenario (IEA 2011a)



Energy providers already play important roles in delivering end-use energy efficiency improvements. The IEA has estimated that in 2011 energy providers spent almost USD 12 billion on energy saving activities (See Table 1). Most of this spending is from state and provincial efforts in North America, where some energy providers spend as much as 3% of their revenue on energy efficiency (Wallace and Forster 2012). In the UK, annual spending by energy retailers under the Carbon Emissions Reduction Target (CERT) supplier obligation has been USD 1.6 billion per year, while the Italian White Certificates scheme accounted for over USD 260 million annually in 2010 and 2011 (Lees 2012). Australian energy providers delivered another USD 100 million in spending (Crossley et al 2012), while Brazilian energy providers spend about USD 250 million each year (Mauer 2012).

Table 1 • Energy efficiency spending by energy providers

Region	Energy efficiency spending (USD billions)
North America	9.1
EU 27	2.5
Australia	.09
Brazil	.25
Total	11.95

Source: IEA, 2012

Governments turn to energy providers to deliver energy efficiency (EE) for several reasons. Energy providers have a strategic position in energy markets, often serving as middleman between energy producers and energy consumers. Energy providers have long-standing commercial relationships with even the smallest end-use customers, allowing them to influence energy saving activities in diffuse markets. Energy providers have the technical capacity and infrastructure for delivering

services, by virtue of offices and facilities in their area of operations or service territory. Energy providers also enjoy name recognition by end-users, and are often viewed as impartial or objective sources of information and expertise. Energy providers also possess detailed information on the consumption habits of energy consumers, a useful resource when providing energy savings advice. Finally, energy providers produce very large revenue streams from selling energy which can be an alternative to public budgets as a source of energy efficiency funding (IEA 2010).

Policies for Energy-Provider Delivered Energy Efficiency Project

In 2011 the IEA and the Regulatory Assistance Project (RAP) took on a work programme focused on the role of energy providers in delivering energy efficiency to end-users. This work was part of the IEA's contribution to the PEPDEE Task Group, which falls under the umbrella of the International Partnership on Energy Efficiency Cooperation (IPEEC). In addition to organizing regional dialogues between governments, regulators, and energy providers, the PEPDEE work stream conducted global stock-takings of regulatory mechanisms adopted by governments to obligate or encourage energy providers to delivery energy savings and the energy savings activities of energy providers.

For its part the IEA conducted a global review of energy provider-delivered energy savings programmes. The IEA reached out to energy providers to identify the energy savings activities they engaged in. The review identified over 220 energy savings activities, from which 41 detailed case studies from 18 countries were developed. Although the stock-taking is not a definitive survey or census, it does provide an in-depth look at the range of energy provider-delivered energy efficiency efforts underway.

Drivers of energy provider-delivered energy efficiency

Most of the case studies describe how energy providers comply with regulatory mechanisms, such as energy efficiency obligations (EEOs). The case studies suggest that most energy providers find ways to make a business virtue out of the necessity of regulatory compliance. In Denmark, France, Italy, and the UK energy providers have met their energy savings goals with programmes that have established new business lines or contributed to retention of customers. In the US and Canada energy providers have improved utilization of existing assets and avoided addition of new capacity through their energy saving activities.

The case studies also show that regulatory mechanisms are not the only reason why energy providers undertake energy saving activities. The IEA found 17 cases where non-regulatory driving forces were in play - market mechanisms, financial incentives, and funding opportunities; voluntary agreements, community relations, and corporate sustainability policies; demand management and system operations; and business retention and development. These non-regulatory drivers can produce levels of energy savings activity comparable to those mobilized by regulatory mechanisms.

Energy-saving activities delivered by energy providers

The IEA identified nine distinct types of energy saving activities that energy providers engaged in. Advice and assistance to energy consumers was the most common energy-saving activity, observed in most of the case studies. In almost half of the case studies energy providers disseminated information, educated consumers, and promoted energy saving measures. In about one-third of the case studies energy provider offered or helped access financial incentives. Other energy saving activities included comprehensive implementation, direct installations, replacing equipment, on-bill financing, bulk procurement and/or distribution, and technology development (see Table 4). These energy savings activity categories are by no means exclusive and in most cases energy providers

deliver a combination of energy saving activities. For example, advice and assistance to identify energy saving opportunities is often combined with financial incentives or on-bill financing to help the customer overcome the cost hurdle of making an energy-saving investment.

Lessons learned

The case studies afford an opportunity to identify patterns and organizing principles useful for governments, regulators and energy providers who are contemplating their own energy provider delivered energy efficiency policies. These case studies show the importance of local circumstances, opportunities and needs in driving energy provider involvement in energy efficiency. By the same token there are also several elements that are found across many of the case studies that may have general application.

- Energy providers improve the effectiveness of their programmes by taking on local delivery partners. Local partners fill in gaps in the core competencies of energy providers and allow the delivery process to take on a local flavour and produce local benefits.
- Energy providers should be strategic in selecting the type of energy saving activity they undertake. In particular energy providers should leverage their core competencies and proprietary knowledge and technology to gain competitive advantage and cost savings in their energy efficiency programmes.
- Placing energy savings targets on energy providers is clearly an industry-wide approach to mobilizing delivery of energy savings by energy providers. The case studies suggest that voluntary agreements may provide another basis for industry-wide concerted action. This may be worthy of further consideration by policy makers.
- Energy providers seem particularly adept at bundling together goods, services, and programmatic offerings to create attractive energy savings opportunities for customers. Policy makers should work with energy providers to coordinate incentives and other offerings to make the bundling process most effective.
- There is increasingly less to distinguish energy providers from energy services companies (ESCO). More and more energy providers also provide energy services, and in many cases have created an ESCO business line or an ESCO subsidiary. Such blurring of conventional distinctions between energy and energy services providers will encourage innovation, but also may complicate the lives of regulators.

Future work

The case studies provide perspective into what drives energy providers to take on energy savings activities, what type of energy savings activities they perform, and how they achieve success. The patterns, principles and lessons drawn from the case studies could be a starting point for recommendations on energy provider policies for governments consider. The case studies also highlight the many unanswered questions that governments and regulators face in designing policies for energy-provider delivered energy efficiency. As energy provider-delivered energy savings activities are scaled-up it will become more important to understand the interaction between policies, programme design, and the cost of delivered energy savings. Future work might include building capacity of governments and regulators to develop energy efficiency policies for energy providers, developing metrics for evaluating and comparing energy provider-delivered energy efficiency policies, policy research on unanswered question such as the merits of tradability and maintaining social equity in satisfying obligations, and including the PEPDEE results in the IEA's PAMS database.

Case study analysis

The IEA worked with energy providers to identify and document specific energy saving activities and programmes. Some 250 energy saving activities were considered, and 41 detailed case studies spanning 18 countries were developed. Geographic balance was a major consideration, and much effort was expended identifying energy provider-delivered energy savings case studies from around the world (See Table 2). Taken together these case studies represent over USD 1 billion in annual spending, or about 8% of estimated energy provider spending on energy efficiency (See Table 2).

Table 2 • Geographical distribution of the case studies

Region	Case Studies
Europe	19
North America	15
Asia	4
Australia	1
Africa	1
Latin America and Caribbean	1
Total	41

The case studies were developed through a process of telephone interviews and email exchanges, using a standard template. Case study respondents provided details on annual budgets and savings for each programme and indicated the type of energy saving activities delivered. The IEA undertook additional analysis to fit each case study into the energy saving activity types presented here.

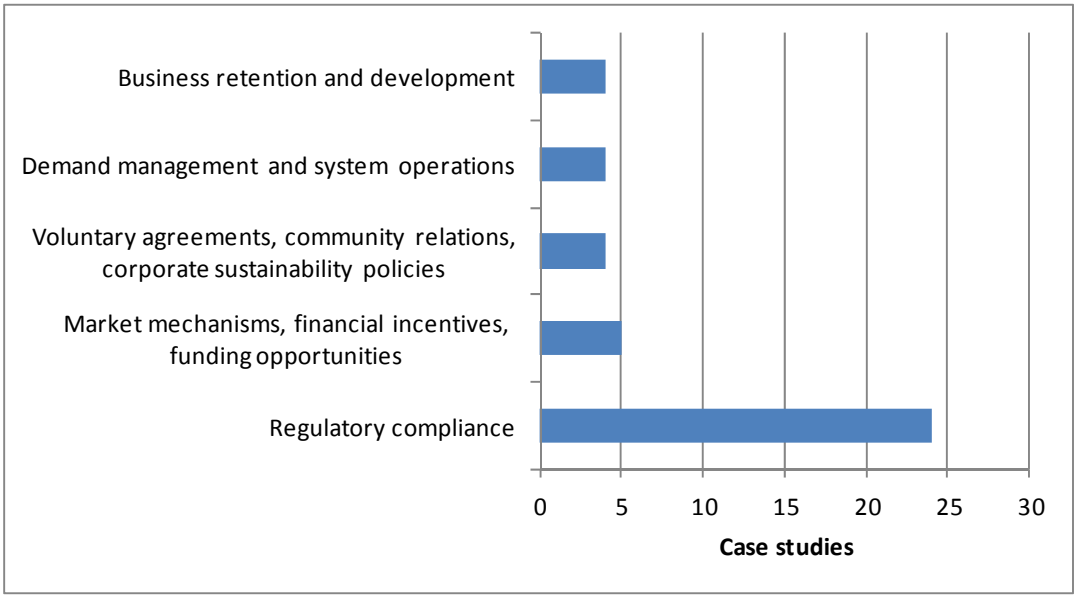
Each case study includes a summary table plus narrative on background, programme design, regulatory and market drivers, and lessons learned. The case studies are not intended to be a census of all energy provider activity in energy efficiency; rather, they provide a basis for appreciating the diversity of approaches energy providers take in promoting energy savings. This chapter presents a thematic analysis of the case studies. The following chapter presents the detailed case studies.

Drivers of energy provider-delivered energy efficiency

For some observers it might seem illogical for an energy provider to undertake activities which reduce sales of their product. Indeed, in many countries the idea that energy suppliers should seek to reduce energy demand remains counter-intuitive. However, in a world with competitive and open markets, and where energy is increasingly scarce even while demand for it grows, an energy provider business model that incorporates energy-savings activities is becoming commonplace.

The IEA's analysis of energy provider-delivered energy efficiency case studies identified several reasons why energy providers engage in energy saving activities (See Figure 2). Compliance with government policies and regulatory requirements was the driver in most, but not nearly all, of the case studies. Other drivers included taking advantage of market mechanisms, financial incentives, and funding opportunities; contributing to voluntary agreements, community relations, and corporate sustainability policies; meeting demand management and system operations objectives; and retaining customers and building new businesses. An analysis of how these drivers influence energy provider behaviour, using examples from the case studies, is provided below.

Figure 2 • Drivers of energy provider-delivered energy savings



Regulatory compliance

A recent study by the Regulatory Assistance Project (RAP) found Energy Efficiency Obligations (EEOs) and Energy Efficiency Resource Standards (EERS) to be the most common regulatory mechanisms imposed by governments on energy providers (Crossley, et al 2012). These mechanisms are popular because they can be developed to reflect industry ownership, energy market design, regulatory framework, and energy efficiency opportunities. EEOs can be used to oblige not only grid-delivered energy providers (e.g., electricity, gas, district heat), but providers of other energy forms (e.g., liquid petroleum gas, heating oil, or transportation fuels).

A survey by IEA and RAP found literally dozens of jurisdictions around the world with some form of EEO (See Table 3). Twenty-four US states have an EEO or EERS, while three Australian states, five Canadian provinces, and five EU Member States have EEO schemes (Lees 2012; Swanson 2012; Faruqui 2011; Heffner 2012; Crossley et al 2012; Nowack et al 2011).

Table 3• EEO and EERS schemes around the world

Country	Obligated Entities	Eligible Sectors
Belgium	Electricity distributors	Residential and non-intensive industry
France	Energy retailers including transport	All except large industry
Italy	Networked energy distributors	All including transport
Great Britain	Energy retailers	Residential only
Denmark	Networked energy distributors	All except transport
Australia – NSW	Electricity retailers	All except trade-exposed industries
Australia - Victoria	Networked energy retailers	Residential, commercial added in 2012
South Australia	Networked energy retailers	Residential only
US	Networked energy distributors/retailers	All
Canada	Networked energy distributors/retailers	All
Brazil	Electricity distributors	All, with targets for vulnerable groups

Sources : IEA and RAP

In more than half of the 41 case studies the principle driver of energy provider delivery of energy saving activities was compliance with regulatory mechanisms or market opportunities created by

these mechanisms. Examples include:

- **Case Study # 6:** The Brazilian electricity distribution company CEMIG created Efficientia as a subsidiary dedicated to complying with CEMIG's energy efficiency spending obligations under Brazil's Federal Law 9.991. This law obligates franchised energy providers to spend 0.50% of annual revenues on energy efficiency projects. Efficientia helps CEMIG to manage the portion of its yearly spending obligation spent on the non-residential sector. Efficientia operates as an Energy Service Company (ESCO), providing project design, financing, supervision, and monitoring and verification of energy saving projects. Efficientia is representative of the Brazilian ESCO industry, which is now capable of finding, financing, and delivering energy savings projects across all consuming sectors. The spending obligation imposed by federal law and administered by the national electricity regulator ANEEL is credited with delivering cumulative annual savings of almost 6 TWh since 1998 (Broc et al 2012).
- **Case Study # 20:** HERA SpA is a large Italian utility providing energy, water, and waste management services for 3 million customers. HERA SpA is obliged to meet annual energy savings targets under the Italian White Certificates (WhC) Scheme. In the early years of the WhC Scheme HERA met its energy savings targets through energy-saving projects developed for its own plants and building (e.g. offices buildings, water treatment, lighting improvements, district heating and cogeneration). More recently the company has been able to apply its know-how gained from operating its own industrial facilities (power plants, waste treatment facilities, municipal waste incinerators) to develop a suite of energy services valuable to industrial operators throughout Italy. HERA provides energy audits, develops projects, sources equipment, prepares and measurement and verification planning, and handles the paperwork needed to originate the WhC – all on a no-fee basis. HERA and the industrial end-user enter into an agreement regarding project development and sharing of energy savings and WhC revenues. Through this strategy HERA has maintained diversity in how it meets its energy savings obligations, producing one-quarter of its 160,000 toe annual energy savings obligation by originating energy savings projects in partnership with industrial end-users.
- **Case Study # 37:** China's State Council in 2010 issued a new Demand Side Management (DSM) Rule in response to rising power demand, supply constraints, and national energy-saving policies. The DSM Rule obligates government-owned grid companies (State Grid Corporation of China and China Southern Grid) to achieve annual "power savings" of 0.3% of energy and peak demand (based on the previous year). The power savings can be achieved through end-use energy efficiency and upstream energy savings, such as line loss reductions. As part of their compliance strategy, the State Grid Corporation of China (SGCC) and Jiangsu Electric Power Company (JEPCO) are establishing energy service company affiliates at the city and country level. The Suzhou City Power Utility has created six Energy Efficiency Services Activity Groups (EESAGs) comprising 69 large power users who have together delivered 12 GWh of energy savings over the past year. The EESAG allows electric power market participants (energy providers and their customers) to share energy-saving experiences and achievements, improve energy efficiency management skills, and originate energy savings projects which contribute to meeting the power savings obligations of SGCC and JEPCO.
- **Case Study # 34:** SE Big Blue is a wholly-owned subsidiary of SE, the third-largest energy provider in Denmark. SE Big Blue was established in 2011 to consolidate all of SE's EE work and take advantage of the numerous business opportunities created by the Danish EEO scheme. SE Big Blue uses its specialized EE expertise, especially in industrial process measurement, to identify and implement energy savings opportunities and verify their energy savings. SE Big Blue counts the savings credit against SE's energy savings obligation or trades the savings to other obligated parties. SE Big Blue acts as a consultancy providing energy services, financing, and project implementation, all governed by energy performance contracts, and in so doing satisfies SE's regulatory obligations.

Although the nature of the regulatory mechanism is different in each case, the energy provider has taken broadly similar actions to comply. New technical and institutional capacity has been created and engagement with energy users on energy savings opportunities has been scaled up. In some cases new subsidiaries specializing in energy services and project development have been established. The case studies illustrate the effectiveness of regulatory mechanisms in creating compliance markets for energy efficiency and stimulating development of new industries which may provide a source of revenues for energy providers well into the future.

Market mechanisms, funding opportunities and financial incentives

Compliance with regulations is not the only way to mobilize energy providers to take on energy saving activities. The IEA's analysis identified five case studies in which the main driver was market mechanisms and funding or financial award opportunities. As with regulatory mechanisms, these opportunities and incentives usually resulted from government policies. An important difference is that energy providers are able to voluntarily choose the level of energy savings activities rather than having an obligatory target set for them. Examples of market mechanisms, funding opportunities and financial incentives include:

- **Case Study # 8:** CLP Power in Hong Kong provides free energy audit services to non-residential customers. The audits assess the energy efficiency of commercial and industrial customers, identify energy-saving opportunities, and provide advice on carrying-out improvements. Since 1999, CLP Power has conducted more than 1,300 detailed energy audits. A loan scheme of USD 3.2 million per year over the period 2009–2013 has been established to assist commercial and industrial customers to implement the energy-saving improvements identified through the Energy Audit Programme. These energy savings activities are encouraged under the Scheme of Control (SoC) for regulating energy providers in Hong Kong, which offers energy providers an increase in their allowed return on equity (ROE) - if targets for delivering energy audits and energy savings are reached. CLP Power is allowed a 1 basis point increase if it delivers 150 or more energy audits to commercial and industrial customers or if customers receiving an audit save more than 12 GWh per year as a result.
- **Case Study # 14:** The Portuguese Energetic Services Regulatory Entity (ERSE) launched the Promotion Plan of Efficiency in the Consumption of Electrical Energy (PPEC) in 2007. PPEC is a competitive tendering mechanism for energy efficiency projects. The Portuguese regulator ERSE (Energetic Services Regulatory Entity) tenders biennially for energy efficiency projects seeking co-financing from PPEC. A range of "eligible promoters" can tender, including energy providers, ESCOs, network operators, state energy agencies, consumer associations, private enterprises, academic institutions and others. In 2011 a new household energy usage feedback scheme developed by Energias de Portugal (EDP) and Home Energy, called Knowatt, was selected for funding. The Knowatt scheme installs in-home devices to help monitor daily energy use, and uses this information plus multiple media channels to proactively advice and assist end users on how to optimize their energy use. The PPEC provided start-up funding for a a 100,000 household trial of the Knowatt scheme.
- **Case Study # 24:** ISO New England (ISO-NE) is the regional transmission system and wholesale market operator serving the New England region of the United States. ISO-NE operates the Forward Capacity Market (FCM), which uses a competitive auction to procure capacity resources in response to forecast capacity needs. Energy efficiency (EE) competes in this market on an equivalent basis with generation. In the sixth annual capacity auction, EE bids accounted for one-quarter of the winning capacity bids (Yoshimura 2012). The vast majority of this capacity was bid into the market by utilities, which use the revenues from the FCM to supplement ratepayer-funded energy savings activities. On average energy providers can source about 10% of programme costs from the FCM, providing valuable headroom in the programme budgets authorized by regulators.

These case studies illustrate that market mechanisms as well as regulatory mechanisms can mobilize energy providers to delivery energy efficiency. Rewarding energy providers with increased return on equity, creating a dedicated funding source for energy savings programme development, and establishing a market mechanism that compensates energy provider for verified capacity savings all provide financial rewards for undertaking energy savings activities. In these case studies the energy provider can choose how much, or how little, energy savings activity to engage in.

Business retention and development

Many energy providers realize that delivering energy efficiency goods and services can be a new business opportunity good business, and have adjusted their business models accordingly. In some cases energy providers have created virtue out of necessity, using energy savings obligations as a new basis for interacting with customers. Other energy providers have not needed a regulatory nudge to develop energy services business lines. Considering that supplying energy is a competitive business with a low profit margin, the introduction of energy savings activities not only diversifies energy companies but provides them with a new and potentially more profitable business line. For many energy providers, helping customers save energy is a way to retain them as customers. With business retention or new business development as the driver, the energy savings activities of energy providers are constrained only by the market opportunities available and internal resources and capabilities.

The IEA's analysis found 4 case studies which illustrate how business retention and new business development can motivate energy providers to undertake energy saving activities. Three are described below:

- **Case Study # 12:** Endesa's Energy Management Platform is an advanced software product that provides large users with real-time and historical data on energy and water consumption. It facilitates comprehensive resource management, and helps identify energy and water savings measures. The Platform is sold as a turn-key package inclusive of training and an energy audit. The Energy Management Platform has about 400 users, many of whom use it to meet ISO energy efficiency certification standards. The Platform has been an important revenue source but is even more important as a way to retain large customers. Endesa plans to evolve the Platform further, expanding its applications to incorporate enterprise-wide as well as facility-specific applications.
- **Case Study # 25:** Kalmar Energi is a combined heat and power (CHP) network operator in Sweden. Kalmar identifies customers who use expensive fuel oil or electricity for their process heat needs and works with them to investigate whether an oil/electricity-to-district-heating conversion project is economical. Many industries that use oil-fired boilers and hot water heaters for their process heat needs (e.g., such as dairies, hospitals, slaughterhouses) are connected to the CHP network but only for space, not process, heating demand. Kalmar works with these customers to identify conversion opportunities, engineer the project, and mobilize financing. The conversion from oil or electric boilers to district heat is both a commercial opportunity for Kalmar Energi and an energy-savings opportunity for customers willing to invest in the conversion equipment.
- **Case Study # 32**: RWE is the largest power producer in Germany, and one of the five largest energy companies in Europe. Over the past decade RWE has incorporated energy efficiency services as an integral part of its product portfolio. RWE subsidiaries working with industry have achieved an annual sales volume of about EUR 500 million through energy efficiency services. A new subsidiary, RWE Effizienz GmbH, has been formed to market residential energy efficiency products. The "150 Million Euro EE Programme", launched in 2007, is an ongoing showcase of energy efficiency products and services. Some 10,000 projects have been implemented over the past five years, including information, education, and promotion,

advice and assistance, equipment replacement, bulk procurement and distribution, and technology development. The costs of the "150 Million Euro Programme" were supported entirely by RWE. The campaign and training delivered as part of the programme have served to increase the understanding of energy savings and create demand for RWE Effizienz's energy efficiency products.

These examples illustrate how energy providers engage in energy savings activities in order to pursue business opportunities and new revenues sources. None of these energy providers is subject to a regulatory mechanism. These case studies illustrate the growing recognition by energy providers that helping customers save energy is not only expected by their customers, but is an important basis for commercial innovation and new business development.

Voluntary agreements, community relations, and sustainability policies

Energy providers often deliver energy savings to fulfill their commitments to industry-wide cooperation, community relations, or corporate sustainability. In these cases the energy savings activities contribute to a larger objective - community good will, satisfying corporate objectives, or maintaining government and public relations. Voluntary agreements are a particularly interesting driver of energy provider-delivered energy savings activities, as they represent an alternative to regulatory mechanisms which, if established properly, can yield large energy savings with less administrative complexity. The IEA's analysis identified five case studies where the main driver was delivering on voluntary agreements, improving community and public relations, and reaching corporate sustainability objectives. Three of these are described below:

- **Case Study # 1:** *Heizen mit Öl Förderinitiative* is a programme established by the Austrian heating oil industry to replace old boilers with new condensing boilers, thus improving efficiency by up to 40%. This voluntary programme was established in 2009 in cooperation with the Ministry of Economic Affairs. All companies importing or distributing heating oil in Austria contribute to a fund, resulting in 100% market coverage.[1] Confirming eligibility and disbursing subsidies is coordinated by a third party (*Heizen mit Öl GmbH*) programme implementer. Market factors and political considerations, including a declining trend in heating oil sales, contributed to industry cohesion and willingness to enter into a voluntary agreement. The voluntary agreement is also an important pillar in Austria's response to the EU Directive on energy end-use efficiency and energy services.
- **Case Study # 17:** Finland has a long tradition of utilizing voluntary agreements to achieve energy savings. Finland's 2008–2016 voluntary Energy Efficiency Agreements were established between the government, Finnish Energy Industries, and individual energy providers (e.g. electricity and district heating producers, providers, and distributors), and communities. Under the Action Plan for Energy Services, companies providing transmission, distribution and retail sales of electricity and district heating and cooling not only improve their own energy efficiency, but provide energy saving guidance to their customers. Participating companies provide advice to customers by telephone, e-mail, Internet, and through special events. The companies prepare regular reports on customer energy consumption, including year-on-year comparisons of individual customer's consumption as well as benchmarking against similar customers. About 90% of members of Finnish Energy Industries have signed the voluntary agreement. Participation enhances their company's image and maintains good government and public relations, which are important considerations in a competitive retail energy market such as Finland.
- **Case Study # 34:** Airtricity is a wholly-owned division of Scottish and Southern Energy, the second largest energy utility in the UK. As part of its on-shore wind-power generation

[1] This necessary as the heating oil supply industry is fully deregulated, with consumers free to buy from any supplier. All suppliers must be subject to the same treatment in order to avoid any competitive disadvantage.

expansion SSE seeks good community relations with areas affected by wind-power development. The SSE/Airtricity Community Fund offers a way for SSE to build community support by sharing the benefits of the wind-power development. The Fund receives a percentage set-aside of annual revenues from each wind farm which is disbursed through an annual project identification process. The Fund supports activities that enhance community quality of life, promote community spirit, and foster sustainable communities. Energy efficiency projects are encouraged, and many energy-savings projects in schools, parish halls, sports pitches, and other town facilities have been funded. As of 2011 annual spending was EUR 720,000, and over 1,000 projects had been implemented with annual savings of 0.4 GWh.

Based on these case studies, voluntary agreements in particular appear to be a quite flexible instrument. In Austria they have been adopted for a narrow spectrum of non-networked energy providers who operate in a fully competitive environment, saving around 11% of the yearly demand for heating oil. In Finland they have been adopted for a very broad spectrum of entities engaged in producing and delivering energy of all types, saving between 1% and 3% of total household demand.

Demand management and system operations

Energy providers sometimes undertake energy savings activities in response to reliability considerations or the operational needs of energy networks. The IEA has previously studied the role of energy providers in coping with energy shortages in two previous reports – *Saving Electricity in a Hurry* and *Saving Electricity in a Hurry – An Update* (IEA 2005 and IEA 2011b). As a general proposition, energy providers have an operational motivation to save energy whenever marginal supply cost exceeds the average costs of existing consumption, when the cost of serving existing consumption is less than the revenues collected, and whenever there is unmet demand. Several of the energy providers included in the IEA's global stock-taking engaged in energy savings activities out of a need to manage demand growth or peak demand or to fill a supply shortfall. It is noteworthy that these cases are mostly from the developing world.

- **Case Study # 31:** Reliance Infrastructure Limited (RInfra) is an integrated infrastructure company and utility serving 3 million electricity consumers in Mumbai, India. With the encouragement of the Maharashtra Energy Regulatory Commission (MERC), RInfra launched several initiatives to reduce peak loads. The Mumbai Efficient Lighting Programme focused on small commercial and residential users, who accounted for much of the use of inefficient incandescent lamps. RInfra developed a bulk procurement programme that reduced the cost of CFLs and T5 tube-lights by about 50 percent, and provided an on-bill financing scheme that allowed the cost to be recovered over 12 monthly payments. The programme popularized the use of CFLs, increased consumer awareness of energy efficiency, and drove down the costs of CFLs. A total of 206,000 customers participated in the programme, resulting in CFL sales of 617,000 and energy savings estimated at 48 GWh annually.
- **Case Study # 11:** In the early 1990s, electricity demand in Thailand was growing faster than power plants could be built, and the country's reserve margin fell to dangerously low levels. At the direction of the National Energy Policy Office, and with the participation of the World Bank and the Global Environmental Facility (GEF), the Electricity Generating Authority of Thailand (EGAT) pursued a series of energy savings initiatives designed to reduce demand growth. Beginning with voluntary appliance labelling, EGAT has been active in promoting ESCOs, transforming the marketplace for residential and commercial lighting, and improving buildings energy efficiency. EGAT continues to implement its DSM programme, with the CFL replacement effort being a key contributor.
- **Case Study # 16:** In 2008 South Africa faced a capacity shortfall of 10% of peak demand due to high demand growth and insufficient investment in new capacity. The national electricity

provider Eskom drastically scaled-up its energy and demand savings efforts, in particular via a national roll-out of residential CFLs.[2] Eskom's National Efficient Lighting Project and its follow-on programme, the CFL Sustainability Project, have made massive resource contributions – equivalent to a peaking power plant of 2000 MW - and have reduced energy demand by 7 TWh per year.

Capacity shortfalls and demand management needs are a powerful motivator for energy providers to take on energy savings efforts. Demand management-driven spending on energy efficiency can be as ambitious as the need to reduce energy or peak demand. However, energy providers interested in saving energy solely because of system needs may be less interested in saving energy once additional capacity is constructed. In the case of Thailand, energy savings programmes which were originally focused on deferring the need for new power plants were repositioned as a corporate social responsibility (CSR) function once the capacity shortfalls were resolved.

Types of energy-saving activities

Based on literature review nine distinct categories of energy saving programmes were identified (see Table 4). Each of these energy saving activities were observed in the case studies, some more frequently than others.

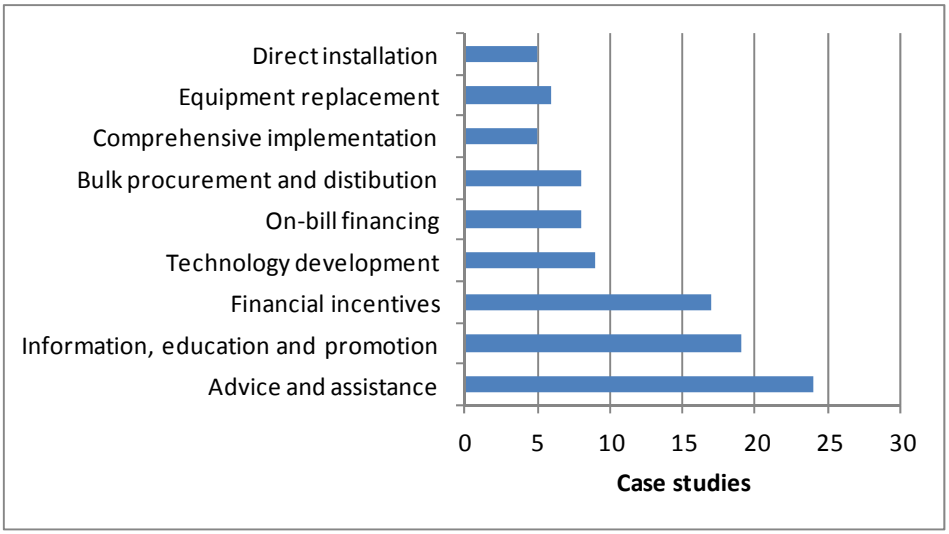
Table 4• Energy savings activity descriptions

Programme category	Description
Advice and assistance	Individualized outreach to end-users, such as advice or energy audits
Information, education and promotion	Generalized provision of information via web sites, advertising, or social media
Financial incentives	Cost-sharing or subsidies that make energy savings investments more affordable for end-users or that encourage retailers and manufacturers to make energy-savings products more available
Direct installation	The energy provider installs low-cost energy savings measures, often at little or no charge
Comprehensive installation	The energy provider works with an end-user to identify and implement all economical energy savings measures
Equipment replacement	Older, inefficient equipment or appliances are replaced with newer, more efficient equipment, with the old equipment removed and destroyed
On-bill financing	Loans for purchase of energy savings measures are provided to end-users and repaid through the energy provider's billing system
Technology development	Energy providers undertake research, development, demonstration and commercialization of energy saving technologies
Bulk procurement and distribution	Energy providers reduce the cost and increase the availability of energy saving equipment through large-scale purchases and/or their distribution network

By far the most common energy saving activity was providing advice and assistance, practiced by most of the energy providers (see Figure 3). Almost half of the energy providers delivered information, education and promotion activities, while about one-third provided financial incentives. The other types of activities – comprehensive implementation, direct installation, equipment replacement, on-bill financing, bulk procurement and/or distribution, and technology development – were important for individual schemes but not dominant across the case studies. Each of these energy saving activities is described below, with examples from the case studies.

[2] The residential sector is critical to energy demand growth in South Africa, accounting for over one-third of electricity consumption.

Figure 3• Prevalence of energy savings activities by type



Advice and Assistance

Advice and assistance programs allow energy providers to engage directly with customers on saving energy. Many energy providers offer some form of outreach to individual customers, and this often includes energy advisory services such as energy audits or technical advice. Advice and assistance activities often identify specific energy savings measures that may qualify for other types of energy saving activities, such as financial incentives or on-bill financing.

Advice and assistance programmes can be a low-cost way to help energy consumers help themselves to realize energy savings. Depending on the consuming sector and type of customer, advice provided can range from simple product awareness, to system optimization training, to corporate-level energy management opportunities.

Advice and assistance plays a key role in most of the case studies; three are described here:

- **Case Study # 10**: DONG Energy is one of the leading energy groups in Northern Europe, with numerous subsidiaries engaged in exploring, producing, distributing and trading energy. As part of its Climate Partnership Programme, DONG Energy provides energy services to participants at its own cost, helping identify and develop bankable energy savings projects. The partner entity finances the savings and DONG Energy claims the savings against the energy savings obligations of its distribution subsidiaries. Each Climate Partner signs an agreement which obliges both parties to work together to identify energy savings projects, develop the project details including measurement and verification, financing, and risk management, manage project implementation, and report the results to the participant and to regulators.
- **Case Study # 4:** BPA's Scientific Irrigation Scheduling activity, underway for over thirty years, provides predictive analytic services to growers, allowing them to reduce energy consumption by using less water. Activities includes weekly field visits, soil testing, weather data collection and ongoing communication with agricultural customers, keeping them appraised on an ongoing basis of suggested irrigation strategies. BPA cooperates with retail utilities throughout the Pacific Northwest that in turn provide recommendations to irrigation districts and growers.
- **Case Study # 8:** CLP Power Hong Kong provides free energy audit services to non-residential customers. The audits assess the energy efficiency of commercial and industrial customers, identify energy-saving opportunities, and provide advice on carrying-out improvements. Since 1999, CLP Power has conducted more than 1,300 detailed energy audits. Many customers

who have received the energy audit service have proceeded to implement energy-saving projects.

Achieving energy savings through providing advice and assistance can be relatively low cost, as the energy provider bears mostly the up-front portion of total project costs. However, advice and assistance is almost always a prelude or companion to other energy saving activities, such as providing rebates or financing for energy saving measures.

Information, education and promotion

Information, education and promotion programmes help consumers become more aware of their energy use, understand how much their energy use costs, and learn about energy savings opportunities. These programs may include traditional pathways such as mailings or websites, unconventional channels such as retail promotions or kiosks, and access to new technologies such as smart meters and energy "dashboards". The sophistication of such programs is increasing with the growth of social media and new communications technologies. Regardless of technology, the aim of information, education and promotion efforts remains raising consumer awareness and promoting energy savings actions.

Examples of information, education and promotion from the case studies include:

- **Case Study # 3:** BC Hydro's Team Power Smart Residential Behavioural Programme was created in 2008 as a loyalty programme wherein residential customers voluntarily sign up and receive benefits including energy-saving tips and incentives and exclusive offers. The Team Power Smart programme offers various membership and benefit levels, each with its own range of access to special offers, online information, billing services, and conservation and planning tools and incentives. Multiple themes and constantly changing content encourage return visits to the website. Early evaluation efforts suggest an annual reduction of 200 kWh per participating household, or about a 2% reduction.
- **Case Study # 19:** The Energy Efficiency Platform from GDF SUEZ guides customers from the initial idea of saving energy through implementation of energy savings measures. Energy Efficiency Platforms are available not only for households but for other type of energy consumers - business, industry, and communities. The Platform allows easy access to a broad range of energy efficiency goods and services and also includes unique features for social networking on energy efficiency, accessing subsidies, and monitoring consumption and savings. In 2012 the platform received 1.2 million visitors, while the social networking feature has 34,000 members. The Platform plays a central role in encouraging customers to think of GDF SUEZ when considering home energy efficiency improvements, and contributes to meeting GDF SUEZ's energy savings obligations.
- **Case Study # 18:** Florida Public Utilities joined several other Florida gas utilities to create a state-wide programme encouraging customers to install energy-efficient gas appliances and electricity-to-natural gas appliance conversions. A flagship of the state-wide programme is a shared website, GetGasFL.com, along with promotional strategies tailored to each of the appliance categories (e.g., stove, furnace, clothes dryer, water heater). Initiatives include an Energy Partners network, an FPU partner programme for contractors and builders improving outreach to target customers and making rebate payments easier for end users.

Information, education and promotion programmes are usually the lowest-cost form of energy saving activity that energy providers can undertake. However, making the connection between generalized dissemination of information and actual energy savings outcomes can be difficult.

Financial Incentives

Energy providers use incentives to encourage investment in energy efficiency goods and services by end-users. Rebates, price discounts, subsidies, or concessional lending can be offered directly to the end-user, to the equipment manufacturer or vendor, or to a performance contractor. Incentive programs are typically designed to help reduce the initial cost of the energy efficiency measure or the repayment terms, making the energy saving investment more affordable. Exactly half of the 42 case studies collected included some form of financial incentive.

Examples of financial incentives programmes from the case studies include:

- **Case Study # 1:** The *Heizen mit ol* programme offered by Austrian heating oil supply companies encourages owners of old oil boilers to purchase a new condensing boiler by offering a lump sum payment of EUR 2,000 (about 20% of the cost) upon installation of the new boiler. This subsidy encourages homeowners to replace older, inefficient boilers by reducing the initial cost. The results show the effectiveness of financial incentives in overcoming first-cost hurdles. The average age of an applicant is 61 years, indicating that retired persons with limited financial resources can benefit from the programme. Full implementation of this incentives programme is expected to reduce Austrian oil heating consumption by over 10% by 2016.
- **Case Study # 7:** CenterPoint Energy's Custom Process Rebate programme offers a cost-share of up to 50% of the cost of renovating industrial process equipment such as waste heat recovery systems, energy management systems, and economizers. CenterPoint engineers work with industrial customers to identify and engineer the process improvements, including the design fees of industrial energy efficiency specialists. In some instances, C&I customers reach out to CenterPoint, seeking more effective EE processes. The financial incentive has helped to grow the programme even during the recent economic downturn, as industrial customers lacking capital to invest in EE projects can stretch available resources.
- **Case Study # 2:** Baltimore Gas and Electric's Small Business Energy Solutions Programme (SBES) helps small business owners who have minimal time and money to invest in energy saving measures. The SBES addresses the main barriers to energy savings investments by small businesses – lack of financing, technical resources, and management attention. BGE overcomes these barriers by providing a turnkey service using approved programme contractors who develop customized lighting, refrigeration and hot water solutions and an incentive that covers 80% of the total cost of the EE lighting, refrigeration and hot water retrofit. Over 10,000 small businesses have participated, and the incentives are sufficient that many participants pay back their share of the costs in under a year.

Achieving energy savings through providing financial incentives is more expensive than other energy savings activities, as the energy provider is sharing the investment costs of energy savings measures to varying degrees. These case studies show how financial incentives can be adjusted to accommodate market conditions and the particular barriers facing different customer segments.

Direct Installation

Direct installation programs offer customers an instantaneous and simple implementation of energy savings measures, usually as part of or shortly following an energy audit or assessment. The key feature of a direct installation program is that the energy provider or contractor engaged by the energy provider does the installation as part of a bundled activity. These programmes are particularly effective with residential and smaller business customers and usually focus on generic measures which can be easily installed with little or no lead-time (*e.g.,* CFLs, programmable thermostats, water heater insulation, and some weatherization measures). Direct installation

programmes offer simple energy savings measures free of charge or at a reduced price, and can be implemented very quickly and economically.

Examples of direct installation programmes from the case studies include:

- **Case Study # 27:** National Grid's Small Business Energy Efficiency Programme targets difficult-to-reach small businesses in Massachusetts and Rhode Island with standardized energy savings measures. The programme offers a free, no obligation on-site energy audit of energy-consuming equipment which is used to identify electricity and gas energy savings measures. Local contractors install lighting upgrades, occupancy sensors, energy management systems, walk-in cooler efficiency measures, and water heater and boiler re-sets. The utility provides a large financial incentive, up to 70% of the installed cost of the measures, with the remaining 30% paid by the business owner. The utility also offers a no-money down option, financing the business's 30% project share through on-bill financing with zero interest and payment terms of up to 24 months. The programme provides a turn-key solution, from energy audit to specifying materials, arranging financing, and hiring installers, thus avoiding taking away from the limited time and resources of small business managers.
- **Case Study # 28:** Northeast Utilities and United Illuminating's Home Energy Solutions (HES) programme provides comprehensive in-home weatherization and EE services to residential customers. Under the HES umbrella all of the electricity and gas distributors in Connecticut have pooled their resources to create a state-wide one-stop diagnosis, weatherization and energy efficiency upgrade service. Authorized contractors perform standardized in-home energy assessments and services such as sealing critical air leaks, weather-stripping doors and windows, wrapping hot-water pipes, and sealing air ducts. Contractors also provide EE light bulbs, faucet aerators and low-flow showerheads. Participants receive about USD 800 in services per home; the customer contributes USD 75.
- **Case Study # 35:** Southern California Edison is one of three investor-owned California utilities who together implement the state-wide Energy Savings Assistance Programme (ESAP) for low-income customers. Through a network of community-based organizations and private contractors, SCE provides energy education, assesses customer homes for eligible measures, and directly installs these energy efficient measures at no cost for low-income households. Energy saving measures include lighting, refrigerator replacement, weatherization (insulation and envelope improvements), minor home repair, pool pumps and household heating and cooling measures. An integrated approach allows for a broad range of goods and services to be offered, from efficient lighting to load control devices to tariff options and bill payment assistance. SCE will offer this programme to 1.4 million low-income households in the coming years, using a variety of new technologies to speed up implementation.

Direct installation puts the energy provider or its contractor in the front-line position, delivering goods and services to consumers. Direct installation activities tend to be more costly than other energy savings activities, but can also be implemented to take advantage of economies of scale or through campaigns targeted to specific communities.

Comprehensive Implementation

Comprehensive implementation takes a bundled approach to identifying, financing, and installing multiple energy savings measures within a household or facility. The objective is to maximize the uptake of energy efficiency measures that are economical for a given customer. Comprehensive implementation programs encompass several measures offered through a single program or succession of linked programmes which are packaged in a customer-friendly way. For example, comprehensive implementation may start with a free energy assessment that leads to direct installation of lower cost measures (such as lighting) followed by the purchase of larger, more costly energy efficient measures that qualify for financial incentives or on-bill financing programmes.

Comprehensive programmes can target both the residential and non-residential market, but the most notable successes have come with larger users who need customized project development and access to one or more incentive streams. Examples of a comprehensive implementation approach from the case studies include:

- **Case Study # 30:** Energy Upgrade California (EUC) is a state-wide programme implemented by Pacific Gas and Electric Company and the other investor-owned California utilities. The programme provides a "whole house" approach to residential energy savings, through which a network of contractors work to offer subsidized audits, energy modelling, and equipment installation. EUC represents a major transition from a measures-based energy efficiency programme to a comprehensive, whole-house programme, with the objective of extracting deeper energy savings. Average savings have amounted to 30% per home, with an average cost of implementation per home of USD 13,000.
- **Case Study # 23:** Innowatio is an Italian ESCO which uses an energy management portfolio approach to optimize procurement and consumption of gas and electricity for large energy users in the industrial, tertiary sector and public sectors. Innowatio provides energy assessments, detailed planning of energy requirements, and identification, development, realization and operation of energy savings projects. In partnership with Humanitas, Innowatio worked with engineers, managers and health care professionals from two hospitals in Milan and Bergamo to shape an energy management portfolio that integrated patient needs and energy savings opportunities. Such an integrated and comprehensive approach can yield savings of up to 20% without affecting the quality of health care operations.
- **Case Study # 9:** Connecticut Light and Power's Small Business Energy Advantage (SBEA) serves smaller businesses that lack the engineering staff, resources and expertise to evaluate their energy savings opportunities. Specialist contractors provide energy audits and installation services for non-residential customers between 10 and 200 kW. Initial audits are accompanied by project development and installation services covering the range of measures offered by Connecticut Light and Power. The SBEA programme software is linked to customer utility bills, so that any project proposal is based on actual customer usage and can be confirmed as cost effective. SBEA software allows the utility to screen and approve all potential projects before the contractor presents a comprehensive proposal that includes all cost-effective energy savings measures (lighting, refrigeration, heating and cooling). On-bill financing is available to qualifying customers, which is useful in encouraging business owners to undertake more comprehensive measures. On average, the Connecticut Energy Efficiency Fund covers 35–40% of project costs, with the balance paid by customers under a zero-interest loan.

A comprehensive implementation approach may require more preparatory work, but also can yield larger and longer-lived energy savings. More and more energy providers are turning to comprehensive approaches as the opportunities for easy, short payback period measures are exhausted.

Equipment Replacement

Equipment replacement programmes allow energy providers to target older, low-efficiency energy-using equipment for replacement by high-efficiency equipment. This type of energy saving activity is often used by energy providers seeking to reduce energy and peak demand in response to capacity shortfalls or as a way to reduce the energy costs faced by low-income or vulnerable populations. Depending on equipment replacement costs, energy providers may offer incentives for the higher-efficiency model or even offer the replacement free of charge. A vital ingredient of any equipment replacement programme is removal and disposal of the older, low-efficiency appliance. Equipment replacement activities are usually targeted to the household sector, but the concept works for commercial customers and buildings as well. CFLs, refrigerators, pumps, motors, fans, and boilers have all been the focus of equipment replacement programmes.

There were numerous examples of equipment replacement programmes in the case studies, several of which have already been described. In addition to the Austrian oil-heated boiler replacement programme, Endesa water heater replacement programme, and the EGAT and Reliance Infrastruture CFL replacement programmes, other examples include:

- **Case Study # 14**: In 2007 Energias de Portugal (EDP) launched the nationwide ECO EDP programme. A key element of the ECO EDP programme has been large-scale CFL distribution to households and social institutions. Promotion of CFLs was necessary, as the public only gradually came to accept CFLs as ECO EDP provided quality bulbs and scaled-up distribution efforts. A door-to-door service exchanging CFLs for incandescent light bulbs proved effective, as did distribution through hypermarkets, shopping centers, and EDP kiosks. Since 2007 over 10 million CFLs have been distributed to the Portuguese population — nearly one CFL per person. So far the ECO EDP programme has reduced consumption by almost 5 TWh and saved EUR 438.5 million in energy bills.
- **Case Study # 21:** Iberdrola's Integrated Energy Management initiative utilizes an ESCO model to upgrade and manage centralized heating and hot-water systems. Iberdrola manages everything related to renewing and operating heating and hot water systems, including higher-efficiency equipment to allow greater energy savings and maintenance and a longer service life. Iberdrola offers a 10-year energy services contract, providing an all-inclusive suite of services including the upfront investment, engineering, procurement of equipment and execution of installations, natural gas supply, electrical connections, maintenance, remote monitoring and operation, and 24-hour assistance. With no investment, the customer receives only the heating and hot water they need plus part of the energy savings of 20-25%.

The cost of equipment replacement programmes can vary considerably depending on the details of the energy saving activity and the cost-sharing arrangement. A very large programme focused on CFLs can have a very low cost, as can programmes which use an ESCO model for financing and repaying the initial costs.

On-Bill Financing

Energy providers offer on-bill financing to help customers finance the first cost of energy efficiency measures, thereby spreading the costs over the lifetime of the energy savings measure. On-bill financing is particularly effective when the customer's monthly repayment is less than the monthly energy bill savings. On bill financing may work in combination with financial incentive programs to help the customer finance their portion of the energy savings measure costs. The utility often provides concessional terms – either a low interest rate or a longer term. Collateral or loan guarantees are generally not needed, especially if loan repayment can be enforced by the threat of service cut-offs. On-bill financing is one of the fastest-growing types of energy provider-delivered energy savings activity.

There were ten case studies which featured on-bill financing as one of the characteristics of an energy provider-delivered energy savings activity. Several examples are described below.

- **Case Study # 26:** The Power Smart Residential Loan Programme allows Manitoba Hydro customers to finance home energy efficiency improvements through their monthly utility bill. Manitoba Hydro manages everything relating to the financing, essentially acting as a bank would. Pre-qualification for customers is based on a utility bill payment history check. The Programme has a default rate of just 0.4%. The funds are provided through a provincial Affordable Energy Fund funded in turn by a tax on provincial pipeline gas exports. This Fund makes preferential lending and administrative cost recovery possible. This programme targets middle-income customers with an interest rate of 3.9% and a maximum loan of CAN 7500, payable over 5 or 15 years depending on the life of the energy saving measure. Since its beginning in 2001, over 65,000 customers have taken out energy efficiency loans totalling CAN 265 million. The programme has proved a boon to the energy efficiency industry in Manitoba,

with almost 2,000 suppliers of efficient windows, HVAC and furnaces signing on to a Participant Supplier Agreement and agreeing to spot checks of work quality and measures installed.

- **Case Study # 36:** San Diego Gas and Electric Company (SDG&E) and Southern California Gas Company (SoCalGas) each provide an on-bill financing programme with easily accessible, zero interest, unsecured loans for purchasing and installing qualified EE equipment. The programme is designed for businesses interested in accessing rebate offers for purchase of energy-efficient equipment, but who are unable to finance the remaining investment cost. The financing can only be used for purchase of energy-saving equipment for which rebates are available, and the loan amount and repayment terms are based on a "bill-neutrality" calculation with a maximum five-year payback. Loans for commercial customers must be no less than USD 5,000 financed and no more than USD 100,000 per meter, with a simple payback of no more than three or five years depending on type of energy savings measure. Public agencies at the state and local level area eligible. Over USD 27 million had been lent to over 1000 customers as of the end of 2011, with annual energy savings estimated at 100 GWH.
- **Case Study # 29:** The Energy Savings Guarantee (ESG) programme stems from collaboration between Origin Energy, a leading Australian energy retailer, and Low Carbon Australia, a government-supported company established to support movement towards a low-carbon economy. LCAL provides loan finance to Origin to on-lend to businesses, at the same time sharing EE experience and expertise. Origin offers business customers a full service model for developing energy saving solutions, including end-to-end project management, zero upfront cost, and a guarantee that the monthly cost to business customers will be offset by energy savings, with no net increase in their energy bill and no risk to the business customer. The combination of a full-service model for developing the energy savings project together with the Energy Saving Guarantee has proven attractive to customers that have deferred EE projects due to lack of funding, perceived risk, or lack of energy efficiency expertise.

On-bill financing can be a very inexpensive way to deliver energy savings to customers. Assuming the terms are not overly concessional, the energy provider is mainly responsible for administrative and loan servicing costs and provisioning for defaults. However it is very important to make sure that an on-bill financing programme complies with applicable financial regulations.

Technology Development

Energy providers are well-positioned to identify gaps in energy savings technologies and support development of new technologies. In many countries energy providers take on an active role in promoting new technologies for monitoring and managing energy use, improving efficiency of appliances and equipment, and buildings, and influencing the behaviour of energy consumers. Technology development programmes directly support research, development, demonstration, and commercialization of technologies that deliver or support energy savings.

There were eight case studies in which technology development played a role. Examples include:

- **Case Study # 41**: The Vermont ENERGY STAR New Homes Programme is jointly delivered by Vermont Gas and Efficiency Vermont. ENERGY STAR is an endorsement labelling programme which encourages builders and home buyers to continuously improve the efficiency of single-family dwellings in Vermont. Homes qualify for the ENERGY STAR label if they meet a specified home energy rating threshold plus additional energy efficiency criteria (e.g., mechanical ventilation and insulation meeting the Vermont residential energy code, EE lighting, appliances, and HVAC equipment). Depending on their overall home energy rating, ENERGY STAR homes receive an incentive of up to USD 1,500. The programme actively encourages adoption of new technologies, changes to the ENERGY STAR guidelines, and changes to the

building energy codes in Vermont, which have become progressively more stringent. ENERGY STAR sets the bar higher than this code, preparing buildings for compliance with both code and ENERGY STAR, while adding both perceived and actual (e.g., property) value to homes.

- **Case Study # 38:** Studio Bartucci is an Italian Energy Services Company (ESCO) which has combined its knowledge of industrial process innovations with the Energy Performance Contract (EPC) business model to implement more than 60 industrial energy efficiency projects. Studio Bartucci specializes in process innovation and new technologies that result in verifiable energy savings that can be used to create energy savings certificates under the Italian White Certificates scheme. Studio Bartucci identifies process innovations with energy savings potential and then finances and installs the technology application itself, thus drastically reducing the risk of investing in new technology. ESCO and factory owner enter into an Energy Performance Contract that governs measurement of savings, how costs are recovered, and sharing of the energy savings and White Certificates revenue streams. A typical industrial process innovation would have a payback period of 3-5 years for both the ESCO and the factory owner.
- **Case Study # 40:** Vattenfall, an integrated electricity provider wholly owned by the Swedish Government, has set a target of reducing the carbon intensity of its operations by 50% by 2030. Vattenfall developed the One Tonne Life project to demonstrate how a climate-smart household can adopt a more sustainable lifestyle through new technologies and more sustainable consumption patterns. A test family spent six months living in a climate-smart manner, attempting to reduce their carbon dioxide emissions to one ton per person.[3] The test family lived in a net-zero-energy home, drove a plug-in hybrid electric car, ate in a climate-smart way, and benefited from coaching in consumption patterns. The technology used, including the house, car, and appliances, was available but required practical demonstration. Vattenfall technology development partners included A-hus, Volvo, and Siemens.
- **Case Study # 39**: TOTAL is the fifth-largest publically-traded international oil and gas company in the world. As an importer and distributor of transportation fuels in France, the French White Certificates scheme requires TOTAL to achieve an energy savings target of 30 TWh cumac over the period 1 January 2011 through December 31 2013.[4] The challenge for French energy providers supplying transportation fuels is that there is relatively little scope for transportation fuel savings measures compared to the scale of the energy savings targets for the transportation sector. Total has decided to develop and test a number of potential transportation energy saving measures linked to light and heavy duty vehicles, and explore what volume of energy savings can be economically achieved. Vehicle fuel savings measures being tested include: (i) Assistance in improving vehicle fleet fuel consumption of vehicle fleets; (ii) promotion of premium lubricants which reduce engine friction and thus produce improved fuel economy; (iii) Low rolling-resistance (LRR) tyres; (iv) free tire inflation services at TOTAL outlets; and (v) long-haul ride-sharing schemes. If successful, these programmes are projected to deliver as much as 10% of TOTAL's energy savings target.

Technology development programmes can be expensive or inexpensive, depending on the design, objectives and the development state of the technology. One-off high-profile demonstrations such as One Tonne Life may be relatively expensive but have considerable promotional value. Technologies that can be quickly put into commercial use should be able to pay for themselves.

Bulk Procurement and Distribution

Bulk procurement and distribution programmes work in two ways – by reducing the price of energy

[3] Current average household GHG emissions in Europe is 7 tonnes per family per annum
[4] Cumulative and discounted - cumac for short. This term refers to the annual delivered energy savings from an energy efficiency measure, summed over the lifetime of the measure and discounted at 4% annually.

saving products and increasing the availability of energy efficient products. Large-scale procurement allows energy providers to buy in bulk, thus gaining a lower per-unit price which can then be passed along to customers. Direct distribution of energy savings products increases market availability, bolsters private demand for energy saving products, supports broader market transformation goals, and creates new revenue streams for energy providers. Developing these programs requires close cooperation between the program implementer, equipment suppliers, distributors and retailers, and of course customers. The involvement of energy providers in bulk procurement and distribution of CFLs has been effective in many developing countries, especially in Africa and South Asia.

The IEA identified six bulk procurement and distribution case studies. Other examples in addition to the CFL bulk procurements undertaken by EGAT, Reliance Infrastruture and Eskom are:

- **Case Study # 13:** Enel's energy efficiency partnership program brings together energy efficiency suppliers (technology providers, financing, installers, and operators) with energy consumers (residential, municipal, services, and industrial customers). Retail outlets have proven an effective strategy in addressing the fragmented market of small energy consumers. Enel operates its own franchise network of more than 500 EnelSi stores which sell energy efficient services (energy analysis and audits) as well as energy efficient products (heat-pumps, efficient lighting, efficient appliances and motors, water saving devices) and even renewable energy (solar panels). Enel has built up the retail energy efficiency market by making EE products more affordable (through centralized procurement), distributing branded energy efficiency goods and services through franchised retailers, and through market support mechanisms including sales force training, marketing, and customer support.
- **Case Study # 22:** The Block Bidding Programme is administered by the New York State Electric & Gas Corporation (NYSEG) and Rochester Gas and Electric (RG&E), both subsidiaries of Iberdrola USA. It is a sealed-bid auction designed to provide commercial, industrial and municipal energy savings project developers with an opportunity to offer energy saving projects additional to those already being delivered. The Block Bidding Programme is open to ESCOs, performance contractors, management companies and end-users. Bids are submitted in response to periodic auctions for blocks of permanent energy savings, with a minimum reduction of 100 MWh in annual savings. Winning bidders can have their projects funded by energy providers. The programme has proven an effective way to mobilize additional energy savings projects from customers and third parties who might otherwise not participate in traditional energy provider-offered programmes.
- **Case Study # 5:** The Community Energy Saving Programme (CESP) is part of the UK's energy efficiency obligation policy for energy suppliers. Under CESP, British Gas is required to deliver insulation and heating measures in households in defined low-income areas across the country. British Gas's Walsall CESP activity is a GBP 9 million project delivering seven distinct schemes within the Walsall Rivers area. Solid wall insulation was installed in more than 1,000 properties, as well as biomass district heating for 150 properties, gas district heating for 150 properties, and domestic heating for 700 properties. In the second stage British Gas has been contracted to provide domestic heating for a further 300 properties as well as loft and cavity wall insulation. Delivery is undertaken through a broad mix of delivery partners who have contracted directly with the obligated parties.

Bulk procurement and distribution can be a very cost effective way to deliver energy savings, as it takes advantage of the size, administrative capacity, and distribution network of an energy provider. The CFL replacement programmes, all of which incorporate bulk procurement and distribution, are particularly cost-effective.

Patterns, principles and potential lessons from the case studies

The case studies afford an opportunity to identify patterns and organizing principles useful for governments, regulators and energy providers who are contemplating their own energy provider delivered energy efficiency policies. These case studies show the importance of local circumstances, opportunities and needs in driving energy provider involvement in energy efficiency. By the same token there are also several elements that are found across many of the case studies that may have general application.

Leverage local delivery partners

Policymakers and regulators point to energy providers as energy efficiency delivery agents partly because of their existing relationships with energy consumers. However, many of the case studies stress the importance of involving third party contractors as delivery agents – especially for programmes involving direct intervention with customers. Baltimore Gas & Electric, British Gas, Connecticut Light & Power/Yankee Gas Services, Eskom, Florida Public Utilities, Manitoba Hydro, National Grid, Northeast Utilities/United illuminating, Pacific Gas and Electric, and Southern California Edison all pointed to third-party contractors as integral to their energy saving activities. Delivery partners are important because energy providers often lack the in-house expertise, capacity or interest needed to perform many energy efficiency services, *e.g.,* home energy audits, installation of equipment. Delivery partners can also be chosen to have a special appeal to certain target audiences (*e.g.,* low-income populations) or to create jobs and ensure that economic benefits stay in the community in which the energy savings are delivered.

Understand market barriers and design programmes to overcome them

Mobilizing customers to save energy requires a firm understanding of the barriers and challenges these customers face. Energy providers are well-positioned to identify distinct customer segments, understand the particularities affecting their choices, and deliver energy saving activities that met their needs. Baltimore Gas and Electric's SBES programme, BC Hydro's Residential Behaviour Programme, Innowatio's Health Care Provider Initiative, National Grid's Small Business Energy Efficiency Programme, Origin Energy's Energy Saving Guarantee, and Studio Bartucci's industrial process innovations all illustrate the effectiveness of energy providers at understanding market barriers and energy saving opportunities specific to different customer segments.

Build on core competencies

Energy providers are most effective when using their core competencies to deliver energy savings. Some energy providers are well placed to provide their customers with historical and real-time data on their consumption. Other energy providers are able to leverage their experience saving energy in their own facilities to helping other large energy users save energy. In this fashion BPA has used its in-house analytic services to provide water and energy saving advice to irrigation districts and individual growers. Endesa's Energy Management Platform is a web portal and software tool that uses hourly usage data from its meter to allow customers to monitor energy consumption and reduce or shift hourly demand. HERA SpA developed significant technical capacity In the early years of the Italian WhC Scheme by implementing energy-saving projects developed for its own plants and building (e.g. offices buildings, water treatment, lighting improvements, district heating and cogeneration). Since then the company has been able to apply know-how gained from its own industrial facilities to develop a suite of energy services broadly applicable to industrial operators.

Industry-wide approaches work

Many noteworthy energy provider-delivered energy savings activities result from an industry wide

approach. Both the Austrian oil heat supply industry and the Finnish energy provider industry are good examples of how voluntary agreements with government can effectively mobilize an entire energy supply industry to deliver energy savings activities. Voluntary agreements are effective in bringing together the government and private sector, with coordination and reporting shared by the industry association and state energy agencies. This helps remove any competitive disadvantages to signing the voluntary agreement, as companies are allocated the same targets, commitments and associated activities.

Energy provider obligations are of course another way to mobilize an entire industry, and have been used effectively in the UK, France, Denmark, and Italy. Both voluntary agreements and regulatory mechanisms work to create a level playing field with transparency and reporting, key elements needed to avoid conferring competitive disadvantage on private sector energy providers.

Helping save energy builds customer loyalty and creates new markets

Several programmes used promotion of energy efficiency and other sustainability tips as a way to retain business, build customer loyalty, and develop new business. BC Hydro's Team Power Smart Residential Behaviour Programme, British Gas' Community Energy Savings Programme, EDP's ECO EDP programme, and DONG Energy's Climate Partnership Programme all appealed to the interest of customers in saving energy, conserving resources, and adopting sustainable operations. The Team Power Smart programme has been successful because they took a comprehensive approach to environmental issues, e.g., water conservation as well as energy conservation. These multiple themes have helped keep people coming back to the website. British Gas builds stronger community relations and spirit in addition to saving energy. EDP's ECO EDP programme reached out to literally every household in Portugal. DONG Energy's CPP takes a comprehensive approach in working with companies seeking to become climate neutral, saving energy first and then using the savings to purchase slightly more expensive green power. Each of these examples shows the connectivity of helping consumers save energy with broader societal and business goals.

Create stable expectations

Businesses craves stability, including energy providers, large energy users, and ESCOs. In two of the case studies – CEMIG Efficientia and Studio Bartucci – the issue of stable government polices was of concern. In Brazil a planned reduction in the energy spending obligation on energy providers could negatively impact the ESCO market. In Italy uncertainty about the future regulatory framework for the White Certificates market impeded the ability of ESCOs to develop new projects. Both examples point out the need for governments to create long-term, stable expectations for policies that support investment in energy saving.

Be patient

It takes time to build a successful energy saving activity. CEMIG's ESCO subsidiary Efficientia and HERA sPA all struggled to engage with customers and build experience and credibility as energy savings project developers. CLP Power Hong Kong has performed over 1300 detailed energy audits, but projects require a very long lead time for the financing and engineering details to come together. Origin Energy/Low Carbon Australia developed the Energy Savings Guarantee especially to attract customers who have deferred EE projects due to lack of funding, perceived risk, or lack of expertise to deliver. Even with an internal champion, competition with other priorities for budget and other resources often pushes energy savings projects to the bottom of the list. Patience and constant efforts to raise visibility of opportunities for saving energy efficiency can increase the awareness and acceptance of energy efficiency in the long term.

Energy provider as bundler of goods, services, and offers

Many energy providers built their energy savings activities around facilitating uptake of incentives or subsidies offered by others. CEMIG Efficientia, Manitoba Hydro, Innowatio, Studio Bartucci all used government-supported financing or financial incentives as key parts of their energy savings activities, effectively acting as brokers to help customers access this assistance. Efficientia helps identify energy savings investments that can access concessional funding from the Energy Efficiency Plan. Manitoba Hydro on-lends concessional lending made available through the provincial Affordable Energy Fund. Innowatio and Studio Bartucci work to identify energy savings projects that can originate revenues from the Italian White Certificates scheme, thus reducing the project payback period and increasing the profitability of these ESCOs. National Grid and SoCalGas/San Diego Gas and Electric both offer supplemental financing to customers who need to finance their share of already-subsidized energy savings investments, helping to make the investment affordable.

Look for gaps and fill them

A successful programme can be as simple as finding an unrealized savings opportunity and designing a programme to address it. CenterPoint Energy's Custom Process Rebate Programme addressed a market opportunity not covered by existing programmes - energy-intensive industrial customers who cannot avail themselves of standardized energy savings measures. Iberdrola through its market research found many customers running up high energy bills due to old heating systems but reluctant to take on the expense and risk of replacing them. Iberdrola developed a 10-year energy services contract comprising engineering, financing, installation, and remote monitoring and operation specifically designed for these facilities. Kalmar Energi has identified promising opportunities to switch process heat users from oil to district heat, thus saving customers money while creating more business for district heat providers.

Leverage economies of scale and scope and partnership

Many energy providers have already exhausted the low-cost, easy-to-implement energy savings, such as CFLs. Continuing to meet energy savings targets means looking at more expensive measures, taking a comprehensive view, finding new energy savings opportunities, and working with more diverse partners – in other words, thinking more broadly about where energy savings are possible and how to realize them.

In some cases, setting a wide scope may mean targeting more than one commercial or industrial sector at a time. Studio Bartucci in Italy, for example, is an EE services company with expertise in multiple business areas. It is often able to take solutions that have worked for a client in a particular industrial segment and apply them to customers in areas that are quite different. Efficiency providers who lack direct experience in specific sectors can enter into strategic alliances with partners who do, or who can provide funding to expand programs beyond where an EE provider could develop them on their own. For example, Origin, an EE provider in Australia, has entered into a partnership with Low Carbon Australia (LCAL), a government created but independent agency that manages a clean energy and efficiency fund, but that is not directly involved in EE delivery.

Vertically integrated utilities are in a position to develop programs that combine energy efficiency with clean generation. In Denmark, DONG Energy has tied its EE program to its wind program. DONG's EE program gets its customers to commit some of their savings to procure power from DONG's wind farms. This allows both DONG and the customer to meet their respective sustainability goals, and gives DONG a stable source of funding for its wind development program. Such a model would be more difficult to replicate in a deregulated, distribution only utility model, though one could envision a distribution company using long-term power purchase agreements to create a similar program. DONG Energy, interestingly, has developed this program without offering additional incentives or favourable financing, making the case that a customer can lower their overall energy

costs despite a slightly higher electricity charge (DONG charges a 10% premium for electricity sourced from wind) while getting the public relations benefit of meeting a broader sustainability goal.

Large scale can also make it possible to avoid or remove artificial barriers to deployment, which are often due to policy restrictions. Programs that are confined to work within specific service territories may limit the deployment of EE to a small subset of the total potential customer base. In the case of British Gas, one whole-building retrofit project could only target three out of four buildings in a particular development because the forth building was in a separate postal code. Artificial barriers like this make it difficult to scale programs up, and limit the sort of cross-pollination of programs described above.

Creating sustainable energy savings activities

As investment in energy savings measures ramp up it will be important to understand how to sustain these energy savings over time. This is complicated by the fact that some energy savings investments have much longer life times than others. While a high-quality CFL will last as long as 5 years, an industrial motor may last 15 years and an efficient building 30 years. Keeping track of these life times will be important to sustaining energy savings over the long term. For example, Eskom has recognized the need to maintain the massive energy savings gains from its national CFL roll-out, and has developed the CFL Sustainability Programme to ensure that CFLs are replaced with new CFLs at the end of their 5-6 year lifetime. Eskom will distribute another 20-40 million CFLs nationwide between 2011 and 2013 to maintain the energy savings achieved in 2005-2008.

Saving energy can add to profits

Many of the case studies illustrate how energy savings activities can be a profitable alternative to simply supplying energy. ENEL has created a significant new business by offering energy savings goods and services through retail distributor network it has created. EDP derives considerable revenues from its Energy Management Platform. Kalmar Energi improved its system performance and heating network sales through energy-saving oil-to-district-heat conversions. SE Big Blue has been very successful, even though in the early days of Danish energy provider obligations it was feared that obligations would be bad for the business of energy distributors. However experience has shown that compulsory energy savings targets can be good for business, if the energy providers are proactive in engaging with their customers to deliver the energy savings themselves. ESCO subsidiaries of net companies, such as CEMIG's Efficientia, SE Big Blue, and HERA SpA provide a new revenue source which is often more profitable than the energy supply business.

Future work

The case studies provide perspective into what drives energy providers to take on energy savings activities, what type of energy savings activities they perform, and how they achieve success. The case studies make it clear that energy providers respond to other motivations in addition to obligations and resource standards. The case studies also demonstrate diversity in the type of energy savings activities undertaken, and how different energy saving activities are combined to develop programmes that are effective in overcoming the barriers to energy efficiency faced by particular customer segments. The patterns, principles and lessons drawn from the case studies could be a starting point for recommendations on energy provider policies for governments consider. Finally, the case studies highlight the many unanswered questions that governments and regulators face in designing policies for energy-provider delivered energy efficiency. These considerations lead to some recommendations for future PEPDEE work, summarized in Table 5 and described below.

Table 5 • Future work possibilities

Task	Objective	Deliverable and timeframe	Audience
Capacity building on PEPDEE	Share results of PEPDEE work and build capacity of governments and regulators to develop energy efficiency policies for energy providers	Written handbook, workshops delivered in 2013	Governments, regulators and energy providers in IEA and non-IEA member countries
PEPDEE metrics	Collaboratively develop metrics for evaluating and comparing energy provider-delivered energy efficiency policies	Workshop, development of protocols for collecting data and calculating metrics, toolkit	Governments, regulators and energy providers in IEA and non-IEA member countries
Policy research	Collaborate on research to resolve PEPDEE policy questions	Workshops and policy recommendations	Governments, regulators and energy providers in IEA and non-IEA member countries
PEPDEE policies and measures data base	Broaden the existing PAMS database to include PEPDEE policies and energy provider-delivered energy savings activities	Expansion of the PAMS database to incorporate a module on PEPDEE	All visitors to the IEA website

PEPDEE handbook

The involvement of energy providers in delivering energy efficiency is growing. Over the next year each EU Member State must decide how to implement Article 7 of the EED – Energy Efficiency Obligations Schemes in a way that reflects national conditions and delivers energy savings equivalent to the Directive's targets (DG-Energy 2012). In China experimentation with implementing the DSM Rule continues (Crossley 2012). In the US activities such as the SEE-Action Network are exploring policy options for energy providers and energy efficiency in states which have not yet adopted an EERS or EEO (US DOE 2012a). In Australia the Commonwealth Government is considering an Energy Savings Initiative which might include harmonization of existing state-delivered EEO schemes (Golding 2012).

The perspective provided by case studies contained here would be useful for building capacity of governments and regulators to develop policies for energy provider-delivered energy efficiency. The IEA could facilitate the uptake of these energy provider perspectives and experiences through bilateral or multilateral engagement, both through workshops or preparation of a PEPDEE handbook. Such an effort would be useful in disseminating the diversity of approaches to energy saving programme designs by energy providers around the world. An area of particular interest might be the role of market mechanisms and voluntary agreements as an alternative to EEO and EERS policies..

Metrics for energy provider delivered energy efficiency

There is no uniform set of metrics for measuring the scale, impacts or effectiveness of energy provider delivered energy saving activities. Metrics are useful both as an oversight tool for policy makers and as an evaluation and decision-making tool for energy provider management and regulators. Three types of metrics have found common use in evaluating policies and programmes for energy provider-delivered energy efficiency:

- Direct impacts (energy savings, peak reduction, consumer bill reductions, and the environment
- Programme cost-effectiveness and cost of saved energy
- Absolute and relative spending on energy efficiency

Each type of metric is applied in varying degrees, but with great variation and little comparability (see Table 6).

Table 6• PEPDEE metrics and their application

Metric	Formulation	Significance	Requirements
Direct impacts	GWh, MW, MMCF, % bill reductions, $MtCO_2$	Scale of energy saving activities and their impact on consumers, systems and the environment	EM&V or other impact measurement protocol
Cost of saved energy	US cents/kWh	Delivered cost of energy saving activity, allowing side-by-side comparisons of programmes	Consistent systems for reporting programme costs and energy savings
Energy efficiency spending	Total EE spending; total EE spending/energy provider revenues	Scale of energy saving activities and relative scale compared to the size of the energy provider	Consistent systems for reporting programme costs and energy provider revenues

Impacts of energy saving activities are often reported, usually energy and demand reductions and bill savings. However, the rigour of evaluation protocols varies between countries, with some results self-reported while others are based on independent, third-party analysis. California has developed a rigorous and exhaustive system for EM&V of demand-side programmes which carries over to all aspects of programme design and policy development (CPUC 2001). A US DOE initiative under the SEE-Action Network is working to broaden the EM&V methods available to accommodate new types of energy saving activities, such as behaviourial programmes (US DOE 2012b).

Programme cost-effectiveness evaluation makes it possible to calculate the cost of saved energy, a useful metric in comparing the cost of saving vs. producing energy or the costs of different energy savings activities (ACEEE 2009). Many data issues must be resolved before comparing the cost of energy saving activities, notably the different lifetimes of energy saving measures and the expense categories included in energy savings programme costs. Energy savings activities should only be compared on a levelized, cumulative basis, with paying, with appropriate discounting of cost and benefits streams.

A third metric measures the scale of energy spending activities, either on an absolute basis or relative to total energy sales. Such a metric can be constructed on an aggregate (state or country) level or an energy provider level. The Consortium for Energy Efficiency issues an industry report which tracks absolute spending by US and Canadian gas and electricity providers, while the ACEEE produces an annual “score card” comparing the aggregate performance of US states against several energy saving activity metrics, including energy provider spending (Wallace, et al 2012; ACEEE 2012).

Regulators, governments and energy providers would all benefit from collaboration and improvement in each of these metrics. Setting achievable and sustainable energy savings targets requires an understanding of the market potential for energy savings, which is in turn dependent on the scale and cost of realizing energy saving opportunities. In this task the IEA would work with governments and experts to assemble a database sufficient to benchmark existing energy provider energy saving activities and develop a simple tool-kit for relating targets and trajectories to policies.

The IEA explore which metrics for energy provider-delivered energy efficiency provide the best basis for tracking and refining the results of energy provider-delivered energy saving activities. The IEA would review the metrics in use today and make recommendations on which metrics have the most policy relevance and which could inform policy makers on the cost-effectiveness of energy provider-delivered energy efficiency relative to other energy efficiency programmes and policies. The key deliverable would be a toolkit containing protocols for developing comparable metrics, and workshops to facilitate capacity-building on PEPDEE metrics.

Policy gap research

The IEA in cooperation with governments and other interested parties would undertake focused research on key PEPDEE issues and questions which are currently unresolved. Solutions-oriented policy research would focus on: (i) policies and programme designs for delivering energy savings to low-income households; and (ii) pros and cons of trading and other market-based instruments as a component of obligation policies.

Policies and programmes for saving energy in the low-income household sector

Participants in the three regional workshops (Sydney, Brussels, Washington DC) held as part of the PEPDEE work stream were in general agreement on the importance of incorporating social considerations into energy efficiency obligations policies. However, there was no consensus on the best way to ensure that vulnerable consumers, mainly low-income households, can benefit from energy-provider delivered energy saving activities. In this policy research the IEA would investigate and compare the cost, effectiveness and implementation issues associated with low-income energy efficiency programmes around the world. The IEA would also explore whether market-based instruments, such as White Certificates, could be applied to reducing the transaction costs associated with delivering energy savings to low income households.

Efficacy of trading as a component of EEO and EERS policies

Market-based instruments (MBI) such as White Certificates (WhC) are a common feature of many EEO schemes, especially in countries with liberalized energy markets and retail competition (Crossley 2012). Policymakers include WhC and similar MBIs because they can potentially reduce the cost of reaching an energy savings target while creating market opportunities for third parties such as ESCOs. They also provide energy providers with the option to purchase rather than deliver their energy savings obligations. However, MBIs can be expensive to administer, and can produce speculative behaviour and price volatility.

This policy research effort would evaluate White Certificate market operations in IEA member countries (Italy, France, Australia) to estimate the impact of these MBIs on third party energy efficiency provider formation and the cost of saved energy, and identify patterns of market distortions, illiquidity, and volatility. The research would also examine other MBIs worthy of consideration by policymakers, such as feed-in tariffs, auctions, bulk procurement mechanisms, and wholesale markets for capacity and energy.

Incorporating energy-provider delivered energy savings activities into PAMS

The Energy Efficiency Policies and Measures database provides information on policies and measures taken or planned to improve energy efficiency.[5] The database supports the IEA G8 Gleneagles Plan of Action mandate to “share best practice between participating governments”, and the agreement by IEA Energy Ministers in 2009 to promote energy efficiency and close policy gaps. The database currently covers over 5,000 individual energy efficiency policies and measure from 92 countries, and is updated continuously by governments and IEA staff.

The IEA is considering whether to incorporate energy provider-delivered energy savings activities into the PAMS data base. Proper representation in the PAMS databases allows the participating countries to demonstrate progress in their internal policies. At the same time, it provides a solid background of existing best practice in clean energy policy, which can be used when developing new policies. PAMS serves an important role in compiling and disseminating information on clean energy policies planned or undertaken internationally. Broadening the clean energy policy representation in

[5] www.iea.org/policiesandmeasures/energyefficiency

PAMS to include both policies for energy provider delivered energy efficiency and energy savings activities undertaken by individual energy providers would be an important addition to this on-line resource available to all visitors to the IEA web site. Broadening PAMS to include PEPDEE content would also be an important vehicle for energy providers and energy provider associations wishing to highlight their approach and accomplishments in delivering energy savings to their customers.

The PEPDEE case studies

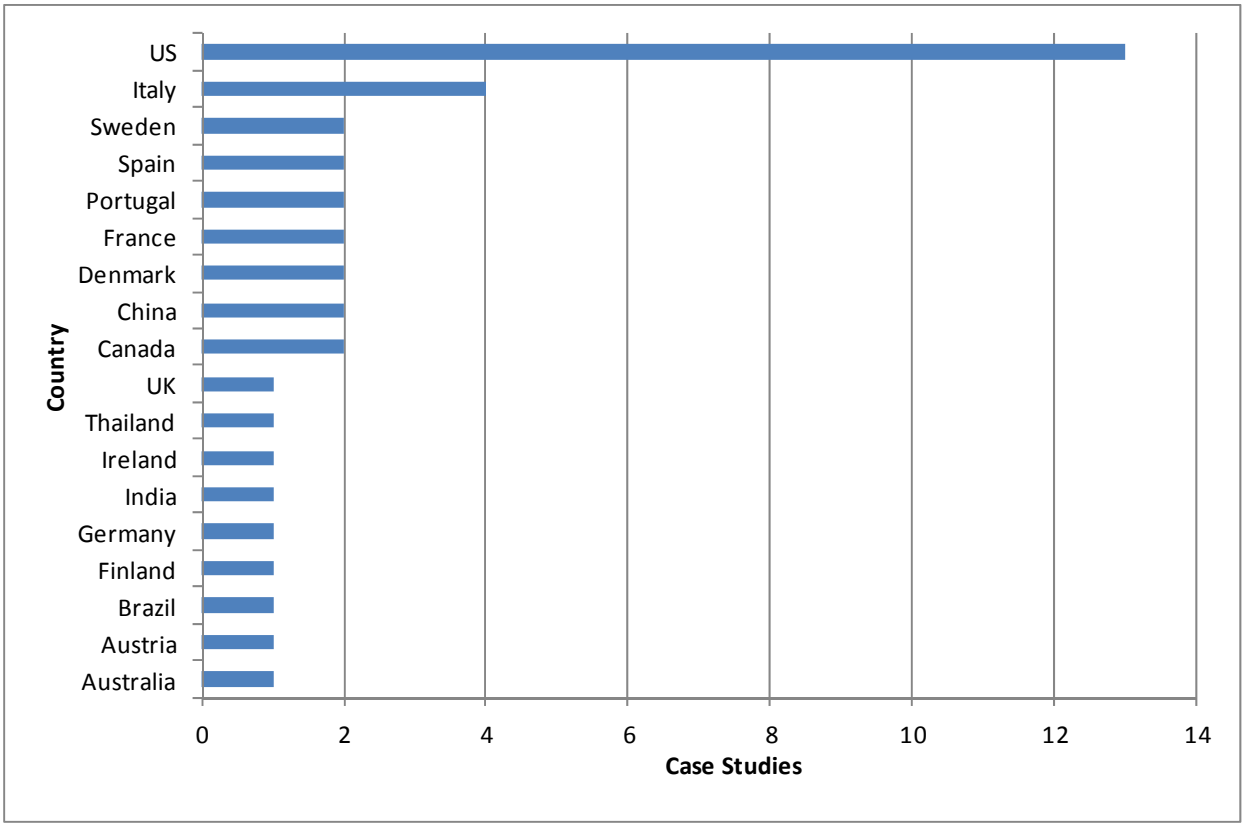
Overview

The 42 case studies from 19 countries were chosen to be broadly representative of global energy savings activities undertaken by energy providers. In aggregate these case studies accounted for over USD 700 million in annual spending and delivered over 45 TWh in energy savings. The case studies account for about 7% of estimated energy provider spending on energy efficiency.

Table 7provides a complete listing of the case studies, with key information included. Each case study includes a summary table plus narrative on programme background, description, regulatory and market drivers, and lessons learned.

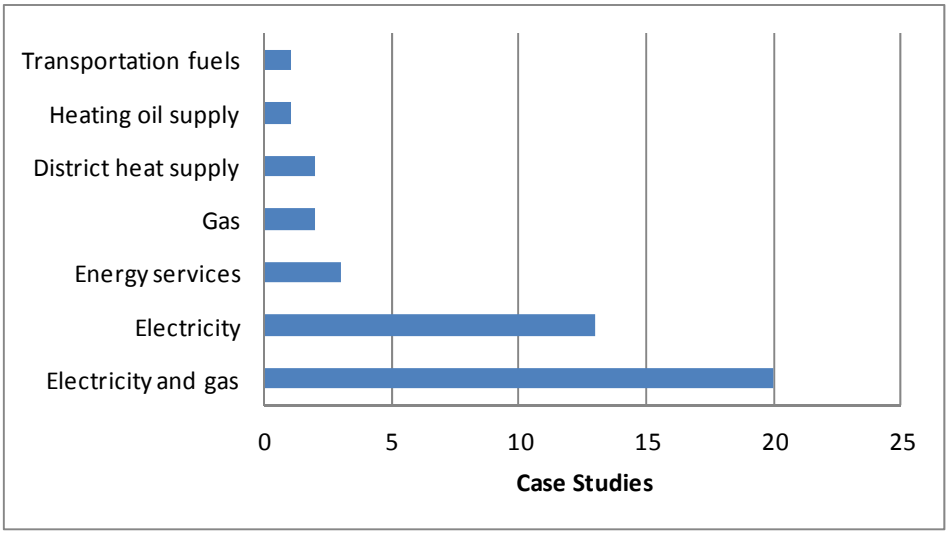
The distribution of the 42 case studies by country (Figure 4) roughly reflects global energy provider spending patterns – the US has the most case studies (13), followed by Italy (4), with the UK, Canada, China, France, Denmark, Portugal, Spain and Sweden with two each. Nine other countries were represented with a single case study.

Figure 4• Distribution of case studies by country



The stock-taking demonstrates the diversity of energy providers active in delivering energy-savings activities (see Figure 5). Fully half of the 42 case studies were from providers of gas and electricity, followed by electricity-only providers (14). The stock-taking also found at least one case each for providers of other forms of energy – district heat (Kalmar Energi), heating oil (Austrian Oil Heat Supply Industry), transportation fuels (TOTAL), and energy services (CEMIG Efficientia, Innowatio and Studio Bartucci).

Figure 5• Types of energy providers



Energy providers usually tailor energy savings activities for particular types of end-users. We found the residential and commercial sectors to be the two most commonly-targeted sectors for energy savings, followed by the industrial and municipal sectors (See Figure 6). Most energy savings activities reflect the information needs, market opportunities, and barriers particular to each sector. In particular residential and non-residential energy savings activities hardly ever overlap. Most commercial programmes also targeted the industrial and municipal sectors. A very few programmes focused on the agricultural or transportation sectors.

Figure 6• Targeted consuming sectors

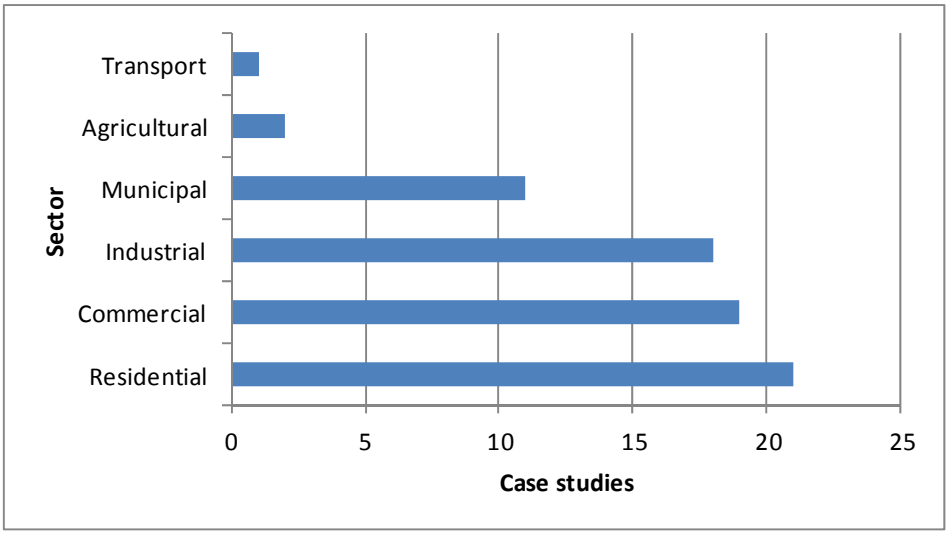


Table 5 summarizes key details of the 41 case studies analyzed. The following sections present each of the case studies in their entirety.

Table 7• Summary of the case studies

Case Study	Energy Provider	Programme Name	Programme Type	Sector Focus
1	Austrian oil heat suppliers	"Heizen mit Öl Förderinitiative"	Financial incentives Equipment replacement	Residential Commercial Municipal
2	Baltimore Gas and Electric (BGE)	Small Business Energy Solutions	Comprehensive implementation Financial incentives Advice and assistance	Commercial
3	BC Hydro	Residential Behaviour Programme	Information, education & promotion	Residential
4	Bonneville Power Administration	Scientific Irrigation Scheduling	Advice and assistance Financial incentives	Agricultural
5	British Gas	Community Energy Savings Programme	Direct installation Bulk procurement and distribution	Residential
6	CEMIG (Brazil)	Efficientia ESCO subsidiary	Advice and assistance On-bill financing Financial incentives	Industrial Municipal Commercial
7	CenterPoint Energy	Industrial Process Rebate Programme	Advice and assistance Financial incentives	Industrial
8	CLP Power Hong Kong	Energy audits	Advice and assistance Information, education and promotion	
9	Connecticut Light & Power/Yankee Gas Services Company	Small Business Energy Advantage Programme	Advice and assistance Financial incentives Comprehensive implementation On-bill financing	Commercial Industrial
10	DONG Energy (Denmark)	Climate Partnership Programme	Advice and assistance Information, education and promotion	Industrial Commercial Municipal
11	Electricity Generating Authority of Thailand (EGAT)	CFL replacement programme	Equipment replacement Bulk procurement and distribution information, education and promotion	Residential
12	Endesa (Spain)	Energy Management Platform	Information, education and promotion Advice and assistance	Commercial Industrial

13	Enel (Italy)	Energy efficiency Partnership Programme	Information, education and promotionTechnology development Bulk procurement and distribution	Residential Commercial Industrial Municipal
14	Energias de Portugal, S.A.	ECO EDP Programme	Infor16mation, education and promot17ion Equipment replacement	Residential
15	Energias de Portugal/ Home Energy	Knowatt Programme	Advice and assistance Information, education and promotion Technology development	Residential
16	Eskom (South Africa)	National Efficient Lighting Programme	Equipment replacement Bulk procurement and distribution Information, education and promotion	Residential Commercial
17	Finnish Energy Industries	Action Plan for Energy Services	Information, education and promotion	Residential Commercial Industrial Municipal
18	Florida Public Utilities	Appliance rebates	Financial incentives Information, education and promotion	Residential
19	GDF Suez (France)	Energy efficiency platform	Advice and assistance Information, education and promotion	Residential Commercial
20	HERA SpA (Italy)	Industrial energy savings programme	Advice and assistance Financial incentives Information, education, and promotion	Industrial
21	Iberdrola (Spain)	Integrated energy management programme	Advice and assistance Equipment replacement	Residential Commercial Municipal
22	Iberdrola USA	Block bidding programme	Financial incentives Bulk procurement and distribution	Commercial Municipal Industrial
23	Innowatio (Italy)	Energy savings for health care facilities	Advice and assistance Comprehensive implementation Financial incentives	Commercial Municipal
24	ISO New England	Forward Capacity Market	Bulk procurement and distribution Financial incentives	Commercial Industrial Municipal

				Residential
25	Kalmar Energi (Sweden)	Oil-to-district heat conversion programme	Advice and assistance Technology development	Commercial Industrial
26	Manitoba Hydro (Canada)	PowerSmart Programme	On-bill financing Information, education and promotion	Residential
27	National Grid (USA)	Small business energy efficiency programme	Financial incentives Advice and assistance Direct installation On-bill financing	Commercial
28	Northeast Utilities and United Illuminating (USA)	Home Energy Solutions Programme	Advice and assistance Financial incentives On-bill financing Comprehensive implementation	Residential
29	Origin Energy/Low Carbon Australia	Energy Savings Guarantee Programme	Advice and assistance On-bill financing	Commercial Industrial Municipal
30	Pacific Gas and Electric Company	Energy Upgrade California	Advice and assistance Comprehensive implementation Financial incentives Direct installation	Residential
31	Reliance Infrastructure (India)	Mumbai Efficient Lighting Programme	Information, education and promotion' On-bill financing Bulk procurement and distribution	Residential Commercial
32	RWE Effizienz GmbH (Germany)	EUR 150 Million EE Programme	Advice and assistance Information, education and promotion Direct installation Technology development	Residential Municipal
33	Scottish and Southern Energy (Ireland)	Airtricity Community Fund	Financial incentives Advice and assistance	Municipal
34	SE (Denmark)	Big Blue ESCO subsidiary	Advice and assistance	Industrial Commercial Municipal
35	Southern California Edison	Energy Savings Assistance Programme	Equipment replacement Direct installation Advice and assistance	Residential

36	Southern California Gas/San Diego Gas & Electric	Non-residential on-bill financing programme	On-bill financing	Commercial Industrial
37	State Grid Corporation China/Jiangsu EPCO	Energy Efficiency Service Activity Groups	Advice and assistance	Industrial Commercial Municipal
38	Studio Bartucci	Industrial energy savings through energy performance contracting	Advice and assistance Technology development Financial incentives	Industrial
39	Total	Demonstrating transportation energy savings measures	Technology development Information, education and promotion	Transport
40	Vattenfall	One Tonne Life	Information, education and promotion Technology development	Residential
41	Vermont Gas/Efficiency Vermont	ENERGY STAR New Homes Programme	Financial incentives Information, education and promotion Technology development	Residential

Austrian Oil Heat Supply Industry

Table 8 • Oil heating boiler renovation programme

City, country, region	Austria
Programme type	Financial incentives, equipment replacement
Programme tenure	May 2009 – Dec 2017
Sector focus	Residential buildings, family houses, commercial buildings
Technology focus	Condensing heating oil boilers
Objective	Encourage replacement of old, inefficient household oil boilers with new and efficient condensing boilers
Budget	EUR 130 million for the period 2009-2016
Savings	5,000 to 7,000 boilers replaced annually 2.1 TWh cumulative savings for the period 2009-2016 (11% of total heating oil consumption in Austria)
Contact information	Martin Reichard. Tel: +43 1 890 90 36 förderung@heizenmitoel.at
Reference	www.heizenmitoel.at;

Summary and background

The "Heizen mit Öl Förderinitiative" was established by the Austrian heating oil industry to provide lump sum payments encouraging owners of old heating oil boilers to install new condensing boilers, thus increasing energy efficiency by up to 40%. This is a sector-wide voluntary programme established cooperatively with the Ministry of Economic Affairs. The programme is related to the EU Directive on energy services, aims for a 9% reduction in energy demand by 2016.

Programme description

The programme provides easy access for the consumer, with no prerequisites other than having a boiler more than 10 years old, agreeing to purchase a new condensing boiler, and installing the replacement on a property located in Austria. There are no other restrictions regarding who is eligible for the subsidy. The subsidy is equally available for homes, businesses, and factories.

Market and economic factors have combined to make the delivery scheme successful:

- Boiler replacement rates are generally very low, as consumers are unwilling to invest large just to adapt an existing heating system to a new source of energy;
- Compared to the large investments (EUR 50,000) needed to insulate walls and ceilings and replace windows and doors, changing the boiler costs only about EUR 9,000 and can lead to very significant energy savings.

The industry-wide voluntary agreement with the entire oil heating sector is necessary for such a private subsidy scheme. All companies importing or distributing heating oil in Austria must contribute. This is important as the heating oil supply industry is fully deregulated, with

consumers free to buy from any supplier. The subsidy-granting process is coordinated by a third party (the "Heizen mit Öl GmbH") established to carry out this measure.

The content of the programme is constantly updated, with the subsidy changed to reflect market conditions. A recent programme change placed an emphasis on higher performance units and larger units, where the savings potential is greater. Higher incentives (EUR 5,000) are now offered for replacing heating oil units over 50 kW.

In the first year the marketing expenses have been very low while uptake has been high. Over time, marketing efforts may be increased to achieve higher market penetration. Marketing so far has been done through advertisement in print media and on the radio.

Results have been very good. More than 85% of the exchanged boilers are older than 20 years; 40% are older than 30 years. The average age of an applicant is 61 years, indicating that retired persons with limited financial resources can benefit from the programme. These older beneficiaries would likely not be able to afford a complete renovation of their home.

A participant survey showed that 30% of the applicants saved more than 40% of their energy bills, and 98% were very satisfied or at least content with their decision to participate.

In terms of aggregate results, the programme is projected to save 2.1 TWh by 2016 (compared to 2009), which is about 11% of the total annual demand for heating oil in Austria.

Regulatory and market drivers

The EU policy framework facilitated implementation. Without a policy and legislation setting energy savings targets over a defined time frame, the prospects of a voluntary agreement among all the market players would have been lower. Similarly, the willingness to cooperate is higher if there is political pressure. Market factors also contributed, as a declining trend in heating oil unit sales supported the sector's cohesion and desire to cooperate in efforts to retain market share.

Another factor contributing to effective collaboration was the clear definition of targets. The amount of energy savings due to the replacement of a boiler has been clearly defined with the Austrian Energy Agency, creating stable expectations.

The programme is financed by heating oil suppliers, who pass along the extra costs to the consumer. Results are reported yearly to the Austrian Energy Agency, which verifies the numbers and includes the results in tracking progress towards national energy savings goals.

Lessons learned

The programme increased the sales of heating oil boilers in the first year by 84%, showing that incentives encourage the consumer to invest in energy efficiency. These results suggest that future incentive programmes might start with a lower subsidy offer which can then be increased as needed to modulate sales. This approach might create some dissatisfaction among early-adopters but would ultimately increase the cost-effectiveness of the programme.

Complete market penetration is unlikely due to barriers on both the supplier and consumer sides. The initial challenge was convincing all the heating oil suppliers to contribute to and to become part of the system. Convincing all consumers to participate is an ongoing challenge.

The programme concept also faced concerns about whether a voluntary agreement involving an entire energy supplier sector constituted a potential cartel. This anti-trust issue was raised and cleared with the authorities.

Baltimore Gas and Electric

Table 9 • Small Business Energy Solutions (SBES) Programme

City, country, region	Baltimore, Maryland
Programme type	Comprehensive implementation, financial incentives, advice and assistance
Programme tenure	2009 – ongoing
Sector focus	Commercial
Technology focus	Lighting, refrigeration, and hot-water efficiency improvements
Objective	Help small businesses reduce their energy us by promoting energy efficient appliances and equipment
Budget	USD 25 million in 2009–2012
Savings	68 GWh annual electricity savings USD 93 million in lifetime cost savings
Contact information	Ruth Kiselewich, Director, Demand Side Management Programmes: Tel. +1 (410) 470-1361; ruth.c.kiselewich@bge.com.
Reference	www.bgesmartenergy.com/business/small-business-energy-solutions

Summary and background

The Small Business Energy Solutions Programme (SBES), sponsored by the Baltimore Gas and Electric (BGE), helps small business owners reduce energy usage through energy efficient (EE) lighting and equipment. SBES targets small businesses that have minimal time or money to invest in EE improvements. Owners are provided with a time-saving turnkey approach that reduces their operating costs and helps them stay in business. Programme offerings include lighting, refrigeration and hot water solution service, free energy analysis and recommendations, and an incentive covering 80% of total retrofit cost.

Programme description

SBES is tailored for small business owners with a monthly power demand of less than 60 kilowatt (kW) and limited investment funds.

Participation is promoted by way of case studies, customer testimonials, the BGEsmartenergy.com website, advertising, bill inserts, and co-marketing with trade allies and delivery contractors. The programme addresses the three main barriers to energy efficiency investments by small businesses: lack of capital, absence of technical resources, and getting the attention of business owners focused on business issues rather than energy.

The SBES programme design provides tools to overcome these barriers, such as: (1) a turnkey service using pre-approved contractors who deliver customized lighting, refrigeration and hot water solutions; (2) a free energy analysis which produces easy-to-follow recommendations for

improving EE; (3) an "opportunities checklist" in the programme audit software that will identify additional EE opportunities beyond those covered by the SBES analysis itself; and (4) an incentive covering 80% of the total cost of the EE lighting, refrigeration and hot water retrofit (including materials, labour and recycling).

The programme increases market penetration because participation is easy and the payback period is short. There are no forms to complete, and specialized contractors retained by BGE work to eliminate confusion and streamline processes. Many participants see payback periods of one year.

A measurement and verification (M&V) protocol is tied to a three-year programme cycle of measures and budgets. The Maryland Public Service Commission Staff receives regular progress allowing comparison of actual-to-forecast participation.

As of September 2012, there were more than 10,000 participants, half of which had completed an installation. To date the SBES has yielded 68 GWh in energy savings, 15 MW coincident peak demand reduction, and USD 93 million in lifecycle cost savings.

Regulatory and market drivers

The EmPOWER Maryland legislation established a state-wide target of reducing per capita electricity consumption 15% by 2015 (compared to 2007 levels), as well as a 15% reduction in per capita peak demand. In response the Maryland Public Service Commission (PSC) has obligated electric utilities to reduce per capital electricity consumption by 10% by 2015.

Under EmPOWER Maryland, regulatory review and approval of programmes and budgets takes place on a three-year cycle. Energy providers consult with the Maryland Energy Administration (MEA) on programme design and implementation and then submit plans to the PSC for achieving the specified energy consumption and peak demand reductions. The PSC is tasked with evaluating the plans based on cost effectiveness, rate impacts for each ratepayer class, job creation, and environmental impacts.

Lessons learned

- Costs remain a significant barrier for many BGE small business customers, despite the turnkey programme design and incentive offerings. Stimulating customer demand is the major challenge that Maryland electric utilities face in meeting their energy saving targets.
- Word of mouth is particularly important in spreading programme awareness within certain communities, given their concentration in certain retail segments. Face-to-face customer contact is the most effective way to raise awareness of energy saving opportunities and encouraging participation in the programme. Face-to-face contact is also important in engaging and sustaining trade allies and implementation partners.

BC Hydro

Table 10 • Residential Behaviour Programme

City, country, region	Vancouver, British Columbia
Programme type	Information, education and promotion
Programme tenure	2008 - Ongoing
Sector focus	Residential
Technology focus	All
Objective	Continuous engagement with customers to promote and sustain energy-saving behavioural change
Budget	CAD 10.9 million for fiscal years F09–F11 CAD 236 million over 20 years
Savings	5.1 GWh annual energy savings; 1.02 peak MW reduction (2010) 370 GWh of cumulative savings forecast to 2028
Contact information	Iris Sulyma, Manager, Residential & Commercial Evaluation: Tel. +1 604 453 6269; iris.msulyma@bchydro.com
Reference	http://www.bchydro.com/powersmart/residential.html

Summary and background

BC Hydro launched its Power Smart programme in 1989, aiming to promote energy conservation as an alternative to building new generation facilities. In 2008 the Team Power Smart Residential Behavioural Programme was created as a loyalty programme wherein residential customers voluntarily sign up and receive benefits including energy-saving tips and incentives and exclusive offers and contests.

Programme description

British Columbia's relatively mild climate and lack of piped gas mean that equipment replacement alone is unlikely to greatly improve household energy efficiency. Growth in plug load accounts for most of the 2% annual increase in residential demand. A 2007 study estimated potential energy savings from behaviour change in the residential sector at between 700-1400 GWh annually (BC Hydro 2007). Based on this evidence, BC Hydro initiated efforts to promote behavioural change as a means of managing demand growth.

The Team Power Smart programme offers various membership and benefit levels, each with its own range of privileged access to contests and special offers, online information, billing services, and conservation and planning tools and incentives. Much of this is available to new members; other privileges kick in after a year in the programme. Twice-yearly campaigns encourage Team Power Smart members to recruit their friends and acquaintances.

The programme is moving into the evaluation stage, with one year of pre-programme customer data and one year of post-joining data now available. In the first year, energy savings amounted to 5.15 GWh annually and peak savings of 1.02 MW, with additional spill-over savings. The programme has fostered moderate awareness in its target market, achieved high levels of customer satisfaction and reduced barriers to behavioural change. It is difficult to extrapolate these savings — early adaptors tend to be more enthusiastic than late adapters who join only once it has become a social norm, plus energy savings could decline after the first year, with only some of the new habits persisting. Maintaining interest means constantly reinventing behavioural programmes to maintain interest.

The programme will soon include smart meters and in-house display devices. Team Power Smart will likely serve as the main vehicle for engaging people in demand management. BC Hydro also plans to involve existing community organizations in the programme.

Regulatory and market drivers

In 2002 the Utilities Commission Act was amended to ensure demand-side measures are included in long-term resource planning. It requires utilities to pursue cost-effective investments in demand-side management, and encourages them to develop programme portfolios that offer energy savings opportunities for everyone. The Clean Energy Act of 2010 requires BC Hydro to apply demand-side measures and energy conservation sufficient to offset two-thirds of the expected increases in demand to the year 2020.

Lessons learned

- Behavioural programmes are based on social science, so thought needs to be given as to how and why people respond to marketing and how social interactions might be used to influence energy consuming behaviour. The Residential Behaviour Programme has taken a comprehensive approach to environmental issues, emphasizing overall resource conservation including energy and water, and these multiple themes have helped keep people coming back to the website.
- Behavioural programmes are slow to get started and yield results, so they need a long term commitment (three- to five-year) and steady funding. Interruptions in programme continuity or messaging can cause years of progress to unravel.

Bonneville Power Administration

Table 11 • Scientific irrigation scheduling

City, country, region	Pacific Northwest region
Programme type	Advice and assistance, financial incentives
Programme tenure	1981 - Ongoing
Sector focus	Agricultural
Technology focus	Irrigation/water pumping
Objectives	Provide growers with information critical to optimizing irrigation scheduling, thus reducing pumping demand and energy use
Budget	USD 1 million per year
Savings	165 GWh annual savings (2006–2010)
Contact information	Jennifer L Eskil, Industrial & Agriculture Sector Lead, Tel 1-509-527-6232, jleskil@bpa.gov
Reference	http://www.bpa.gov/energy/n/agriculture.cfm

Summary and background

The Bonneville Power Administration (BPA) established the Scientific Irrigation Scheduling incentive programme in 1981. The programme provides predictive analytic services to growers, allowing them to reduce energy consumption by using less water. Activities includes weekly field visits, soil testing, weather data collection and ongoing communication with agricultural customers, keeping them appraised, on a weekly basis, of appropriate irrigation strategies. BPA cooperates with retail utilities throughout the Pacific Northwest that in turn provide recommendations to irrigation districts and growers.

Programme description

Improved irrigation practices produce savings in water, pumping demand, and energy use. The Scientific Irrigation Scheduling programme provides an irrigation water management network which informs growers about when and how much to irrigate. A crop irrigation model uses historical and forecast weather along with soil moisture measurements to recommend crop- and area-specific irrigation schedules. A variety of factors determine the ideal rate of watering for a specific crop over its growing season, and the Scientific Irrigation Scheduling programme works to model optimal irrigation scheduling.

In operation for over 30 years, Scientific Irrigation Scheduling is essentially an advice and assistance programme provided by utilities with the aid of local consultants. BPA provides the regional economies of scale and technical capacity to make the service sustainable. The grower

or irrigation district hires and pays the consultants for their work, and the grower receives an incentive check at the end of the growing season. The incentive is based on water and energy saved, based on M&V using historical usage data, cropping patterns, and a standard calculation. In some cases, the consultant contracts with the electric utility to bring a certain number of acres into the programme.

The Scientific Irrigation Scheduling programme offers a customer incentive of USD 5.20 per acre per year, based on M&V showing average annual savings of 200 kWh per acre and an avoided energy cost of USD 0.026 per kWh. Programme energy savings goals are routinely exceeded, and the participating acreage is approaching the 1 million mark.

Regulatory and market drivers

The Bonneville Power Administration is required by law to view EE as an electricity generation resource. Since 1981, BPA has invested USD 2 billion in acquiring demand-side resources, saving energy equivalent to that produced by a nuclear power plant.

The Northwest Power Planning Council (NPPC) produces a power resource plan every five years, looking to a 20-year horizon. Each plan is dedicated in part to DSM resource planning. Historically, BPA accepts the targets, and undertakes what they can to achieve the targets, reporting progress annually. Scientific Irrigation Scheduling is one of the main measures addressing the agricultural sector.

BPA serves 137 publicly owned utilities, including co-ops, rural electric associations, and municipal utilities. These entities buy their power from BPA. Since BPA is required to view EE as a resource, they include investments made to acquire demand-side resources in the wholesale tariffs these utilities pay.

Lessons learned

- Scientific Irrigation Scheduling is one of the longest running DSM programmes in existence, proof of its value to both agricultural customers and system planners
- Incentive structures need to be carefully considered to avoid market or price distortions, and to avoid systematic bias towards large or small energy users. Presently larger growers benefit from economies of scale from incentives paid on a per-acre basis, thus skewing programme participation towards larger users.
- The programme benefits from economies of scale in providing advice and assistance. With an average energy savings cost of less than USD 1 cents/kWh, this is a very cost effective programme.
- Looking to the future, the programme needs to explore new technologies to further reduce costs. At present implementing the programme is labour-intensive, as growers must perform pump and physical testing to generate the necessary data and perform the required metering.

British Gas

Table 12 • Community Energy Savings Programme

City, country, region	UK
Programme type	Direct installation, bulk procurement and distribution
Programme tenure	1 October 2009 – 31 December 2012.
Sector focus	Residential
Technology focus	Insulation and heating
Objective	Deliver large-scale, community-based household energy efficiency improvements in areas of low income across Great Britain
Budget	£350m (total estimated cost, whole industry)
Savings	19.25 MtCO2 (whole industry)[6]
Contact information	Emma Johnson: Policy Manager, British Gas New Energy Emma.johnson@centrica.com
Reference	http://www.decc.gov.uk/en/content/cms/funding/funding_ops/cesp/cesp.aspx

Summary and background

The Community Energy Saving Programme (CESP) is part of the United Kingdom's (UK) energy efficiency obligation policy for networked energy retailers. CESP employs community-based strategies to target low-income households in order to improve EE standards, lower fuel bills, and cut CO_2 emissions. As an obligated company, British Gas is investing in 95 projects to help reduce fuel poverty in low-income communities across Great Britain. The Walsall activity, the first project developed under the CESP programme, is described below.

Programme description

The Community Energy Saving Programme (CESP) requires energy suppliers in the United Kingdom to deliver insulation and heating measures in households in defined areas of low income across the country. The programme follows previous energy efficiency obligations policies in the United Kingdom, but is the first government scheme to focus on solid wall insulation (a more complex and costly EE measure than loft or cavity wall insulation), and the first to actively promote a "whole house" approach. Significant bonuses are awarded for tackling multiple properties in the same area, and for including multiple measures for each property.

The Department of Energy and Climate Change (DECC) introduced the programme, following the usual programme of consultation with industry and other interested stakeholders, aiming to reduce heating costs in vulnerable households by implementing EE measures.

British Gas's first CESP project was in Walsall, where £9 million was spent on seven distinct schemes within the Walsall Rivers area, with a further planned spend of £11 million. Solid wall

[6] British Gas/Centrica was allocated approximately 20% of this total target.

insulation was installed in more than 1,000 properties, as well as biomass district heating for 150 properties, gas district heating for 150 properties, and domestic heating for 700 properties. In the second stage British Gas has been contracted to provide domestic heating for a further 300 properties as well as loft and cavity wall insulation. The project also included provision of solar panels for both tower blocks and individual homes. Delivery is undertaken through a broad mix of delivery partners who have contracted directly with the obligated parties.

The different nature of these seven communities meant that British Gas had to find energy answers for seven different sets of circumstances, in each case delivering equally effective levels of heating efficiency. This involved developing a close working relationship with the Walsall local authority to develop a long-term EE plan. This regeneration of these seven distinct areas, including renovation of property, has generated much local pride, with 90% of householders giving the works a rating of seven out of ten or higher.

Funding was provided by British Gas, Walsall Housing Group, and Walsall Metropolitan Borough Council. The funding mix meant the scheme could be extended across whole communities in Walsall, with no additional cost for the private tenants. In the Walsall Rivers district, all private owners were given the opportunity to have this work carried for free; this benefited more than 200 private home owners in the area.

Regulatory and market drivers

The CESP programme is part of the UK's broader Heat and Energy Saving Strategy, and also contributes to the government's Fuel Poverty Strategy by requiring actions to be delivered in geographic areas selected using the Income Domain of the Indices of Multiple Deprivation (IMD) in England, Scotland, and Wales.

The obligation to deliver the CESP programme lies with the country's various energy suppliers and power stations, including British Gas.[7]

Walsall and other CESP projects will be phased-out as the UK develops a new Green Deal and Energy Company Obligation (ECO) framework which will take force beginning in 2013.

Lessons learned

- The "whole house" approach and the practice of treating clusters of properties at the same time, have both worked well. Significant non-energy benefits, including local jobs creation and enhanced community identify, have been delivered using the CESP model.
- Complex contracts with local authorities and other partners sometimes delays implementation.
- Rigid definition of eligible properties based on postal code boundaries has led to frustration and foregone economies of scale. In one case three tower blocks could be addressed, but the fourth—next door, but officially in a neighbouring postcode—could not benefit.[8]

[7] Electricity and gas suppliers with more than 50,000 domestic customers and power generators producing more than 10 TWh per year

[8] Many of these artificial official constraints will be relaxed for the Communities element of the forthcoming ECO framework

CEMIG

Table 13 • CEMIG's ESCO subsidiary Efficientia

City, county, region	Brazil
Programme type	Advice and assistance, financial incentives, on-bill financing
Programme tenure	Since 2002
Sector focus	Industrial, municipal and commercial
Technology focus	All
Objectives	• Optimize obligated spending on energy efficiency projects through an ESCO subsidiary specializing in creating business opportunities out of regulatory obligations. • Develop a new for-profit business line based on energy savings project development services such as design, supervision, monitoring and verification. • Invest in profitable projects, creating a positive feedback loop for funding industrial energy savings
Budget	USD 20 million (2012)
Savings	110 GWh cumulative annual savings in 2011; 17 MW peak demand reduction; 22MtCO2eq avoided in 2011. 50 GWh additional annual savings expected in 2012
Contact information	Cláudio Latorre (General Superintendent) latorre@cemig.com.br
Reference	www.efficientia.com.br

Summary and background

The Brazilian energy distributor CEMIG created Efficientia as a subsidiary company responsible for CEMIG's compliance with energy efficiency spending obligations under Brazilian law.[9] Efficientia operates as an Energy Service Company (ESCO), providing energy efficiency project design, financing, supervision, and monitoring and verification services for energy-intensive industries. An Energy Efficiency Programme Fund (EEPF) provides concessional lending which is replenished with CEMIG's annual spending obligation and repayments from previous energy efficiency project loans. Industrial operators enter into an Energy Performance Contract with Efficientia which governs loan repayment and ESCO compensation terms.

Programme description

Efficientia is charged with managing the portion of CEMIG's yearly spending obligation that can be spent on the non-residential sector. Efficientia offers project development services together with performance based project finance. Potential projects compete on their relative economic merit for funding from a concessional revolving fund replenished from CEMIG's spending obligation. Energy audits, project design, construction supervision, and M&V services are

[9] Federal Law 9.991obligates franchised energy providers to spend 0.50% of annual net revenues in projects for energy efficiency

provided by Efficientia are paid by the industrial customer, along with a success payment based on the actual energy savings results.

An energy performance contract governs the terms under which services are provided, loans from the EEPF are repaid, and savings are shared. Project development costs vary greatly depending on the size, complexity of projects and the risks involved, among others, but range from 5% to 10% of total project cost. Loan repayments flow to a single account, supervised by the Brazil's Electricity Regulatory Agency (ANEEL) and managed by CEMIG, which in turn reinvests in new energy efficiency projects on an annual basis. The yearly compulsory spending under the CEMIG obligation adds to these repayment flows, increasing the capability of the EEPF to funding projects originated by Efficientia.[10]

Between 2004 and 2011 Efficientia has delivered 34 projects, and is currently implementing another 11. Typical projects include lighting substitution, cogeneration, and industrial process efficiency improvements. Cumulative energy savings are expected to reach 160 GWh per year by the end of 2012, and the programme is expected to continue growing along with the EEPF. Other benefits include promoting industrial growth and competitiveness, developing an energy efficiency industry, and jobs creation. Another benefit is CEMIG's high standing in the Dow Jones sustainability index.

Regulatory and market drivers

Federal Law 9.991 obliges franchised Brazilian energy providers to invest 0.50% of their net operating revenues in energy efficiency projects under the Plano de Eficiência Energética (PEE). An amendment to the law in 2010 established that a ceiling of 40% of spending (0.2% of net revenues) may be used for commercial and industrial customers, with the remaining 60% set aside for energy efficiency for low-income households. The national electricity regulator, Agência Nacional de Energa Elétrica (ANEEL), sets obligations, approves projects, validates results, and fines distribution utilities which do not comply with its regulations.

Lessons learned

The PEE scheme has accomplished quite a lot over the past fifteen years. A network of Brazilian ESCOs routinely identify, finance, and implement energy savings projects for industry, municipalities, households, and businesses. Many of these ESCOs are subsidiaries of electricity distributors or offshoots of engineering companies. However, current levels of ESCO activity may not continue if the energy efficiency spending obligations is reduced (Broc et al 2012).

In its early years Efficientia struggled with lack of interest in energy efficiency on the part of industrial managers. Many industrial managers did not see the benefit of energy efficiency improvements, and distrusted the savings claimed. Efficientia had to demonstrate economical, technical and financial viability, as well as ensure energy savings and financial payback periods despite project uncertainties. Investments in energy efficiency had to compete with spending on productivity improvements or plant expansion. Efficientia's bundling of the ESCO model with the EEPF offered new possibilities for industrial managers - a source of financing that was immediately available, had concessional rates, and side-stepped the bureaucracy and often-onerous requirements of commercial lenders.

[10] In 2011, CEMIG was obligated to spend USD 19 million (0.5% of its net revenues) on energy efficiency projects. By law, 60% or USD 11.5 million must be spent on low income housing efficiency projects, leaving USD 7.6 million available for industrial energy saving projects. However, CEMIG's annual spending is supplemented by repayments of previous project loans, ensuring a steady stream of USD 20 million annually for new industrial efficiency projects.

Despite these advantages, Efficientia still had to build credibility by successfully implementing projects, thus reducing the risk of energy efficiency projects perceived by industrial managers. Measurement and verification results allowed Efficientia to demonstrate the persistence of energy and cost savings, thus building confidence in the entire model.

The concessional revolving fund is essential to Efficientia's ESCO model. Access to affordable project financing creates the demand by industrial customers for Efficientia's project development services.

Developing a successful industrial energy efficiency programme requires time and careful attention to detail. Successes with early projects are important to build credibility in the programme and build confidence in potential industrial participants.

A comprehensive approach to project development is essential, especially in the beginning stages. The performance contracting model is a very useful business model for turn-key project development from audits to verification of savings.

The scheme's financial backbone is the regulatory driver, but Efficientia's expertise on energy efficiency made it a profitable company by providing services of project design, supervision and monitoring to energy intensive sectors.

CenterPoint Energy

Table 14 • Custom Process Rebate Programme

City, country, region	Minneapolis, Minnesota
Programme type	Advice and assistance, financial incentives
Programme tenure	Late 1990s – ongoing
Sector focus	Industrial
Technology focus	Custom
Objective	Provide assistance and financial support to energy efficiency projects that do not qualify under prescriptive programmes.
Budget	USD 2.4 million (2011)
Savings	110 GWH equiv (2011)
Contact information	Todd Berreman, Manager CIP Implementation: Tel. +1 800 234 5800; todd.berreman@CenterPointEnergy.com
Reference	http://www.centerpointenergy.com/services/naturalgas/business/MN/

Summary and background

Through a state-approved Conservation Improvement Programme, CenterPoint Energy provides financial incentives to customers who improve EE through innovative, customized energy-saving projects. The Custom Process Rebate Programme provides rebates primarily to large-volume and dual-fuel customers that use throughput for process rather than heating purposes. Financial incentives are awarded to customers to assist with the first cost of the EE upgrade. The programme has promoted such projects as bio-methane energy recovery, waste-heat energy recovery, boiler flue-gas condensers, thermal oxidizers, integral quench furnaces, heat-treat ovens, control packages, window replacement, stack economizers, and enthalpy wheels.

Programme description

Industrial customers consume large amounts of energy and often have considerable EE potential. However, industrial energy savings projects are often unique or specific to a given customer. Standardized or prescriptive measures do not suit these customers.

This programme provides financial incentives to customers who improve their EE through innovative customized energy-saving projects. Each prospective project is compared to a base case to calculate efficiencies gained by installing the new technology. Once a project passes all requirements, an appropriate financial incentive is awarded to assist with the first cost of the EE upgrade(s).

In some instances, C&I customers reach out to CenterPoint, seeking more effective EE processes. CenterPoint also works with customers to develop customized systems and solutions, and offers to buy down the new equipment, paying up to 50% of incremental cost.

The programme is administered in-house, where three CenterPoint mechanical engineers dedicate 90% of their time to the programme and five key account managers devote 60–70% of their time. In many instances, account managers identify available opportunities by performing a plant walk-through alongside a technical sales engineer, while some customers come to the programme with an outside engineering firm that they have retained to help with a specific upgrade or retrofit.

Account managers are the main programme marketing driver, connecting with prospective C&I clients and conducting value-based profiling to identify candidate beneficiaries of active account management and the programme as a whole. Related marketing techniques include direct mail, newsletters, e-mail, and case studies publicizing unique processes or technologies. An annual technology conference engages outside speakers and past participants.

Account managers become experts on market segments for which they handle the entire service territory. Each manager is assigned a technical sales engineer who helps identify EE opportunities plus associated cost and energy savings. Coordination between manager and technical sales engineer continues until the equipment is installed and verified.

CenterPoint Energy or third-party contractors conduct M&V on projects in excess of 20,000 dkTherms. An M&V plan is developed and implemented following approval from the regulator (Division of Energy Resources). M&V data is gathered throughout implementation and CenterPoint submits its M&V report to the Division of Energy Resources.

In 2011 the programme processed 148 custom projects that achieved a savings of 374,000 dkTherms.

Regulatory and market drivers

The programme is based on the Next Generation Energy Act, which in 2010 shifted from a state-mandated spending goal to a savings target. All investor-owned utilities must now aim for 1.5% savings of annual usage. Investor-owned utilities are to file a Conservation Improvement Programme Plan demonstrating a minimum 1% savings of overall throughput.

Lessons learned

- The Custom Process Rebate Programme addressed a big gap in CenterPoint Energy's energy efficiency programme coverage - energy-intensive industrial customers who cannot avail themselves of standardized energy savings measures.
- The greatest implementation challenge was the economic downturn. Many industrial customers lacked the capital to invest in EE projects, especially the larger and more expensive ones. This barrier was most evident in 2008 and 2009, with participation improving in 2010. An even bigger challenge is historically-low gas prices. With gas cost in the USD 3/MCF range, custom rebates are not as appetizing, and paybacks have gotten longer.
- Finally, expanding the programme will require more extensive audits for those customers interested in energy efficiency but unsure of where to begin or exactly how their facility may benefit. Providing funding for energy audits to these customers is something CenterPoint Energy is now exploring.

CLP Power Hong Kong

Table 15 • Energy efficiency and conservation programme

City, country, region	Hong Kong
Programme type	Advice and assistance, information, education and promotion
Programme tenure	2008–2018
Sector focus	Energy audits and loan scheme – commercial and industrial customers. Energy efficiency and conservation education – schools, general customers.
Technology focus	Buildings HVAC and industrial processes
Objective	Help business and industrial customers realize energy savings potential, and increase awareness on energy efficiency and its benefits
Budget	USD 4.2 million annual budget
Savings	48 GWh energy savings (2009 – December 2011)
Contact information	Ron Chung: Manager, Group Sustainability Support; +852 2678-8718; r_chung@clp.com.hk.
Reference	www.clponline.com.hk/Pages/home.aspx

Summary and background

CLP Holdings Limited is one of the largest investor-owned power businesses in the Asia –Pacific region. Its Hong Kong business, CLP Power Hong Kong (CLP Power), is a vertically integrated electricity business which is regulated by the Scheme of Control Agreement (SoC) established with the Hong Kong Government. The current SoC (2008–2018) includes regulatory conditions and financial incentives for CLP Power to help customers improve their energy efficiency. Under this framework CLP Power delivers a variety of energy efficiency services, including energy audits, loans for energy savings measures, and education and awareness-building on energy efficiency.

Programme description

CLP Power has two main energy efficiency initiatives – helping businesses to identify and finance energy savings measures, and building awareness on energy efficiency and its benefits.

Free energy audit services are provided to non-residential customers upon request. The audits assess the energy efficiency of commercial and industrial customers, identify energy-saving opportunities, and provide advice on carrying-out improvements. Since 1999, CLP Power has conducted more than 1,300 detailed energy audits. A loan scheme of USD 3.2 million per year over the period 2009–2013 has been established to assist commercial and industrial customers to implement energy-saving improvements identified in the energy audits under the Energy Audit Programme.

CLP Power also supports energy efficiency education and promotion activities. Promotional measures include Eco Optimizer (an online energy benchmarking tool for residential customers), community exhibitions, outreach activities, and the Green^{PLUS} Programme, which helps small and

medium enterprises (SMEs) and non-profit organizations implement energy efficiency and conservation measures.

Regulatory and market drivers

The current SoC regulates the two electricity companies serving Hong Kong, setting their permitted return at 9.99% of average net fixed assets. The SoC offers the utilities a financial incentive - incremental increases in the rate of return - if "stretch" targets for delivering energy audits and energy savings to customers are reached. CLP Power is incentivised with a 1 basis point increase if it delivers 150 or more energy audits to commercial and industrial customers or if customers receiving an audit undertake energy-savings yielding equal to or greater than 12 GWh in savings per year.

Lessons learned

- Commercial and industrial customers, particularly SMEs, are interested in reducing their energy consumption and costs, but lack the necessary expertise and resources to do so.
- Many customers who have received the energy audit service have already implemented major energy-saving projects over the last two years.
- In most cases, customers require a long lead time to plan and implement more complex energy-saving projects.
- Regulatory incentives for energy efficiency are very useful in aligning the interests of utilities, ratepayers, and the community if they are properly designed and implemented in a transparent manner
- Energy efficiency and conservation require a commitment that extends past the provision of energy audits or loans. Changes in technology, commercial viability, and customer behaviour make ongoing monitoring and continuous improvements necessary.

Connecticut Light & Power and Yankee Gas Services

Table 16 • Small Business Energy Advantage

City, country, region	Connecticut
Programme type	Advice and assistance, comprehensive implementation, financial incentives, on-bill financing.
Programme tenure	2000 – ongoing
Sector focus	Commercial and industrial
Technology focus	Buildings and equipment
Objectives	SBEA serves small businesses, which traditionally lack the in-house engineering staff, resources and expertise to review EE measures and cost savings alternatives.
Budget	UAS 13.5 million (2011)
Savings	30 GWh (2011); 4,759 peak demand reduction kW (2011).
Contact information	Stephen Bruno: +1 (860) 665-4752; brunosj@nu.com.
Reference	http://www.cl-p.com/business/saveenergy/services/energyadvantage.aspx

Summary and background

Connecticut Light & Power Company and Yankee Gas Services Company launched Small Business Energy Advantage (SBEA) to deliver energy audit and EE project installation services to small (10 kW to 200 kW) commercial and industrial customers. Approved contractors provide support for programme administration with audit and installation services. A combination of energy audits, easy-to-access installation services plus project cost-sharing and on-bill financing makes participation very attractive.

Programme description

SBEA is implemented by specialist contractors who work with small commercial and industrial customers (10 to 200 kW) to identify significant energy savings opportunities. SBEA provides energy audits and installation services directly and also offers energy engineering and installation services for both prescriptive and custom measures. On-bill financing is available to qualifying customers, which encourages business owners to undertake a more comprehensive approach to saving energy.

Prices for prescriptive measures including energy audits are fixed, so all customers receive the same pricing from any programme contractor. Contractors perform a no cost, no obligation room-by-room audit before prescribing applicable measures. Information regarding both existing and proposed measures is used to calculate estimated energy savings, installation costs, and EE fund incentives, as well as overall customer project cost, energy savings and loan amount. The SBEA programme software is linked to customer utility bills, so that any energy savings proposal is based on actual customer usage and can be confirmed as cost effective. The programme software allows the utility to screen and approve all potential projects before the contractor

presents a proposal to the customer. The programme focuses on all cost-effective end uses, including lighting, refrigeration, heating and cooling.

Zero percent financing is available with a maximum loan of USD 100,000 and the maximum term of three years. Loan terms are based on customer payback period plus one month, so no cash outlays are required. In Connecticut, all Energy Efficiency Fund programmes, including the SBEA programme, undergo regular evaluations conducted by independent third parties. The impact evaluations aim to verify that reported savings are accurate, and also to help support continuing programme improvement. Savings are reported to Connecticut's regulatory bodies. An annual plan, filed with state regulators, outlines annual goals, including energy savings (electric and natural gas), number of businesses served and cost effectiveness. An annual report is also submitted that shows actual programme costs, savings, and environmental benefits.

The Energy Efficiency Board assists utility administrators in the design of fund programmes. Board sub-committee groups comprising board members, consultants, vendors and utility staff meet every month to consider improved programme design and performance.

The utilities market the SBEA programme via print and radio advertising, direct mail, automated phone calls, public relations and special events, including corporate presentations. SBEA contractors also conduct their own promotions, extending the overall message well beyond what either utilities or contractors could accomplish independently.

The SBEA program began offering incentives for natural gas energy efficiency measures in 2012.

Regulatory and market drivers

SBEA is regulated by the Connecticut Department of Energy and Environmental Protection, with oversight provided by the Energy Efficiency Board, an appointed group of 14 members representing residential, business, community and municipal consumers.

Capital funding is provided directly by the utility company. Contractors are authorized by the utility to offer customer loans at point of sale, which streamlines the sales process. On average, the Connecticut Energy Efficiency Fund covers 35–40% of project costs. The balance is paid by customers under a zero-interest loan averaging about USD 12,000 financed by the utility company. SBEA funding comes from several sources, including a surcharge on electricity bills, sale of Class III Renewable Energy Credits and revenues from the ISO-New England Forward Capacity Market (See Case Study # 24).

Lessons learned

- Identifying and mobilizing the specialized knowledge needed for a commercial and industrial energy efficiency programme is vital to early success
- On-bill financing with no initial cash outlay greatly increases project size, customer acceptance, and overall volume
- Bring in a higher volume of projects will require mobilizing third party financing. Ultimately the programme should become more market based, by providing greater incentives for contractors and developing financing models which encourage lender participation
- Continuous investment in building contractor capability helps ensure the latest energy saving technologies and opportunities are implemented.

DONG Energy

Table 17 • Climate Partnership Programme

City, Country, Region	Denmark
Programme Type	Advice and assistance, Information, education and promotion
Programme tenure	Since 2007
Sector focus	Business customers, large users, municipalities
Technology focus	Industrial processes, lighting, cogeneration, waste to energy
Objectives	• Contribute to fulfilling the energy savings obligations of its DONG Energy distributor subsidiaries. • Broaden DONG Energy's role from energy provider to energy services provider, by delivering cost effective savings in cooperation with customers. • Provide a stable market for DONG Energy's offshore wind power production. • Contribute to a green transformation of Danish industry, including the power sector.
Budget	Over 25 engineers and account executives support the CPP
Savings	• Partners set a target to save 10% of their energy consumption and progress towards carbon-neutral operations. • The CPP delivered 60 GWh of annual energy savings in 2011, 20% of DONG Energy's savings obligation. • Cumulative annual energy savings of more than 200 GWh
Contact Information	Allan Schefte, VP--Sales, Denmark & Sweden (allan@dongenergy.dk)
References	http://www.novonordisk.com/images/Sustainability/PDFs/Blueprint_ClimaChange.pdf http://www.dongenergy.com/anholt/en/cooperation/pages/climatepartnerships.aspx

Summary and background

DONG Energy is one of Northern Europe's leading energy groups, with numerous subsidiaries engaged in exploring, procuring, producing, distributing and trading energy. Energy distributors in Denmark are obliged to meet energy savings targets, and two Dong Energy distribution subsidiaries - DONG Gas Distribution A/S and DONG Electricity distribution A/S – have a total savings obligation of 308 GWh for 2011. In 2007 DONG Energy began its Climate Partnership Programme (CPP), initially working with the large pharmaceutical company Novo Nordisk. DONG agreed to help Novo Nordisk identify and develop energy savings projects with a target of reducing primary energy consumption by 10 percent. Novo Nordisk reciprocated by supporting construction of DONG Energy's new offshore wind power plants through a power purchase agreement. The premium for green power premium was offset with bill savings from energy efficiency. In this way the CPP creates a virtuous circle of energy efficiency improvements and green power investment by Danish large energy users. The programme has grown rapidly to 135 partners in line with the desire of many other Danish entities to become climate-neutral.

Programme description

The CPP grew out of a close cooperation with Novo Nordisk on reducing its CO2 emissions. In 2006 Novo Nordisk committed to reducing its corporate climate footprint in 2014 by 10 percent

compared to 2004. This target was to be achieved by saving energy at its Danish production sites and increasing its purchases of renewable energy. In 2007 after extensive consultations between senior management of the two companies, DONG Energy agreed to help Novo Nordisk reduce the company's Danish energy consumption, while Novo Nordisk has agreed to convert the savings realised at its Danish production sites into the purchase of wind power from DONG Energy's Horns Rev 2. This agreement is in force until 2020. As a result of this and other initiatives, Novo Nordisk will be able by 2014 to source all of the power needed for its Danish production facilities from renewable energy. An important element of the CPP is a stated intent of the partners to become climate-neutral.

As of 2012 there were 135 climate partners. Other well-known partner companies include Novozymes, A.P. Moller-Maersk, Rockwool, Siemens, Tivoli, ISS, Philips, and many Danish municipalities. Cumulative annual energy savings realized through partnerships is 200 GWh. In 2010, the partnership was -extended to include steam, heat and gas supply.

DONG Energy provides energy services to CPP participants at its own cost, helping identify and develop the energy savings projects. In some cases DONG energy will supervise implementation. The partner entity finances the savings and DONG Energy claims the savings against the energy savings obligations of its distribution subsidiaries. The partner also agrees that part of the net energy savings (energy savings less project implementation costs) will be used to purchase the output of new renewable power that DONG Energy constructs. The term of the power purchase agreement is 3-5 years or longer, while the energy savings project repayment period is 2--5 years. Contracts for wind power include a 10 percent premium for green (vs. brown) power. CPP partners are willing to pay this premium because (a) it is paid for with energy savings; and (b) it contributes to branding as a green or climate-neutral company. Experience with CPP so far suggests that partners grow used to the image of being climate neutral so they will likely not revert to brown kWh purchases after their renewable power purchase commitment expires.

Each new partner signs an agreement with DONG Energy. DONG Energy agrees to identify energy savings projects, develop the project details including measurement and verification, financing, and risk management, manage project implementation, and provide M&V and report the results to the participant and to obligations scheme administrators. The CPP participant enters into power purchase agreements with DONG Energy to satisfy their agreed wind power purchase commitment, sign over the energy savings to DONG Energy, and create renewable energy certificates (HR2). After the commitment expires they are free to keep purchasing wind power or change providers. Both parties agree to cooperate on communicating the benefits of climate partnerships, via stakeholder engagement, networking, communication, and brand leveraging.

Regulatory and market drivers

Dong Energy is a Distribution System Operator in Denmark and is obliged under the Danish obligations scheme to meet energy savings targets. Electricity, district heating, gas and oil providers are all obliged to reduce final consumption by 1.2 per cent annually, growing to 1.8 per cent annually beginning in 2013. DONG Gas Distribution A / S and DONG Energy Electricity distribution A / S have a total savings requirement of 308 GWh in 2011 increasing to 450 GWh in 2012. The CPP delivered about 20 percent of DONG Energy's 2011 obligations.

To measure and verify the energy savings the regulator asks for engineering estimates of energy savings projects together with evaluation of metered savings. DONG Energy pays for the accounting and measurement and verification required to claim the energy savings against its targets under the Danish obligations scheme.

Lessons learned

- The Climate Partnership Programme takes advantage of the several energy business lines of a large and integrated energy provider. DONG Energy benefits in three ways: (i) by meeting its energy savings obligation at very low cost (DONG Energy provides engineering services but does not provide incentives or co-financing, nor does it need to purchase white certificates); (ii) by creating stable demand for its offshore wind power production; and (iii) by positioning itself as the preferred green retailer in a green Danish economy.
- The CPP provides a comprehensive approach for companies seeking to become climate neutral. Saving energy first and then using the savings to purchase slightly more expensive green power allows businesses to accelerate their progress towards climate-neutral operations. DONG Energy claims most of its partners will be climate neutral (at least for electricity consumption) by 2020.
- For individual CPP members the results have been impressive. DONG Energy has assisted Novo Nordisk in more than 250 energy savings projects with an average payback time of 2 years. From 2004-2009 Novo Nordisk invested USD 21 million in energy savings projects and realised USD 24 million USD in cost savings through reducing global energy consumption by 10%. Following repayment of project costs, continued savings of USD 8 million per year will purchase enough wind power to make Novo Nordisk carbon-neutral.

Electricity Generating Authority of Thailand

Table 18 • CFL Replacement Programme

City, country, region	Thailand
Programme type	Equipment replacement, bulk procurement and distribution, information, education and promotion
Programme tenure	1996 – ongoing
Sector focus	Multiple
Technology focus	Lighting
Objectives	Transformation of the household lighting market to CFLs
Budget	Phase I: USD 0.6 million per year Phase II: USD 0.3 million per year Phase III: USD 1 million per year Average cost of savings: USD 0.006/kWh
Savings	179 GWh annual electricity savings (through 2011)
Contact information	Napaporn Phumaraphand, Director, Demand Side Management Office: Tel. +66 2 436 8100; napaporn.p@egat.co.th.
Reference	http://www.dsm.egat.co.th/en/index.php

Summary and background

The Electricity Generating Authority of Thailand (EGAT) has pursued a series of energy savings initiatives over the past twenty years, in response to rapid demand growth and the need to moderate growth of residential and commercial peak demands. Beginning with voluntary appliance labelling, EGAT has been active in promoting ESCOs, transforming the marketplace for residential and commercial lighting, and improving buildings energy efficiency. EGAT continues to implement its DSM programme, with the CFL replacement effort being a key contributor.

Programme description

Phase I (1996–2001) of EGAT's market transformation efforts included promotional campaigns to raise awareness of the benefits of energy conservation, bulk purchasing to increase product availability and reduce unit costs, and cooperation with retailers on promoting CFLs. In Phase II (2001–2007), EGAT responded to an influx of low-quality CFLs by employing quality controls and applying its own endorsement labelling scheme. Phase III (2007–2011) activities included working with the Ministry of Energy, with financial support from Thailand's Energy Conservation Promotion (ENCON) Fund, to phase out all incandescent lamps in the Thai market, using integrated demand-urging and supply-adjustment strategies.

In 2005, EGAT conducted a survey that revealed 30 million incandescent lamps in the Thai market. The current CFL programme aims to replace these through a combined programme of free distribution for low-income households and by partnering with retailers to offer CFLs at below-market prices. The energy-saving and cost-saving lamps were promoted as EGAT-certified,

while the stores benefited from free advertising. The increased volume of CFL sales as a result of the EGAT campaign reduced the market price for typical CFLs by about 25%.

The CFL and other EE programmes are funded through base tariffs and supplemented with project-based funding from the government-operated Energy Conservation Promotion Fund.

Regulatory and market drivers

In the early 1990s, electricity demand in Thailand was growing faster than power plants could be built, and the country's reserve margin fell to dangerously low levels. Thailand's electric utilities were directed by the National Energy Policy Officeto develop a DSM Master Plan. Although there is a national regulator, EGAT's energy efficiency efforts are overseen by the Ministry of Energy and partially funded through the Energy Conservation Promotion Fund.

Lessons learned

- Utility DSM programmes in developing countries can achieve significant electricity savings and contribute to market transformation for lighting and other end-uses. The EGAT DSM programme has served as a model for other Asian countries in this regard
- CFL quality is vital to successful CFL programmes, and energy providers embarking on bulk purchase programmes must take accountability for ensuring quality to avoid credibility issues with consumers. Technical specifications and endorsement labelling are effective QA tools. This lesson is applicable to other high efficient lighting programme as well, based on EGAT's experience with thin-tube fluorescent lamps and LEDs.
- Successful implementation of energy efficiency programmes enhances an energy provider's public image as a company concerned about both sustainability and customers.
- Attaining complete transformation of the lighting marketplace remains elusive. Despite considerable success in replacing incandescent lamps, many consumers still prefer them because they are inexpensive and emit a warmer colour. A regulatory approach, e.g. banning production and use of incandescent lamps in the country, may be necessary to effect a complete market transformation.
- DSM programme need to be developed and conducted in a phased manner over a period of years. This makes it possible to capture synergies with other activities and adapt in response to changing market, funding, social and even political conditions.
- DSM programmes should be flexible and resilient in order to adapt to changing market conditions and corporate strategy. EGAT's DSM programmes originally focused on deferring the need for new power plants. As the electricity supply condition improved, EGAT has gradually shifted to DSM programmes that support the corporate social responsibility (CSR) function.

Endesa

Table 19 • Energy Management Platform

City, country, region	Spain
Programme type	Information, education and promotion, advice and assistance
Programme tenure	2011 – ongoing
Sector focus	Commercial and industrial
Technology focus	All
Objectives	Help customers reduce energy costs, help the energy provider improve its load factor, and contribute to customer retention.
Budget	EUR 80,000 annual budget
Savings	50 GWh cumulative annual energy savings
Contact information	Joaquin Reina: Tel. +34 95 453 09 59; Joaquin.reina@endesa.es. Miquel Àngel Verd: Tel. +34 971 771 500; miguelangel.verd@endesa.es.
Reference	http://www.endesaonline.com/ES/grandesclientes/index.asp

Summary and background

Endesa offers the Energy Management Platform (EMP) to its large commercial and industrial customers. The EMP is the latest evolution in energy management software offered by Endesa for monitoring and managing energy and water costs. Endesa benefits from a closer commercial relationship with large customers and an additional revenue stream from EMP sales.

Programme description

The EMP stemmed from customer demand for an independent way to monitor their hourly energy consumption and verify their energy bills. Endesa developed a web portal and software tool that allowed customers to access real-time data from their meter, thus allowing customers to reduce or shift demand in response to electricity prices. The EMP has developed over the years and is now a sophisticated software platform that can collect and manipulate data from gas and water meters as well as production data to give customers the insight needed to optimize their operations and minimize their energy demand.

The EMP provides not only real-time but historical data on energy and water consumption, helping customers manage different types of energy consumption. The service allows for comprehensive energy management, including consumption, generation, carbon emissions, project tracking, cost tracking, and invoice management. Endesa trains its customers to use the system and helps them to adapt it for a given site. The EMP is an important tool in conducting energy audits, which is another service provided that often leads to recommended energy savings measures. It is sold as a package along with the energy audit. The EMP has about 400 users, a number of whom use it in conjunction with implementing the ISO 50001 standard.

Customers receive a government rebate if they pay for the EMP up front. Most customers pay for it in instalment payments via their utility bill.

Endesa is evolving its business model for the EMP. By cooperating with customers in measuring and analyzing water, gas, electricity and production data, opportunities for cost-savings investments can be identified using an ESCO-like approach. Endesa is now targeting larger companies with multiple branches or operations. In the second half of 2012, they will conduct pilot measurements in factories, using multi-meters on gas, electric and water consumption. They also will install smart meters and energy management systems in banks with multiple branch locations.

Regulatory and market drivers

There is no regulatory mandate for retail utilities in Spain to offer energy-saving programmes. The main driver for this programme is customer retention and exploring new commercial opportunities in the ESCO area. At the same time, the EMP is proving a useful tool among customers, especially those who adopt the ISO 50001 management standard, a new tool for improving efficiency and reducing costs.

Lessons learned

- Promoting energy management systems and energy savings measures has become easier in recent years, as facility managers pay increasing attention to energy costs. Endesa now partners with manufacturing companies, including providers of lighting and heat recovery equipment, to provide equipment for its customers.
- Endesa has evolved a more sophisticated version of the EMP for its large customers, and encourages them to upgrade from the simpler version of the software, which currently remains in use among 80–90% of Endesa's energy management customers.
- The biggest difficulty in promoting the EMP is showing proof about energy savings expectations. This often involves visiting customers and providing demonstrations using real data. However, such one-on-one approaches can be difficult, time-consuming and costly
- Creating demand for energy management systems begins with demonstrating the value of relatively simple and inexpensive solutions. Only later can customers be persuaded they can save more by adopting a more powerful system.
- The EMP has proven a useful tool to build long-term customer relationships and retain customers.
- There are many additional potential upgrades to energy management systems such as the EMP, including the capacity to model real-time pricing.

Enel

Table 20 • Energy Efficiency Partnership

ENERGY IN TUNE WITH YOU.

City, Country, Region	Italy
Programme Type	Information, education and promotion, technology development, bulk procurement and distribution
Programme tenure	Ongoing since 2008
Sector focus	Residential, commercial, light industrial
Technology focus	Efficient appliances and equipment, energy management, demand control
Objectives	• Provide existing and new customers with an integrated package of energy services including energy efficiency • Capture new market opportunities offered by energy efficiency • Customer retention by providing desirable services and products
Budget	Not Available
Savings	5 Mtep of primary energy savings (2005-2011) 9.7 GWh per year
Contact Information	Daniele Agostini, Head of Wholesale, Renewable Energy and Energy Efficiency Regulation, Enel Holding, Daniele.agostini@enel.com
References	http://www.autorita.energia.it/it/index.htm http://www.enel.it/it-IT/reti/efficienza_energetica/ http://www.enelgreenpower.com/retail/it-IT/offerta/efficienza_energetica/

Summary and background

The Enel Group operates along the entire electric power value chain, including generation, distribution, retail and energy services. This allows Enel's Energy Efficiency Partnership (EEP) to mobilize energy efficiency savings throughout the Italian energy sector. Enel is well-placed to bring together energy efficiency suppliers (technology providers, financing, installers, and operators) with energy consumers (residential, municipal, services, and industrial customers). Business models carried out under the EEP umbrella include framework agreements, engagement of trade allies and working partners, services add-ons to information and communications technology (ICT) deployments, and customer out-reach.

Programme description

The EEP has two main thrusts. On the demand side Enel provides existing customers and potential customers with an integrated package of energy services, capturing new opportunities and building customer loyalty. On the supply side, Enel seeks out and engages with trade allies to overcome or bypass market barriers and create delivery capacity for energy efficiency goods and

services. The Partnership is designed to overcome two main obstacles to achieving a robust energy efficiency market:

- Insufficient coordination of market actors along the energy value chain, e.g., lenders, technology providers, project developers and promoters
- Informational, institutional, and capacity gaps preventing development of energy efficiency demand and supply (e.g., customer awareness, energy efficiency suppliers, lenders)

Partner engagement begins at the top of the energy value chain with large industrial players that design and manufacture energy savings technologies and products (e.g., efficient end-use equipment and demand monitoring and control devices). To achieve economies of scale and scope, Enel has partnered with trade associations such as COAER (Heat pump producers) and ANCI (construction companies) as well as large industrial players - Ariston (electrical appliances), Schneider Electric and General Electric (producers of energy monitoring and control devices), Philips (stand-by controllers), and Sonnenkraft (solar thermal water heaters). Partnership arrangements are flexible, in some cases involving joint targeting and marketing and in other cases using sourcing to exploit economies of scale (e.g., bulk procurement) for its franchise network (see below).

Enel also plays a role in bringing efficient technologies to market. Technology providers are often not in the best position to identify market opportunities and target specific consumer segments. Enel's central role in the retail energy sector creates an ideal opportunity to help supply meet demand, by engaging with technology and delivery partners and aggregating retail demand. For example, Enel recently concluded partnership agreements with Federalberghi (a hotelier association), Confesercenti (a association of small businesses, with more than 350,000 members), the Italian Federation for the Rational Use of Energy, or FIRE (more than 500 energy managers, ESCOs and technology providers), Domotecnica (a network of more than 1,200 energy efficiency-oriented companies) and CEOnline (a network of more than 2,000 energy auditing professionals). Through these partnerships Enel promotes energy efficiency awareness for business consumers through training and information on tariff optimization and access to financial incentives. Enel also promotes energy efficiency products and services provided by these partners through its marketing and sales channels.

Another strategy that addresses the especially fragmented market of small consumers is retail outlets. Enel operates its own franchise network of more than 500 EnelSi stores which sell energy efficient services (energy analysis and audits) as well as energy efficient products (heat-pumps, efficient lighting, efficient appliances and motors, water saving devices) and even renewable energy (solar panels). Individual stores not only sell energy efficient equipment but also mobilize local contractors to install and service the devices. Enel thus fills an important niche in the retail energy efficiency market both by creating a distribution network of franchised energy efficiency goods and services providers but also by making energy efficient products more affordable through centralized procurement, sales force training, marketing, customer support and maintenance.

Financing is always an issue in selling energy efficient products and services. Customers' are often interested in more-efficient products but may not be able to afford the extra purchase cost. Some customers may also be concerned about performance or other risks associated with new energy-efficient technology. Recognizing the need to address these challenges, Enel engaged with large operators in both the banking sector (MPS Bank, Intesa San Paolo Bank, Banca Popolare di Sondrio, GE Capital) and the insurance industry (RSA Insurance Group, INA Assitalia S.p.A) to create financial and insurance products tailored to the energy efficiency market. Through these partnership arrangements Enel promotes energy efficiency awareness in the financial sector through information and training on energy efficiency technology as well as

opportunities for energy efficiency products and services supported by public subsidies (*e.g.,* White Certificates). Enel not only provides financing but often advances the value of the public subsidies (white certificates) that are generated by an energy savings measure. Enel can provide these supportive services by exploiting the economies of scale of a large energy provider.

Enel's Energy Efficiency Partnership, undertaken in collaboration with strategic industry partners and consumer groups, are slowly building the Italian energy efficiency market. Enel occupies a strategic position in these efforts both because of its position within the energy value chain and its ability to leverage economies of scale and overcome the obstacles to robust markets for energy efficiency products and services.

Regulatory and market drivers

The main regulatory driver is the energy efficiency obligation placed on energy distributors, which requires Enel to achieve yearly energy saving targets based on the volume of gas and electricity it distributes.

Budgets vary depending on the type of initiative pursued, the target and the technology. Financing through government subsidies may also vary depending on the type of intervention. White certificate funding is approximately 90 Euro/toe. Fiscal credits are also available for residential refurbishments and installation of heat pumps and thermal solar heaters which will cover up to 50% of the cost of the energy saving measure.

Lessons learned

A true break-through in scaling-up the market for energy efficiency will only occur by better coordination and cooperation among all the market actors in the energy chain (technology providers, financial institutions, contractors, energy providers, and customers).

The energy efficiency market is still quite immature, making it difficult to exploit the economies of scale in providing energy efficiency services and products needed to bring down costs and broaden consumer appeal

Energy providers are well-placed to play a role in scaling-up the market, through a variety of activities including raising awareness, building technical capacity, creating economies of scale, and bringing energy efficiency to retail markets.

Energias de Portugal, S.A (EDP)

Table 21 • ECO EDP programme

City, country, region	Portugal
Programme type	Information, education and promotion, equipment replacement.
Programme tenure	Since 2007
Sector focus	Households
Technology focus	Lighting
Objective	Encourage consumer behaviour that will make Portugal more energy efficient. Distribute 10 million CFLs to households and social institutions
Budget	EUR 10 million per year (from 2007-2011)
Savings	5 TWh lifetime electricity savings 700 GWh annual electricity savings
Contact information	João Martins da Silva, EDP – DMK, joaomartins.silva@edp.pt.
Reference	www.eco.edp.pt

Summary and background

Energias de Portugal (EDP) encourages energy efficiency among its consumers as part of its commitment to sustainability. In 2007, EDP initiated the nationwide ECO EDP programme, which encompasses a variety of EE projects as part of Portugal's Consumption Efficiency Promotion Plan (PPEC). A key element of the ECO EDP programme has been large-scale CFL distribution to households and social institutions.

Programme description

ECO EDP has been implemented in stages, in line with the broader PPEC framework. Activities aimed at residential customers have included CFL education and promotion, appliance rebates, and energy saving advice. Educational promotion campaigns directed at the younger generation have included EE training and a touring "energy bus." Industrial sector activities included power-factor corrections and installation of electronic speed drives, while commercial sector activities focused on installing efficient lighting. Many of these programme components continue in today.

CFL promotion has proven one of the programme's most successful components. Although CFLs were not new when ECO EDP was introduced, the public still preferred incandescent lights, and only gradually came to accept CFLs as ECO EDP provided quality bulbs and conducted new distribution methods, notably a door-to-door CFLs for incandescent light bulbs exchange service, as well as distribution through hypermarkets, shopping centers, and EDP stores. The latest initiatives have been addressed to the needs of vulnerable populations, *e.g.*, social support institutions and families in need. Since 2007, almost 10 million CFLs have been distributed to the Portuguese population — nearly one CFL per person. In 2011–2012, in response to market saturation, CFLs have been distributed only to needy families who would otherwise have

difficulty affording them.

ECO EDP encountered issues that were specific to each campaign. The CFL activity faced difficulties with lamp connection size. In the most recent campaign, this was solved by providing packages with a mix of connection sizes. Concerns about verifying CFL installation were reduced by requiring CFL recipients to complete a survey form as proof of delivery. The surveys also collected important data on household lighting patterns, such as the total number of light fixtures, number of efficient bulbs, and hours of operation. The installation verification process has been refined over time, with simplified survey questions, contractor assistance in survey completion, and pre-paid envelopes making it easer and cost-free to return the survey forms

Based on analysis of survey data, the ECO EDP programme has helped reduce consumption by almost 5 TWh, equivalent to the energy consumed annually by nearly 2 million Portuguese families, while achieving savings of EUR438.5 million. EDP tracks customer satisfaction, compiling quarterly reports since 2007. Asked if they thought EDP helped them save energy, about 65% of customers have replied in the affirmative.

Regulatory and market drivers

Portugal's Consumption Efficiency Promotion Plan (PPEC) funded by Portugal's Energy Services Regulatory Agency (ERSE), provides financial support to initiatives that reduce electricity consumption (ERSE 2012). ECO EDP promotions and partnerships, two of the main drivers of success, have meant that most people have been eager to accept the CFL offer.

EDP fully supports ECO EDP activities. Those falling under the PPEC receive funding of up to 80% of the total cost of the measure from ERSE, paid for through electricity tariffs complemented by EDP financing. A total of EUR56.4 million have been invested in the ECO EDP programme — EUR14 million from EDP, and EUR42.4 million from ERSE.

Lessons learned

- Educating both residential and business energy customers becomes reinforcing, as energy consumers become more aware of energy savings opportunities that work equally well at home and at the office.
- Mass market programs such as CFL distribution require safeguards and M&V in order to maintain credibility and estimate energy savings results

Energias de Portugal, S.A (EDP) and Home Energy

Table 22 • Home Energy Knowatt Programme

City, Country, Region	Portugal
Programme Type	Advice and assistance, information, education and promotion, technology development
Programme tenure	Starting late 2012
Sector focus	Residential customers with smart meters
Technology focus	Smart meters and devices for informing customers on their energy use
Objective	Demonstrate that smart metering together with advice, assistance, and information can encourage consumers to save energy
Budget	EUR 225,000 for 100,000 customer trial
Savings	107 KWh annually per household (estimated) 1.1 GWh annually for the whole programme (estimated)
Contact information	Maria Ferreira maria.ferreira@homeenergy.pt

Summary and background

Home Energy's Knowatt programme was originally designed as a subscription service where consumers would pay for special energy monitoring devices. The programme has been restructured to take advantage of the energy data available to households with smart meters. The new Knowatt programme will not only provide data on customer energy use, but will also use multiple media to advice and assist end users to optimize their energy use. Knowatt will test whether customer outreach and communications can influence energy use.

Programme description

In 2011 the Knowatt scheme was selected by the Portuguese regulator for funding under the Promotion Plan of Efficiency in the Consumption of Electrical Energy (PPEC). PPEC is the main instrument in Portugal for funding energy savings projects.

The Knowatt scheme was originally conceived by Home Energy as a voluntary programme where consumers would pay for an in—home "energy dashboard" (e.g., a device that displays real-time energy-usage), with the balance of programme costs through the PPEC. In 2012, Home Energy was acquired by the Portuguese energy group Energias de Portugal (EDP), and the programme was redesigned to accommodate home energy monitoring of 100,000 households in a smart metering project. As redesigned, Knowatt will offer customers who already have smart meters the possibility of end-use data to be processed by Home Energy, who would in turn provide advice and assistance to induce more efficient energy consumption behaviour.

Knowatt's main innovation is to go beyond data processing and display services to present energy use information in a comprehensive and personalized way. Proactive customer outreach services will reach customers through cell phone instant messaging and smart phone applications. Through these, Home Energy will send personalized information on daily consumption patterns; perform extrapolations of consumption trends per household to project end of month costs; compare consumption averages with similar households and benchmark efficiency standards; and finally, provide advice on how to reduce or optimize consumption. The outreach strategies are expected to promote the idea of energy efficiency in customer's daily life.

ERSE will finance EUR 22.4 per household subscribed, based on an analysis of expected energy savings. Home Energy will finance the initial costs itself, estimated at EUR 225,000, and will recover these costs only if the programme is fully subscribed. Households will be charged a small subscription fee to help cover the roll-out costs.

Regulatory and market drivers

The main driver for Knowatt has been the yearly co-financing scheme offered by the Portuguese Regulatory Entity (ERSE). Even though it will only guarantee paybacks according to the number of client subscriptions, leaving a certain risk for Home Energy, the project is unlikely to have been considered viable without it. The smart metering pilot project undertaken by the electricity distributor is a major opportunity for Home Energy to demonstrate the valued-added of their advice and assistance concept.

Lessons learned

Knowatt will be launched in 2013, and its prospects for technical and commercial success are uncertain. The conditional co-financing approach used by ERSE places considerable risk on Home Energy regarding recovery of their start-up costs. Convincing customers that the advice and assistance is worth the subscription fee may be difficult, especially in tough economic times.

Beyond gaining subscriptions, Knowatt's most important challenge is to actually reduce household consumption through its informative approach. Although it will recover its initial investment if 10 000 customers apply, it is still unsure of how customers will react to the information assistance.

Project development experience to date provides a few otherlessons:

- Aim for a service/product that is simple/cheap and easy to adhere to, giving clients a first experience of consumption knowledge.
- Take advantage of infrastructure already in place or planned, preferring cheaper solutions that don't require equipment installation.
- Be careful of relying heavily on consumer's will to adhere to efficiency programmes. Perhaps it is best to create schemes that reach out to them in attractive ways.
- It is difficult to relate savings to the many activities that Knowatt will undertake through a measurement and verification scheme.

Eskom

Table 23 • National Efficient Lighting Project

City, country, region	South Africa
Programme type	Equipment replacement, bulk procurement and distribution, information, education and promotion
Programme tenure	Since 2007
Sector focus	Households and small businesses
Technology focus	Lighting
Objectives	Combat the power shortage by managing demand growth in the residential sector Help consumers manage their energy bills Provide jobs and economic stimulus to the energy efficiency industry and local communities Demonstrate the value of carbon development mechanism
Budget	USD 200 million per year through 2013
Savings	From 2004-2010: 6.7 TWh annual energy savings 2000 MW peak demand reduction 47 million CFLs installed
Contact information	Andrew Etzinger, Senior General Manager, Integrated Demand Management, Eskom: EtzingA@eskom.co.za.
Reference	http://www.eskomidm.co.za/funding-options

Background and summary

Eskom is a generation and transmission company wholly owned by the South African Government. Eskom administers a large Integrated Demand Management Programme (IDM) which includes energy and demand saving opportunities for both large and small users. Over the past decade standardized energy efficient products for mass market distribution have proved useful in combating power shortages and stimulating economic development. Over a six year period (2005-2011) Eskom replaced 47 million incandescent lamps with CFLs, saving 6.7 TWh of energy and reducing peak demand by 2000 MW. The National Efficient Lighting Project has delivered three-quarters of the total IDM demand savings over the past 8 years and played a crucial role in managing Eskom's ongoing power shortage. The programme also created 30,000 local jobs to carry out door-to-door and kiosk exchange campaigns. As a registered Clean Development Mechanism (CDM) project the programme received carbon credits for the seven million tons of CO2 emission reductions annually. It also saved participating households money on their electricity bills. As CFLs have only a 6-8 year lifetime, Eskom will distribute another 20-40 million CFLs nationwide between 2011 and 2013 under the CFL Sustainability Programme. [11]

[11] A ban on sale of incandescent lamps is expected to take effect in 2015.

Programme description

Eskom's National Efficient Lighting Project (NELP) and its follow-on programme, the CFL Sustainability Project, have been the most successful activity managed under the IDM. The resource contributions of the NELP are massive – equivalent to a peaking power plant of 2000 MW and avoiding 7 TWh of generation each year. The programme addressed the critical residential sector, which accounts for over one-third of electricity consumption. Lighting and water heating are the two most significant residential end-uses, and CFL replacement is by far the less expensive demand reduction measure at a cost of USD 150/kW or USD .007/kWh.

An equipment replacement programme such as the NELP has four elements – bulk procurement, delivery, safe disposal, and measurement and verification (M&V). Each is briefly described below.

Bulk procurement begins with equipment specifications, and Eskom set stringent specifications on CFL manufacturers (*e.g,* 15,000 hour life; Restriction of Hazardous Substances (RoHs); and Efficient Lighting Initiative compliant). International competitive bidding procedures were used, and vendors were selected based on availability, pricing and compliance with specifications. Eskom sourced CFLs from Osram, Philips and Eurolux with a delivery lead time of six weeks.[12]

Delivery took place via a national roll-out organized on a provincial and municipal basis. Several delivery modalities were used, including door-to-door, temporary community-based kiosks, and through Eskom and municipal distributor local offices. The roll-outs were promoted via community papers and radio stations and through household leafleting to alert residents that installer canvassing was imminent. Beginning in 2008, retailers including Woolworths and Pick 'n Pay organized their own CFL take back and disposal initiatives, directly partnered with CFL manufacturers. Retailers have a special advantage in disposing of the incandescent lamps and providing ongoing exchanges and safe disposal. Exchange points were maintained as part of each roll out, allowing any failed lamps to be quickly returned for replacement. All lamps were labelled with an Eskom logo and marked as "not for sale".

Mercury is an essential element in CFLs. Because mercury is a hazardous substance, extra measures need to be taken for safe disposal. Although an individual CFL operated normally emits no mercury and presents no hazard, the cumulative impact of a roll-out involving millions of CFLs can create a significant environmental impact. In particular CFLs disposed of in landfills can result in concentrations of mercury over time, and thus CFLs should not be disposed of within the normal household waste stream. Eskom, in partnership with municipalities and industry is investigating possible mechanisms for isolating CFLs from the general household waste stream.

South Africa has developed an impressive M&V capacity as part of its IDM. Eskom maintains an independent Energy Audit group situated in Eskom's Assurance and Forensic department to manages all IDM M&V. Eskom contracts with universities who provide their independent M&V results to the Energy Audit group. Thus there are two degrees of separation between the evaluators and the programme implementers. Annual M&V audits and site visits are conducted to track energy and demand savings as well as physical installation of EE projects (Eskom 2011).

Eskom's National Efficient Lighting Programme delivers significant socio-economic co-benefits in addition to energy savings and demand reduction, through job creation and reduced energy expenditures by households. Since 2005 Eskom has engaged a large workforce to exchange the CFLs for incandescent lamps by door-to-door campaigns, in temporary kiosks installed in communities, and through Eskom local offices. Additional workers were required to undertake the extensive M&V tasks associated with claiming the carbon credits for the programme.

In addition to hiring workers directly, Eskom also promoted small business development by

[12] There is no domestic manufacture of CFLs in South Africa.

encouraging ESCO start-ups specializing in working with local communities.

CFLs are also a significant cost-saver for consumers. A 60W incandescent lamp removed in favour of a 15W CFL will deliver approximately USD 5 per year in lower household energy bills, or USD 30 per year for a household receiving six CFLs. This is a significant savings for low and middle-income households. Other less tangible co-benefits include increased education and awareness on climate change issues and an enhanced sense of community as the CFL roll-outs stimulate the local economy and empower individual households (Eskom 2011).

Regulatory and market drivers

The main driver for EE/DSM programmes is insufficient power-system reserve margins caused by rapid demand growth and insufficient construction of new generation. A looming power shortage led to development of a new Regulatory Policy on Energy Efficiency and Demand-side Management, developed by the National Electricity Regulator of South Africa (NERSA). NERSA established the EE/DSM Fund, to be administered by Eskom, and defined the rules and procedures for its implementation. Eskom's IDM has capitalized on the contribution that lighting can make to achieve the national energy efficiency objectives, in line with the South African Government's 2005 National Energy Efficiency Strategy (NEES). The strategy sets a target of reducing energy intensity in the residential sector by 10% by 2015 through efficiency improvements. Eskom with consent of NERSA drastically scaled-up its EE/DSM efforts, relying heavily on the modality of the national CFL roll-out.

Lessons learned

- The National Efficient Lighting Project demonstrated the effectiveness of mass roll outs where the efficiency measure is provided for free. This works well for residential lighting, as individual consumers do not derive large benefits or are cost averse.
- Partnerships with local governments were a key ingredient. CFL projects rolled out in partnership with municipalities and local stakeholders (e.g., ward councillors and community leaders) and utilizing local installers were most effective.
- Customer communication done in cooperation with local government helped ensure buy-in and better understanding of how to resolve any product issues (e.g., exchange of failed units, safe disposal of spent CFLs).
- The spill-over benefits in terms of other economic development policies are also important to reflect and capture. In South Africa Black Economic Empowerment (BEE) Energy Services Companies (ESCos), particularly those qualifying as Black Woman Owned (BWO) and SBE (Small Black Enterprise), are trained up and hired to implement the CFL door to door exchanges. These companies often hire unemployed members of the local community, delivering both an economic boost to the roll-out area, support to small black entrepreneurs, and a general feel-good vibe in the local community.
- An important lesson just now emerging is how to sustain the energy savings gains from a mass roll-out of a relatively short-lived energy efficient device such as a CFL. Unless legislation banning sale of incandescent lamps is enacted, which is unlikely until 2015, or some other programme is introduced to induce households to replace spent CFLs with new CFLs, the demand reductions produced from the 2005-2011 roll-out will be progressively depleted. In the absence of a legislative ban Eskom is now beginning a second progressive roll-out of CFL exchanges, beginning with 6 million CFLs to be distributed in Western Cape, Limpopo, Mpumalanga, and the Eastern Cape.

Finnish Energy Industries Association

Table 24 • Action Plan for Energy Services

City, country, region	Finland
Programme type	Information, education and promotion
Programme tenure	2008–2016
Sector focus	All
Technology focus	All
Objectives	Mobilize private industry to meet the energy savings targets contained in the Finnish Energy and Climate Strategy as well as obligations under the Energy Services Directive
Budget	Unavailable
Savings	2.6 TWh equiv in cumulative annual heating energy savings; 1.3 TWh in cumulative annual electricity savings Goal is annual energy savings of 9% against 2005 levels by 2016
Contact information	Sirpa Leino, Adviser: Tel. +358505481128, sirpa.leino@energia.fi.
Reference	http://www.energiatehokkuussopimukset.fi/en/

Summary and background

Finland has traditionally utilized voluntary agreements to achieve energy savings. Finland's 2008–2016 voluntary Energy Efficiency Agreements were established between the government, Finnish Energy Industries[13], energy producers and distributors, and communities. The Action Plan for Energy Services is one of 13 plans that Finland has undertaken as part of the Finnish Energy and Climate Strategy. Under the Action Plan companies providing transmission, distribution and retail sales of electricity, and district heating and cooling not only improve their own energy efficiency, but also provide energy saving guidance to their customers.

Programme description

Aside from improving the efficiency of their own operations, companies that enlist in the Action Plan for Energy Services provide advice to their customers through a variety of channels including telephone, e-mail, Internet, and special events. They also distribute energy savings information to customers and educational materials to schools. The companies prepare regular reports on

[13] Finnish Energy Industries (ET) is a sector organization representing companies that produce, acquire, transmit and sell electricity, district heat and district cooling and offer related services. Finnish Energy Industries is responsible for the managing collective agreements undertaken on behalf of member companies, and it provides advice and training for its members as well as information collection and dissemination.

customer energy consumption, including year-on-year comparisons of individual customer's consumption as well as benchmarking against similar customers. The companies report annually on energy data, the EE measures delivered, and other activities related to the Action Plan.

About 90% of members of Finnish Energy Industries have signed the voluntary agreement. Participation enhances their company's image, which is important in a competitive retail energy market such as Finland. Finnish Energy Industries conducts education days for participating companies, providing EE information and recommendations on what they should report to their customers and how. They also assist in building networks and partnerships between companies, *e.g.* through annual two-day conferences where information and experiences are shared.

The Finnish state-owned energy services company Motiva is responsible for collecting information on consumer participation and energy savings from participating companies' online monitoring systems (Motiva, 2011).

Finnish Energy Industries has no budget to support the Energy Efficiency Agreements, and private companies implement these as part of their own commercial operations. However, the Ministry of Employment and the Economy provides some support.

Regulatory and market drivers

The voluntary agreement scheme plays a central role in Finland's effort to meet its EE targets. It is the primary tool for implementing both the 2008 national Energy and Climate Strategy and the EU Directive on Energy End-use Efficiency and Energy Services. The fact that this programme is a voluntary agreement works well, since it is widely understood in Finland that, by joining the agreement, companies help to avoid new legislation curbing climate change.

Lessons learned

- Voluntary agreements are effective in bringing together the government and private sector, with coordination and reporting shared by the industry association and state specialist agencies (e.g. Motiva). This helps remove any competitive disadvantages to signing the voluntary agreement, as companies are allocated the same targets, commitments and associated activities. Ministry involvement has helped to ensure the effective collaboration of all parties.
- Companies in Finland prefer voluntary agreements, and are more motivated to participate in such programmes, since they avoid the need for legislation, and voluntary agreements are more flexible and easier to amend than is legislation.
- Smaller companies often have more difficulties fully participating in such voluntary agreements, since they lack the resources to do much of the required research and work.
- Results to date indicate that provision of advice, assistance and information by energy providers can deliver household energy savings of 1-3%. However, no M&V has been done on which measures are more or less effective or economical. Many of the 'soft' measures that Finnish utilities provide - energy saving advice (telephone, e-mail, events), energy saving communication (magazines, printed material, internet), consumption feedback (opportunity to monitor one's own consumption on the internet on line, energy consumptions monitoring report sent to customers) need to be more thoroughly evaluated.

Florida Public Utilities

Table 25 • Residential Natural Gas Appliance Rebates

City, country, region	Winter Haven, Florida
Programme type	Financial incentives, information, education and promotion
Programme tenure	Ongoing since 2010
Sector focus	Residential
Technology focus	Various
Objectives	• Encourage wise appliance purchase decisions • Inform builders regarding benefits of natural gas appliances
Budget	USD 2 million annually
Savings	119,000 MWh annual savings (2011)
Contact information	Aleida Socarras, Marketing & Sales Director: Tel. +1 863 885 1806; E-mail: asocarras@fpuc.com.
Reference	http://www.fpuc.com/naturalgas/rebates-conservation/

Background and summary

Florida Public Utilities (FPU) provides rebates through the Residential Natural Gas Appliance Rebates programme for both new residential construction and upgrades of existing customers. The two upgrade categories include retention (gas to gas) and replacement (electric to gas). Natural gas appliances qualifying for this programme include high-efficiency furnaces, ranges, dryers, water heaters, high-efficiency tank water heaters, and tank-less water heaters. The rebate level varies according to category and appliance.

Programme description

This is a state-wide programme that encourages customers to apply for rebates to replace existing gas appliances with more efficient gas appliances and for electricity-to-natural gas appliance replacements. Seven investor-owned natural gas utilities developed the programme through a joint filing with the state regulator. Each participating energy provider applies the same rebates, which allows these gas distributors to mount state-wide marketing and advertising initiatives and simplifies participation by gas appliance trade allies (builders and contractors) who operate across energy provider jurisdictions. Much work was needed to conduct the joint filing, including cost-data compilation from each utility, development of methods to calculate customer participation rates, and the development of a consistent state-wide marketing strategy.

A flagship of the state-wide programme is a shared website, GetGasFL.com, along with promotional strategies tailored to each of the appliance categories (*e.g.,* stove, furnace, clothes dryer, water heater). Initiatives include an Energy Partners network, an FPU partner programme for contractors and builders improving outreach to target customers and making rebate payments easier for end users. Retention rebates will be improved by a model which predicts demand for new equipment among existing customers so that awareness promotions can be

better targeted. Replacement customers benefit from advice on phasing their transition from electric-to-gas, including the latest technology options and deciding between upgrading or changing fuels.

Main regulatory and market drivers

The USD 1.9 million budget for the Residential Natural Gas Appliance Rebates programme represents more than half of FPU's entire energy conservation programme. The rebate programme is funded through tariffs and must be submitted annually for approval by the Florida Public Service Commission. All ratepayer-funded EE programmes must comply with cost effectiveness tests. Natural gas programmes in particular must comply with the state-mandated *Cost Effectiveness Manual for Natural Gas Utility Demand Side Management Programmes*, which states that all rebate programmes must pass both the G-RIM (gas rate impact measure) and the Participants Test.

Lessons learned

- State-wide coordination among energy providers helps align the interests and objectives of stakeholders, and realize economies of scale in promoting and delivering energy savings measures. In Florida the energy Partner network has increased programme participation and market penetration.
- Marketing strategy should reflect the characteristics of distinct customer groups and appliance markets. Each of the three major household appliance markets - new construction, retention and replacement - requires tailored promotion and outreach strategies.
- Making new technology more accessible can led to greater market penetration. For example, tankless natural-gas water heaters are very popular for customers considering a switch from electricity to gas appliances.
- The natural gas industry in Florida would benefit from more clearly identifying quantifiable non-energy benefits associated with each appliance rebate, e.g. carbon dioxide emission reduction, job creation, and other economic benefits.

GDF Suez

Table 26 • Energy Efficiency Platform

City, Country, Region	France
Programme type	Advice and assistance, information, education and promotion
Programme tenure	Ongoing since 2006
Sector focus	Households
Technology focus	Appliances, household heating and cooling
Objectives	• Provide a single energy efficiency channel by delivering the complete energy efficiency value chain: initial assessment, project definition, realisation of work, sustainable operation, monitoring of results. • Save energy and therefore contribute to carbon emission reduction • Generate incentive for energy efficiency actions that contribute to meeting GDF SUEZ energy saving obligations.
Budget	Not available
Savings	GDF SUEZ delivered 14 TWh cumac for the first (2006-2009) period, and will deliver an estimated 65 TWh cumac for the second (2011-2013) period.
Contact information	Alexandre JEANDEL, Attaché Efficacité Energétique, Direction Stratégie et Développement Durable, tél : 01 44 22 43 65 alexandre.jeandel@gdfsuez.com
Reference	http://www.gdfsuez-homeperformance.fr/eco-efficacite http://www.gdfsuez-dolcevita.fr/portailClients/client/c/2/Mes_services/outils_sim/financer_travaux) http://www.lesecohabitants.fr/

Summary and background

The Energy Efficiency Platform from GDF SUEZ is a comprehensive programme that guides customers from the initial idea of saving energy through implementation of energy savings measures. Energy Efficiency Platforms are customized for each distinct market segment, including households, business, industry, and communities. Results are monitored in terms of numbers of contacts with working partners generated and of work proof returned.

Programme Description

The purpose of the Energy Efficiency Platform is to provide information, advice and assistance to customers considering how to save energy in their household or business.

For understanding household energy consumption and identifying everyday energy savings opportunities the offerings include:

- Free Energy Efficiency assessment (online or by telephone)
- Recommendations on conserving energy and living a sustainable lifestyle
- Access to personalized energy usage data and tools for analyzing home energy consumption (“Cap Eco Conso”)

- Community website (www.lesecohabitants.fr) for sharing energy saving information and advice.

For assistance in implementing an energy services measure GDF Suez offers:

- Energy savings measures implementation partner referrals
- Financing energy savings measures
- Subsidized credit lines through a commercial banking partner
- Maintenance services
- Equipment maintenance contracts with GDF Suez partners

The Platform allows easy access to a broad range of energy efficiency goods and services and also includes unique features for social networking on energy efficiency, accessing subsidies, and monitoring consumption and savings. The Platform also has a portal addressed to fuel poor people including energy efficiency recommendations and access to specialized energy-social services professionals.

The platform design drew from marketing studies, with the individual modules developed at the GDF SUEZ R&D Centre. It is branded as GDF Suez "Dolce Vita".

In 2012 "Dolce Vita" received 1.2 million visitors. Some 25,000 customers use the online "choose your actions" simulator annually, and the community website has 34,000 members.

The Platform is continually updated and refined based on feedback and suggestions from customers and GDF SUEZ staff and trade allies. A recent addition is the "Cap Eco Conso" service, which allows customers to access their energy consumption and estimate the savings from various energy savings measures..

The Platform plays a central role in encouraging customers to think of GDF SUEZ when considering home energy efficiency improvements. This is accomplished by positioning the Platform at the centre of many information and communications channels: direct phone contact, energy bills, trade partners, leaflets and promotions, and websites.

Regulatory and market drivers

The main driver behind this programme is the French White Certificates Scheme (Certificats d'économies d'énergie, or CEE), which obligates energy providers to meet energy savings targets.

The first obligation period ran from mid 2006 to mid 2009 with a savings target of 54 TWh cumac, of which GDF Suez accounted for 14 TWh cumac.[14] French energy providers including GDF Suez performed very well, surpassing the national savings target by over 11 TWh cumac. The second period runs from the beginning of 2011 till the end of 2013 with a much higher national savings target of 345 TWh cumac including 90 TWh cumac for car fuel providers. GDF Suez expects to deliver 65 TWh cumac through its Energy Efficiency Platforms and other activities.

The Platform also connects to other national, regional subsides or tax reduction scheme in order to respond to the financing needs of the customer.

[14] The unit of certificates is "TWh cumac" (TWh cumulé et actualise - cumulated and discounted), a unit that is unique to the French scheme. It counts the reduced TWh cumulated over the lifetime of the eligible measure. Savings are being discounted at an annual rate of 4%.

Lessons learned

The Internet and the dedicated “energy efficiency” phone line effectively respond to the needs of household customers. Customers can access information and other on-line resources freely and independently as they desire, and once they have decided to access further services they can quickly access a GDF SUEZ agent with whom to respond and interact.

Field testing is very important to successful launches of new product and services. In late September 2012, a new “Cap Eco Conso” services was officially launched. This free service makes it possible to access and analyze consumption online, using tools such as year-on-year comparisons, benchmarking based on similar buildings, and self-guided elaboration energy efficiency action plans. The new service offering following four months of intensive field testing and only after participants gave the service a high customer satisfaction grade.

Future additions to the Platform will include modules tied to energy savings opportunities associated with specific “life events”, such as renting an apartment or buying a house.

HERA SpA

Table 27 • Mobilizing industrial energy savings within the Italian White Certificates framework

City, country, region	Northern Italy
Programme type	Advice and assistance, financial incentives, Information, education and promotion
Programme tenure	Since the 2005 inception of the Italian White Certificates scheme
Sector focus	Industry
Technology focus	Industrial process improvements and equipment replacement
Objectives	• Satisfy part of Hera's energy efficiency obligations as an energy distributor. • Help customers to save energy, in line with meeting the EU 20-20 target.
Budget	EUR 300,000 annually
Savings	About one-quarter of HERA's annual energy savings obligation of 160 ktoe. Cumulative savings: 135 ktoe since 2009.
Contact information	Claudio Artioli (claudio.artioli@gruppohera.it) www.gruppohera.it Cumani Margherita (margherita.cumani@gruppohera.it)
Reference	http://eng.gruppohera.it/group/business_activities/business_energy/energy_efficiency/context_efe/page2.html

Summary

HERA SpA is a major multi-utility company in Italy, operating in almost 200 municipalities in the Northern Italy. HERA SpA provides not only energy (gas, electricity), but water (water systems, sewage and treatment), and waste management (collection and disposal) services to a customer base of 3 million users (including 1 million gas customers and 500,000 electricity customers).

HERA SpA is obliged to meet annual energy savings targets under the Italian White Certificates (WhC) Scheme. Building on early success with internal projects, HERA organized technical seminars that informed industrial end-users about energy savings opportunities and the business benefits of participating in the Italian WhC scheme. Once engaged, HERA provides a suite of energy services including energy audits, project development, equipment sourcing and energy savings measurement plans, and filling the WhC application– all on a no-fee basis. As the energy savings project is defined, HERA and the industrial operator enter into an agreement regarding joint development of the project and sharing WhC revenues. HERA thus assumes the risk of project identification and development, with industrial operators not required to assume any costs until the project is fully developed and bankable.

Through this strategy HERA diversifies how it meets its obligations. HERA originated energy savings of 45,000 toe/year during 2009-2011, one-quarter of its total annual obligation.[15]

[15] 1 ton of oil equivalent (toe)= 1 White Certificate

Programme description

As one of Italy's main gas and electricity distributors, HERA SpA is obliged under the Italian White Certificates (WhC) programme to meet an annual energy savings target, about 200,000 toe for 2012. Although HERA has the option of satisfying its energy savings target by purchasing WhC, it attempts to produce as much energy savings as possible through projects that it initiates. In the early years of the WhC Scheme HERA met its energy savings targets through energy saving at its own facilities. HERA has capitalized on the know-how gained from operating its own power plants, waste treatment facilities, municipal waste incinerators to develop a suite of energy services broadly applicable to industrial operators.

HERA engages with industrial operators to inform them of the business opportunity provided by the Italian WhC scheme. Beginning with informative lessons and workshops, HERA engages with individual operators to perform energy audits, identify energy savings opportunities, specify technologies, analyze savings and costs, and develop financing arrangements. HERA's partnership with industrial customers is governed by a Protocol of Agreement laying out the working and financial responsibilities of each party, including arrangements for sharing energy savings, the WhC revenue stream, and allocation of project-related costs.

The engagement with industrial partners contributes to the system development and allows HERA to release white certificates at comparatively low costs, in some cases sharing the energy savings shared with its industrial partners. HERA works across industrial sectors – food processing, chemicals, manufacturing. Typical energy savings projects include heat recovery, drying furnaces, mechanical vapour compression, cooling systems, lighting, and process improvements. HERA also maintains a stable of specialist partners – ESCOs, consultants, technology providers – and often brings these specialists in as project partners.

The industrial operators are best-acquainted with their own equipment, processes and productive cycle, and thus energy audits and identification of the most promising technological improvements are conducted in a participative way. Industrial operators typically require a period of 3-4 years or less for them to commit to a project. The additional revenue flow from creating WhC can reduce significantly the payback period. In the most favorable cases, energy savings can produce, in a 5 year-period, up to 60 % of the revenue stream while creation of WhC can reach the other 40% of the revenue stream. HERA makes the energy savings project bankable by offering industrial end users risk-free access to the WhC scheme. Because HERA is accredited by the regulator authority (AEEG), and surrenders its White Certificates annually, the value of each certificate generated with its industrial partners is more predictable and stable than spot market prices. The percentage of the recovery price shared with the partner is defined on the contract, depending on complexity and size of the project, type of M&V system, and project development costs. HERA primarily seeks to recover the costs of its Energy Management Unit.

While the industrial operator ultimately makes the project investment, HERA helps reduce the project risk and transaction costs by providing a suite of services including:

- Project development, technical specification, costing and scheduling;
- Preparing the WhC applications and submitting to the regulator;
- Managing project implementation;
- Developing, implementing and operating the M&V scheme;
- Transacting the White Certificates directly with the Italian energy regulator (AEEG).

HERA has delivered more than 40 projects across several industrial subsectors including chemicals, manufacturing and food processing. Technological improvements have focused mostly on more efficient furnaces, mechanical vapour compression in chemical industry, more

efficient evaporators, and efficient cooling systems. HERA's business model has generated several co-benefits. Participating industries have become more competitive as energy savings result in lower production costs. Within HERA itself, there has been an increase in staff. A new working group was established within the Energy Management Unit, with operators dedicated to the development and monitoring of HERA's industrial energy savings projects.

HERA has developed new competencies in complex M&V schemes. Every project is customized – there are never any standard measures in the industrial sector - and must be carefully monitored to determine actual vs. projected savings. This is also vital because each monitored variable is used in the shared savings algorithm defined in the project proposal submitted to the regulator. The simulated efficiency gains performed before the projects' implementation have been generally accomplished, assuring the expected flow of WhCs for HERA and its partners.

Regulatory and market drivers

There is both a regulatory and a market driver behind HERA's business model. Italian electricity and natural gas distributors are required by law to pursue end-use energy efficiency, according to targets determined by the Italian energy regulator. Distributors such as HERA can either directly implement energy efficiency measures, contract energy service companies to implement energy efficiency measures, or purchase energy efficiency certificates through a WhC market. The regulator accredits any eligible party wishing to create WhC through energy savings projects, and also verifies and certifies the energy savings delivered, on the basis of detailed documentation.

The market driver is the opportunity for energy providers such as HERA to diversify into providing energy saving project services. By creating an Energy Management Unit, HERA is well positioned to take advantage of a growing market for energy efficiency goods and services in the future.

Lessons learned

- The industrial sector offers many opportunities for obligated energy distributors seeking to develop energy savings projects. Industries are receptive to partnerships that mobilize incentives from the WhC scheme to create bankable energy saving projects.
- HERA's business model offers an opportunity for industries to invest in guaranteed energy savings and access the incentives coming from the WhC scheme. The White Certificate scheme acts directly to reduce the payback period of industrial energy savings investments, thus making many more projects financially feasible than would otherwise be the case. The distributor and the industrial operator are natural partners as they both stand to benefit from developing energy savings projects.
- HERA's business model is replicable for distributors who develop the necessary skill sets for engaging with industrial partners, developing diverse projects, and implementing complex M&V schemes. HERA developed core competencies in drawing the attention of industrial managers to the potential of the White Certificate scheme, identifying, preparing, and delivering energy savings projects, and designing the monitoring, measurement and verification (M&V) plans needed to originate the WhC and satisfy the regulator.
- Gaining the trust of industrial operators was a major challenge for HERA. Collaborating with industrial associations and offering information seminars on the energy savings incentives provided by the WhC scheme was a good strategy for engaging with individual industrial managers.

Iberdrola

Table 28 • Integrated Energy Management Programme

City, country, region	Spain
Programme type	Equipment replacement, advice and assistance
Programme tenure	2010 – ongoing
Sector focus	Large residential, commercial and administrative (municipal, regional and state) buildings with centralized heating and hot-water production.
Technology focus	Centralized heating and hot-water heating systems
Objective	Develop an integrated energy and energy services management model for centralized heating and hot-water systems
Budget	EUR 100,000 (per project)
Savings	0.13 GWh annual energy savings (per project)
Contact information	Raquel Blanco Collado, Head of Efficiency and Energy Services, Tel. +34917842345; **rblancoc@iberdrola.es**.
Reference	https://www.iberdrola.es/webibd/corporativa/iberdrola?IDPAG=ENWEBCLIINSEFI

Summary and background

Iberdrola's Integrated Energy Management initiative utilizes an ESCO model to upgrade and manage centralized heating and hot-water systems. Iberdrola manages everything related to renewing and operating heating and hot water systems, including higher-efficiency equipment to allow greater energy savings and maintenance over a 10-year contract period. No investment is required from the customer, overcoming what is often a major barrier to energy savings projects. Iberdrola's Integrated Energy Management initiative contributes to both good customer relations and new business development.

Programme description

Through this activity Iberdrola finds and replaces older fuel-oil or coal-burning boilers with newer, more efficient natural-gas installations, facilitating financing and then maintenance under a long-term contract.

Iberdrola's market research found many customers running up high energy bills due to old heating systems but reluctant to take on the expense and risk of replacing them. Iberdrola decided to orient this product towards centralized heating and hot-water production in residential blocks and complexes, hotels, commercial centres, and sporting facilities. Iberdrola offers a 10-year energy services contract, providing an all-inclusive suite of services including the upfront investment, engineering, procurement of equipment and execution of installations, natural gas supply, electrical connections, maintenance, remote monitoring and operation, and 24-hour assistance. With no investment, the customer receives only the heating and hot water they need plus part of the energy savings, which can be as much as 20–25% (under the energy

services contract a portion of the savings flows to Iberdrola to repay their investment costs). Both Iberdrola and customers benefit from operation of the more efficient systems, and after the ten-year contract expires the customer can claim all of the energy savings.

Iberdrola is piloting the first four installations since 2011 and is scaling-up the activity in the next years. If successful, Iberdrola will establish this activity as an ongoing part of their energy services offerings to residential complexes, hotels, and sporting complexes.

Regulatory and market drivers

The Integrated Energy Management programme is purely market-driven. There is no mandate for Iberdrola to implement this programme.

The budget depends on the required number of installations. A single installation typically costs EUR 100,000–200,000. Depending on the complex, it could cost more. The Government subsidizes as much as 10–15% of the investment with certain types of EE equipment and depending on the region. As part of their ESCO service, Iberdrola manages applications for these subsidies on behalf of customers.

Lessons learned

Residential apartment buildings are a particularly promising niche market for installation of high-efficiency centralized heating and hot water systems. Customers are not fully aware of the improvement potential such an upgrade can offer. This market opportunity represents a significant business opportunity for Iberdrola, as energy savings are shared between the energy provider and the customer.

Iberdrola USA

Table 29 • Non-residential Block Bidding Programme

City, country, region	New York State
Programme type	Financial incentives, bulk procurement and distribution
Programme tenure	2010–2015
Sector focus	Commercial, municipal, and industrial customers
Technology focus	All
Objectives	Mobilize energy savings via open bidding for new projects
Budget	USD 6.7 million combined for NYSEG and RG&E
Savings	25 GWH electricity savings (2011); 4,602 kW peak demand reduction
Contact information	Joni Fish-Gertz, Manager, EEPS Programmes: Tel. +1 607 725 3936; jjfishgertz@nyseg.com.
Reference	http://www.nyseg.com/UsageAndSafety/usingenergywisely/eeps/blockbid.html http://www.rge.com/UsageAndSafety/usingenergywisely/eeps/blockbid.html

Summary and background

The Block Bidding Programme is administered by the New York State Electric & Gas Corporation (NYSEG) and Rochester Gas and Electric (RG&E), subsidiaries of Iberdrola USA. It is a sealed-bid auction designed to allow project developers to offer energy saving projects that increase total savings above levels expected from energy provider-administered programmes. The programme has been recognized by the New York state regulator as a model for other investor-owned utilities.

Programme description

The Block Bidding Programme is open to everyone - commercial, industrial and municipal customers, ESCOs, performance contractors and management companies. Bids are submitted in response to periodic closed-ended auctions administered by NYSEG and RG&E. Winning projects are funded by energy providers and counted against the New York State Public Service Commission's Energy Efficiency Portfolio Standard (EEPS).

Any non-residential NYSEG or RG&E electric customer that pays an EEPS System Benefit Charge (SBC) can submit an energy saving project. A bidder can aggregate multiple sites and multiple measures into a single bid in order to reach the minimum bid threshold of 100 MWh. This permits smaller projects to bid in, promoting broader participation. The Programme encourages third-party bidders, such as ESCOs, performance contractors, and management companies, to

prospect for customers and energy savings projects. Within the confines of each auction, bidders compete against each other for a finite amount of energy savings up for bid. This competitive procurement approach allows NYSEG and RG&E to reduce the costs of the energy savings projects chosen.

Programme marketing includes targeted e-mail, direct mail, press releases, website announcements, outreach meetings with potential bidders, direct customer and bidder contacts, secondary outreach through other programmes, and training webinars. NYSEG and RG&E conduct process evaluations and M&V, applying internal quality assurance (QA) processes as well as protocols and standards specified by the regulator.

This programme has been well received and successful, as NYSEG and RG&E exceeded their energy savings targets for 2010-2011. The programme has been extended through 2015.

Regulatory and market drivers

The programme was established by a New York State Public Service Commission Order in 2010. Earlier, in 2007, the Public Service Commission adopted a regulatory directive to reduce, by 2015, New York State energy consumption by 15% through a combination of utility-sponsored EE programmes, and programmes offered by a separate, public benefit corporation, the New York State Energy Research and Development Authority (NYSERDA). Then, in 2008, the New York Energy Efficiency Portfolio Standard (EEPS) provided the framework and impetus for NYSEG and RG&E/Iberdrola USA and other state programme administrators to develop and implement EE programmes in New York State.

The programme is funded by the EEPS system benefit charges (SBC) paid by most customers.

Lessons learned

- A pre-qualification step ensures that all projects meet basic cost effectiveness criteria, reducing administrative expense while building the capacity of bidders to submit better proposals
- The block bidding programme is a novel concept, and thus traditional trade allies need education on how the bidding programme differs from traditional utility programmes
- The programme has attracted its highest participation rates in urban areas, where most ESCOs and aggregators are located. There is a need to mobilize such third parties in suburban and rural areas.

Innowatio

Table 30 • Mobilizing energy-savings and White Certificates from healthcare facilities

City, Region, Country	Italy
Programme type	Advice and assistance, financial incentives, comprehensive implementation
Programme tenure	Ongoing since February 2011
Sector focus	Hospital, Commercial, and Municipal
Technology focus	Combined Heat and Power, tri-generation, end use efficiency
Objectives	Exploit energy savings opportunities through an Energy Portfolio Management programme, sharing the savings and White Certificates revenues with customers via an Energy Performance Contract.
Budget	EUR 6 Million case study project cost
Savings	1900 toe annual savings (23 GWh)
Contact information	Mattia De Vecchi, Business Development Manager, +39 329 9035 621 – mattia.devecchi@innowatio.it
Reference	www.innowatio.it

Summary and background

Innowatio is an Italian ESCO providing energy management services to large energy users. Innowatio provides energy assessments, sourcing of energy requirements, and development and operation of energy saving projects. Innowatio specializes in matching up technology providers who can deliver the plant and process improvements identified for a given client. Innowatio benefits from the White Certificates scheme which obligates Italian energy distributors to meet energy savings targets. Innowatio recently delivered a EUR 6 million energy management project in two different hospitals of the privately-owned Humanitas Group. Innowatio identified, designed, financed and coordinated the installation of multiple energy efficiency improvements, sharing the operations cost savings and White Certificate (WhC) revenues with Humanitas through an Energy Performance Contract (EPC).

Programme description

Innowatio is a specialized player in the Italian ESCO and White Certificates markets by virtue of its energy management portfolio approach, which seeks to optimize procurement and consumption of gas and electricity from both traditional and renewable sources. Innowatio works with large energy consumers in the industrial, tertiary sector and public sector, cutting their expenses through energy savings, demand-side management, and sourcing low-cost wholesale energy.

The Innowatio-Humanitas partnership targeted two hospitals in Milan and Bergamo with combined capacity of 900 beds and 28 operating rooms. The energy management portfolio was shaped jointly by engineers and managers from both Innowatio and Humanitas over a six month

planning period. Through daily observations, both parties studied the medical and comfort needs of patients, with the aim of integrating patient needs and energy savings opportunities.

Innowatio conducted energy audits and cost-benefit analysis in order to evaluate the energy savings opportunities within each facility. This evaluation led to several energy saving initiatives which were financed by Innowatio:

- Defined optimal levels of thermal and lighting comfort for different hospital spaces;
- Optimized cooling systems through centralized production of chilled water, addition of absorption chillers, and improved distribution controls;
- Light Emitting Diode (LED) and occupancy sensor installations;
- Revamping of existing CHP plants (yet to be executed);

Innowatio and Humanitas entered into an energy performance contract (EPC) projecting expected energy and demand savings, price baselines, and WhC revenues. In exchange for its investment, Innowatio receives half of the monthly energy savings and half of the White Certificates revenues generated. The EPC has a buyback provision regarding energy efficiency investments with a payback period longer than three years, thus allowing the customer to change partners by buying-out Innowatio's depreciated plant investments.

Process and operational changes in the first year of the project's operation delivered energy savings of 8%, energy bill reductions of 12.5%, and produced 900 White Certificates.[16] Energy bill savings generate the lion's share of project benefits – almost 90% over the 10 year life of the project. Innowatio takes charge of applying for the White Certificates administered by the Italian Energy Authorities. In 2011 the market value of 1 toe, or 1 TEE, is about EUR 100.

Regulatory and market drivers

The energy efficiency obligations on Italian energy providers are the market driver, creating the additional revenues from White Certificates that make the EPC more desirable for both energy users and ESCOs. Energy providers in Italy are obligated to self-produce or purchase increasing amounts of TEECs each year.

Lessons learned

- An integrated approach to procurement and management of energy produces maximum energy bill savings. Innowatio's Integrated Energy Management contract bundles together services that are usually separated. Combining efforts on the price/quantity continuum makes it possible to optimize the type, price, and quantity of energy supply and demand.
- Detailed energy audits are essential for developing a durable Energy Performance Contract, including the baseline price and savings estimates and M&V approach.
- Innowatio's demand side management assessment approach works well in facilities with complex energy needs. Innowatio worked closely with Humanitas to develop measures which save energy without jeopardizing the healthcare operations.

[16] TEE stands for titoli di efficienza energetica, and is equal to a toe

ISO New England

Table 31 • Forward Capacity Market

City, Country, Region	New England
Energy provider	ISO New England
Progamme type	Bulk procurement and distribution, financial incentives
Programme tenure	December 2006, with first auction in Feb 2008
Sector focus	All sectors
Technology focus	All technologies
Objectives	Procure sufficient capacity resources to ensure overall resource adequacy at economically-efficient prices. For energy efficiency providers, bids accepted into the capacity market provide additional revenue to offset energy efficiency programme costs.
Budget	USD 62.4 million in annual transactions
Savings	1,514 MW cleared in 2012 (peak MW reduction for the capacity commitment year 6/1/2015-5/31/2016) 5.5 TWh of annual savings in 2012 projected to increase to 7.2 TWh of annual savings in 2015
Contact information	Henry Yoshimura, Director, Demand Resource Strategy hyoshimura@iso-ne.com
Reference	http://iso-ne.org/markets/othrmkts_data/fcm/

Summary

ISO New England (ISO-NE) is the regional transmission system and wholesale market operator serving the New England region of the United States. ISO-NE operates the Forward Capacity Market (FCM), which uses a competitive auction to procure capacity resources based on future capacity needs. Energy efficiency (EE) and other demand-side resources can compete in this market on an equivalent basis with generation. ISO-NE acts as the market administrator, managing the auction and setting requirements for participation. From the system operator's perspective, a forward capacity auction ensures there is enough future capacity available to ensure overall resource adequacy at economically-efficient prices. The Forward Capacity Market is a break-through because the procurement rules do not distinguish between supply-side capacity contributions and demand-side capacity contributions. ISO-NE's FCM is indifferent to sector or technology when procuring capacity, as long as it can be measured and verified. The FCM is notable because it is the first application of a market construct, instead of an integrated resource planning construct, to place a value on the capacity supplied by energy efficiency programmes.

Capacity prices available through the FCM have created a supplemental source of revenues supporting efficiency programmes funded through retail rates. The vast majority of EE bids into the capacity market have come from the region's utility distribution companies and third party administrators. Institutionally the FCM has produced very positive results, proving the resource value of energy efficiency in a practical way to planners, operators, regulators, and policy makers.

Programme description

The objective of ISO-NE's wholesale capacity market is to procure enough capacity to ensure overall resource adequacy at economically-efficient prices. The FCM is designed to procure capacity commitments three years in advance of when it is required. Energy efficiency bids into the annual auctions under Passive Demand Resource categories and ISO-NE only considers capacity contributions, e.g., its ability to reduce summer and winter season peak load. Bids are selected on a dollars-per-kilowatt-month (USD/kW-month) basis and compared to other supply and demand-side resources in its ability to provide capacity. Bids are invited on an area (locational) basis, attracting new resources to where they are most needed by offering higher price signals in constrained areas.

EE providers were active in the FCM development process, seeing an opportunity to shape a new wholesale market in which they could participate and receive payments. However, EE providers were also challenged by the higher compliance standards and prospect of penalties included in the market rules. Bids into the FCM must be underwritten, and capacity suppliers are penalized if they do not deliver as scheduled. For system and market operators, the willingness of energy efficiency providers to accept these conditions contributes to a higher level of confidence that energy efficiency can substitute for other capacity resources.

Suppliers of EE capacity have received over USD 100 million (USD) in capacity payments between 2008 and 2012, about USD 25 million annually (Hurley, 2012). The vast majority of EE capacity is bid into the market by utilities, which are already required to deliver EE by state regulators and policymakers. In the sixth capacity auction, held April 2-3, 2012, 1,514 MW of EE resources cleared, or approximately 42% of the total demand resource capacity (3,645 MW). Notably, EE made up more than three-quarters (78%) of all new demand resource capacity (Yoshimura 2012).

Although an important supplement, this revenue makes up only a small portion (about 5%) of the total amount of total ratepayer spending for EE programmes in New England.[17] Since EE budgets have been increasing (from 353 million USD in 2008 to 1,029 million in 2012) while capacity market revenues have remained essentially flat, the proportion of EE revenues from the capacity market has actually been shrinking. Capacity market prices remain too low to develop an EE industry not supported by obligations on energy providers.

Developing effective M&V protocols was the most-challenging aspect of opening up capacity auctions to allowing demand-side resources. A typical EE programme in the US is required to meet a relatively modest evaluation standard, *e.g.,* benefits must exceed costs on a programme-wide basis. If a ratepayer-funded programme estimated *ex ante* to have a benefit to cost (B/C) ratio of 3 turns out to have an *ex post* B/C ratio of 2, the programme is still cost-effective and counts toward the utility's EE obligation. A demand resource bid in as to capacity must meet a much stricter standard. A MW of capacity offered by an energy efficiency programme must offset a MW of generation at the time of scheduled delivery. M&V for energy efficiency capacity offers must prove that the programme did indeed deliver, just as a 50 MW generator would be expected to produce 50 MW of power.

Capacity M&V protocols focus mainly on two things: what is the load reduction during scheduled

[17] Over that same time period, New England utility budgets totalled USD 2,804 million.

delivery hours, and what is the confidence that the load reduction delivered as scheduled on a given day. Because energy savings comes from many sources and sectors, the ISO had to develop M&V protocols that could handle a wide variety of technologies and that could be adapted to new technologies as they are developed. Individual programmes must also be tracked throughout their life in order to ensure continued compliance, adding an additional administrative burden on EE suppliers and ISO-NE (ISO-NE, 2012).

Regulatory and market drivers

The FCM was shaped by several driving forces. After establishment of competitive wholesale markets in the New England region, a number of generators operating older plants found it difficult to earn enough revenues in the wholesale energy market to maintain profitability. The amount of capacity being retired was large enough to threaten system reliability, and caps on wholesale energy prices imposed by federal regulators weren't high enough to construct new generation.[18] ISO-NE sought to resolve the reliability problem within the constraints of wholesale energy price caps imposed by federal regulators and fixed retail energy pricing imposed by state regulators. The solution was a new market focused on procuring forward capacity.

After extensive consultation, in 2006 ISO-NE proposed a market design which would offer a supplementary source of income for market participants providing capacity resources. The settlement process covered the nature of the auction, how resources would qualify, how resource performance would be measured, penalties for non-delivery, and what capacity types would be included. For the first time demand resources were deemed eligible to bid capacity, without any detail as to how this would work. ISO-NE organized a stakeholder process including third-party energy efficiency providers, energy efficiency aggregators, and utilities to develop these details. A key task was extending ISO-NE market rules to incorporate demand-side participation in capacity auctions. Basic questions, such as what qualifies as a resource, what is a suitable M&V protocol, and what penalties would be levied on non-performance, needed to be reformulated to include passive and active demand-side resources.

Lessons learned

- Energy efficiency has demonstrable capacity benefits which can be valued in a wholesale market construct. However, opening up capacity markets to demand-side participation requires modifying market rules to include demand-side resources while maintaining the high compliance standards for all capacity providers.
- ISO-NE was the first system operator to create a wholesale market structure that allowed demand-side resources to compete, on a USD /kW-month basis, with generators. Another regional transmission system and market operator, PJM LLC, quickly followed suit. The auction process is distinct from least-cost planning, where the utility derives the need for energy efficiency based on the forecast avoided costs of supply. Under a capacity auction, it is the market clearing price that determines the final resource mix.
- The FCM has proven to be a reliable, if not dominant, source of co-funding for energy efficiency programmes. The FCM market construct places a value on the capacity co-benefits derived from energy efficiency programmes. Energy providers deliver energy efficiency to meet their energy savings obligations, expressed in MWh. The forward

[18] Theoretically energy markets should provide sufficient revenues to generators to stimulate capacity additions. However, market power concerns and a desire to avoid price volatility led to the development of a bid price cap on wholesale energy prices of USD 1,000 per MWh. One side effect of the cap, however, was to reduce the ability of peaking generation to earn enough revenue through the wholesale markets to recover their fixed costs.

capacity market allows these energy efficiency providers to monetize and capture the capacity benefits that energy efficiency also delivers.

- Reformulating market rules to accommodate demand-side resources was a challenge. Designing this new market required establishing market rules at least three years prior to the first auction. It is essential to involve all of the relevant stakeholders from the beginning in such a process. Although a wide range of stakeholders complicates the rule-making process, it is important to ensure everyone has a say in the rules as they are developed. Such stakeholder involvement also yields better results as all of the relevant issues can be revealed and addressed in the rule making process.
- Strong M&V protocols are required to ensure energy efficiency can participate comparably with generation resources in a capacity market. The protocols need to be in place and agreed upon before the market opens. This is in contrast to utility EE programmes, which may not be measured until after they are already underway. M&V protocols also need to be harmonized. ISO-NE is regional, covering multiple states each of which may have different M&V requirements. Work at the beginning of the process to make all of the requirements as comparable as possible is essential.
- The capacity auction and accounting process had to be adjusted to handle the smaller scope and shorter life span of EE measures. Energy efficiency measures are allowed to set the capacity clearing price in their first year, but must be capacity price takers for each following year and must be removed from the auction completely at the end of their expected life. Demand-side measures also come in much smaller units than generators. Keeping track of the total capacity available is thus an accounting and record-keeping challenge.
- Annual auctions also mean that new energy efficiency measures are bid in every year, with a corresponding need to consider appropriate M&V protocols and compliance standards. This is in general beneficial, as the FCM acts as an innovation engine to spur new demand-side technologies and measures. However it also places a strain on the market operator, who must be able to accommodate these measures within the strict M&V regime, and also on the EE providers who are required to offer into an auction years into the future, beyond any approved budgetary timeframe or certainty of programme design. A current development is behavioural programmes, which can be particularly difficult to measure.
- Forecasting has also become more complex with the inclusion of energy efficiency and demand side measures. Unlike a generator, which acts to serve load, a demand-side resource reduces the load that needs to be served. This considerably changes the system operator’s current methods for both long-term forecasting and short-term system balancing.

Kalmar Energi

Table 32 • Oil-to-district-heating conversion programme

City, Country, Region	Kalmar, Sweden
Programme Type	Advice and assistance, technology development
Programme tenure	Ongoing since 2010
Sector focus	Commercial and industrial
Technology focus	Boilers, hot water heaters
Objectives	Help commercial and industrial customers with process heat requirements to switch to district heating
Budget	Approx. EUR 0.5-1 million per project
Savings	Approx. 8 GWh annual energy savings (indicative single project)
Contact information	Urban Bergsell Kalmar Energi Försäljning AB Direct line and mobile: +46 480 451 053 urban.bergsell@kalmarenergi.se
Reference	http://www.kalmarenergi.se/

Summary and background

Kalmar Energi is a vertically integrated supplier of heat and power to the Kalmar region of southern Sweden. Following the Swedish energy philosophy, Kalmar strives to improve primary energy efficiency through expansion of its combined heat and power (CHP) network. Kalmar can achieve higher primary energy efficiency by producing and distributing more hot water production, and thus seeks opportunities to partner with customers who use expensive fuel oil or electricity to produce process heat and hot water. Kalmar's oil/electricity-to-district-heating conversion programme increases overall efficiency in Sweden, provides consumers with more convenience and lower energy bills, helps reduce Sweden's dependence on imported oil, and affords Kalmar Energi with the opportunity to grow its business.

Programme description

Sweden has well-developed systems for district heating and combined heat and power generation. In the Kalmar area over 95 percent of the houses and businesses are served by district heat. Kalmar Energi is a municipal electricity and heat provider operating a super-high efficiency 90 MW CHP plant and associated power and heat distribution networks. As there is no pipeline gas in this part of Sweden, customers must choose between electricity, district heat or oil for their process heat and hot water requirements.

In Sweden many industries with large process heat requirements, such as dairies, hospitals, slaughterhouses, and food processors, use oil-fired boilers and hot water heaters to meet their steam needs. These industries may or may not be connected to a CHP network. As a district heating supplier, Kalmar Energi is always seeking to optimize the overall efficiency and cost of co-

producing power and heat. Kalmar currently seeks to produce more hot water and more electricity and as appropriate add additional customers to its network.

Kalmar Energi's oil/electricity-to-district-heating programme seeks to move large energy users away from oil/electricity and towards district heating for their process-heat needs. Such fuel switching is beneficial to customers as they avoid a large environmental tax levied on oil consumption, and experience overall energy savings as already-available district heat is substituted for expensive, imported oil. In Sweden, the dairies and other industrial facilities are very close to cities and many are currently connected to district heating systems for space-heating, making it possible to consider converting dairies and other food processors to hot water provided by the district heating system.

Kalmar Energi looked at their biggest industrial consumers of oil to find possible markets for the oil-to-district-heating programme. These industries are more concerned with producing goods than saving energy, so Kalmar assists them in evaluating the feasibility of an oil-to-district-heat conversion project. These efforts are consistent with previous district heating energy efficiency measures undertaken by Swedish combined heat and power operators, such as:

- individual metering and room-by-room heat adaptive regulation for customers
- improving delivery efficiency through insulating pipes and improved pumping
- Improving the end-use mix of electricity and heat at the point of consumption
- Improving the end-use efficiency of energy consumption

One dairy in Kalmar uses low-pressure process steam produced from either oil fired or electric boilers, as is traditional in Sweden. Process analysis revealed that 80% (15 GWh) of this energy has the potential to be replaced with district heating. This can be accomplished by installing a new internal system of distribution, replacing the steam with hot water. In addition to a new internal distribution system, this project will call for the installation of a heat-exchanger to separate the internal system from the main district heating system to ensure the safety and cleanliness required by food producers.

Achieving half of the total 15 GWh saving potential from conversion would cost 500,000 Euros for the dairy and 250,000 Euros for the district heat supply modifications. Because of the expense, the project will occur in stages. Implementation of this project would benefit Kalmar Energi by allowing them to readjust their co-production towards more electricity and hot water output; it would benefit the dairy by decreasing energy consumption and cost, and increasing efficiency. In order to proceed, the dairy needs a 3-4 year payback period; however, the current payback is closer to 6-8 years.

Kalmar Energi is developing their technical expertise and engineering development on projects like this; similar technical solutions of can be replicated and used elsewhere in Sweden and across Northern Europe by energy companies and dairies. They also work closely with the Swedish District Heating Association to share knowledge and create working groups.

Regulatory and market drivers

There are no energy provider obligations in Sweden, and Kalmar Energi has no regulatory obligations to deliver energy efficiency services to its customers. The conversion from oil or electric boilers to district heat represents both a commercial opportunity for Kalmar Energi to improve its balance of production between heat and electricity and an energy-savings opportunity for customers willing to invest in the conversion equipment. Co-benefits include lower oil imports and improved primary energy efficiency in Sweden.

Lessons learned

Taking a holistic view of primary energy efficiency in Sweden in the context of combined heat and power networks provides specific opportunities for energy-saving fuel-switching. Prospecting for opportunities among industrial customers and cooperating on project development gives the CHP operator more production flexibility while contributing to customer-retention. Building technical and commercial experience in district heating conversion projects helps build the capacity of energy specialist who can then more easily convince other customers to consider fuel-switching possibilities.

Manitoba Hydro

Table 33 • Power Smart Residential Loan Programme

City, Country, Region	Manitoba
Programme type	On-bill financing, information, education and promotion
Programme tenure	Ongoing since 2001
Sector focus	Residential
Technology focus	Gas and electric furnaces, windows, insulation, hot water heaters
Objectives	• Provide financing for customers purchasing energy efficiency measures promoted under the Power Smart programme; • Make low-interest financing for energy efficiency available to all households; • Provide the added convenience of on-bill financing of energy efficiency • Mobilize energy efficiency suppliers throughout Manitoba
Budget	Cumulative lending to date: CAN 265 million Annual administrative budget: CAN 500,000
Savings	7.4 GWh energy savings; 4.2 peak MW reduction; 14.2 million m3 (through March 31, 2011)
Contact information	Colleen Kuruluk, Manager, Power Smart Marketing ckuruluk@hydro.mb.ca
References	http://www.hydro.mb.ca/index.shtml?WT.mc_id=2000

Summary and background

The Power Smart Residential Loan Programme is a concessional lending programme that allows Manitoba Hydro customers to finance home energy efficiency improvements, repaying the loan through their monthly utility bill. Manitoba Hydro manages everything relating to the financing, essentially acting as a bank would. Installation of energy efficiency technology is the responsibility of the customer, who personally applies for the loan, but advertising and awareness is provided by energy efficiency suppliers, e.g., contractors and home-improvement retailers as well as Manitoba Hydro itself. The combination of preferential loans and a network of pre-qualified home retrofit contractors have proven very convenient for Manitoba Hydro's electricity and natural gas customers. Since its beginning in 2001, over 65,000 customers have taken out energy efficiency loans totalling CAN 265 million. Pre-qualification for customers is based on a utility bill payment history check run by Manitoba Hydro itself and in some cases reliance on existing consumer credit agencies such as Equifax. This prequalification has proven effective, as the Programme has a default rate of just 0.4%. The interest rate is 3.9% and average loan is CAN 4500 and the maximum allowed is CAN 7500, depending on the project; customers take approximately five years to pay back the majority of loans, although furnace projects have the option of taking up to 15 years.

Programme description

The programme began as a financing measure for energy efficient equipment, with a preferential interest rate. Operating on a stand-alone commercial basis, the programme allowed Manitoba Hydro to maintain a presence in residential DSM without committing operating dollars. The on-bill financing provided a flexible tool to help customers finance efficiency improvements offered through the umbrella Power Smart programme.

Manitoba Hydro has a long history of offering on-bill financing for service connections, line extensions, water heaters, and other expensive items. Back-office systems to process loans and repayments were already in place, and it was relatively straightforward to add energy efficiency equipment to the list. This easy access to financing directly supports sales of efficient measures and equipment offered under the Power Smart programme.

The programme was helped considerably by the 2007 passage of the Winter Heating Cost Control Act, which created an Affordable Energy Fund meant to assist rural customers finance home weatherization and rehabilitation. This Fund makes preferential lending and administrative cost recovery possible. This programme targets middle-income customers, as there are separate programmes for low-income customers. The planning process emphasized consultations with the home rehabilitation and improvement industry. A key factor in the programme's success was showing how participation would bring these suppliers more business. Subsequent to the launch of the loan programme Manitoba Hydro launched Power Smart incentive programmes for insulation in 2004 and high efficiency gas furnaces in 2005. Cross-promotion of these programmes with the loan resulted in increased participation in all programmes. Where a customer uses the loan to finance an upgrade under one of the incentive programmes, all savings are claimed by the incentive programme.

Energy efficiency suppliers provide much of the promotion, as they rely on the access to preferential lending to boost their energy efficiency business. Construction supply stores also have advertisement displays in order to reach those customers who don't use contractors. Each participating home renovation contractor must sign a Participant Supplier Agreement, which is a legally binding contract setting standards of performance and obliging suppliers to submit to spot-checks and other quality controls. Since 2001, Participant Supplier Agreements have been signed by almost 2000 suppliers of efficient windows, HVAC, insulation, and furnaces. Suppliers rely heavily on the loans to convince customers of the affordability of their services and products.

Manitoba Hydro also contracts with the participating customer through a loan agreement. This loan belongs to the customer, with any outstanding balance paid in full prior to transfer of home ownership. At present, the loan maximum is CAN 7500 per household.

The programme is zero-cost and fully self-supporting because a portion of the revenues from on-bill repayments goes to pay for administrative costs and make provisions for the 0.4% loan default rate. Since 2001, Manitoba Hydro has made 65,000 loans and financed over CAN 265 million in energy efficiency upgrades through this programme. A typical loan is between CAN 4500 and CAN 7500.

Periodic quality assurance is provided through field surveys performed with summer interns. Measure savings are estimated using engineering calculations. Overall impacts are estimated at the Power Smart Portfolio level.

Regulatory and market drivers

The main driver was the need to help customers finance their purchases of energy savings measures contained in the Power Smart Programme, which are not otherwise subsidized. There is no government mandate for Manitoba Hydro to implement this programme; however, there

are goals for energy efficiency in the region and this programme helps meet them. As a Crown Corporation, Manitoba Hydro is regulated by the provincial energy regulator who reviews the utility's annual plans but is not required to provide formal approval. The biggest regulatory intervention was the 2007 creation of the Affordable Energy Fund.

Lessons learned

- The programme is fast and easy, with contractors providing a turn-key service including filling out the financing paperwork and submitting the proof of purchase. Almost 2,000 suppliers of efficient windows, HVAC and furnaces participate by signing a Participant Supplier Agreement and agreeing to spot-checks of work quality and measures installed. The programme is entirely self-supporting, with administrative costs recovered through the interest payments. There is no impact on rates.
- Programmes that are market-creators should anticipate price and market dislocations, notably price inflation of equipment up to the ceiling allowed by the programme. Typical challenges faced were supplier price increases and managing the tendency of both contractors and homeowners to game the system by including non-efficient home renovation elements into loan requests.
- Early in the programme there were charges of discrimination because electric furnaces were initially excluded as not energy efficient equipment; however, 25% of customers still have no access to gas and so it was decided that high-efficiency electric and gas furnaces should both be eligible for financing.
- Getting buy-in as well as commitment from trade partners at the beginning of the programme is the key to success.
- Billing mechanisms can be a problem if the proper software and back-office systems are not already in place.
- Don't underestimate the high level of customer service involved in the customer-contractor relationship. Even though the Participation Agreement absolves MH of legal responsibility for contractor error, MH still often gets involved. Dispute resolution can be a significant issue, and intervention/arbitration by the utility may be required.
- Managing defaults is important to maintain low interest rates and administrative costs. Fortunately the regulator has provided MH with the ability to disconnect on non-payment of the energy bill which includes the loan. In wintry Canada this provides a big incentive to keep up with payments. Additionally, Manitoba Hydro corrects its algorithms to spot potential default indicators in customer billing data.
- MH is working on a version of the programme that will offer an extended term (up to 25 years) to allow for payments to match savings with the goal of zero impact on the customer's total monthly bill. The loan will be eligible to be transferred to the new owner when a property is sold which is not allowed under current financing programmes. This type of loan will also be offered to commercial customers, especially targeted local government buildings. This will require new legislation as Canadian local government cannot by law finance capital improvements through operating budgets.

National Grid

Table 34 • Small business energy efficiency programme

City, country, region	Massachusetts and Rhode Island
Programme type	Financial incentives, advice and assistance, direct installation, on-bill financing
Programme tenure	1994 – ongoing
Sector focus	Commercial
Technology focus	All
Objective	Assist small businesses in using electric and gas more efficiently through free energy audits, subsidized direct installation, and equipment incentives
Budget	USD 36 million annually
Savings	442 GWh annual electricity savings (2011).
Contact information	Alice Hourihan, Senior Analyst, Energy Efficiency: Tel. +1 401 784 7154; **alice.hourihan@us.ngrid.com**
Reference	http://www.ripuc.org/eventsactions/docket/4295-NGrid-2012EEPP(11-1-11).pdf

Summary and background

Under this programme National Grid and its contractors install electricity and gas efficiency measures in small businesses, defined as commercial customers with loads of less than 300 kW. The programme targets difficult-to-reach small businesses by market segment. Small businesses generally do not implement EE measures on their own initiative, and this programme is focused on making saving energy easier for them.

Programme description

The programme offers a free, no obligation on-site energy audit of energy-consuming equipment. The audit results are used to develop a proposal for installation of electric and gas EE measures. If the customer accepts, the measures are installed using local installers. Measures on offer include lighting upgrades, occupancy sensors, energy management systems, walk-in cooler efficiency measures, water heater and boiler re-set, and site-specific custom projects covering both gas and electricity. Programme design and administration is conducted in collaboration with regulatory agencies, universities, energy users and consumer advocates. Implementation is carried out by specialty contractors who carry out the audits, specify the measures and their costs, and install the improvements.

Low participation in EE programmes by small businesses has four main causes: (i) lack of awareness of EE options and their benefits; (ii) limited cash available for discretionary investments such as energy efficiency; (iii) concerns about disruption to business operations from the installation process; and (iv) lack of confidence that energy savings will materialize. This programme is designed to overcome these barriers.

Recruitment has been aided by use of direct mailings and e-mails targeted to specific areas. The utility provides a significant subsidy, providing 70% of the installed cost of the measures, with the remaining 30% paid by the business owner. The utility also offers a no-money down option,

financing the business's 30% project share through on-bill financing with zero interest and payment terms of up to 24 months. The programme also provides a turn-key solution, from energy audit to specifying materials and hiring installers, thus avoiding taking away from the limited time and resources of small business managers.

Regulatory and market drivers

The Massachusetts Department of Public Utilities and the Rhode Island Public Utility Commission require all utilities in their respective jurisdictions to meet energy efficiency obligations. The utilities must file three- to five-year DSM plans. The savings targets in the Massachusetts 2013-2015 Energy Efficiency Plan are to save 2.49% and 1.06% net savings as a percent of 2015 sales for electric and gas respectively. In Rhode Island, National Grid's 2012-2014 Energy Efficiency and System Reliability Procurement Plan[1] has a savings target of meeting 2.5% and 1.2% of Rhode Island's 2009 electric and natural gas load, respectively, through energy efficiency by 2014.

Lessons learned

- Small businesses have tight cash flows, and even energy efficiency investments with short paybacks are difficult to finance. Small businesses often shy away from taking on additional debt, and banks are not always willing to lend for energy efficiency. This is why the offer to finance the customer share of project investment through energy bill payments over two years has successfully scaled-up participation.
- Customizing EE measures to meet specific small-business needs through an expanded list of available measures has also been an attractive programme feature.
- Turnkey solutions are attractive to small-business owners, as they do not want implementing an energy efficiency project to distract them from running their businesses.

Northeast Utilities Company and United Illuminating

Table 35 • Home Energy Solutions Programme

City, country, region	Connecticut
Programme type	Advice and assistance, financial incentives, on-bill financing, direct installation
Programme tenure	Ongoing since 2006
Sector focus	Residential
Technology focus	All
Objective	Maximize energy savings in residential structures
Budget	USD 30 million (2011) 30,000 homes weatherized (2011)
Savings	44 GWh annual savings in 2011 and 1.2 million therms gas savings)
Contact information	United Illuminating: Sheri Borrelli: +1-203-499-2583; sheri.borrelli@uinet.com Northeast Utilities: Stephen Bruno: +1 (860) 665-4752; brunosj@nu.com.
References	http://www.ctenergyinfo.com/dpuc_home_energy_solutions.htm

Summary and background

Home Energy Solutions[SM] (HES) is a Connecticut state-wide programme offered through all of Connecticut's investor-owned energy providers, including the United Illuminating Company, the Connecticut Light and Power Company (CL&P), Southern Connecticut Gas, Connecticut Natural Gas, and Yankee Gas Services Company. HES is an umbrella programme which provides direct installation of weatherization and other EE goods and services to residential customer, including programme elements tailored to different residential populations. HES–Income Eligible (HES-IE), e.g., targets low-income customers, while the core HES is for customers with higher incomes. HES–Home Performance (HES-HP) offers a deeper, more comprehensive service. All are supported through the Connecticut Energy Efficiency Fund, which is funded by a surcharge on gas and electricity bills.

Programme description

HES began in 2006 as the Ductworks program, which focused on sealing ducts and installing efficient lighting in electrically-heated homes. In 2007 the Connecticut gas distribution companies (Yankee Gas, Southern Connecticut Gas and Connecticut Natural Gas) pooled their resources to create the state-wide one-stop diagnosis, weatherization and EE upgrade service now known as HES.

In 2008, the utilities introduced outside financing, developed a formal training and vendor certification process, and created a HES working group comprising representatives from gas and electricity providers, HES vendors, the Energy Conservation Management Board, and other interested parties. The programme continued to evolve into a comprehensive, all-fuels in-home energy services package, adding oil heated homes via the funding available through American Reinvestment and Recovery Act (ARRA) and the Regional Greenhouse Gas Initiatives (RGGI) dollars.

The Home Energy Solutions programme targets participants through direct mail, billing inserts, home-show exhibits, public relations, radio advertisements, and TV campaigns. Authorized contractors perform in-home energy assessments and directly install measures such as sealing critical air leaks, weather-stripping doors and windows, wrapping hot-water pipes, and sealing air ducts. Contractors also provide EE light bulbs, faucet aerators and low-flow showerheads, and apply an educational field service tool to demonstrate further home EE measures to customers. Rebates are offered for appliances, insulation, HVAC and windows

Participants receive about USD 800 in services per home, including administration (USD 220) and installation (USD 580); the customer contributes USD 75. Beginning in 2010, a residential financing pilot programme offered concessional financing for loans up to USD 20,000 for HES-recommended improvements. The average loan for EE upgrades is USD 11,000, which can cover such measures as insulation, central a/c systems, boilers, furnaces, water heaters, heat pumps, and windows.

The HES programme includes a special portal for low-income families (defined as 60% of the state median income or less) who spend a disproportionate amount of income on energy. HES-Income Eligible provides the same core services as HES, but eligible residents receive the service at no cost, as well as additional energy-savings measures such as window, appliance, insulation upgrades, and heating system replacement. This programme is leveraged through a private vendor network and through agencies with experience within communities with high limited-income populations. Energy providers have worked with US Department of Energy Weatherization Assistance Programme (WAP) to mobilize project funding and have entered into partnerships with community and social service organizations to deliver these programmes to low-income households.

Regulatory and market drivers

The HES programme has won several awards and is distinctive in being a state-wide, coordinated, all-fuels conservation programme. The Connecticut Department of Energy and Environmental Protection and Public Utility Regulatory Authority provide oversight and an Energy Efficiency Board provides for stakeholder input. The programme is a key element in reaching a legislative goal that 80% of Connecticut homes be weatherized by 2030.

The HES programme is funded by a surcharge on electric and gas bills. Funding also comes from sales of renewable energy credits and ISO-New England's forward capacity market. All Energy Efficiency Fund programmes undergo regular evaluations conducted by independent third parties.

Lessons learned

- Programmes evolve over time, in response to market needs, regulatory policies, and funding opportunities. Having a formal or informal working group of stakeholders can help
- Growth in scale and complexity brings administrative burdens, especially monitoring vendors who provide services and ensuring quality control. Transparency, consistency, continuous review, reporting, and communications are helpful in smoothing this administrative burden
- Comprehensive programmes must take into account the interests of multiple links in energy efficiency goods and services value chain, synchronizing their goals and work with the efforts of programme administrators and contractors.
- Capacity building proved challenging initially, especially recruiting enough qualified contractors to meet demand and training contractors to promote available financing options
- Mobilizing third party capital into the OBF model proved more difficult than anticipated, and remains a major focus for programme administrators.

Origin Energy

Table 36 • Energy Savings Guarantee Programme

City, country, region	Australia
Programme type	Advice and assistance, on-bill financing
Program tenure	Ongoing since 2011
Sector focus	Commercial and industrial, public sector.
Technology focus	All
	Encourage business investment in energy efficiency and clean technology, while contributing to Origin Energy's energy efficiency obligation.
Budget	AUD 12.7 million (2011-2013) Investment cost of <USD 23/tCO_{2e}
Savings	Annual savings:
Contact information	Daniel Trujillo (Origin Energy): Tel. +61 3 9821 8028, Daniel.trujillo@originenergy.com.au Paul Greenop(LCAL): Tel. +61 7 3188 1643, Paul.Greenop@lowcarbonaustralia.com.au.
Reference	http://www.lowcarbonaustralia.com.au/media/13545/origin_factsheet.pdf

Summary and background

Origin Energy and Low Carbon Australia (LCAL) established a strategic alliance to make it easier and more cost effective for businesses across Australia to finance and implement their EE projects. Origin provides an end-to-end service, adding value to their business customers and improving their ability to acquire new customers and retain old ones. LCAL provides the financial support and repayment model while Origin is a strong brand partner with good access to business customers as well as markets and distribution channels.

The Energy Savings Guarantee (ESG) programme features on-bill financing. Origin structures the terms so that payment are offset by energy savings, thus providing energy bill stability and eliminating the need for businesses to raise the upfront capital for energy efficiency investments.

Programme description

The strategic alliance between Origin and LCAL provides accessible project financing to Origin's business customers. The programme provides end-to-end project support, including energy audits and project identification, structured repayment terms offset by energy savings, provision of project financing from LCAL and repayment through the Origin Energy's billing system, and provision of expertise and support needed to deliver the project.

Origin applies a simple 5-step delivery process: 1) assess a candidate organization's objectives and suitability; 2) perform on-site assessments; 3) provide detailed energy savings reports, quantifying costs and savings in kWh and CO_2; 4) implement energy saving measures which can be guaranteed within ±20%; and 5) deliver a complete M&V report to verify the savings.

LCAL provides a credit line to Origin to on-lend to businesses, adding its own EE experience and expertise. Meanwhile, Origin offers business customers a full service model for delivering EE solutions, with end-to-end project management, zero upfront cost, and an energy savings guarantee. This means the monthly cost to business customers is offset by energy savings, with no net increase in their energy bill and no risk to the business customer. In some cases, customers achieve a cost reduction in their energy bill even while repaying the loan from LCAL.

This programme is marketed to Origin's existing and prospective commercial and industrial customers with a minimum annual energy consumption of 160 MWh.

Regulatory and market drivers

Given the introduction of a price on carbon in Australia, and existing state and federal reporting schemes, EE has become a near necessity for a business's economic viability. Other regulatory drivers include the Energy Savings Opportunities Programme managed by Department of Resources, Energy and Tourism (DRET) and the state energy efficiency obligations schemes in New South Wales, Victoria, and South Australia.

Energy savings from the ESG can be accredited for sale in the Energy Savings Certificates (ESC) market. Origin Energy and LCAL support participating customers to generate ESCs for projects delivered but the participating customer, not Origin Energy, owns these ESCs. Depending on the circumstances and the project, Origin Energy might buy the ESCs generated from the participating customer, but this is a separate transaction from the project itself. In other cases the ESCs are left with the participating customer to trade directly with market intermediaries.

Lessons learned

- Customer decision-making can be very time-consuming. Decisions often require multiple decision-makers to buy in to the project. Even with an internal champion, competing priorities within the business and unclear mandates may delay or even halt a project.
- EE must constantly compete with other priorities for budget and management attention. Customer education is needed to emphasize the value of EE, especially given increasing energy costs and regulations. Targeted marketing campaigns regarding EE finance options and other government incentives have strengthened the overall Origin value proposition.
- The Energy Saving Guarantee is very attractive to customers that have deferred EE projects due to lack of funding or lack of expertise to deliver. Customers with the capacity and capability to implement projects themselves may prefer to self-fund activities.
- The EE industry is burgeoning in Australia, but there is sometimes spotty product quality and expertise. In response Origin has built a network of trusted, experienced partners and suppliers in the most common EE areas.

Pacific Gas and Electric Company

Table 37 • Energy Upgrade California

City, country, region	Northern California
Programme type	Advice and assistance, comprehensive implementation, financial incentives, direct installation
Programme tenure	2010 – ongoing
Sector focus	Residential
Objectives	Reduce energy consumption in residential homes by 20%
Budget	USD 15 million annually (2010–2012)
Savings	30 GWh annual energy savings (to date)
Contact information	Bryce Gilleland: Tel. (415) 973-9075; B1G2@pge.com
Reference	www.energyupgradeca.org/overview

Summary and background

Energy Upgrade California (EUC) is a state-wide programme implemented by Pacific Gas & Electric (PG&E), Southern California Edison (SCE), and Sempra. The programme provides a "whole house" approach to residential energy savings, through which a network of contractors work to offer subsidized audits, energy modelling, and equipment installation. The whole-house approach allows considerable flexibility in which EE measures are applied.

Programme description

EUC encourages homeowners to make more comprehensive, cost-effective energy efficiency investments. EUC contractors conduct energy audits, run building-energy simulations to determine potential savings, consult with customers on recommended energy efficiency measures, and directly install the energy efficiency improvements.

The programme is heavily stakeholder driven. Stakeholders include the regulator (California Public Utilities Commission, or CPUC), the California Energy Commission (CEC), investor-owned and municipal utilities, regional and local governments, and energy efficiency services providers.

EUC represents a major transition from a measures-based energy efficiency programme to a comprehensive, whole-house programme, with the objective of extracting deeper energy savings. The major challenge in making this transition was creating the contractor capacity to deliver a whole-house approach and coordinating the several administrative bodies involved.

PG&E hired a team led by non-profit Build It Green to manage day-to-day programme activities, including the overseeing of more than 100 participating contractors. As programme implementer, this team recruits contractors and trains them. It also conducts certification and quality assurance. The programme includes several stages of delivery partners. Local governments conducted much of the marketing and outreach activities, targeting customers according to three criteria: high energy use, high energy intensity, and a propensity to adopt programmes in the past. CPUC, CEC and the Department of Energy (DOE) perform the program

evaluations. Contractor surveys are also conducted, with surveys of local governments, programme managers, and customers will provide feedback on the programme process.

Average savings have amounted to 30% per home, while average cost of implementation per home of USD 13,000. Incentives ranging from USD 2,000 to USD 4,000 are offered for energy savings of 20% up to 40%.

Regulatory and market drivers

The CPUC asked utilities to develop holistic programmes that deliver larger and longer-lasting savings using a whole building rather than a measure-by-measure approach. This holistic approach is now being further investigated by the regulator and IOUs across all consuming sectors. The result is increased flexibility in finding energy savings and additional synergies in delivering energy savings, whether from lighting, weatherization or HVAC.

EUC relies on a system benefits charge, which provides funding to all of California EE programmes, plus federal funding. Some locations also provide additional incentives to customers based on percentage of saved energy.[19] The PG&E budget was USD 46 million, with additional federal funding of USD 150 million.

Lessons learned

- Capacity building and training of contractors is important. These contractors must be aware of safety concerns, including fire risks, and know how and when to test for these
- Energy modelling is a key ingredient in the whole-house approach, and developing the capacity to collect the data and run the models for a programme of this scale was difficult
- Aligning how the programme is offered and marketed with how it is delivered can be a challenge, especially when transitioning to a new programme approach. As a general rule, providing customers with more flexible allows for deeper market penetration and more energy savings.

[19] The California Home Energy Retrofit Coordinating Committee, initiated by the US Environmental Protection Agency (EPA), aimed partly through a number of public meetings, to determine how to organize and align the PGC, ARRA, and Block Grant funds.

Reliance Infrastructure Limited

Table 38 • Mumbai Efficient Lighting Programme

City, country, region	Mumbai, India
Programme type	On-bill financing, bulk procurement and distribution, information, education and promotion
Programme tenure	2006–2007
Sector focus	Residential and commercial
Technology focus	Lighting
Objective	Reduce peak demand from household lighting and educate the public regarding the benefits of CFL lamps
Budget	USD 1 million
Savings	48 GWh annual energy savings 12 MW peak demand reduction
Contact information	Pramod Deo, Addl. Vice President: Tel. +91-9323552952; Pramod.Deo@relianceada.com.
Reference	http://www.rinfra.com/pdf/pressreleases/MediaRelease_Change4Mumbai_16thMarch11.pdf

Summary and background

Reliance Infrastructure Limited (RInfra) is an integrated infrastructure company and utility serving about 2.9 million electricity consumers in the suburbs of Mumbai. In 2005, the Maharashtra Energy Regulatory Commission (MERC) directed Maharashtra energy providers to implement pilot demand-side management (DSM) programmes. RInfra conducted a load research study which revealed that high peak demands over the period 10 am to 11 pm was due to residential and commercial customers. Consequently, RInfra launched several initiatives in energy conservation and peak load reduction, including the Mumbai Efficient Lighting Programme.

Residential and commercial customers have a high penetration of incandescent lamps, and these consumers are sensitive to the high initial cost of energy-efficiency CFLs. It was decided to develop a programme to help these consumers overcome this cost barrier.

Programme description

The limitation to uptake of efficient lighting products in India has been high purchase costs. Thus, RInfra developed a programme that reduced the cost of CFLs and T5 tube-lights by about 50 percent. Furthermore, the cost of lamps purchased under the scheme was recovered from consumers through 12 monthly payments made as part of their electricity bill.

The scheme was promoted by RInfra by way of coupons attached to its residential consumers' monthly electricity bills, a radio campaign, a website and SMS. The programme has popularized the use of CFLs while increasing consumer awareness regarding EE lighting. A total of 206,000 customers participated in the programme, with CFL sales totalling 617,000 numbers.

The concept of demand-side management was a novel one when the programme was designed, so communicating the DSM concept to manufacturers and consumers was challenging.

Regulatory and market drivers

Maharashtra State Electricity Regulatory Commissions (MERC) was the first regulator to encourage energy providers to develop a demand-side management capability. In May 2005, in response to power shortfalls and load shedding, MERC directed distribution utilities including Maharasthra State Electricity Distribution Company (MAHADISCOM), Reliance Infrastructure (Rinfra) and Tata Power Company (TPC), to develop DSM and EE plans (Forum of Regulators 2010). MERC also created its own DSM cell to oversee these efforts, and briefly imposed a Load Management Charge on excess consumption to fund DSM efforts. In 2008-2009 both RInfra and TPC established DSM cells and implemented pilot DSM projects, including load research, on-bill financing programme for CFLs, lighting replacement, and even refrigerator replacement programmes (Bharvikar, et al 2010). MERC permitted cost recovery for these pilot projects even after withdrawal of the Load Management Charge.

Other states have also been active in encouraging energy provider-delivered energy efficiency. After consultation with international experts, the Delhi Electricity Regulatory Commission (DERC) ordered distributors to submit DSM program proposals similar to those required by MERC, with cost recovery through annual tariff review. Recently (February 2012) DERC issued draft DSM regulations that would create a permanent Demand Side Management implementation framework to be followed by distribution licensees (DERC 2012).

Final DSM Regulations have also been issued by Jharkhand, Maharashtra and Himachal Pradesh SERCs, with regulations in draft in Assam, Kerala, Delhi, Bihar, Haryand, and Orissa (Joshi 2011). These directives are largely drawn from the same model, and have similar objectives - make DSM an integral part of the day-to-day operation of licensee, and develop and implement programmes that deliver strategic energy conservation, load shifting and power factor correction (MERC 2010; Himachal Pradesh Electricity Regulatory Commission, 2011).

This growing regulatory support is reflected in energy provider activity. RInfra and TPC are both carrying forward their earlier pilot efforts, offering special price discounts on 5-star split air conditioners, ceiling fans, and T5 tube-lights obtained through bulk procurement (Reliance Infrastructure 2011; Tata Power Company 2012). In keeping with two investor-owned energy providers chasing the same customers, RInfra's *Change for Mumbai* campaign now competes with TPC's *My Mumbai, Green Mumbai* initiative.

Lessons learned

- In addition to an effective communication, offering final prices to consumers that are substantially lower than prevailing market prices is an effective way to encourage people to try new, energy efficient technologies
- In most DSM programmes the products offered are manufactured by a third party, making it difficult to guarantee product quality. This increases risk for both the consumer and the energy provider, unless steps are taken to guarantee quality using a reliable manufacturer.
- The biggest challenge in early demand-side management efforts are enlisting the best manufacturers, establishing effective delivery channels, and creating new facilities for delivering the new lighting products and removing and recycling/destroying the old ones.

RWE Effizienz GmbH

Table 39 • 150 Million Euro energy efficiency programme

City, Country, Region	Germany
Programme type	Advice and assistance, information, education and promotion, direct installation, technology development
Programme tenure	Ongoing since 2007
Sector focus	Residential and local authorities, public buildings
Technology focus	Building heating and hot water systems, lighting
Objectives	Showcase what energy efficiency can deliver in the context of municipalities, households, and social housing Conduct a broad-based efficiency campaign demonstrating practical energy savings measures ready to be implemented.
Budget	150 million Euro programme total (~ EUR 30 million per year)
Savings	>600 GWh cumulative annual energy savings
Contact information	Claus Fest, Head of Energy Policy and Government Funded Projects, RWE Effizienz GmbH claus.fest@rwe.com
Reference	http://www.rwe.com

Summary and background

Energy efficiency has been an integral part of German energy policies and regulations since the 1970s. Over the past twenty years these policies have improved the energy intensity of the German economy (final energy demand/gross national product) by an average of 1.8% annually.

Three main factors have produced these results – government regulations (laws and ordinances), public promotion (*e.g.* through the public bank KfW), and voluntary programmes undertaken by individual companies. Germany energy efficiency efforts have so far relied more on competition and market mechanisms than regulatory mechanisms.

Over the past decade RWE has incorporated energy efficiency services as an integral part of its product portfolio, especially with regard to the industrial sector. RWE has several subsidiaries which work with industry to develop energy saving improvements. These subsidiaries have achieved an annual sales volume of about EUR 500 million through energy efficiency services.

In 2009 a new subsidiary, RWE Effizienz GmbH, was formed to develop and market energy efficiency solutions for residential consumers. Key products include the Smart Home (system for automation of residences, demand side management), E-Mobility (charging infrastructure), energy advice (thermography, insulation, renewable energy, heating and control systems, energy performance certification), and HomePower Mikro-CHP. RWE offers a web portal, (www.energiewelt.de), containing information on product offerings and free-of-charge

comprehensive advice.

The "150 Million Euro EE Programme" is a comprehensive energy efficiency effort initiated in 2007 to showcase what energy efficiency can deliver. So far 10,000 projects have been implemented with municipal, industrial, and building sector partners. Project categories include awareness raising and information, analysis and advice and R&D.

Programme description

Mobilizing consumers to adopt energy savings measures requires information, education and promotion. The "150 Million Euro EE Programme" awareness-raising component includes public campaigns, distribution of comprehensive and detailed information, competitions and promotions, and energy efficiency educational programmes for schools.

The "150 Million Euro EE Programme" also provides analysis and advice to develop and implement energy savings projects. For example, municipalities are important energy consumers with particular analysis needs as regards investments in energy efficiency. RWE developed a programme of advice-giving to municipalities to help them optimise energy demand of public buildings and street lighting. This includes RWE investment of EUR 10 million to sponsor energy performance certificates for over 3,000 public buildings and hospitals, including cost-benefit analysis of energy savings measures. RWE also financed EUR 2 million to for high-efficiency street lighting. Over 100,000 sources of light in more than 2000 municipalities were replaced with an average annual demand reduction of 120-170 kWh for each lamp.

RWE worked with OSRAM to install 46,200 CFLs and with heat pump manufacturers to install 5,000 high-efficiency heat pumps, leading to an emission reduction of around 15,000 tCO_2.

R&D plays an important role in energy efficiency technology development. RWE has invested in heat pump pilot projects in multi-family-homes (EUR 1 million); a large-scale smart metering pilot (100,000 units) in Mühlheim an der Ruhr; advanced demand reduction and load management systems; and development of neighbourhood virtual power plants based on small-scale Combined Heat and Power (CHP) technology.

The costs of the "150 Million Euro Programme" were supported entirely by RWE. The campaign and training delivered as part of the programme have served to increase the understanding of energy savings and create demand for RWE Effizienz's energy efficiency products.

Regulatory and market drivers

There are presently no regulations obligating energy providers in Germany to promote or deliver energy efficiency, other than a ban on incentives for excessive energy consumption (*e.g.* declining block tariffs). Germany energy efficiency efforts have so far relied more on competition and market mechanisms than regulatory mechanisms.

There are however strong market drivers for energy providers to deliver energy efficiency services and products to their customers. In Germany end-users change energy suppliers more frequently than other countries, giving German energy suppliers an incentive to provide goods and services that save customers money. Another market driver is the potential that energy efficiency products and solutions present as a stand-alone business line producing their own revenue streams.

Lessons learned

- Promoting energy efficiency requires a combination of measures such as advice and assistance, information, education and promotion, and financial incentives. Energy

efficiency must be understood as a societal task and promoted accordingly by public/communal authorities.

- Customers are more likely to invest in energy efficiency when the client can generate additional comfort (e.g. Smart Homes) and when the energy savings measure is part of a larger retrofit investment (e.g., home renovation inclusive of thermal insulation and heating system replacement).
- Delivering energy efficiency goods and services is useful for energy providers as part of an overall customers retention strategy, as long as efficiency products can be integrated entirely and without friction into the existing portfolio
- The "150 Million Euro Programme" helped mainstream energy efficiency through increased public awareness and product development. Implementing a broad range of measures for different sectors and end-uses, involving diverse consumers (residential, industrial and communal) clients, and communicating results have established a basis for future promotion of energy efficiency by energy providers and governments.
- Energy efficiency is always closely related to innovation and sustainable development. The product portfolio of RWE-Effizienz is continuous development and improvement and will incorporate new efficiency products as technology development and market opportunities arise.

Scottish and Southern Energy

Table 40 • Airtricity Community Fund

City, Country, Region	Northern Ireland and the Republic of Ireland
Programme Type	Financial incentives, advice and assistance
Programme tenure	Ongoing since 2002
Sector focus	Communities
Technology focus	Energy efficiency & sustainability
Objectives	• Build community goodwill in localities affected by on-shore wind power development; • Share the benefits of renewable energy infrastructure development with local communities; • Encourage sustainable development
Budget	Approx. 700,000 EUR annually, growing according to wind power expansion
Savings	0.4 GWh annual savings based on projects to date
Contact information	David Manning (David.Manning@sserenewables.com) Aoife Power (aoife.power@airtricity.com)
Reference	http://www.sse.com/Ireland/Community/CommunityProjects/

Summary and background

SSE is the third largest and fastest growing-energy utility in Ireland. SSE is also Ireland's largest renewable energy developer, with almost 1400MW of projects under development and 25 wind farms totalling 500MW in operation. As part of its on-shore wind-power generation expansion SSE seeks good community relations with areas affected by wind-power development. The SSE/Airtricity Community Fund offers a way for SSE to build community support by sharing the benefits of wind-power development. The Fund receives a percentage of annual revenues from each wind farm which are then disbursed to affected communities through an annual project selection process. The Fund supports activities that enhance community quality of life and well-being, promote community spirit and bring people together, and foster vibrant, sustainable communities. Energy saving projects are encouraged, especially for community facilities such as schools, parish halls, sports pitches, and other town facilities. As of 2011 annual spending was EUR 720,000, and over 1,000 projects had been implemented. Annual energy savings from these projects is about 0.4 GWh.

Programme description

The Community Fund has existed for ten years, since SSE began on-shore wind power development. The Fund helps SSE/Airtricity to gain the support of local communities for wind-power projects. The Fund provides a direct linkage between the financial benefits of a wind power project and the development needs of impacted local communities. Separate accounts within the Fund are established for each wind power project, and once the annual spending is established it continues for the 25-year economic life of the project.

Qualifying communities determine for themselves how the funds are used - for community amenities, educational purposes, charitable purposes, social enterprises, or environmental purpose. Communities put forward their own projects through an annual applications process. The project applicant proposes their own contractors, so the benefits are all local. Eligible project applicants include constituted community groups, not-for-profit organisations and registered charities working in the defined locality.

The 1 percent set-aside flowing to the Fund totalled 700,000 Euros in 2011; however, this budget is increasing as more wind-farms are developed. As of 2011 there were 501 MW of wind generation spread over 26 wind-farms of varying sizes. The overhead cost of SSE/Airtricity staff is an operating expense. About 10 staff work on activities related to the Community Fund.

Using an annual application process, communities within 20 km can apply for project funding, with communities within 5 km receiving priority. SSE encourages energy efficiency and sustainability projects as a priority. Each year they publicize the annual project application process, work with communities who have not yet made applications, and try to spread out the funds available from each wind project as much as possible.

SSE/Airtricity has established foundations in each of its jurisdictions (England, Scotland, Wales, Northern Ireland and the Republic of Ireland) which receive and process applications. SSE/Airtricity establishes local advisory panels made up of residents and representatives from the Community Council areas which meet regularly to choose projects and make grant awards.

There is a demand for energy efficiency projects, and energy efficiency improvements remain one of the main uses for which funds are requested. The application process requires a contractor quote, so communities must enlist the participation of a local professional. They also encourage the community to do an energy audit which can be used to develop applications for subsequent years. Because it occurs on an annual basis there are learning opportunities. First time applicants sometimes need more help, but over time community groups become very adept in their project applications. Some communities are very clever and are very patient. They will apply for small bits of a bigger project each year.

Since the Fund's inception over 100 projects have been constructed. Typical projects include weatherization of local schools, renovating a sporting pitch with energy efficient floodlights to accommodate more sports activities while managing energy bills, and renovating a local parish hall with cavity wall insulation and a high-efficiency boiler.

Given the objectives of the Airtricity Community Fund, co-benefits are as important as energy savings. These include enhanced community quality of life, improved community spirit, local economic development including jobs creation for construction and operation of new facilities, and lower community energy bills.

Regulatory and market drivers

The main driver for this activity has been creating the community good will needed to gain local support for wind power projects. After 10 years of existence the main driver continues to be sharing the benefits of renewable energy projects with local communities, and creating tangible examples of community cooperation. Delivering long lasting benefits to communities is an important way of achieving public acceptability for such projects.

More recently and under the new Irish energy provider obligations policy it may be possible to apply community energy savings results towards SSE's obligations.

Lessons learned

- Every effort should be taken to make the application process as simple, accessible and transparent as possible. Local groups should be advised and consulted well ahead of time, and efforts made to inform and involve all interested parties.
- An emerging challenge is integrating the energy savings impacts of the projects funded by the Community Fund into the new Energy Provider Obligations scheme introduced by Ireland last year. Measuring and verifying energy savings is necessary to capture the credit against energy savings obligation, and this introduces additional project cost and operating expense which communities are reluctant to undertake. SSE/Airtricity is working with SEAI on how to integrate the activities and which type of M&V – metering or deemed savings – might be applicable.
- SSE/Airtricity is an industry leader in using community funds to forge ongoing good relations with communities impacted by wind-power project development. SSE/Airtricity is convinced that long-term profit-sharing with communities not only helps maintain good relations with impacted communities, but also helps overcome difficulties encountered in gaining approval of new projects.
- SSE/Airtricity would like to use the Community Fund as a vehicle to leverage funding from other entities. The annual 1% set-aside would act as seed money to attract additional donors. They are undertaking a partnership with Sustainable Energy Agency Ireland (SEAI) to trial this concept.

SE (Denmark)

Table 41 • SE Big Blue ESCO subsidiary

City, Country, Region	Denmark
Programme Type	Advice and assistance
Programme tenure	Ongoing since October 2011
Sector focus	Industrial, commercial, municipal
Technology focus	Industrial processes and buildings EMCS
Objective	• Find and deliver sufficient energy savings in the industrial, commercial and municipal sectors to meet SE's annual energy savings obligations • Develop SE Big Blue's energy efficiency expertise for use in other commercial projects outside Denmark
Budget	Approx. EUR 5.4 million annually
Savings	Energy savings obligation is 80 GWh per year (1.5% of final energy consumption) in 2012, rising to 160 GWh (or approx. 3.0% of final energy consumption) by 2015 Total energy savings delivered by SE Big Blue since 2006 in response to Danish energy savings obligations is 400 GWh.
Contact information	Jes Brinchmann Christensen, [Head of Public Affairs]: Tel: [+45 4020 8915]; jbch@se.dk
Reference	www.sebigblue.dk/en/

Summary and background

SE Big Blue is a subsidiary of SE, the third-largest energy provider in Denmark. SE and SE Big Blue originated in the south of Denmark, but are now expanding into national and international operations. SE Big Blue is a wholly-owned but independent EE consultancy operating both within and outside Denmark, established in 2011 to consolidate all of SE's EE work. SE Big Blue is a specialty energy services consultancy which sources energy savings projects from industries and businesses throughout Denmark and beyond. Through identifying and implementing these projects, SE Big Blue produces bottom-line energy savings for businesses, while at the same time satisfying SE's energy obligations under the Danish EEO scheme. SE Big Blue's success in Denmark has allowed it to enter other energy services markets in Europe on a pure commercial basis.

Programme description

The Danish EEO scheme has created numerous business opportunities. SE Big Blue uses its specialized EE expertise, especially its expertise in industrial process measurement, to work with businesses to identify and implement energy savings opportunities. SE Big Blue counts the savings credit against SE's EEO or trades the savings to other obligated parties. Engagements can take many forms. SE Big Blue acts as a consultancy providing services including measurement and advice, offers financing, and implements projects via energy performance contracts. Financial and energy saving flows vary according to the business model used.

SE Big Blue has enjoyed particular success working with the pulp and paper, plastic, corn and feedstock, dairy and brewery industries. They specialize in working with industries with large process heat requirements and opportunities for ventilation cooling and heat recovery. They recently developed a project in which a district heating company purchases the excess heat recovered from a pulp and paper plant.

Danish energy distributors can recover their energy savings programme costs through tariffs by reporting these costs to the regulator (Danish Energy Authority). The regulator calculates and promulgates a benchmark rate (currently USD 70/MWh), based on average results of all net company energy savings programmes.

SE Big Blue enters into an Energy Performance Contract with the customers they work with. Customers usually make the investments in energy savings projects. The customer recovers all of the energy cost savings, while SE Big Blue claims the energy savings for purposes of the Danish EEO scheme. SE Big Blue does not charge for its project development services in these cases.

SE Big Blue used its industrial measurement expertise to screen industrial operations for energy savings opportunities. This helped convince industrial managers that energy savings estimates were credible, a necessary condition for mobilizing investment. SE Big Blue's track record is a significant asset in Denmark, where word-of-mouth endorsement is the best advertisement.

SE Big Blue also enters into long-term relationships with clients. Using their measurement expertise plus energy audits they create a '"menu" of energy savings possibilities for their customers. Each item on the energy savings menu includes financials and a recommended sequencing of each project. The client initially selects the "low-hanging fruit", and then moves on step-by-step down the menu, building on their earlier successes.

Regulatory and market drivers

The main regulatory driver is the Danish energy savings obligation scheme, under which all energy net companies including gas and electricity distributors, district heating operators, and even heating oil providers are obliged from 2006 to save 1.5% of their energy sales equivalent each year.[20] This annual target will double to 3.0% in 2015 and remain there until 2020. These energy savings can be sourced from any type of energy (other than transport fuels) or consuming sector anywhere in Denmark. Net companies such as SE cannot source the energy savings themselves but must rely on independent third parties. For this and other reasons SE Big Blue operates at arm's length from the net company.

There are no subsidies from the government to net companies or end-users to motivate energy savings. However, net companies do receive cost recovery through tariffs for the expenditures necessary to deliver their energy savings obligations, after registry with the regulatory authority (Danish Energy Agency). The cost impact on ratepayers from the benchmark price and SE's EEO target works out to less than USD 7 per household per year.

Within this legal framework the key stakeholders have come together to negotiate voluntarily on how to achieve the intent of the law. The Danish Energy Agency cooperated with the Danish Energy Association as well as the other energy associations (District Heating Association, Heating Oil Providers Association) to develop a voluntary agreement with all of the players in the Danish Energy market. This coordination makes it possible to agree upon difficult issues such as how to allocate the energy savings targets by type of energy and type of energy provider.

For the period 2008-2012 the agreed allocation is 47% for power companies, 31% for district

[20] Energy net companies include electricity and gas distributors and district heating operators. The 1.5% energy savings obligation grows to 2.5% for 2013-2014 and then 3.0% for the period 2-015-2020.

heating companies, 18% for natural gas companies, and 4% for heating oil companies. Since electricity only makes up 30% of Danish primary energy consumption, power companies are indeed pulling more than their relative weight.

This cooperation has also created protocols established regarding how to calculate baselines and additionality and how to measure and verify savings. The net companies can only report savings which can be shown to be additional to what would not otherwise have been generated by end-users. Using the M&V protocols SE Big Blue self-validates the savings from the projects and then DEA validates the aggregate results by randomly sampling and reviewing project reports. They also hire third parties to do further spot checks.

Lessons learned

- Experience has shown that compulsory energy savings targets can be good for business, not only for the energy providers but for the businesses where the energy savings take place. Energy providers can serve a growing number of customers without adding new infrastructure, as overall energy demand has not grown. ESCO subsidiaries of net companies provide another revenue source, and the cost recovery funds flowing from the government ensure that net companies and their subsidiaries do not lose money.
- The current business model has been able to deliver the annual energy savings now required. However the energy savings target will double from 1.5% to 3.0% by 2015, and there is concern that this increased demand for energy savings will increase project costs. Energy net companies might have to consider tendering directly into the market place, rather than originating their own projects, and even then the price is likely to go up. Danish policy might also need to be reconsidered, including the level of the benchmark cost (scheduled to rise only to USD 73/MWh by 2015), the current cap on sourcing energy savings from buildings, and inclusion of energy output from renewable energy production when calculating the energy savings target.
- Mobilizing the interest and attention of industry is the biggest challenge for ESCOs or EE consultancies. Industrial managers are reluctant to invest in anything that does not immediately contribute to production, especially if new technologies or potential disruption to output might be involved. Industrial operators also heavily discount any investment with longer than a three year payback period. Convincing these industrial operators that energy savings projects are worthwhile is the biggest challenge.
- The diversity of market actors under the Danish scheme is a perpetual challenge. ESCO subsidiaries of obligated net companies are only one market actor. Businesses can originate the energy savings themselves or engage independent third party ESCOs to develop projects.

Southern California Edison

Table 42 • Energy Savings Assistance Programme

City, country, region	Southern California
Programme type	Advice and assistance, equipment replacement, direct installation
Programme tenure	2008–ongoing
Sector focus	Low-income households
Objective	Assure universal acess to energy efficiency services by proactively delivering EE services and savings to low-income households
Budget	USD 61 million annual budget (for 2009–2011).
Savings	• 278,263 homes treated • 82 GWh annual savings
Contact information	Gene Rodrigues gene.rodrigues@sce.com, (626) 302-0801; Jack Parkhill jack.parkhill@sce.com, (626) 302-0745.
Reference	http://www.sce.com/residential/income-qualified/income-qualified-programs.htm

Summary and background

Southern California Edison (SCE) has operated the Energy Savings Assistance Programme (ESAP) for over 25 years. The history of ESAP dates to the early l980s, when the California Public Utilities Commission (CPUC) laid out the requirements for free installation of attic insulation, caulking, and other weatherization measures for low-income customers. The objective was to promote equity and to help relieve low-income households from the burden of rising energy prices.Today ESAP has a 3-year funding level of $183 million and SCE continues to help low-income customers manage their bills through direct hardware installations, education and outreach. Traditional objectives of improved health, safety, comfort and quality of life continue to be emphasized.

SCE's ESAP is part of a state-wide energy efficiency programme targeted to low-income customers and administered by the four investor-owned utilities (SCE, Pacific Gas & Electric, San Diego Gas & Electric and Southern California Gas). As part of the California Long Term Energy Efficiency Strategic Plan the CPUC has directed that each Investor-owned utility (IOU) offer ESAP to all eligible low-income customers by the year 2020. For SCE this means more than 1.4 million customers must be invited to participate over the next 8 years.

Programme description

Through a network of community-based organizations and private contractors, SCE provides energy education, assesses customer homes for eligible measures, and installs these energy efficient measures at no cost for low-income households. Energy saving measures include lighting, refrigerator replacement, weatherization (insulation and envelope improvements), minor home repair, pool pumps and household heating and cooling measures.

SCE makes extensive use of community-based organizations (CBOs) and faith-based organizations (FBOs) in implementing ESAP. These local delivery agents are particularly effective in engaging low-income customers, assessing homes, and installing energy and demand saving measures. An integrated approach allows for a broad range of goods and services to be offered, from efficient lighting to load control devices to tariff options and bill payment assistance.

SCE will finish installing over 5 million smart meters by the end of 201, with an estimated one out of every three installed in low-income homes. SCE will offer an array of services to better assist these customers to manage their electric bills. Other improvements planned include information in more languages, accommodating the needs of disabled persons, and using smart meters and data analysis to encourage energy and demand saving behaviour.

Regulatory and market drivers

The Energy Savings Assistance Programme (ESAP) is designed to improve access to energy efficiency goods and services for low-income customers. The goal of equitable delivery of energy efficiency is now official state regulatory policy. Programmes are funded through tariffs and are evaluated thoroughly even though they are not held strictly to the cost-effectiveness evaluation criteria applied to strictly resource-based energy efficiency programmes.

ESAP cannot meet the Total Resource Cost (TRC) threshold of 1.0 applied to other energy saving programmes, as the program is offered free of charge. However, when non-energy benefits (*e.g.,* health, safety, comfort, and well-being) are considered – an important consideration for vulnerable populations – the programme may be justified.

Lessons learned

SCE has developed new technologies to support the expansion of ESAP to another 1.4 million customers. These operational tools include Direct Connect, tablet PC technology, intelligent scheduling/routing technology, and new customer communications tools.

- SCE utilizes an automated outbound calling tool called Direct Connect, which allows SCE to utilize a whole-neighbourhood approach to programme outreach. The Direct Connect feature puts customers immediately in touch with SCE representatives.
- SCE utilizes tablet PCs and portable scanners to streamline enrollment. Paperless enrollment helps verify eligibility on the spot and maintains customer privacy.
- Schedule Manager and Routing Tool (SMART**)** is a scheduling and routing tool that complements paperless enrolment and improves scheduling for SCE's service providers. SMART offers functionality that provides proximity-based scheduling of jobs, mileage and time calculations, and route maps to and in between appointments.
- SCE is broadening its customer communications to include e-mail, text messaging and Voice Over Internet Protocol (VoIP) technology. Customers can choose how they would like to be reminded of upcoming appointments. SCE can also use this technology to remind customers of scheduled maintenance on their new appliances.

SoCalGas/San Diego Gas & Electric

Table 43 • Non-residential on-bill financing programme

City, country, region	Southern California
Programme type	On-bill financing
Programme tenure	2007 – ongoing
Sector focus	Non-residential
Technology focus	Any electric or gas efficiency improvements
Objective	Provide attractive financing for businesses participating in utility rebate programmes
Budget	1050 loans totalling USD 27 million (as of end-2011)
Energy Cost Savings	$10 million per year (SDG&E, 2007-2012) 100 GWH annual savings (based on tariff rate of $0.1/kWh)
Contact information	Frank Spasaro (SoCalGas), Programme Manager: FSpasaro@semprautilities.com. Jill McGhee (SDG&E), Programme Manager: JMcghee@semprautilities.com.
References	www.sdge.com/obf www.socalgas.com/for-your-business/rebates/zero-interest.shtml

Summary and background

San Diego Gas and Electric Company (SDG&E) and Southern California Gas Company (SoCalGas) each provide an on-bill financing programme with easily accessible, zero interest, unsecured loans for purchasing and installing qualified EE equipment. The programme is designed for businesses interested in taking part in a programme that provides rebates on purchase of energy-efficient equipment, but who are unable or unwilling to finance the remaining investment cost for the energy efficiency improvement. The loan amount and repayment terms are based on a "bill-neutrality" calculation with a maximum five-year payback.

Programme description

Non-residential utility customers participating in a business EE rebate or incentive programme are eligible for the on-bill financing programme if they have been utility customers for two years and have a good bill payment history. No other credit checks are performed.

Eligible EE equipment for gas customers include pipe and tank insulation; high-efficiency fryers and steamers; furnaces, kilns and ovens; heat recovery equipment; natural-gas engines; and boiler economizers. Eligible equipment includes lighting, occupancy sensors, HVAC, refrigeration, motors, pumps and energy management systems.

Loans for commercial customers must have a minimum of USD 5,000 and a maximum of USD 100,000 per meter, with a simple payback of no more than five years. For taxpayer-funded customers (public agencies), loans must have a minimum of USD 5,000 financed and up to a maximum of USD 250,000 per meter, with a simple payback of no more than 10 years. State agencies are eligible for loans up to USD 1 million.

The loan is designed to be "bill neutral" — that is, the term is calculated so that monthly repayments are equal to the monthly energy savings realized from the installed efficiency measures. Loans can only be used for the purchase and installation of EE equipment that qualifies for the utility rebate or incentives.

Regulatory and market drivers

As investor-owned gas and electricity providers, SDG&E and SoCalGas are obligated to meet energy savings and programmatic targets set by the California regulator (California Public Utilities Commission, or CPUC). The non-residential on-bill financing programme was first introduced for the 2006–2008 programme cycle, in response to a CPUC recommendation that utilities investigate new approaches to rapidly scaling-up energy efficiency investment. The CPUC also suggested that the utility programme administrators should consider practices used in other states in resolving rate making, cost allocation and consumer protection issues related to on-bill financing. In 2009, the CPUC officially directed the California utilities to adopt on-bill financing programmes. On-bill financing programmes continue to evolve in California, and it is likely that beginning in 2013 there will be a state-wide programme for third-party financing of buildings efficiency improvements with on-bill repayment through any investor-owned utility (Environmental Defence Fund 2012).

Lessons learned

- Energy providers should thoroughly investigate the regulations related to lending institutions, and their applicability to on-bill financing, to make sure that programmes comply with existing law and financial regulations.
- Customer information and billing systems may need to be substantially modified in order to accommodate an on-bill financing programme, an expensive and time-consuming process. In the case of SoCalGas and SDG&E, the total cost was about USD 1.5 million
- Energy providers should retain the right to disconnect customers who are in default of the loan repayments, just as they can disconnect customers for non-payment of energy bills. This is essential for keeping default rates to acceptably low (less than 1 percent) levels.

State Grid Corporation/Jiangsu Electric Power Company

Table 44 • Energy Efficiency Service Activity Groups

City, Country, Region	Jiangsu Province, China
Programme type	Advice and assistance
Programme tenure	Since 2011
Sector focus	Large energy users
Technology focus	Energy management
Objectives	• Help consumers save energy by providing advice and establishing energy management systems • Increase the potential of member companies to identify and implement energy savings projects.
Budget	Program expenses shared by all the participants - Roughly USD 80,000 per year for each Energy Efficiency Services Activity Group
Savings	12 GWh annual energy savings About USD 1.25 million savings in electricity costs in the past year
Contact information	Mr. Zhang Lei, Jiangsu Power Company, State Grid Corporation of China Email: jslszl@163.com Telephone:+86-13770693950
References	http://www.sgcc.com.cn/ztzl/newzndw/zndwzx/gnzndwzx/2012/05/273507.shtml http://www.sgit.sgcc.com.cn/newzxzx/xyzx/05/273841.shtml (in Chinese)

Summary and background

In response to rising power demand, supply constraints, and national energy-saving policies, China's State Council in 2010 issued a new Demand Side Management (DSM) Rule. The DSM Rule obligates the two government-owned grid companies (State Grid Corporation and China Southern Grid) to achieve "power savings" of 0.3% of energy and peak demand (based on previous year's sales and demand figures) each year on an ongoing basis. The power savings can be achieved through end-use energy efficiency and upstream energy savings, such as line loss reductions. The National Development and Reform Commission (NDRC) is responsibility for establishing relevant indexes and methodologies for checking the performance of obligated entities. As part of their compliance strategy, the State Grid Corporation of China (SGCC) and Jiangsu Electric Power Company (JEPCO) are establishing energy service company affiliates to work with city and country power companies. The Energy Efficiency Services Activity Group (EESAG) model has been established to promote energy-saving activities and improve awareness of energy conservation. EESAG allows electric power market participants (energy providers and their customers) to learn together, share energy-saving experiences and achievements, promote national energy policy, improve energy efficiency management, enhance the market competitiveness of enterprises through regularly technical exchanges, and originate energy savings projects which contribute to meeting the power savings obligations of SGCC and JEPCO.

Programme description

SGCC put forward the energy-saving service system arrangement as part of the national "12th

Five-Year Plan" energy saving and emission reduction activity. A total of 25 EESAGs were set up by the city branches of Jiangsu Electric Power Company in 2011, and Changzhou branch was selected as a pilot due to the large number of big industrial energy users in that city. Changzhou EESAG is led by the local power utility and consists of 12 enterprises, including six domestic enterprises and six joint ventures. The participating industrial enterprises vary in size (from 2 GWh to 6 TWh) and sector (machinery, textile, iron and steel) but share a strong interest in saving energy. Participating in EESAG provides access to outside technical assistance and the resources of the group in reducing energy costs. The group supports the energy-saving work of member companies and explores new business models for power company affiliates. Jiangsu's energy service company affiliates benefit from potential project opportunities.

The EESAG model is also being tried in Suzhou City. Suzhou Power Utility, another branch of Jiangsu Electric Power Company. Suzhou created six EESAGs each headed by Suzhou Electric Power Company and comprising 69 electricity users. EESAG activities in 2011 included promulgation of energy efficiency standards, seminars on energy savings technologies, free energy audits, energy-saving case studies and experiences exchange, and assistance in developing energy-saving projects. Participants in an EESAG typically include the energy efficiency service staffs of the local utility, technical staff of energy service company affiliates, expert consultants, and technical experts of equipment suppliers.

A typical energy saving assessment for a large energy-using participant would consist of:

- A preliminary assessment, which allows energy efficiency staff of the local power utility to learn about the customers' energy management efforts and collect energy data. EESAG mobilizes experienced engineers to help in the assessment process.
- A goal setting process, during which energy-saving goals are developed. These energy-saving goals may be linked to government-assigned goals or energy provider obligations.
- A project implementation process, which draws on the EESAG network to mobilize energy services companies and collect additional information needed to develop an energy efficiency scheme tailored to the large energy user. Each large energy user then takes decisions on the projects to be implemented. During this process the energy service company affiliated to the electric power company can also make recommendations and offer project development and implementation services.
- Feedback tracking. Participants cooperate with energy management consulting companies or energy-saving equipment, and exchange information on energy savings results.
- Evaluation and outcome sharing. The power company is available to assist large energy-using participants in evaluating energy savings. The power company also keeps track of good practices in diagnosis, goal-setting, project implementation, and project savings. These good practice projects are summarized and shared throughout the EESAG and eventually through the energy efficiency management platform of SGCC.

Regulatory and market drivers

Chinese energy providers are very familiar with the use of demand-side management to cope with power shortages and manage peak demand. Continued concerns about growing electricity demand and prospects for shortages led the State Council to issue a new DSM Rule on 4 November 2010. Administered by NDRC, the DSM Rule requires electricity distribution companies to meet 0.3% of annual energy and 0.3% of annual peak demand (based on previous year's sales and demand figures) with energy savings measures. The DSM Rule obligates the two large government-owned grid companies (State Grid Corporation and China Southern Grid) to achieve "power savings", which includes both end-use energy efficiency and upstream energy savings (e.g., line loss reductions), up to certain limits (Crossley, et al 2012).

Implementation of the DSM Rule is complex. Six central government authorities are involved, with NDRC in the lead but Ministry of Finance (funding, budget approval), State Electricity Regulatory Commission (SERC) and provincial authorities also involved.

Obligated entities can meet their energy savings targets in several ways: (i) through direct implementation of end-use efficiency improvements in their own facilities or those of their customers; (ii) through energy service companies established by the grid company to implement energy efficiency projects; (iii) through energy savings purchased from third parties; (iv) by promoting energy efficiency to end-use customers; or (v) by making infrastructure or operational improvements in the transmission and distribution networks that save energy.

Grid companies are ultimately responsible for financing the cost of complying with the DSM Rule, incorporating the related expenses into their power supply costs. Provincial governments are also establishing new funding sources to support their additional costs, such as surcharges collected through electricity tariffs, revenues from differential pricing for energy-intensive users, or special funds supported by government budgets (Crossley et al, 2012).

State Grid Corporation and China Southern Grid Company are positioning themselves to utilize all of the allowed energy savings modalities available to them. State Grid has created provincial ESCO subsidiaries throughout its energy service companies in all 26 provinces within its service territory and signed contracts worth 0.7 TWh of savings. State Grid has also launched an end-use energy efficiency promotional campaign, as well as construction of high-voltage DC transmission lines which will decrease grid losses by 0.07 percent (China-US Energy Efficiency Alliance 2012).

Lessons learned

- The business evolution of Chinese power companies has not emphasized competence on power savings from the customer side. Newly established energy service companies, even if they are affiliated to the power company, may not have the technical or customer knowledge to gain the customer's trust. There is no guarantee that the new energy services companies will be selected by large energy-users to implement projects.
- Both the EESAG model and the SGCC energy efficiency management platform of SGCC will benefit in the long run from high quality energy efficiency consulting engineers trained through EESAG activities. The biggest start-up problem is mobilizing the appropriate professional consulting companies to help group members carry out comprehensive preliminary diagnosis for energy efficiency and implement energy-saving and cost-saving measures.

Studio Bartucci

Table 45 • Role of ESCO's in the Italian White Certificates scheme

City, country, region	Italy
Programme type	Advice and assistance, technology development, financial incentives
Programme tenure	Ongoing since 2010
Sector focus	Industrial (Cement, steel)
Technology focus	Industrial process improvements
Objective	Identify and develop energy savings projects in Italian industry Deliver energy savings through energy performance contracting with saving financial support of the White Certificates Scheme
Budget	EUR 1 million
Savings	Cement manufacturer case study: 175 MWh annual electricity savings, 1 000 tons of Pet Coke saved per year
Contact information	Davide Manganotti Tel. +39 3402622776; Davide.manganotti@studiobartucci.it
Reference	http://www.studiobartucci.it http://www.tenovagroup.com/efsop_systems.php

Summary

Studio Bartucci is an Italian Energy Services Company (ESCO) specializing in identifying and implementing industrial process energy savings. Working as energy and carbon management specialists throughout Italy, and with industrial technology providers from around the world, Studio Bartucci provides industrial clients with process energy audits, implementation management, financing, and M&V. This case study looks at the application of combustion control analyzer/probe technology taken from the steel industry and applied in an Italian cement plant. The ESCO financed the technology application itself, entered into an Energy Performance Contract with the factor owner to recover its costs, and converted the energy savings into an additional revenue stream using the mechanism of the Italian White Certificates scheme.

Programme description

Successful ESCOs tend to specialize in one sector or end-use and replicate proven project designs Studio Bartucci specializes in energy-saving process innovations that borrow technology from industrial sector and apply it to another. This case study describes how Studio Bartucci and its client, a cement manufacturer, reduced energy and feedstock requirements and lowered the environmental impacts of a large cement plant through calcination process optimization based on off-gas analysis technology.

Applying combustion probe/analyzer (CP/A) technology developed for steel mills to an Italian

cement plant is a good example of how an ESCO can exploit a technology or industrial application niche. Having identified its potential for the Italian cement industry and purchased a license, Studio Bartucci offered the cement plant owner, a shared savings Energy Performance Contract (EPC). Under the terms of the EPC the ESCO finances the process improvement, minimizing the risk to the factory owner while sharing the verified savings that result along the following years. Combined with the stable revenue stream offered through a White Certificates scheme, such industrial process improvements can mobilize large industrial energy savings and significant profits for ESCOs and factory owners.

The CP/A is an advanced process control (APC) device which induces a highly efficient burning of calciner. A key technical advantage of close proximity to the burner allows for accurate and reliable monitoring of oxidation reaction to determine the optimal oxygen level at all times. Data from the analyzer is transmitted to a control system that determines oxygen insertion fan speed in real-time, thereby avoiding excessive oxygen input. The result is reduced CO2, NOx and SOx emission together with substantial energy savings in the form of electricity and Petroleum Coke.

This improvement yields significant process and energy savings. The project generates credits of 3000 tCO2/year within the European Union Allowances (EUA) scheme, saves 1 000 tons of Pet coke/year, and reduces electricity use by 175 MWh per year. Within the Italian White Certificate Scheme regulations, these energy savings result in a total estimate of 2000 White Certificates generated per year along the project's lifetime.[21]

ESCOs can be highly effective in mobilizing energy efficiency investment and energy savings results. The three greatest barriers to energy efficiency investments, especially in industry, are long payback periods, uncertainty associated with energy savings projects, especially when new technology is involved, and transaction costs associated with developing and implementing projects. Market mechanisms such as the Italian White Certificates scheme plus the use of Energy Performance Contracts (EPCs) can work to overcome these barriers. The CP/A process improvement provides a good example. The first-cost or payback obstacle was removed because the ESCO took on the entire investment cost. The CP/A was installed and is owned by Studio Bartucci, with ownership eventually reverting to the cement manufacturer after the term of the EPC expires. The uncertainty associated with new energy savings technology such as the CP/A was reduced by using a Shared Savings EPC. Studio Bartucci and the cement manufacturer agree to share the revenue associated with the energy savings throughout the EPC duration and Studio Bartucci uses the White Certificates created by the verified energy savings from the CP/A installation to minimize the project risk associated with a new technology such as CP/A. Finally, transaction costs are reduced through the specialized knowledge of the ESCO. Studio Bartucci brings not only industrial process expertise and familiarity with the CP/A technology but also prepares the application for the White Certificates, develop the Measurement and Verification scheme, and contracts with a trading company to get the best price for the White Certificates.

The shared savings component of the EPC specifies that the cement manufacturer will transfer 50 % of the verified energy savings value from the CP/A application to Studio Bartucci as payback. Studio Bartucci adds its participation in energy savings to the revenues it expects to make from White Certificates systems and CO2 emissions reduction according to the ETS scheme, reducing the number of the years needed to get back its investment. After the established repayment period the ownership of the CP/A system reverts to the cement manufacturer, generating further savings over its lifetime for the cement manufacturer's sole benefit.

[21] A White Certificate is equivalent to 1 ton of oil equivalent (toe)

Regulatory and market drivers

There is both a regulatory and a market driver contained within the Italian energy efficiency obligations scheme. Italian law requires electricity and natural gas distributors to pursue end-use energy efficiency, according to targets determined by the Italian energy regulator (*Autorita per l'energia elletrica e il gas*, or AEEG). Distributors can either directly implement energy efficiency measures, contract energy service companies to implement energy efficiency measures, or purchase energy efficiency certificates through White Certificates markets operated by the Italian energy market operator.

The White Certificates market has been instrumental in building up the Italian ESCO industry. ESCOs such as Innowatio and Studio Bartucci rely on the revenues provided by originating White Certificates to reduce the payback period of energy saving projects and create an additional revenue stream to make projects bankable. In fact Italy has the most active energy efficiency certificate market in Europe, characterised by significant market participation by energy efficiency providers and ESCOs, and high levels of certificate trading through the spot and over-the-counter markets (Crossley et al 2012).

Lessons learned

- Studio Bartucci's expertise across industrial subsectors (cement, steel, chemicals) helped the ESCO to identify process innovations in one subsector that could be applied in others. Studio Bartucci developed an EPC arrangement through which it assumed the technology risk in exchange for a share in the expected energy savings. Energy Performance Contracts together with a compliance market created by energy provider obligations is a powerful combination for ESCO innovative project development.
- The biggest barrier to developing an energy saving project, especially one involving new and untested technology, is gaining the industrial operator's trust that the innovation will indeed save energy and money. This is where the credibility and experience of the ESCO is most important.
- The Italian ESCO industry is largely reliant on tradability of energy savings certificates via the White Certificates market. However recent fluctuations in WhC market prices have concerns about the stability of WhC revenue streams. Furthermore, with the current obligation scheme expiring May 31 2013, some Italian ESCOs are already encountering difficulties developing new projects. This underscores the importance of stability regarding obligations policy and trading instruments in order to sustain an ESCO industry.

Total

Table 46 • Meeting energy savings obligations through transportation energy savings measures

City, Country, Region	France
Programme Type	Technology development, information, education and promotion
Programme tenure	2011-2013
Sector focus	Transport
Technology focus	Vehicles
Objectives	Demonstrate and scale-up new energy savings measures for vehicle transport Help satisfy Total's energy savings obligations under Grenelle II Show whether the transportation fuel industry can meet its energy savings obligations through transportation energy savings
Budget	EUR 13,5 million annually[22]
Savings	3 TWh cumac annual energy savings
Contact information	Christian Deconninck - Energy Savings Certificates Director for Total. Christian.deconninck@total.com, 331 4135 5948 Bénedicte Bouvier – Transportation efficiency manager for Total.
Reference	http://www.total.com/en/our-challenges/preserving-the-environment/combating-climate-change/improving-energy-efficiency/the-total-ecosolutions-program/total-ecosolutions-products-and-services-201012.html&textsize=1

Summary and background

France and Ireland are the only two countries in the world where importers of transportation fuels are obligated parties under energy provider obligation schemes (Crossley, et al 2012). All obliged energy suppliers in France, which include retailers of electricity, natural gas, heating oil, and road transport fuels, must self-provide their energy savings targets, buy energy savings (white) certificates, or pay a penalty of EUR .02/kWh of cumac shortfall. Total as a French company distributing transportation fuels must achieve an energy savings target of 30 TWh cumac[23] over the period 1 January 2011 through December 31 2013. The challenge for companies supplying transportation fuels is that there is relatively little experience on the achievable scope of transportation fuel savings measures compared to the scale of the energy savings targets set for the transportation fuels sector. Total has decided to test several transportation energy saving measures linked to light and heavy duty vehicles, and explore what volume of white certificate production could be economically achieved. This will help Total determine what portion of its energy savings obligation must be met by procuring energy savings from third parties or from the

[22] Calculated with an indicative market price of 4,5 €/MWh
[23] Cumulative and discounted - cumac for short. This term refers to the annual delivered energy savings from an energy efficiency measure, summed over the lifetime of the measure and discounted at 4% annually.

white certificates market. Such a demonstration effort will also contribute to a better understanding of the potential for meeting energy savings targets through transportation energy savings measures.

Programme description

Retailers of electricity, gas and heating oil have been assigned energy savings targets since 2006. Following policy deliberations under Grenelle II, and beginning with the start of the second compliance period in January 2011, importers of transportation fuels must also meet energy savings targets. Of the economy-wide target of 345 TWh cumac for 2011-2013, transportation fuel providers are obliged to provide 90 TWh cumac. As one of the largest transportation fuel providers in France, Total's share of the transportation sector obligation is 30 TWH.

This type of regulation is a new for a transportation fuel provider. As such, Total set out to see whether it would be technically possible and financially practical to meet at least part of its energy savings obligations through transportation energy savings measures. At the moment Total is the only fuel provider in France undertaking such demonstration efforts.

Total has investigated several energy savings measures that are particular to and distinctive of the transportation sector:

- Advice and assistance in improving fuel consumption of vehicle fleets. This is a promising area and has been validated elsewhere. Previous pilot projects in France have shown fuel savings of 2%. Total provides fuel credit cards to corporate fleets, entitling holders to a variety of services, such as online fuel consumption tracking, to help both drivers and fleet managers to manage fuel consumption. Total will develop the M&V procedures needed to receive some energy savings certificates from this measure, as Total's "GR card" already represents more than a 70% market share in the vehicle fleet market.
- Promotion of lubricants which reduce fuel consumption. Premium lubricants help reduce the friction in engines and thus produce improved fuel economy. Improve lubricants could produce a 1-2% improvement in fuel economy. Total has experimented with consumer awareness efforts to promote low-friction engine lubricants. which does not appeal to a reward which is not significant individually (0,3 € for a refill of a light vehicle)
- Low rolling-resistance (LRR) tyres. Studies have shown that fuel economy can be improved as much as 5% through purchasing low rolling-resistance tyres and installing tyre pressure monitoring systems – but only if a large portion of the distance driven is at high speeds and on motorways. Total has experimented with an incentive programme that would provide 2 Euros per car to purchase LRR tyres for fleet cars running 30 000 km/year. However an LRR tyre has drawbacks for consumers – shorter life, reduced traction, and higher costs. From Total's view the reduction in fuel consumption together with the tyre lifetime are not producing enough savings to justify the programme costs.
- A related measure encourages Total service stations to check the tire pressure on cars and provide free tire inflation services for drivers filling up their tanks. This measure has been validated and is being piloted.
- Long-haul ride-sharing schemes, which have produced interesting results.[24] A spot-specific scheme is in operation, and has been validated for the 2011-2013 period. Most of the 3 TWh produced from transportation energy measures are produced by this scheme.

[24] As opposed to ride-sharing for commuting, which because of the lower miles driven and slow driving speeds produces much lower energy savings

- Total also offers advice and assistance on establishing eco-driving programmes, and is experimenting with telematics.[25] These measures are mainly for trucks, but may have significant energy savings potential.
- Fleet renewals for light and heavy duty vehicles, and Incentives for purchasing vehicles with higher fuel economy. Total considered an incentive to encourage customers to purchase cars with a C instead of a D CO2 emissions label, for example. However, an incentive sufficient to mobilize changes in consumer purchase decisions would be very expensive compared to the energy savings over the life of the vehicle.[26]

Regulatory and market drivers

Under the French energy provider obligations scheme covering the period 2011-2013 French transportation fuel providers have energy savings obligations for the first time. The target for the transportation fuels sector is 90 TWh cumac, over one-quarter of the economy-wide savings target. Since Total has a large share of the French transportation fuel market, its share is approximately 30 TWh cumac. Although Total is investing in transportation energy savings measures, these initiatives are not expected to deliver more than 6 TWh over the second compliance period– just 20% of the Total obligation for fuel, with a maximum of 3 TWh being possibly reached with standard operations during the last year of the period in 2013. Total will deliver the rest of its obligations from programmes focused on buildings (e.g., the collaboration with Confederation of Crafts and Small Builders and materials distributors such as Wolseley and Brossette) and other sectors.

Lessons learned

- There is a wide gap between theory and practice in the field of energy savings measures in the transportation sector. Extensive consultations will be needed to work out what measures are feasible and at what cost.
- Developing transportation energy savings measures lags well behind that in other sectors, and although the potential may be quite large, practical and cost-effective measures will take some years to develop. The nature of many measures – such as Eco-driving – may create administrative and M&V burdens larger than energy savings measures in other sectors.
- Transportation energy savings measures tend to be either very lumpy – e.g., modal shift – or very diffuse – e.g., vehicle fuel economy improvements.
- Developing a measurement and verification scheme is difficult. Even developing a deemed savings estimate requires many assumptions which may not apply in a given situation.

[25] Telematics cover an array of technologies useful in optimizing the driving behavior and routing of delivery and long-haul trucks. They typically involve advanced software to optimize daily routing based on delivery schedule, traffic forecasts plus GPS and two-way real-time communications between driver and a central facility

[26] For example purchasing a Class C instead of a Class D vehicle would justify an incentive of only EUR 30 whereas the difference in purchase cost would be several hundred or thousands of Euros.

Vattenfall

Table 47 • One tonne life

City, country, region	Sweden
Programme type	Information, education and promotion, technology development
Program tenure	January 2011 – June 2011.
Sector focus	Residential
Technology focus	Various
Objective	Test whether a family's carbon dioxide emissions could be reduced to just 1 tonnes (compared to 7 tonnes family average) while continuing to enjoy a normal standard of living
Budget	USD 3.5 million
Savings	23 MWh annual electricity savings
Contact information	Ellinor Lindblad: Communication Director, Energy Management Programme; tel. +46 70-5596455; ellinor.lindblad@vattenfall.com.
Reference	www.onetonnelife.com

Summary and background

Vattenfall is an integrated electricity provider wholly owned by the Swedish Government. On the occasion of its centenary in 2009 Vattenfall set a target of reducing the carbon intensity of its operations by 50% by 2030. Seeking to test the appetite of consumers for reducing their carbon footprint, Vattenfall, A-hus, and industry partners Volvo, ICA and Siemens developed the One Tonne Life concept and project. The idea is to create a climate-smart household by inspiring citizens and showing them how they can adopt a more sustainable lifestyle by conserving energy and services and adapting to more sustainable consumption patterns.

Programme description

One Tonne Life is a demonstration project involving one test family who spent six months living in a climate-smart manner, attempting to reduce their carbon dioxide emissions to one ton per person. They lived in a high-efficiency home with EE appliances and building-integrated solar PV panels, drove a plug-in hybrid electric car, ate in a climate-smart way, and benefited from coaching in energy efficiency, transport, food, and climate. The technology used, including the house, car, and appliances, was either commercially available or soon would be. House design was based on three criteria: higher energy efficiency, affordable prefabrication, and attractive design.

The various project collaborators, providing expert input from different parts of the business community and academia, were essential to programme success, and effectively extended its purview beyond issues of energy efficiency. While Vattenfall supplied renewable electricity, visualization tool and energy coaching, A-hus provided the house, Volvo the electric car, and Siemens the household appliances. The cooperation with food retailer ICA was the first of its type for Vattenfall. Experts from Chalmers University of Technology established the methodology to measure the family's carbon emissions.

Rather than market the programme themselves, Vattenfall provided an online platform whereby the family themselves were able, in part through social media, to share their experiences on the Web. This together with mass media coverage of the project inspired many more families to become involved. More than one-third of the Swedish population became aware of the project, and half of those said they were inspired to take related action.

The family achieved an overall reduction of 2.8 tons per year (a 62% decrease) without compromising their normal life (comfort level) and, at one point, a maximum reduction of 1.5 tons per year (a 79% decrease). By sector, the family reduced emissions from food by 84%, from transport by 95%, from the home by 58%, and from all other sectors by 51 percent. Changes in daily living habits, measures available to most families, were thus shown to have significant impact, providing hope for success in tackling climate change.

Regulatory and market drivers

As a demonstration project, One Tonne Life did not have a regulatory driver. The primary drivers were a practical interest in the potential for normal citizens in the Western world to adapt and shift to a lifestyle consistent with the CO_2 reductions required to reach a sustainable climate outcome, and how emerging technology could contribute to such a transition to sustainability.

Lessons learned

- Energy providers should not be afraid of leaving their comfort zone in pursuing innovative programme design.
- Focusing on the consumer perspective and highlighting the lifestyle implications of sustainability generated immense public interest.
- As the metrics for measuring CO2 are sharpened, it becomes necessary to calculate the "backpack" of emissions generated when capital stock items such as a house are constructed. The backpack is calculated using life-cycle analysis spread over the lifetime of the item as a fixed annual "CO2 mortgage."
- This type of programme should operate within a minimum 3-year timeframe. The project family moved back to their original home after the scheduled six months, the data were collected and analyzed, with no further cooperation between the partners. Given that public interest was peaking at this point, it would have been useful to follow up with the family after they moved back to a home without the efficient technology or support from experts.

Vermont Gas and Efficiency Vermont

Table 48 • ENERGY STAR New Homes Programme

City, country, region	Burlington, Vermont
Programme type	Financial incentives, information, promotion and education, technology development
Programme tenure	Ongoing since 2001
Sector focus	Residential new construction
Technology focus	All
Objective	Increase the efficiency, comfort and durability of new homes in Vermont through assistance, third-party energy ratings, and incentives for high-efficiency
Budget	USD 2.5 million (2010)
Savings	3 GWh total annual energy savings in 2010 (1,390 MWh and 54,000 therms gas savings)
Contact information	Scott Harrington, Manger, Energy Services, Vermont Gas Systems: Tel. +1-802-951-0372; SHarrington@vermontgas.com; Chris Gordon, Residential New Construction Manager, Vermont Energy Investment Corporation: cgordon@veic.org.
References	www.efficiencyvermont.com/vesh http://www.vermontgas.com/efficiency_programs/res_programs.html#new_construction

Summary and background

The Vermont ENERGY STAR New Homes programme is jointly delivered by Vermont Gas and Efficiency Vermont, the state-wide, ratepayer-funded energy efficiency provider. Vermont Gas entered into a partnership with Efficiency Vermont in 2001 to promote residential buildings that satisfy ENERGY STAR requirements and deliver prescriptive rebates according to home-energy rating and installed measures.

Programme description

Single-family dwellings in the programme receive a home energy rating by a certified auditor, the cost of which is subsidized by Vermont Gas. Homes qualify for the ENERGY STAR label if they meet a specified home energy rating threshold plus additional energy efficiency criteria (*e.g.,* mechanical ventilation and insulation meeting the Vermont residential energy code, EE lighting, appliances, and HVAC equipment). Depending on their overall home energy rating, ENERGY STAR homes receive an incentive of up to USD 1,500 with Vermont Gas Systems paying up to USD 650 of this incentive for homes in their service territory. Further rebates are available where higher-efficiency appliances are installed. Multi-family residential buildings are still encouraged to receive energy ratings, but are treated on closer analysis of mechanical, thermal and hot-water EE measures. The local municipal utility, Burlington Electric, provides incentives directly to their

customers. This partnership is proving valuable for the separate gas and electricity providers as well as the energy efficiency provider in securing participants.

The programme has progressively adapted to newer technologies, changes to the ENERGY STAR guidelines, and changes to the building energy codes in Vermont, which have typically become more stringent than the 2009 energy code. ENERGY STAR sets the bar higher than this code, preparing buildings for compliance[27] with both code and ENERGY STAR, while adding both perceived and actual (*e.g.,* property) value[28] to homes.

ENERGY STAR is jointly marketed using leads from the electric utilities and Vermont Gas regarding new homes under construction, reaching out to builders and new homeowners with brochures, mailers, websites, and periodicals. State-wide, 30% of new homes receive a programme energy rating, and 25% earn the ENERGY STAR label. The proportion of customers who opt for the ENERGY STAR label is higher (50%) in the more populous areas, where income levels are higher and where developers sign up entire developments.

Regulatory and market drivers

The Vermont Public Service Board (PSB) authorized Vermont Gas to administer natural-gas efficiency programmes (Docket No. 5270-VGS-2). Burlington Electric as a matter of municipal policy is committed to improving the energy efficiency of residential customers. The Vermont PSB and legislature created Efficiency Vermont as the main vehicle and coordinator of electric energy efficiency programmes on a state-wide basis.

Efficiency Vermont is funded by a volumetric "energy efficiency charge" collected by the Vermont Public Service Board on all electric utility customer bills. Efficiency Vermont was created to use this public benefits fund for energy-saving and financial-saving programmes and services, one of which is Vermont ENERGY STAR Homes. Vermont Gas funding for their portion of the programme is recovered from the customer base and is embedded in rates.

Lessons learned

- Establishing a relationship with builders is an effective way to leverage marketing and promotion and achieve higher market penetration.
- Partnerships with other utilities are critical in securing participants and achieving market penetration, especially when there are separate gas and electricity providers
- Working with a national EE rating programme such as ENERGY STAR creates special issues, including the cost of an independent energy rating service. In Vermont the programme was designed to eliminate the cost burden of the energy rating to customers and contractors, significantly increasing sign-up rates.

[27] Code-compliance enforcement mechanisms are lacking in many municipalities.
[28] Efficiency Vermont is working with appraisers to document the added property value.

Acronyms, abbreviations, units of measure

Acronyms

AEEG	*Autorita per l'energia elletrica e il gas* (Italy)
ANEEL	*Agência Nacional de Energia Elétrica* (Brazil)
ARRA	American Recovery and Reinvestment Act
B/C	Benefit to cost ratio
BEE	Black Economic Empowerment
BGE	Baltimore Gas and Electric
BOOT	Build-Own-Operate-Transfer
BPA	Bonneville Power Administration
C&I	Commercial and industrial
CAA	Community Action Agency
CBO	Community-based organization
CDM	Clean Development Mechanism
CEC	California Energy Commission
CEMIG	*Companhia Energética de Minas Gerais* (Brazil)
CERT	Carbon Emissions Reduction Target (UK)
CESP	Community Energy Saving Programme (UK)
CFL	Compact fluorescent light bulb
CHP	Combined Heat and Power
CL&P	Connecticut Light & Power
CLP	CLP Power Hong Kong
CO2e	Carbon dioxide equivalent
CP/A	Combustion probe/analyzer
CPP	Climate Partnership Programme (DONG Energy)
CPUC	California Public Utilities Commission
CSR	Corporate Social Responsibility
Cumac	Cumulative actualized energy savings (France)
DCCEE	Department of Climate Change and Energy Efficiency (Australia)
DECC	Department of Energy and Climate Change (UK)
DG-Energy	Directorate General of Energy (European Commission)
DOE	United States Department of Energy (US)
DSM	Demand-side management
ECO	Energy Company Obligation
EDP	*Energias de Portugal*
EE	Energy efficiency/energy efficient
EEO	Energy Efficiency Obligation
EEPF	Energy Efficiency Programme Fund (Brazil)
EERS	Energy Efficiency Resource Standard
EESAG	Energy Efficiency Saving and Advisory Group (China)
EGAT	Electricity Generating Authority of Thailand
ELP	Energy Leader Partnerships (Enel)
EMP	Energy Management Platform (Endesa)
EM&V	Evaluation, measurement and verification
Enel	*Ente Nazionale per l'energia Elettrica* (Italy)
EPC	Energy Performance Contracts
ERSE	*Entidade Reguladora dos Serviços Energéticos* (Portugal)

ESAP	Energy Savings Assistance Programme (SCE)
ESC	Energy Savings Certificates
ESCO	Energy Service Company
ESG	Energy Savings Guarantee (Origin Energy)
EU	European Union
EUA	European Union Allowances
EUC	Energy Upgrade California (PG&E)
FBO	Faith-based Organization
FCM `	Forward Capacity Market (ISO-New England)
FPU	Florida Public Utilities
FTL	Fluorescent tube lamp
GDF	Gaz de France
GEF	Global Environmental Facility
GHG	Greenhouse gas
GME	*Gestore Mercati Energetici* (Italy)
G-RIM	Gas Rate Impact Measure
HERA	*Holding Energia Risorse Ambiente* (Italy)
HES	Home Energy Solutions (Connecticut, USA)
HVAC	Heating, ventilation and air-conditioning
ICT	Information and communications technology
IDM	Integrated Demand Management Programme (Eskom)
IEA	International Energy Agency
IMD	Indices of Multiple Deprivation (UK)
IOU	Investor-owned utility
IPEEC	International Partnership for Energy Efficiency Cooperation
ISO-NE	ISO New England
JEPCO	Jiangsu Electric Power Company (China)
KfW	*Kreditanstalt für Wiederaufbau* (Germany)
LCAL	Low Carbon Australia
LED	Light Emitting Diode
LG	Local government
M&V	Measurement and verification
MBI	Market-based instrument
MEA	Maryland Energy Administration
MERC	Maharashtra Energy Regulatory Commission (India)
NEES	National Energy Efficiency Strategy (South Africa)
NELP	National Efficient Lighting Project (South Africa)
NERSA	National Electricity Regulator of South Africa
NPPC	Northwest Power Planning Council (US)
NYSEG	New York State Electric and Gas Corporation
OBF	On-bill financing
PEPDEE	Policies for Energy Provider Delivery of Energy Efficiency
PG&E	Pacific Gas & Electric
PPEC	*Plano de Promoção da Eficiência no Consumo* (Portugal)
PSC	Public Service Commission
QA	Quality assurance
QC	Quality control
RAP	Regulatory Assistance Project
REC	Renewable energy credit (1 annual MWh of EE equals 1 REC)
RFP	Request for Proposal

RG&E	Rochester Gas & Electric
RGGI	Regional Greenhouse Gas Initiative
RInfra	Reliance Infrastructure Limited
ROE	Return on equity
RoHs	Restriction of Hazardous Substances
ROI	Return on investment
RTO	Regional Transmission Owner
SBC	System Benefit Charge
SBEA	Small Business Energy Advantage (CL&P)
SBES	Small Business Energy Solutions (BGE)
SCE	Southern California Edison
SCG	Southern California Gas Company
SDG&E	San Diego Gas and Electric Company
SGCC	State Grid Corporation of China
SME	Small and Medium Enterprises
SoC	Scheme of Control Agreement (Hong Kong)
SoCalGas	Southern California Gas
SSE	Scottish and Southern Energy
TEEC	*Titoli di Efficienza Energetica* (Italy)
Th	Therm
TRC	Total Resource Cost
UK	United Kingdom
USBR	United States Bureau of Reclamation
WhC	White Certificates

T

Units of measure

Ccf	100 cubic feet (of natural gas)
Cumac	Cumulative actualized kWh of energy savings (France)
dkTherms	thousands of therms
GW	gigawatt
GWh	gigawatt hours
Ktoe	kilotonnes of oil equivalent
kW	kilowatt
kWh	kilowatt hours
MW	megawatt
MWh	megawatt hours
MCF	One thousand cubic feet of natural gas
MMCF	Million cubic feet of natural gas
$mtCO_2$	millions of metric tonnes of CO2
Th	Therm
toe	tonne of oil equivalent
TWh	terawatt hours

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