

Achieving Large-Scale Energy Efficiency: Selected international examples

As European institutions and Member States consider the pathways to greater energy efficiency, there is a wide body of international experience, both within and outside of Europe, to draw upon. The following presents a small subset of examples to illustrate that a wealth of international experience is available to European policy makers. Among other things, these examples demonstrate that there is no single path to deep energy savings, and that good ideas must be adapted to local market and administrative conditions. Experience also teaches that effective efficiency programmes require a combination of at least three elements:

- **Meaningful energy efficiency targets or standards of performance** to raise an appropriate level of ambition, rising over time;
- An **effective delivery mechanism** to deploy efficiency investments widely and accomplish deep savings; and
- **Adequate and stable funding**, including public funding that can leverage private financing to meet increasingly aggressive energy savings targets¹.

A. Binding efficiency targets or enforceable mandates are in effect in a number of jurisdictions. Some have been in effect for many years, others recently created. They vary in coverage, but most are framed in terms of percentage reductions in end-use consumption.

- **New South Wales (Australia): 34% by 2020.** The Energy Savings Scheme set targets to reduce a percentage of total electricity sales in New South Wales from 2009 through 2020. Annual targets gradually increase from 0.4% of sales in 2009 to 4.0% of sales 2014-2020. Targets are allocated each year to electricity retailers in proportion to their liable electricity sales. Power providers are required to meet these goals. By 2020, savings will be 34% of electricity sales to all but energy-intensive/trade-affected industries.
- **European Supplier Obligations.** Across Europe there are a number of mandatory savings targets already in place, including major programs imposing savings obligations on energy suppliers in five nations or regions: the UK, France, Italy, Denmark, and Flanders. Savings targets are expressed in a variety of terms, including direct energy sales (TWh or therms), total energy, or carbon equivalents².

¹ For more detail on many of the examples cited here, see the narratives provided in *A Comparison of Energy Efficiency Programs For Existing Homes in 11 Countries*; The Regulatory Assistance Project, Blair Hamilton, Project Director; February 23, 2010 at http://www.raponline.org/showpdf.asp?PDF_URL=docs/RAP%5FHamilton%5FComparisonOfEEProgrammesForExistingHomesInElevenCountries%5F2010%5F02%5F19%2Epdf

² For detailed information on these programs, see *Energy supplier obligations and white certificate schemes: Comparative*

- California: 16.7% + by 2020.** Following California’s 2001 electricity crisis, the main state resource agencies worked together along with the state’s utilities and other key stakeholders and developed the California Integrated Energy Policy Report that includes energy savings goals for the state’s investor-owned utilities (IOUs). The California Public Utilities Commission (CPUC) formalized the goals in decision 04-09-060 in September 2004. The goals called for electricity use reductions in 2013 of 23 billion kWh and peak demand reductions of 4.9 million kW from programs operated over the 2004–2013 period. These goals constituted approximately 8.2% electricity savings by 2013, meeting 55% to 59% of the IOU’s incremental energy needs between 2004 and 2013. This decision also called for the goals to be updated every three years. In July 2008, the CPUC established new interim targets for energy savings for the years 2012 through 2020 that are equivalent to additional savings of about 8.5% electricity savings by 2020. Note: these are in addition to very large savings from building codes, state agency actions, and other autonomous savings. These savings, ordered by the regulator, are binding on electricity utilities. Similar requirements apply to natural gas utilities.
- New York: 15% by 2015.** In April 2007, New York released a comprehensive energy plan that called for, among other goals, a reduction in electricity use in 2015 by 15 % (“15 by 15”), relative to projected use in 2015. In June 2008, the New York Public Service Commission (NYPSC) issued an order establishing an Energy Efficiency Portfolio Standard (EEPS) that incorporated this goal. The order adopts specific, interim, three year targets for MWh reduction, with a forecast trajectory that will achieve the 15 % efficiency goal by 2015; approves specific “fast track” energy efficiency programs for immediate implementation; and requires the utilities and NYSERDA to file energy efficiency program proposals. The electric savings targets begin in 2008 at 0.5 % savings relative to 2007 forecast sales and ramp up by a little over 2 % each year through 2015.
- Arizona: 22% by 2020.** On December 18, 2009, the Arizona Corporations Commission (the energy regulator) approved a rule that requires all investor-owned electric utilities to achieve a 2% annual savings beginning in 2014. By 2020, AZ should reach 22% cumulative savings relative to 2005 sales. This is a binding target. Utilities can count energy supply from combined heat and power systems that do not qualify under the state's Renewable Energy Standards towards the standard, as well as 1/3 of the measured savings from new building codes.
- Illinois: 20% by 2022.** Illinois sets a savings target of 0.2 % of energy delivered in 2008-2009, rising incrementally to 2 % of energy delivered in 2015 and annually thereafter. This adds up to cumulative savings of 16.2% by 2020, and 20.2% savings by 2022.
- China: reduce energy intensity 20% by 2010.** As a developing economy, China’s energy-savings goals are expressed in terms of energy intensity (per unit of production or unit of GDP) rather than in direct energy terms. The goals are taken seriously, and strong actions are sometimes instituted to enforce them. The “Top-1000 Consuming Enterprises Programme”

(“Programme”) establishes energy-saving targets for top energy-consuming industries, which account for approximately one-third of total energy consumption in China.³ The Programme plays an important role in helping China meet a nationwide energy intensity target set forth in the 11th Five Year Plan (“Plan”), which calls for reducing the energy intensity of China’s GDP by 20% from 2005 to 2010.⁴

The Programme sets an overall savings target of 100 million metric tonnes of coal equivalent (Mtce) of final energy consumption between 2006 and 2010. This target is allocated among industries in nine sectors that consumed a minimum of 180,000 tce in 2004. Covered sectors are: iron and steel, petroleum and petrochemicals, chemicals, electric power, non-ferrous metals, coal mining, construction materials, textiles, and paper. Most key power sector entities are included in the Top-1000. It remains to be seen how successful this program will be, but there is no doubt that it is taken seriously by government ministries and utilities. For example, utilities charge substantially higher electric rates to industrial facilities judged to be using power inefficiently and the central government recently ordered the closing of numerous inefficient factories to help speed up compliance with national energy intensity goals.

B. Delivery models around the world vary: from government–industry long term agreements, to government efficiency brands delivered by approved private contractors, or mandates on utilities and other energy suppliers.

- Experience in a number of countries around the world has shown that voluntary long-term agreements (LTAs) with industry to improve energy efficiency—when integrated into a larger national policy scheme that includes energy or emissions taxes, or additional environmental regulations for those industries that do not sign agreements—can be very effective in achieving increasingly aggressive energy-efficiency targets for industrial sectors.⁵ **In the Netherlands**, for example, this has been a foundational approach since the early 1990s to reduce emissions in the industrial sector. The most recent LTAs in the Netherlands cover efficiency improvements in the production process as well as the product chain. By joining the LTA, enterprises agree to submit plans for accomplishing the level of efficiency improvements required under the agreements and are subject to regular monitoring and reporting requirements for their accomplishments. In exchange for meeting their agreement targets, the enterprises are exempt from any additional, specific national measures governing energy conservation or CO₂ reductions. Thirty-two sectors participate in LTA, with more than 1000 companies. Twenty-two industry associations have committed to improving energy efficiency by 30% from 2005 to 2050. The agreements cover various sectors, including information and communication technology, plastics, textiles, oil, and poultry farming. More recently, the water boards have joined with approximately 350 waste treatment plants.⁶ According to one study, the historical energy intensity improvement rate

³ Zhou, N., et al., “Overview of Current Energy Efficiency Policies in China,” Energy Policy, Volume 38: Issue 11 (November 2010) (hereinafter “Zhou 2010”), p. 18. Available at http://china.lbl.gov/sites/china.lbl.gov/files/Overview.Energy_Policy_November2010.pdf.

⁴ Energy intensity of GDP is defined as energy consumption per unit of gross domestic product.

⁵ See in particular, <http://ies.lbl.gov/iespubs/58138.pdf>

⁶ http://www.senternovem.nl/lta/publications/publicationdatabase/longterm_agreementson_energy_efficiency_in_the

of about 1% per year in the Netherlands was more than doubled during the initial 10-year period covered by the program.⁷

- For residential and commercial buildings, **Sweden** promotes a full range of energy efficiency measures, from whole-building deep retrofits to limited measures such as insulation, appliances, and lighting. This wide scope is the result of effective implementation of numerous policies, most recently the 2006 Energy Performance in Buildings Directive. According to Swedish law, whenever buildings are constructed, sold, rented, or have a significant renovation, an inspection must be done and the energy performance of the building must be certified in an energy declaration. The declaration includes energy usage information, baseline statistics for reference, and a proposal of energy efficiency measures. The declaration may be prepared only by companies that have been accredited by the Swedish government. Since 1998, the Swedish Energy Agency has supported a network of Local Energy Advisors (LEA) in all local governments across Sweden. They provide the general public, small companies and organisations with advice and information on energy efficiency and renewable energy. They are supported by Regional Energy Offices that provide training and coordinate information activities.
- **The United States federal government** has developed and promoted a Home Performance with ENERGY STAR® programme and currently implemented in 27 states.⁸ It establishes a common set of requirements and a unified brand for local programs, typically operated by utilities or states. The programme is designed to be delivered by trained and certified private-sector “Home Performance” contractors. It requires comprehensive, whole-building analysis, instrumented testing, quality control, and reporting. There are no national financial incentives, but many state and utility programs offer financial incentives for some or all measures recommended by approved Home Performance contractors.
- **In Vermont, New Jersey, Delaware, Wisconsin, and the District of Columbia,** competitively selected private entities administer area-based energy efficiency programme portfolios. All of these provide some level of performance-based mechanism, where compensation is linked to attainment of savings goals. In Oregon and Maine, sole-purpose non-profit entities have been established to administer efficiency portfolios. Among all these non-utility portfolio managers, some rely largely on in-house staffing to manage implementation of programs, while others subcontract most programme management functions. They use a combination of approaches—including standard performance contracting (see above) to deliver a wide range of energy efficiency services to the end customer. Vermont has been particularly successful with this model of delivery, and has actually turned its load growth “negative” in recent years through the creation of a seamless “one stop shop” for customers in all sectors, a high standard of quality control for the referrals it makes to accredited energy auditors and installers (including post installation

[netherlands results.asp](#)

⁷ Kerssemeeckers, M., 2002. The Dutch Long Term Voluntary Agreements on Energy Efficiency Improvement in Industry. Utrecht, The Netherlands: Ecofys.

⁸ Environmental Protection Agency of the U.S. Department of Energy:
http://www.energystar.gov/index.cfm?c=home_improvement.hm_improvement_hpwes.

inspections), and the development of effective partnerships with local financial institutions and government authorities.⁹

- **Norway** delivers its energy efficiency programs through a single national “branded” organization (Enova), a non-utility quasi-governmental agency overseen by the Ministry of Petroleum & Energy. Norway’s information services and customer financial incentives are funded through a combination of: 1) volumetric charges on energy and fuel suppliers, and 2) a “wires and pipes charge” levied on all customers through the distribution utilities. Program offerings currently focus on reducing the high initial costs of residential heat pumps, solar water heating and biomass heating by providing financial incentives to homeowners, as well providing residential efficiency technician training to installers.
- **California** funds residential, commercial and industrial energy efficiency programs through “wires and pipes” charges and tasks its four largest regulated (private) gas and electric distribution utilities to deliver energy efficiency to all retail customers in their service territories. To create a business model for energy efficiency, California regulators have decoupled sales from revenues as well as adopted positive financial incentives tied to savings performance goals for these companies. These regulatory reforms provide the utilities with a strong incentive to pursue all cost-effective efficiency savings and to meet or exceed the savings targets established for them on an annual and cumulative basis. The four regional utilities are given flexibility to manage their portfolio of program offerings under this incentive framework--and are referred to as the regional “portfolio managers” of energy efficiency delivery, and their portfolio results are subject to independent assessments carried out on the direction of the regulatory agency. Delivery of energy efficiency services and measures to homes and businesses is actually carried out by private (accredited) auditors and installers, often under performance contracts with one or more of the utility portfolio managers. California’s efficiency programs are credited with increasing net benefits to consumers nearly five-fold over the last decade, totaling nearly \$5 billion (US dollars). Energy savings from these programs has increased almost six-fold in the last decade, reaching more than 3,400 GWh of annual savings in 2008.¹⁰
- **The state of Upper Austria** implements a comprehensive building program that combines progressive building standards, financial incentives, targeted training of professionals and a comprehensive program to raise awareness of the general public and decisionmakers. It is designed to cut energy consumption in 95% of all new homes by 50% and every year, the efficiency requirements of new buildings are increased by about 5%. Under the program, energy efficiency requirements for new and renovated buildings are updated regularly and customers are provided very attractive funding to incentivise homeowners and homeowner associations to go beyond the legal requirements, with the result that several hundred passive

⁹ See Parker, Scudder, Blair Hamilton, and Michael Wickenden, “What Does It Take to Turn Load Growth Negative? A View from the Leading Edge.” Proceedings of the 2008 ACEEE Summer Study on Energy Efficiency in Buildings. Washington, DC: The American Council for an Energy-Efficient Economy. August 17-22, 2008 and an overview of the Vermont delivery model at http://www.raonline.org/showpdf.asp?PDF_URL=%22/docs/rap_cowart_gottstein_hamilton_eonlargescale_2009_11.pdf%2

¹⁰ See: *California Restores Its Energy Efficiency Leadership: Smart Policies Produce Enormous Economic and Environmental Benefits*, Natural Resources Defense Council, March 9, 2010. http://switchboard.nrdc.org/blogs/smartinez/california_restores_its_energy.html.

buildings were built in recent years. Face-to-face energy advice sessions to building owners and 20 different courses and training programs for the building industry are also offered each year.¹¹

- C. Funding for efficiency programmes** is of course vital to realizing public policy objectives. Leading examples from many jurisdictions demonstrate that a variety of creative options are available, and they help to overcome the historic market barriers to private investments in energy efficiency. Funding solutions vary in the proportion of private financing and public (or utility) funds, but solutions need to be found for both elements. Funding sources need to be stable in order to permit programs to build capacity and penetrate markets over time. Links to complementary public policies are also valuable: for example, funds designed to address fuel poverty or industrial development, and revenues from carbon taxes and auctions can be used to advance those programs' objectives through investments in energy efficiency.
- **Germany** has established standards for increasing efficiency performance of existing buildings by 30% through its Energy Efficiency Ordinance, and provides financing to meet or exceed these standards through low-interest loan programmes (including cash promotions that increase with the level of savings performance) run by the Kreditanstalt für Wiederaufbau (KfW) development loan bank. These programmes go hand-in-glove with tailored advice for households, particularly from the Federation of German Consumer Organizations. This has developed into the largest financing programme in Europe, known as the “Energy Efficient Construction and Rehabilitation” programme. In 2008, €5.6 billion (£4.9 billion) was committed by KfW in loans and cash promotions for residential energy efficiency construction and retrofits, with hundreds of thousands of households receiving assistance.
 - **Many US states have binding energy efficiency performance obligations** on regulated utilities, and many collect uniform wires charges for efficiency from all suppliers. Approximately \$4 billion per year is now being dedicated to end-use efficiency through this mechanism. In Texas, the regulated distribution utilities implement their binding energy efficiency obligation via an extensive use of standard performance contracts, funded through wires charges.¹² These contracts provide payments akin to feed-in tariffs for “negawatts” and “negawatt-hours” to sponsors of qualifying residential and commercial energy efficiency projects, including retail energy suppliers, energy efficiency service providers and commercial building owners. The state regulators, with stakeholder input, set the level of the incentive payments (on a cents-per-kWh or kW saved basis) as well as other performance terms of the contracts, and the distribution utilities administer the incentive payments and are

¹¹ See *Sustainable Buildings in Upper Austria*, Christine Egger, O.O. Energiesparverband; http://www.esv.or.at/fileadmin/esv_files/Info_und_Service/Greenbuild_09.pdf; and http://www.esv.or.at/fileadmin/esv_files/Medien/Passivhaus_ENGLISCH.pdf.

Passive houses refer to buildings where a comfortable indoor temperature is maintained by the “passive” use of insulation and occupants, therefore the name. They require on average only 1/5 of the space heating compared to conventional built new homes—using very high insulation standards, orientation to the south, solar shading, high-efficient windows, mechanical ventilation with heat recovery and other features.

¹² The electricity market in Texas is fully unbundled, with full retail choice (liberalisation) in many, albeit not all, regions throughout the state.

responsible for reporting. Payments made under these contracts are collected through a small distribution “wires charge” levied on all customers connected to the grid.¹³

- **Two regional power system operators in the United States** are running auctions for capacity on a “forward basis” (i.e., several years in advance of need) that permit energy efficiency and other demand-side resources¹⁴ to compete with traditional generation to meet the region’s peak electricity demand. Energy efficiency programs have successfully competed in these auctions to provide verified demand reductions during peak hours (as well as during other hours in the year) at lower costs than competing supply-side bidders. As a result, additional revenue streams in the form of market capacity payments are flowing to help fund energy efficiency programs, as well as other demand-side resources. In the first auction in 2007 (in New England regional market), demand resources including energy efficiency won 2/3rds of the bids for new capacity and lowered the clearing price. One study estimates that this result potentially saved ratepayers on the order of \$280 million by lowering the price paid to all capacity resources in the market.¹⁵
- **Using carbon auction revenues for efficiency.** Energy efficiency program funding for the 10 Northeast and Mid-Atlantic states participating in the Regional Greenhouse Gas Initiative (RGGI) cap-and-trade program is now substantially augmented through a “cap and invest” strategy for recycling carbon allowance auction revenues into end-use energy efficiency. As in other states and regions in the United States, most funding for energy efficiency programs in the RGGI states has traditionally been collected from all end-use electricity and gas customers through a “wires and pipes” charge, that is, a small charge added to distribution or transmission tariffs. This continues to be the case for the RGGI participants, but recently these states have invested (collectively) on the order of 75% of the total carbon allowance value in the market in energy efficiency improvements—leading to lower cost per tonne avoided, and quicker progress in reducing carbon emissions.¹⁶ More information on this leading practice is presented in the Attachment.
- A growing number of **local authorities and communities in the United States** are implementing an approach to long-term financing for energy efficiency secured by property that has achieved great attention. Under this mechanism - generally referred to as “PACE”

¹³ For more information, see *Texas Energy Efficiency Policy and Regulatory Framework Research Brief* by the Regulatory Assistance Project, at: http://www.raponline.org/showpdf.asp?PDF_URL=docs/RAP%5FMotamedi%5FTexasModelResearchBrief%5F2009%5F10%5F14%2Epdf

¹⁴ Including demand response and distributed generation, as well as energy efficiency programs.

¹⁵ See Cheryl Jenkins, Chris Neme, and Shawn Enterline, Vermont Energy Investment Corporation: “*Energy Efficiency as a Resource in the ISO New England Forward Capacity Market*,” ECEEE 2009 Summer Study Proceedings. Also see: Meg Gottstein and Lisa Schwartz, Regulatory Assistance Project, “*The Role of Forward Capacity Markets in Increasing Demand-Side and Other Low-Carbon Resources: Experience and Prospects*” (February 21, 2010 Review Draft currently circulating) at www.raponline.org

¹⁶ Modeling for RGGI—IPM model runs by ICF Consulting using portfolios developed by the American Council for an Energy Efficiency Economy—found doubling efficiency spending in RGGI would (1) reduce carbon credit prices 25%, (2) reduce the need for new fossil capacity by 33%, reduce customer bills from 5% (industrial) to 12% (residential), and even greater energy efficiency investments would yield greater savings. See Testimony of Richard Cowart, Regulatory Assistance Project, Before the Committee on Energy and Commerce Subcommittee on Energy and Environment, U.S. House of Representatives, April 23, 2009, “The Consumer Allocation for Efficiency: How Allowance Allocations Can Protect Consumers, Mobilize Efficiency, and Contain the Costs of GHG Reduction,” at http://energycommerce.house.gov/Press_111/20090423/testimony_cowart.pdf.

financing (Property-Assessed Clean Energy)¹⁷ - municipalities collect repayment for the cost of home energy improvements, over periods up to 20 years, as a fee added to the property tax for homeowners who choose to use this mechanism. The obligation to pay is passed on in the event of property transfer. Because the repayment is tied to the property (and not the property owner) and can be repaid over a long timeframe, this mechanism appears to have the ability to finance deep, comprehensive retrofits.



About RAP

The Regulatory Assistance Project (RAP) is a global non-profit organisation that provides independent technical and policy assistance to governments, regulators, and other stakeholders on energy and environmental issues. RAP's Mission is to advise decision-makers on policies that bring benefits to consumers, the environment, and the economy as a whole. Over 19 years, RAP has assisted governments at national, regional and local levels in more than 25 nations. RAP's experts include former regulators, government officials, and senior energy executives.

RAP in the EU

In the EU, RAP coordinates efforts with the European Climate Foundation, but with an independent point of view. RAP works with both European-level and national-level policymakers, providing assistance on broad policy choices and implementation details.

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¹⁷ See www.pacenow.org.