Co-funded by the Intelligent Energy Europe Programme of the European Union

ENSPOL Energy Saving Policies

Contract N°: IEE/13/824/SI2.675067

Energy Saving Policies and Energy Efficiency Obligation Scheme

D2.2 Energy Efficiency Obligations outside the EU

Project Coordinator: Joint Implementation Network - JIN

Work Package 2 VITO, Flemish Institute of Technological Research

Task 2.2, University of Oxford

August 2015

Authors:

Eyre, N., Fawcett, T., University of Oxford

Spyridaki, N.-A., University of Piraeus

Oikonomou, V., Joint Implementation Network

Tourkolias., C., Centre of Renewable Energy Sources and Savings

Vega Barbero, J., Stockholm Environment Institute

Table of Contents

Executive Summary

The ENSPOL project focusses on the existing and planned Energy Efficiency Obligation schemes (EEOs) and alternative policies in EU Member States (MS). ENSPOL analysis seeks to inform about the implementation of Article 7 of the EU Energy Efficiency Directive (EED), which requires quantified improvements in energy efficiency in EU MS. There is significant experience of EEOs in several countries outside the EU. The objective of this report is to analyze relevant non-EU experience, including both design and results of EEO policies, and to draw relevant recommendations for MS considering EEOs as a means of implementing the Article 7 of the EED.

The report identifies the most likely non-EU jurisdictions to provide useful information for EU and MS stakeholders and policy makers, based on longevity of experience, scale and good evaluation of EEOs. Based on these criteria, the report examines two states of the USA – California and Massachusetts, one province of Canada - Ontario, one state of Australia – Victoria, and India. Results of the analysis for each are set out in more detail in the full report.

Based on this non-EU experience, the recommendations for policy makers in the EU using and considering EEOs are as follows:

- EEOs should set ambitious goals, at least after a learning phase, i.e. at a level of the order of magnitude of 1% annually.
- EEOs can be used in a variety of market structures, but the details of design need to reflect this structure.
- Obligated utilities should be either required or incentivized effectively, i.e. with penalties or incentives that make non-delivery less profitable than delivery.
- EEOs should be designed to focus on delivering benefits over and above those that will result from minimum standards.
- EEOs should not be used alone, but as part of policy packages that include minimum standards, support for innovation and consumer engagement.
- Policy makers should continue to investigate innovative approaches to delivery using actors other than energy companies.

1 Introduction

The ENSPOL project focusses on the existing and planned Energy Efficiency Obligation schemes (EEOs) and alternative policies and their synergies in the EU Member States (MS). The analysis of these policies is in accordance with the principal aim of the project on exchanging knowledge about the implementation of Article 7 of the EU Energy Efficiency Directive (EED). Policy experience in the EU is clearly the most directly applicable. However, the use of EEOs is not unique to the EU, as there is significant (and, in some cases longer) experience of this type of policy instrument in several countries outside the EU.

The analysis of existing and planned EEO schemes in the EU MS is set out in the deliverable of Task 2.1 (VITO, 2015). The objective of this report is therefore to analyze relevant experiences, concerning both design and results of EEO policies, outside the EU and draw relevant recommendations for MS considering EEO as a means of implementing the Article 7 of the EED.

Based on the methodology described below, ENSPOL identified the most likely jurisdictions to provide useful information for EU stakeholders and policy makers. These jurisdictions were selected on the grounds of relevance of energy efficiency obligation schemes to the EU, on the longevity of experience. The selection comprises two states of the USA – California and Massachusetts, one province of Canada - Ontario, one state of Australia – Victoria, and India. Results of the analysis for each are set out in section 3 below.

2 Methodology

The methodology for analyzing EEO schemes outside the EU and extrapolating results useful for EU schemes consists of a literature review of the various schemes and selected stakeholder interviews in the countries involved.

The first step defines the country/case studies. Drawing on the knowledge of the ENSPOL team and undertaking a broad literature review and discussions with key experts enabled identification of the major jurisdictions outside the EU in which EEOs are (or may have been) used. As a result, references were found to certain use in many states of the USA, some provinces of Canada, some states of Australia, India, as well as possible use in China, South Korea and Brazil. The criteria used to identify the most relevant EEOs in case study countries for further analysis are:

- There is a significant track record of use of EEOs, so that results are available,
- The jurisdictions should be diverse in terms of policy context (e.g. not concentrated in a single country)
- There should be a reasonable chance of securing interviews with knowledgeable stakeholders, about the details of operation and results.

Based on a preliminary scoping study the analysis focuses on these countries for the following reasons. EEOs are best established in the USA with a long experience, and therefore two states are selected– California and Massachusetts – that are geographically very different, but both with extensive experience of EEOs and substantial evaluation information. In the two other countries with significant experience of EEOs – Australia and Canada – the selection has been made of a single jurisdiction (state/province), which appears to have the most successful and well documented experience of EEOs. The next selection is India, as the only country outside the OECD with significant documented use of EEOs.

In all case studies the main source of information is the literature published by the relevant governmental authorities and relevant evaluation studies. In addition, ENSPOL has also carried out interviews with stakeholders identified as likely to be well-informed and reasonably independent, using a common semi-structured interview. The interviewees are acknowledged in Section 5.

The analysis focuses on the following elements that are considered useful to generate conclusions for the EU schemes.

- Policy objectives: *analysis of the key targets set by each scheme,*

- Design of obligations: *analysis of the sectoral scope of the scheme, the obligated parties for the obligation, the eligible parties that can participate in the scheme and other relevant issues concerning the target setting*
- Results of obligations: *analysis of realized savings, expected costs and other issues related to distribution of costs and savings*
- Overall evaluation: *summary of the evaluation outcomes of each scheme.*

The final part of the evaluation report deals with the lessons learned and what key issues can be relevant for the enhancement of the existing and planned EEOs in the EU. These lessons learned contain valuable information for member states planning to implement a new scheme and are therefore the starting point of our overall Summary in this report.

3 Country Analysis

3.1 California, USA

California is a very large state on the west coast of the USA with both cities and large rural areas. Political control at state level has shifted between Democrat and Republican governors, but the energy efficiency policy framework has been fairly stable over a long period. The state is rated second for overall energy efficiency policy in the USA according to the aceee Energy Efficiency State Scorecard. It has competitive wholesale markets, but monopoly distribution utilities, which are required to acquire energy efficiency resources as a priority. Energy efficiency programmes have operated in electricity since the 1970s and more recently natural gas.

3.1.1 Policy objectives

In the 1970s, with electricity demand rising at 5-6% per year, serious power station siting issues and energy security and affordability concerns following the first oil crisis, the state under Ronald Reagan as governor, established the California Energy Commission (CEC) with a mandate to make power station siting decisions, make energy demand projections and to look at energy efficiency policy in the state. The major motivation for energy efficiency at the time was to control the costs of electricity by avoiding new capacity (Blumstein, 2014). Pressures for action in California to act independently of the Federal government grew as Federal activity in energy efficiency declined during the early 1980s (Vine, 2014).

The principal measures adopted were codes and standards, but included utility programmes, initially voluntary, but now under the oversight of the California Public Utilities Commission (CPUC). A public benefits charge of $250 million annually was established to support utility energy efficiency programmes. In 2004-05, following deregulation, the CPUC sought to triple these expenditures. As “part of a deal” with the three major electricity investor owned utilities (IOUs), it was agreed that they would spend an additional $500M annually, on efficiency more cost effective than new supply. The other half of the deal was that the programmes would be implemented by the IOUs and that price controls would ensure there were shareholder incentives to implement them, essentially through a mechanism that decouples energy demand from profits through a revenue adjustment mechanism (Vine, 2014). Current price control design allows the IOUs to return up to 11% of programme costs to shareholders for energy efficiency investment (CPUC, 2014). This is a very different

approach from Europe in that the energy company programmes are motivated by regulatory incentives rather than legally binding obligations (Vine, 2014).

Because of this history, and the 30 year old state policy that programmes should be designed to save 'all cost effective electricity', the mandate is not a percentage sales, but rather is based on a state plan to deliver all cost effective electricity – the 'Potential and Goals study'. This estimates the cost effective potential likely to be delivered through IOU incentive programmes. The potential makes no allowance for innovation so it is probably a conservative estimate (pers comm, 2014).

Climate concerns only became important much later and at that point were added to the policy drivers for energy efficiency policy. Greenhouse gas (GHG) concerns are also now relevant through targets set under Assembly Bill 32 (AB32). So the policy drivers for energy efficiency are now both economic and climate. Although AB32 is primarily known for the introduction of carbon cap and trade legislation, carbon markets are expected to deliver only 20% of the reduction, with 80% from regulation for renewable energy and energy efficiency. There is a 33% Renewable Portfolio Standard for 2030 (which may be raised to 40%), the remainder of AB32 goals are delivered by energy efficiency, with electricity and gas programmes intended to deliver 15%.

Energy efficiency is now formally identified as the 'preferred resource, i.e. utilities are required to consider energy efficiency in advance of any new supply investment and to invest in all energy efficiency that is 'cost effective, reliable and feasible (CPUC, 2014). This is now largely institutionalized within the utilities (Vine, 2014). The programmes form part of a state Energy Efficiency Strategic Plan to transform the energy efficiency market (CPUC, 2011), working with the CEC which has lead responsibility for innovation and standards. The plan includes a move to zero net energy buildings by 2020 and universal access for low income households to energy efficiency support (CPUC, 2011). Such a strategic plan forms an important framework around which certainty can be developed and capacity built (Vine, 2014). This potentially goes further than 'all cost effective', as market transformation is essentially an alternative discourse to 'resource acquisition' and one better suited to the long term challenge of energy sector transformation (Blumstein, 2014).

3.1.2 Design of Obligations

3.1.2.1 Sectoral scope

The obligations apply to natural gas and electricity only, as these are the energy sectors regulated by the CPUC. The CPUC is considering extending them into water to take account of the energy embedded in water supply.

3.1.2.2 Obligated parties

The obligated parties are principally the IOUs. These are four large utilities in the state, namely Pacific Gas and Electric (PG&E), San Diego Gas and Electric (SDG&E), Southern California Edison (SCE) and Southern California Gas (SoCalGas). The publically (usually municipally) owned utilities (POUs) are locally regulated, not by the CPUC, so state regulators have no remit, although state law still requires some level of activity (Blumstein, 2014). These are usually smaller, although some (e.g. Los Angeles Department of Water and Power, Sacramento Municipal Utility District) are very significant. Many municipal utilities, but not all, choose to adopt similar programme goals to those set by the CPUC. 70% of electricity is delivered by IOUs, only 20% by public utilities and 10% is direct sales to large users.

Whilst there are no quantified mandatory goals, the IOUs must meet the energy savings goals set, using programme budgets approved by the CPUC, through cost effective programmes. They must outsource at least 20% of their programmes.

3.1.2.3 Eligible parties

The utilities design and own the programmes, but 80% are contracted out, so there is a large energy efficiency programme management and delivery industry in the state. This is widely seen as an important stakeholder in ensuring the political support for regulation. There are also local government partnerships that bring in the cities without municipal utilities. Some of the programmes are identified as a “statewide” California programme (Vine, 2014), so the IOUs are required to have the same incentives to give a uniform market across the state. The public utilities largely join in these.

3.1.2.4 Target metric

The 'Potential and Goals study' is the agreed basis for identifying "cost effective electricity". It includes assessment of both annual final energy (kWh) and peak demand (kW) savings.

IOU planned savings are reviewed 'ex ante' by the CPUC and then subjected to 'ex post' evaluation and examined again by the CPUC.

3.1.2.5 Other issues

The CPUC oversees the IOU programmes; the CEC has responsibility for other energy efficiency policies, notably codes and standards, including building standards (Blumstein, 2014).

The CEC plan envisages 50% of efficiency savings from codes and standards, which apply to refurbishment not just new build, but it does not have the resources to monitor them adequately, so some of the savings from codes and standards are credited to the utilities, which do the relevant code development, trialling, assessment and monitoring for a fee of approximately $3M annually. The evaluation of savings from codes and standards, and its allocation amongst utilities, is complex (Vine, 2014).

Information programmes are included in the utility programmes as 'non-resource programmes', i.e. it is accepted that the savings cannot be adequately evaluated, but there is agreement that this type of programme is useful, so the utilities are required to undertake them, and can pass through the costs up to a level of $6.3M annually (CPUC, 2014). Some of these are run on a statewide level by a single agency (Vine, 2014).

There are ongoing discussions in the policy community in the state about other models of delivery, for example the public benefits charge and independent agency delivery model used in New York, Vermont and Oregon. There is some concern amongst some stakeholders that IOUs are 'not nimble' and innovative. The energy efficiency supply industry sees the CPUC mandated approach as tough, but rather narrow minded, restricting some delivery options. Some policymakers would like to experiment with other models (not using the utilities) on a small scale, to try to encourage more entrepreneurial business models (pers comm, 2014). Some experimentation is already underway through not for profit regional organisations (Vine, 2014).

However, the role of the IOUs is now very well-established in California. Utilities are committed to avoiding other actors taking over the programmes and their contractors are

often strong energy efficiency advocates (Blumstein, 2014). The importance of the programmes to the state authorities is such that change is very unlikely in the foreseeable future. However, there is room for improvement in the context of regulation and the use of penalty mechanisms (Vine, 2014).

Energy efficiency policy is seen as predominantly a state level issue. However, there is some inter-state cooperation, e.g. California collaborates with Oregon, Washington and other on buildings standards. And there are important networks, e.g. of utility regulators (NARUC), the US Department of Energy itself and its laboratories.

3.1.3 Results of Obligations

3.1.3.1 Savings

Savings targets have progressively increased and are currently 0.85% of total electricity sales annually, but these are estimates of what is expected through the delivery of 'all cost effective energy efficiency', not quantified obligations. The 2013-2014 programme planned savings are 3.8 TWh and 53 Mtherms with a programme cost of $2 billion.

Savings are based on performance above minimum standards and are adjusted as codes and standards change (Vine, 2014).

Cost effectiveness metrics have been the subject of significant debate across the USA. The test of cost effectiveness used in California is the total resource cost (TRC), which is a full cost benefit analysis. Carbon is valued, but only at the current market price of $12/tCO2 (pers comm 2014). Suggestions that a metric of 'non-participant benefit' should be used have been rejected (Blumstein, 2014).

The evaluated savings for the period 2004-2009, for which evaluations are complete are 7.387 TWh of electricity, leading to a peak reduction of 1.3 GW, and 96 Mtherms (2.8 GWh) of gas. In total, the programmes have delivered significant electricity savings, which now aggregate to >1000 kWh/person/year (CPUC, 2014). The (TRC based) benefit cost ratio is approximately 1.3.

Evaluated savings are typically smaller than utility plans and reported savings, largely due to the exclusion of estimated free riders in the final evaluation.

3.1.3.2 Other issues

Programmes are evaluated to agreed protocols and annual evaluation reports are published on the very extensive CALMAC database http://www.calmac.org/search.asp. Evaluation activities include market studies, impact studies (uptake) and measure costs (CPUC, 2014). Standardised approaches are used to assess cost effectiveness and report. Individual utilities undertake process evaluations, with impact evaluations undertaken by the CPUC, based on engineering and utility billing data. Even statewide programmes are evaluated at the utility level. The evaluation process is generally assumed to be reliable and current approaches to evaluation are much improved since the 1980s. To avoid conflicts of interest, process and impact evaluations have to be done by different contractors (Vine, 2014). Evaluation of energy savings from information programmes is challenging (Vine, 2014).

Ex ante assessments are used to inform the utility incentive process to ensure regulatory certainty, with the ex post assessments used to refine the next round of ex ante assessments. In earlier approaches, incentives were based on ex post assessments, which proved extremely controversial, because of their impacts in utility revenues (Vine 2014).

Overall evaluation in California is widely accepted to be good. However, important concerns remain, notably that the evaluation process biases energy efficiency towards programmes that are the most easily measurable rather than the most important, and that issues around 'free riders and spillover' are increasingly important as programme size increases (Blumstein, 2010).

3.1.4 Other Issues

3.1.4.1 Distributional issues

Distributional issues are not considered a major issue by most stakeholders. However, the distinctive needs of low income households for cost free measures is recognized in programme design and the CPUC strategic plan targets 100% coverage of eligible and willing low income households for all cost effective measures by 2020 (CPUC, 2011). There is some support for these low income households from Federal programmes (Blumstein, 2014).

3.1.4.2 Other issues

The longevity of the regulatory approach in California is indicative of a political consensus about investing in efficiency, certainly where it is the cheapest resource. There have been

attempts to overturn this, led by the oil companies, during the recession, but these failed in a statewide vote to repeal AB32 (Blumstein, 2014). The concept is now widely understood by state policymakers and generally outweighs any concerns about higher prices and cross-subsidies.

3.1.5 Overall evaluation

Energy efficiency activities in California are if a significant size, well-established, with a well-understood process for objective setting and evaluation. In the strictest sense, the activities are not obligations, but a commercial response by investor-owned utilities to a regulatory framework in which they make larger profits by undertaking energy efficiency work than not doing so. The approach is the result of a long term understanding between the IOUs and the state regulators. Critically, energy efficiency is California's preferred resource'. The process allows for the delivery of programmes that are understood to be important, but for which savings cannot be precisely determined, including both information programmes and the administration of standards. Evaluation processes are clearly defined and sophisticated. The whole approach is firmly embedded in the energy institutions of the state and has survived changes of political administration.

3.2 Massachusetts, USA

Between 2008 and 2013 a variety of legislative actions, executive orders and new regulations addressing climate change and promoting clean energy happened in Massachusetts.

With the approval of the above mentioned set of legislative actions, Massachusetts established the most aggressive set of measures to address climate change and improve energy efficiency of any state in the US.

Currently, Massachusetts is among the leading states in CO_2 emissions abatement and energy efficiency policies.

The state of Massachusetts is promoting energy efficiency policies, not only through measures aimed to reduce consumption and increase energy efficiency, but also through measures that have GHG emissions abatement as their aim, and targets and laws that provide economic resources to facilitate the transition towards cleaner energy. The main set of legislative actions developed in Massachusetts are:

- The Green Communities Act (GCA) (2008) is a comprehensive piece of energy reform legislation, promoting development of renewable energy, energy efficiency, "green communities," and implementation of the Regional Greenhouse Gas Initiative ("RGGI"). The Act emphasizes energy efficiency in electricity generation, consumption and in building construction.

- The Global Warming Solutions Act (GWSA) (2008) mandates the reduction of greenhouse gas emissions, establishing a schedule of emissions reduction goals designed to spur innovation and promote research and development in the area of clean energy.

- The Green Jobs Act (2008) provides a funding source for the green technology industry, facilitating economic development and job growth in the clean energy sector. This law established the Massachusetts Clean Energy Center (MCEC).

Under the umbrella of the GCA, Massachusetts developed two Joint State-wide Three-Year Plans energy efficiency programmes, one for 2010-2012 and another one for 2013-2015 which allowed the state to be ranked #1 in the annual scorecard for state energy efficiency programmes (ACEEE, 2013).The draft corresponding to the Joint State-Wide Three Year plan for 2016-2018 is been already finalised.

3.2.1 Policy objectives

The current framework for energy efficiency delivery was developed in response to the mandates of the GCA and the GWSA, which set in motion a combination of new polices related to energy supply and use and GHG emissions abatement. However, we focus here on the policy objectives and actions to overcome barriers to energy efficiency required by the GCA.

The GCA represented a significant shift in the state's energy policy, focusing on a number of economic, environmental, and public policy objectives:

- Reducing growth in electricity demand through economical investments in energy-saving devices;
- Expanding the ability of municipalities, residential customers, and businesses to own and benefit from new technologies to produce electricity on their own premises;
- Facilitating commercialization of, and growth in, large-scale energy sources that produce little or no greenhouse gas emissions;

- Expanding activity and employment within the state in the advanced energy technology sector; and
- Reducing Massachusetts' dependence on and payment for fossil-fuel energy resources outside of the state.

To accomplish these objectives the GCA designed many actions focused on overcoming barriers to the adoption of energy efficiency and renewable energy resources:

- Expanding investment in cost-effective energy efficiency (EE) programmes carried out by utilities and supported through charges on energy-consumers' monthly bills;
- Allowing municipalities, businesses and residents to take advantage of "net metering programmes," in which customers who install renewable generation resources on their premises are paid for any surplus electricity they produce at close to the retail rate of electricity;
- Requiring electric utilities to enter into long-term contracts for new grid-connected renewable power sources.
- Expanding the state's renewable portfolio standard (RPS) requirements to increase the percentage of retail electricity supply that would need to come from renewable energy sources.
- Allowing electric utilities to construct and own/operate solar photovoltaic (PV) systems.

Furthermore, the GCA also instituted the 'Green Communities program' to support towns pursuing energy conservation and renewable energy generation activities; and provided for utility 'smart meter' pilot programmes to investigate the potential consumer and system efficiency benefits of using advanced meters and innovative electricity rate structures.

The GCA established the Energy Efficiency Advisory Council (EEAC) which in a new process developed three–year Energy Efficiency plans on an integrated state and cross-industry basis (i.e., natural gas and electric industries). Individual utilities then develop company-specific plans, which are submitted to the Massachusetts Department of Public Utilities (DPU) for review and approval.

The 2013-2015 Three-Year Plan builds on the foundations of the nationally-leading results achieved between 2010 and 2012 - the first plans delivered under the requirement of all cost effective energy efficiency. Like its predecessor, the current Three-Year Plan is the result of collaboration between the Commonwealth's gas and electric distribution companies and municipal aggregators (the PAs), the EEAC, Department of Energy Resources (DOER), and many interested stakeholders in the public, private, and non-profit sectors.

3.2.2 Design of Obligations

3.2.2.1 Sectorial scope

The GCA requires obligated utilities to acquire "all available energy efficiency and demand reduction resources that are cost effective or less expensive than supply". The GCA only covers electricity and natural gas.

The GCA requires that electricity and gas efficiency programme funds should be allocated to all customer classes, including low-income, in proportion to their contributions to those funds. At least 10% for electricity and 20% for gas must be spent on low-income residential sector demand-side management

The GCA emphasizes energy efficiency in electricity generation, consumption, and in building construction. The Act is intended to make energy efficiency programmes compete in the market with traditional energy supplies, and ultimately decrease consumer costs.

3.2.2.2 Target setting

Tables 1 and 2 below include the targets (in percentage and units) included in the 2013-2015 and 2016-2018 state-wide plans for electricity and gas.

Table 1: Savings goals and budget for the electricity sector

Statewide Summary	2013	2014	2015	2016	2017	2018
Proposed Savings Goals as % of Retail Energy Sales	2.5%	2.55%	2.6%	2.51%	2.49%	2.50%
Proposed Annual Energy Savings in GWh	1,195	1,236	1,275	1,178	1,168	1,162
Proposed Program Budget ($ million)	$481.32	$495.66	$518.72	580,772	605,044	632,002

Source: 2013-2015 State-wide Electric and Gas plan and 2014-2016 State-wide Electric and Gas plan

Table 2: Savings goals and budget for the gas sector

Statewide gas Summary	2013	2014	2015	2016	2017	2018
Proposed Savings Goals as % of Retail Energy Sales	1.07%	1.12%	1.15%	1.07%	1.09%	1.09%
Proposed Annual Energy Savings in therms	22,661	24,401	24,949	24,278	25,077	25,432
Proposed Program Budget ($ million)	168	175	180	202	207	213

Source: 2013-2015 State-wide Electric and Gas plan and 2014-2016 State-wide Electric and Gas plan

3.2.2.3 Obligated parties

Electricity and gas distribution utilities and municipal aggregators (collectively known as program administrators or "PAs") are subject to the EEO.

The PAs that developed and prepared the 2013 -2015 Statewide Electric and Gas Plan were: Bay State Gas Company d/b/a Columbia Gas of Massachusetts ("CMA"), The Berkshire Gas Company ("Berkshire"), Blackstone Gas Company ("Blackstone"), Boston Gas Company, Colonial Gas Company, Massachusetts Electric Company and Nantucket Electric Company, each d/b/a National Grid ("National Grid"), Fitchburg Gas and Electric Light Company d/b/a Unitil ("Unitil"), Liberty Utilities (New England Natural Gas Company) Corp. d/b/a Liberty Utilities; ("Liberty"), Cape Light Compact ("Compact"), NSTAR Electric Company, NSTAR Gas Company and Western Massachusetts Electric Company (2013-2015 State-wide Electric and Gas plan, 2012).

The following plan covering 2016-2018 was developed and prepared by jointly by Bay State Gas Company d/b/a Columbia Gas of Massachusetts ("CMA"), The Berkshire Gas Company ("Berkshire"), Blackstone Gas Company ("Blackstone"), Boston Gas Company, Colonial Gas Company, Massachusetts Electric Company and Nantucket Electric Company, each d/b/a National Grid ("National Grid"), Fitchburg Gas and Electric Light Company d/b/a Unitil ("Unitil"), Liberty Utilities (New England Natural Gas Company) Corp. d/b/a Liberty Utilities;

("Liberty"), Cape Light Compact ("Compact"),3 and NSTAR Electric Company, NSTAR Gas Company and Western Massachusetts Electric Company, each d/b/a Eversource Energy ("Eversource") (2016-2018 State-wide Electric and Gas plan, 2015).

The targets do not necessarily apply equally to all obligated parties. The level of energy savings that each proposes to achieve may be different depending on factors such as service territory size and customer makeup. For example four of the smaller utilities in Massachusetts, Western Massachusetts Electric, Berkshire Gas, New England Gas Company-Fall River Service Area, and Unitil, have individual targets lower than the statewide target.

3.2.2.4 Eligible parties

There is no apparent restriction on the energy efficiency measures that may be included in the three-year statewide energy efficiency plans, except that they must be for electricity or gas end-uses, although non-electricity or gas resource benefits such as heating oil cost savings are included in cost-effectiveness calculations.

An emphasis is placed on coordination of electricity and gas efficiency measures in order to maximise energy savings. The Green Communities Act specifically authorises the gas distribution utilities to spend funds on combined heat and power and geothermal cooling and heating projects.

3.2.2.5 Other issues

Compliance regime and fines system

The GCA requires obligated utilities to file a three–year statewide plan describing how they will meet the EEO. These three-year plans provide information on the energy efficiency programmes the utilities intend to implement, costs, funding sources to cover costs, and savings and benefits expected to result from their programmes.

The Energy Efficiency Advisory Council collaborates on the development on these three-year plans and approves or rejects them before they can be submitted for Department of Public Utilities consideration. Provided the plan receives the two-thirds majority vote of the Council, it is submitted to the Department of Public Utilities for approval, which is also the final authority ensuring the Act's requirements to acquire all cost-effective energy efficiency are met.

The obligated utilities must submit annual and quarterly reports to both the Department of Public Utilities and the Energy Efficiency Advisory Council on the status of their programmes. The Department of Public Utilities must determine the effectiveness of each utility's plan on an annual basis. If the utility has not reasonably complied with the joint plan, an investigation may be opened. The utility has the burden of proof to show good cause in failing to comply with the plan. If it cannot, a fine of USD 0.05 per kWh or USD 1 per therm of shortfall may be levied against the utility.

Performance incentives

The GCA required the obligated utilities to propose incentive mechanisms in the jointly drafted statewide energy efficiency plan. In its 28 January 2010 order, the Department of Public Utilities approved in part the incentive mechanism proposed in the state wide plan. The incentives available to each obligated electricity and gas utility is a function of three separate components: a savings mechanism, a value mechanism, and a performance mechanism. The savings mechanism pays out a portion of the total benefits accrued from administration of electricity/gas efficiency programmes.

To be eligible for an incentive payment, an obligated utility must achieve 75% or more of its individual energy saving target. The total incentive payable scales to the energy savings achieved and is capped at 125% of the target for the three-year period.

Table 3 shows the total incentives (for electricity and gas) included in the 2010-2012 plan that were approved by the Public Utilities in its 28 January order:

Table 3 Utility Incentives

(in USD)	Electricity	Gas
2010	17,328,480	4,344,255
2011	21,612,362	4,518,960
2012	25,273,089	5,540,399

Source: 2013-2015 State-wide Electric and Gas plan

Measurement, verification and reporting

The obligated utilities have responsibility for measurement, verification, and reporting of their own energy efficiency programmes. The Energy Efficiency Advisory Council's evaluation consultant works collaboratively with them on their measurement and verification activities.

Ultimately, the Energy Efficiency Advisory Council has oversight over the measurement and verification studies as well as the power to resolve disputes between its consultant and the utilities on measurement and verification issues.

Funding

Funding for electricity efficiency programmes comes from up to five sources. The five sources with their projected total levels of funding from 2010 to 2012 are:

• The systems benefits charge (USD 365 million). The GCA includes an electricity efficiency system benefits charge of USD 0.0025/kWh. The level of EE funded through the GCA EE provision is significant enough to lower regional power demand, thereby lowering the price of power in wholesale markets. Those price reductions affect prices paid by all consumers in Massachusetts and across New England, not just those who install energy efficiency measures in their homes or buildings (i.e., the EE programme participants). Second, those consumers that do participate in the EE program (and typically make some level of investment to install EE measures) get the additional benefit of consuming less electricity and therefore save on their monthly electricity bills.

• Revenues from the ISO-New England forward capacity market (USD 35 million);

• Auction revenue from the Regional Greenhouse Gas Initiative emissions trading scheme (USD 146 million);

• Outside funding from federal grants, bank loans, bond issuances, and so forth (USD 181 million); and

• A surcharge on electricity bills (USD 618 million).

Including funds carried over from previous years (whether positive or negative), total expenditures on electricity efficiency programmes are expected to be approximately USD 1,272 million by 2012. The 2012 expenditures are a 340% increase over 2008 expenditures.

The current funding source for gas efficiency programmes is a surcharge on gas bills, although the obligated gas utilities have set a goal to secure outside funding during 2011 and 2012 (USD 60 million total). The three-year budget is approximately USD 322 million.

Scheme Administration

The obligated electricity and gas distribution utilities and municipal aggregators are responsible for energy efficiency programme delivery and implementation. The obligated utilities anticipate a number of new outreach initiatives such as creating a state-wide set of efficiency "brands."

In 2010, a website portal for all Massachusetts energy efficiency programmes, called Mass Save, was launched. Other activities include marketing and implementing energy efficiency measures by leveraging the networks of community-based organisations, behavioural research, mass media campaigns, and contractor/trade ally training

3.2.3 Results of Obligations

3.2.3.1 Savings

The state's first Three-Year Energy Efficiency Plan (2010 to 2012) delivered cost-effective savings of 2,393 GWh and 37.6 million therms, a return of $4 billion in net benefits on an investment of $1.5 billion (MA EEAC 2009). Cost savings from the second Three-Year Plan (2013 to 2015) are expected to be even higher, with net savings of over $6 billion.

These plans have a benefit-to-cost ratio greater than three-to-one; for every dollar invested in energy efficiency, ratepayers will receive over three dollars in return over the lifetime of measures installed (DPU 12-100, 2013)

The GCA is a wide-ranging set of legislation with a number of initiatives that significantly affect regional demand for electricity (and to a lesser extent, natural gas), the mix of the region's power supply, and price formation in New England's wholesale energy, capacity, and REC markets. Most of these impacts tend over time to decrease total energy consumption and the state's peak power demand. They add renewable resources and increase generation from low- or zero-carbon resources within Massachusetts. And they lower wholesale electric energy prices. In sum, the first six years of implementation of the GCA will generate (by 2016) at least the following changes:

• GCA electric-utility efficiency programmes (mainly the three years plans) that end up decreasing Massachusetts consumers' electricity use by 3,617 GWh (or by 6%), and reducing annual peak load by 614 MW, or 5% of peak load;

• Gas-utility efficiency programmes lead to lower use of natural gas for heating, cooking and process needs by 4.6 million MMBtu, saving consumers approximately $25 million per year in heating, cooking, and processing costs.

• Renewable policies already implemented to date lead to the installation of approximately 715 MW of solar PV capacity, plus approximately 1,000 MW of new wind capacity resources in Massachusetts and the rest of New England (growing to approximately 2,000 MW by 2025);

3.2.3.2 Other issues

The 2012-2015 statewide plan introduced:

- Efficient Neighborhoods+: the PAs proposed to include a new initiative targeting economically challenged neighbourhoods in cities throughout Massachusetts. This new initiative is aimed at providing energy efficacy services in neighbourhoods that contain high portions of economically challenged customers, including lower income and lower middle class families. The initiative calls for neighbourhood-focused outreach, including special incentive structures, and engagement with community representatives and local government agencies.

- Enhanced Integration of Gas and Electric Energy Efficiency Services Plan. The Program Administrators continue to refine their programme designs to reflect the enhanced integration of gas and electric efforts. Regular communication and interaction with each other allows the Program Administrators to share best practices and lessons learned, and the ability to provide gas and electricity information to customers in an integrated manner in order to promote comprehensive installations.

3.2.4 Overall evaluation

Massachusetts has demonstrated the effectiveness of this portfolio of measures. A combination of legislation, executive action and private sector entrepreneurship has aligned incentives and created opportunities for clean energy growth and GHG reductions (Massachusetts Clean Energy and Climate Plan for 2020, 2010). Prior to the GCA,

Massachusetts was saving 0.86% of retail sales through its electricity efficiency programmes. The potential for electricity efficiency savings in the state was recently assessed at 2.5% annually. No similar figures for gas efficiency savings are available (Best practices in Designing and Implementing Energy Efficiency Obligation Schemes, 2012).

After passing the GCA , the suite of energy efficiency measures and programmes offered by the obligated utilities has greatly expanded. For example, prior to 2008, the gas efficiency programmes implemented by one of the utilities companies in Massachusetts, NSTAR (today Eversource) consisted primarily of rebates for efficient heating systems, windows, water heaters and thermostats, and custom commercial, industrial, and residential weatherisation. Today, gas utilities, among other programmes, offer single- and multi-family deep retrofits, new construction, and commercial and industrial direct install programmes.

The implementation of the GCA over the first six years has led to economic benefits to the Massachusetts economy from the perspectives of adding economic value and creating jobs, while also helping achieve the energy and environmental policy objectives behind the GCA.

Both Joint State wide Three-Year Energy Efficiency Plans have been proved to generate excellent results generating (only the first three years plan) $5.5billion in economic benefits (EEAC, 2013). The collective and collaborative efforts of the PAs, the energy efficiency industry in Massachusetts, and valuable partners and stakeholders contributed greatly to Massachusetts achieving its third straight #1 ranking in the 2013 ACEEE State Energy Efficiency Scorecard.

3.3 Victoria, Australia

The *Victorian Energy Efficiency Target* (VEET) scheme also known as the *Energy Saver Incentive* (ESI) was established by the State Government of Victoria and it is a part of Victoria's climate change policy which aims to reduce the State's GHG emissions by 20 percent by 2020 and by 60 percent by 2050, compared to 2000 base-year levels. The State has placed particular focus on cutting down emissions from the energy sector which is responsible for 70 percent of the total GHG emissions. The Scheme promises important reductions in the energy sector emissions by reducing demand as well as lower energy bills for consumers through reduced prices and usage.

The VEET scheme was established on 1 January 2009 and is programmed to end on 31 December 2029. During this period the scheme is legislated to operate in three-year phases

while its energy efficiency targets are expected to increase in strictness over time. The legal framework governing the scheme is the *Victorian Energy Efficiency Target Act 2007*.

3.3.1 Policy objectives

The three main objectives of the VEET scheme as established by the Act 2007 are: (i) to decrease GHG emissions (ii) to stimulate a more efficient usage of electricity and natural gas (iii) to promote investment, employment and technology innovation and development in corporations that supply products and services which reduce the use of electricity and natural gas by consumers.

3.3.1.1 Target metric

The VEET scheme operates in three-year phases. Phase 1 had been running from January 2009 to December 2011 and phase 2 from January 2012 to December 2014. During the first three-year phase, the VEET legislation established an annual target of 2.7 megatonnes of CO_2-e (a total of 8.1 megatonnes over three years) avoided to be achieved by major energy retail businesses in Victoria, through improvements to residential energy efficiency. This target was doubled to 5.4 megatonnes of CO_2-e avoided annually during the next three-year phase (a total of 16.2 megatonnes over three years) primarily as an aftermath of: (i) the scheme's expansion from the residential into the business and commercial sector (ii) the addition of new prescribed energy efficient products such as HE televisions, refrigerator fans, low-flow trigger nozzles and water efficient pre-rinse spray valves.

Table below summarizes the Scheme's energy efficiency savings targets by compliance year. Generally speaking, prior to the beginning of each new phase, the Act requires the VEET targets to be reset by regulation. Energy and gas retailers under the Scheme are allocated individual annual targets based on their share of the combined electricity and gas market in Victoria in the previous year.

Table 4: VEETs energy efficiency savings targets by compliance year

Year	Percentage of sales	$ktCO_2$-e
2009	4.0 %	2,700
2010	4.1 %	2,700
2011	4.1 %	2,700
2012	8.2 %	5,400
2013		5,400
2014		5,400

Source: Essential Services Commission, (2011) Percentage of sales column is an approximate calculation by the authors on the basis of aggregate demand data and carbon dioxide equivalent intensity indexes from www.aemo.co.au.

3.3.2 Design of Obligations

VEET is a market-based instrument, which imposes a legal obligation on energy retail companies to reduce their GHG emissions and is the first scheme of its kind in Australia. For each three-year phase, specific statewide targets for energy savings are placed which results in a number of energy efficient products, assets and services being made available to the domestic and business sector at discounted prices. VEET is a white certificates scheme, with tCO_2-e as the unit of measurement rather than MWh. For every tonne of GHG avoided, a Victorian Energy Efficiency Certificate (VEEC) is created.

The Victorian Essential Services Commission (ESC) which is the regulator of Victoria's energy retail industry is responsible for administration and implementation of the VEET scheme in terms of monitoring admission and performance of energy retailers and accrediting eligible businesses, products, services and appliances. The ESC is also obligated to report annually to the Victorian Government on the performance of the VEET scheme.

3.3.2.1 Sectoral scope

The VEET scheme originally covered only the residential sector premises. From the beginning of phase 2 in 2011, the Scheme was expanded to also cover commercial and other non-residential buildings.

3.3.2.2 Technology scope

Energy savings are created by installing energy efficient products in customer's premises. Activities that install energy efficient products to create VEECs are known as "Prescribed Activities" (PAs). According to the *Act* in order to be considered as PA, an activity must comply with two criteria; firstly, the activity must result in a GHG reduction that would not have occurred in the activity's absence and secondly, the activity must have taken place within Victoria. The ESC maintains and updates regularly an online Register of Products where preapproved energy efficient products are listed. In the case of energy efficient products that are not included into the list, energy saving companies are required to apply for approval to the ESC ahead of the installation. The ESC is responsible for supervising that energy saving companies meet the indispensable requirements and that VEECs are eligible for creation for each particular case-by-case activity.

PAs initially could only take place in residential premises but from the beginning of phase 2, most PAs are also available in commercial and other non-residential premises. Currently, the VEET Regulations have established approximately 36 preapproved PAs which are listed on Table below. The energy efficiency activities approved under the VEET scheme range from low-cost interventions, such as the installation of compact fluorescent light bulbs, to high-value interventions, such as the installation of a solar hot water service. EPs can either provide approved activities free of charge or with a contribution toward the costs of installation from the householder. The more costly the intervention, the more likely it is that a co-contribution will be required. In phase 1 of the Scheme, replacement light bulbs and showerheads were regularly provided free of charge to households.

Table 5: Categories of Prescribed Activities in the Victorian Energy Efficiency Target Scheme

Category	Sch.	Activity	Residential	Commercial
Water Heating	1	Electric to gas or boosted solar hot water	YES	YES
	2	Electric to gas or boosted solar hot water	YES	YES
	3	Gas to gas boosted solar hot water	YES	YES
	4	Solar pre-heater on gas water heater	YES	YES
Space Heating & Cooling	5	Ducted gas to HE ducted gas heater	YES	YES
	6	Central electric to HE ducted gas heater	YES	YES
	7	Ducted heat pump to HE ducted heat pump	YES	YES
	8		YES	YES
	9	Central electric to HE ducted heat pump	YES	YES
	10	Gas fueled space heater	YES	YES
	20	Space heat pump	YES	YES
	23	HE ducted gas in premises without heating or cooling product installed	YES	YES
	28	Air con to ducted evaporative cooler	YES	YES
		Gas ductwork replacement		
Space Conditioning	11	Ceiling insulation	YES	YES
	12	Underfloor insulation	YES	YES
	13	Window replacement	YES	YES
	14	Window retrofit	YES	YES
	15	Weather sealing	YES	YES
Shower Rose	17	Low efficiency to HE rose	YES	YES
Incandescent Lighting Replacement	21	Low efficiency lighting to HE lighting	YES	YES
Refrigerator or Freezer	19	Destroy pre-1996 fridge/freezer	YES	YES
	22	Purchase HE fridge/freezer	YES	YES
Television	24	HE television	YES	YES
Clothes Dryer	25	HE clothes dryer	YES	YES
Pool Pumps	26	HE pool pump	YES	YES
SPCs	29	Standby power controller	YES	YES
IHDs	30	In-home displays	YES	NO
Motors	31	Replacing electric motor with HE motor	NO	YES
Refrigerated Display Cabinets	32[1]	Replacing refrigerated display cabinet with HE unit	NO	YES

Category	Sch.	Activity	Residential	Commercial
Refrigeration Fans	33[1]	Replacing refrigeration fan and motor with HE fan and motor	NO	YES
Commercial Lighting Upgrade	34[1]	Undertaking a commercial lighting upgrade	NO	YES
Low flow trigger nozzles	35[1]	Efficient low flow trigger nozzle replacing decommissioned inefficient trigger nozzle	NO	YES
Pre-rinse Spray Valves	36[1]	Water efficient pre-rinse spray valve installation	NO	YES

1. Products 32, 33, 34, 35 and 36 were not included in the original list in 2009 and were introduced in the middle of the Scheme's phase 2 in May 2012

Source: RAP, "Best Practices in Designing and Implementing Energy Efficiency Obligation Schemes" (2012), (https://www.veet.vic.gov.au/public/Public.aspx?id=VEETActivities)

3.3.2.3 Obligated parties

Energy retailers in Victoria purchase energy (electricity or natural gas) at wholesale and on-sell it to their customers. In general, electricity retailers do not own any infrastructure or the network themselves but rather pay a fee to network operators, so they can provide power to their own customers in turn.

Energy retailers must submit annually to the ESC stating the volume of electricity or gas purchased for on-sale for the reporting year. The process above is also known as *Scheme Acquisition*. This information is carefully examined by the ESC to verify whether an energy retail company has accurately calculated its annual liability under the Scheme.

A scheme acquisition for an electricity retailer is the purchase of electricity for on-sale from the Australian Energy Market Operator. For a gas retailer, a scheme acquisition is the purchase of natural gas for on-sale from a producer, storage provider, or interconnected pipeline operator, or from the Australian Energy Market Operator. Obligated parties (OP), also known as *Relevant Entities* are these electricity or natural gas retailers with more than 5,000 clients in the state of Victoria or with at least 30,000 MWh of electricity overall acquisition under the Scheme or with at least 350,000 GJ of natural gas acquisition under the Scheme in a year.

Every OP is required each year to surrender to the ESC the number of VEECs that corresponds to its individual target for the compliance year. A compliance year is the period over which each annual target must be achieved which is a full calendar year. A VEEC represents one metric tonne of CO_2-e avoided as a consequence of specific energy saving activities. Individual targets for OPs are determined in accordance with their share in the

energy market and are calculated as the product of the retailer's scheme acquisition in the reporting year with a GHG reduction rate for that year also. GHG reduction rates are determined each year separately for electricity or gas by the Governor in Council. For instance, the GHG reduction rate for electricity for the 2011 compliance year had been set at 0.13767 and the GHG reduction rate for gas for the 2011 compliance year had been set at 0.00819, while for the 2013 compliance year these factors were fixed at 0.13974 and 0.00831 for electricity and gas respectively. OPs can either undertake energy efficiency activities themselves, or outsource the implementation of energy efficiency activities to third-party energy service companies, who typically perform the vast majority of energy efficiency activities, or buy VEECs on the market.

Twenty three electricity retailers are currently operating in Victoria providing electricity to approximately 2.1 million customers overall. The five major electricity retailers in Victoria are namely Citipower, United Energy, Powercor, SP Ausnet and Jenema, who own and operate a number of electricity networks in various geographic locations across the state. Respectively, the five major gas retailers in Victoria are namely Red Energy, AGL, Australian Power&Gas, Lumo Energy and Origin.

3.3.2.4 Eligible parties

Eligible parties, also known as *Accredited Persons* may be individuals or companies who are accredited under the VEET scheme to create and register VEECs, by undertaking a range of prescribed energy saving activities. There are no constraints on who can apply for accreditation to the ESC, however, all applicants have to complete an application form and provide the ESC with detailed information about their business processes and policies, record keeping and quality assurance systems, training and development processes and details of intended PAs. The ESC examines that information to decide whether the applicant has the processes and expertise required to operate under the VEET scheme as an EP. An AUD$ 500 fee has to be paid in order to become accredited.

According to the VEET legislation, the right to create VEECs originally belongs to the householder (generally speaking to the energy consumer in the case of the non-residential sector) for whom the energy efficient product has been installed. The householder however cannot personally create the certificates unless he himself becomes accredited. It is only when the householder signs a form assigning to the AP the right to create VEECs on his behalf based on an eligible activity having taken place in the householder's premises that the activity is regarded as additional and therefore gives the right to the EP to create VEECs. In turn for assigning this right, the EP offers the energy efficient product on discount or even

for free to the householder, providing in this way the financial incentive to the latter. After conducting an eligible activity the EP submits the VEEC creation to the ESC for evaluation. Certificates will be registered only after the ESC is convinced, following a risk based assessment, that the VEECs have been created according to the Act. A AUD 1 fee is levied against each VEEC registered to cover the administrative costs of assessing, registering, transferring, surrendering and auditing certificates. Once the certificates have been created and registered, the EP is free to sell them to the OPs.

Via allowing non-obligated third parties to create certificates, the VEET scheme has encouraged an energy services industry to emerge in Victoria, achieving thereby one of the stated objectives of the Scheme. Figure below presents a summary of the yearly levels of accreditations by the ESC over the first six years of the Scheme. The total number of approved EPs until 31 December 2014 was 175 persons.

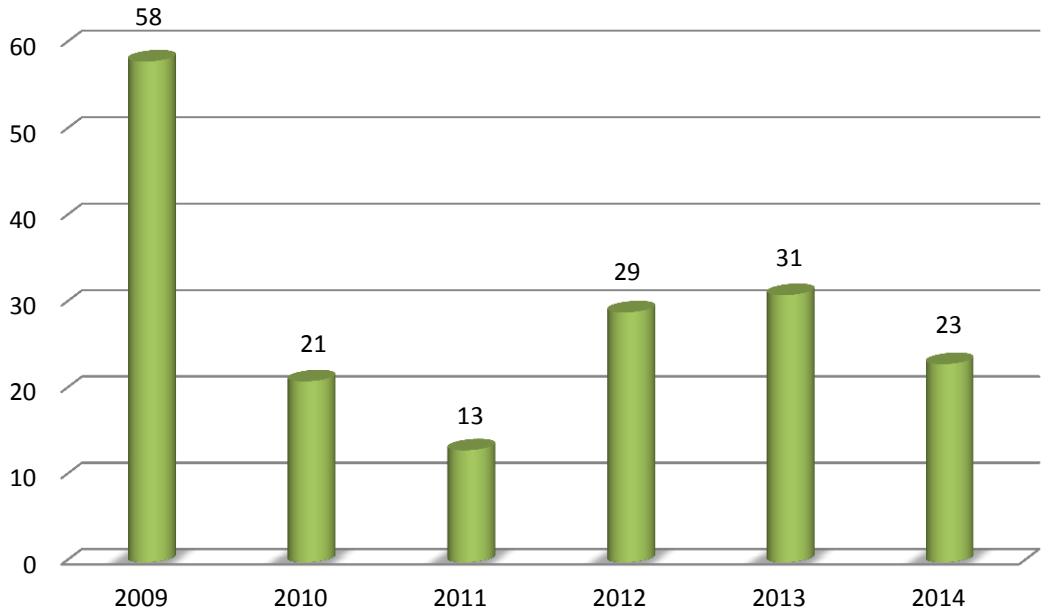


Figure 1: Eligible Parties approvals – 1 January 2009 to 31 December 2014 (source: Essential Services Commission)

3.3.2.5 Compliance and control

Each OP, between 1 January and 30 April each year must surrender to the ESC the number of registered VEECs that corresponds to their individual targets under the Scheme for the previous calendar year.

VEECs surrendered to the ESC must harmonize with two criteria:

a. The certificates must not have expired. The energy efficiency activity from which the certificates were produced must not have been completed later than six years before the OP makes its surrender to the ESC.
b. The certificates must have been created until 30 January of the year following the reporting year. In other case the VEECs cannot be used by OPs to meet their targets for that year, but, however, can be used to meet their next compliance year target.

According to section 28(1) of the Act, OPs that have failed to obtain, register and surrender the appropriate number of VEECs during a compliance year are liable to pay a civil energy efficiency shortfall penalty to the Consolidated fund. Pursuant to section 28(2) the payable amount is calculated by multiplying the VEECs shortfall (in tonnes of CO_2-e) by a prescribed shortfall penalty rate. This rate was AUD 41.23 per VEEC shortfall for the 2011 compliance year, AUD 42.73 for the 2012 compliance year and is annually amended according to changes in the Melbourne consumer price index. The penalty rate for the 2014 compliance year was AUD 44.54 per VEEC shortfall. In this way, the adjusted penalty level establishes a theoretical ceiling price for VEECs on the market.

As already mentioned above, in order to reach its individual target an OP can either create certificates (if accredited) or outsource creation to a third-party company or buy certificates on the VEEC market. The ESC provides an online platform not only to host the registration of VEECs but also to enable trading. The financial value of a VEEC is dependent on supply and demand. As a result the price exhibits considerable fluctuations from year-to-year, month-to-month etc.

Over the last few months of 2014 the wholesale VEEC price experienced a significant reduction. The spot VEEC price fell by 21 percent from AUD 17.50 on May 17 2013 to AUD 13.90 on June 21 of the same year. A possible explanation for that fall may lies on the fact that the VEEC market has been significantly oversupplied with the rollout of free Standby Power Controllers (SPCs) which have dominated VEEC creation, accounting for the 75 percent of all certificates created since the beginning of 2014. This has resulted in a massive oversupply of VEECs, such that, by mid May 2014, sufficient certificates had been created and registered to meet the target for the whole compliance year of 2014. The VEEC price remained reasonably stable until the end of the year as there was an expectation that the level of SPCs installations would start to fall. In March 2015 the VEEC price was AUD 16.

3.3.3 Results of Obligations

3.3.3.1 Savings

Under the VEET scheme, energy savings in the residential sector are calculated using the Deemed Energy Savings Method (DESM). This method estimates typical energy savings for the majority of the listed prescribed activities (e.g. light bulbs, shower heads, appliances) while simultaneously takes into account the expected life span, particular usage patterns of the installed equipment and engineering-specific data. Under this methodology, VEECs are created upfront, rather than over the life of the activity. The reductions of GHG emissions because of each prescribed activity are calculated as the difference between the energy use of the energy efficient product installed and the amount of energy that would have been used if the activity had not taken place (baseline energy use).

Certificates are created in accordance with the Scheme's Regulations which provide abatement factor values or methodologies for each prescribed activity category, as well as regional factors depended of the installations location (e.g. climate zone, metropolitan, regional etc.). The formulae for determining the number of VEECs created by specific activities are as follows:

Water heating, space heating, heating ductwork, televisions, pool pumps, clothes dryers, trigger nozzles, pre-rinse spray valves and refrigerator activities:

No. of VEECs = Abatement factor x Regional factor

Insulation and thermally efficiency window activities:

No. of VEECs = Area (m^2) x Abatement factor x Regional factor

Shower rose activities:

No. of VEECs = No. of Products x Abatement factor x Regional factor

Standby Power Controller activities:

No. of VEECs = No. of Products x Abatement factor

Where the number of products cannot exceed four per household.

In-home display activities:

No. of VEECs = Abatement factor x Regional factor

High efficiency motor activities:

No. of VEECs = Abatement factor x Regional factor,

Where the abatement factor is determined by its minimum rated output (KW).

Refrigerated display cabinet activities:

No. of VEECs = (Total display area (m^2)) x Abatement factor x Regional factor,

Where the abatement factor is determined by the refrigerated display cabinet type.

Refrigeration fan activities:

No. of VEECs = Abatement factor x Regional factor

Commercial lighting upgrade activities:

No. of VEECs = Abatement factor x Regional factor

Weather sealing and incandescent lighting activities:

No. of VEECs = Σ (No. of Products x Abatement factor x Regional factor)

If the value of calculated certificates is not integer, the calculated number must be rounded up to the nearest whole number of certificates, if the value is 0.5 or above (e.g. 2.57 is to be rounded up to 3). In order to assist Scheme's participants in their calculations, the ESC maintains an online certificates calculator software on the VEET website.

The figure below presents the number of VEECs created and registered by compliance year for the period from 2009 to 2014.

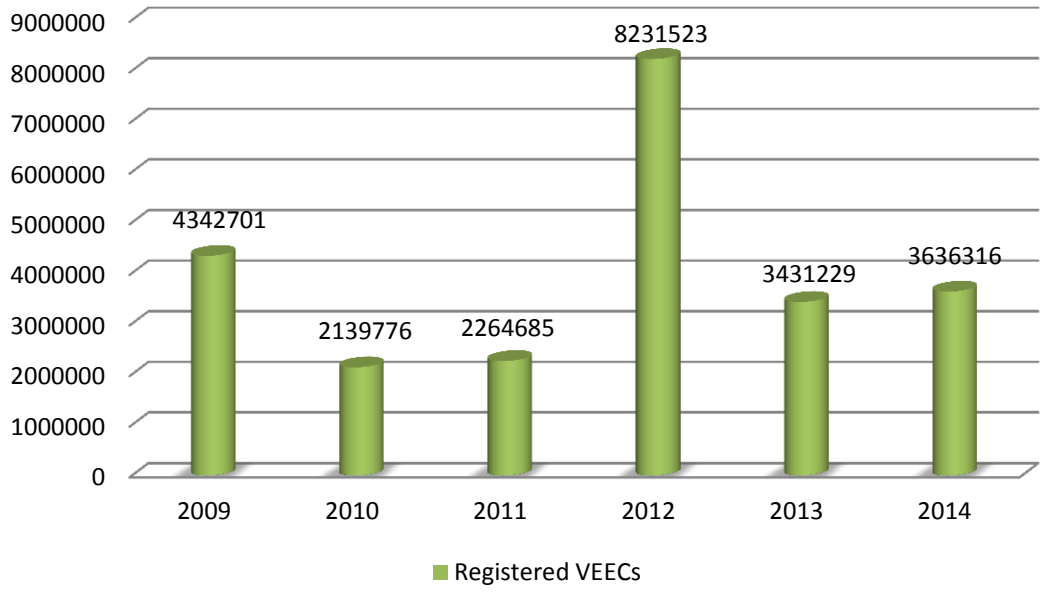


Figure 2: VEECs registered by compliance year (source: Essential Services Commission)

Not all prescribed activities have the same market resonance and thereby, each activity generates a different number of VEECs, as shown at Table and Figure below.

The VEET Scheme produced material energy savings – mostly reducing the use of coal – but did not impact peak electricity demand to any material extent. The electricity savings produced by the measures installed under the VEET scheme in the years 2009 through 2012 are material, amounting to just over 5,400 GWh cumulatively by the end of 2020. The 424,965 MWh saved in 2012 alone equates to approximately 2.2% of Victoria's residential and SME electricity consumption in that year. Virtually all of the energy saved (99.3%) comes

from reduced use of coal for electricity generation, which is consistent with the scheme's objective of reducing carbon emissions.

Table 6: VEECs registered by product – phase 2 of the Scheme

	No. of VEECs	Fuel
Standby Power Controller	9,624,586	electricity
Lighting-GLS Lamps-21A	2,181,540	electricity
Lighting-Downlight 12V-21C	1,329,803	electricity
Weather Sealing	1,015,718	
Low Flow Shower Rose	687,099	
Water Heating	471,644	
Lighting-Downlight Mains-21D	419,968	electricity
Commercial Lighting	374,056	electricity
Space Heating	369,427	
Other	853,000	
TOTAL	16,966,841	

Source: ESC Public Forum (2015)

3.3.4 Other Issues

3.3.4.1 Distributional issues

The purpose of this chapter is to assess the impact of the VEET scheme on the bills of customers who had participated in the Scheme and those who had not. While the primary objective of the VEET scheme is to reduce GHG emissions, it is of crucial importance that costs and benefits arising are equally distributed among different customer classes and population groups. Evidence associated with the way that the effects above are distributed, are only partly available for the Scheme's phase 1 (from 2009 to 2012).

Participating households are these customers, who implement a number of the Scheme's prescribed activities in their premises, giving thereby the right to EPs to create certificates on their behalf. Non-participating parties are the customers (residential and business) that do not implement any of the Scheme's prescribed activities. The financial benefits of the Scheme flow in two distinct ways: (a) through system-wide reductions in the wholesale energy price as a result of the Scheme (which accrue to both participants and non-participants) and (b) direct savings through lower energy bills as a result of reductions in

electricity usage (which accrue to participants only). Financial costs of the Scheme include: (a) network costs (which accrue to residential customers only) and (b) retail costs.

Tables 7 and 8 below outline the costs and benefits respectively, per customer attributable to each customer class, while Table 9 shows the net per customer benefits which is the difference between costs and benefits.

Table 7: Annual costs of the VEET scheme per average customer for each customer class

Customer class	Component	2009	2010	2011	2012
Residential participants	Network costs	$0.29	$1.17	$7.22	$13.60
	Retail costs	$26.80	$10.59	$32.14	$33.69
Residential non-participants	Network costs	$0.30	$1.29	$7.90	$14.61
	Retail costs	$27.85	$11.65	$35.15	$36.19
Small commercial customers	Network costs	$0.00	$0.00	$0.00	$0.00
	Retail costs	$0.00	$0.00	$0.00	$169.77
Medium commercial and small industrial customers	Network costs	$0.00	$0.00	$0.00	$0.00
	Retail costs	$0.00	$0.00	$0.00	$847.65

Source: OGW Analysis

Table 8: Annual benefits of the VEET scheme per average customer for each customer class

Customer class	Component	2009	2010	2011	2012
Residential participants	Wholesale price	$0.45	$1.72	$2.04	$1.90
	Reduction in consumption	$13.20	$48.39	$58.09	$114.74
Residential non-participants	Wholesale price	$0.47	$1.89	$2.23	$2.04
Small commercial customers	Wholesale price	$2.11	$8.79	$10.49	$9.58
Medium commercial and small industrial customers	Wholesale price	$13.18	$49.71	$53.47	$47.83

Source: OGW Analysis

Table 9: Distributional impacts – net annual financial benefit of the VEET scheme per average customer for each customer class

Customer class	2009	2010	2011	2012
Residential participants	-$13.44	$38.35	$20.77	$69.36
Residential non-participants	-$27.68	-$11.05	-$40.82	-$48.75
Small commercial customers	$2.11	$8.79	$10.49	-$160.19
Medium commercial and small industrial customers	$13.18	$49.71	$53.47	-$799.82

Source: OGW Analysis

For residential customers the benefits from participation are the decrease in their personal electricity consumption, which significantly outweigh the network and retail costs incurred as a result of the Scheme. However, according to the OGW analysis, for all non-participating customers (who share the costs of the Scheme), the reduction in wholesale prices is not enough to outweigh the costs of the scheme, and therefore their electricity bills increase.

The OGW Analysis paper indicates that the programme has a negative net economic benefit as its costs outweigh the benefits for non participants in the programme. The financial benefits and costs summarized above for VEET participants and non-participants include a significant amount of transfers. For example, some of the benefits of programme participants are subsidized by costs incurred by non-participants and some of the benefits experienced by programme participants and non-participants come at the expense of reduced net revenue achieved by the shareholders of various parts of the electricity supply chain (e.g. electricity generators, network operators).

However, according to a recent report commissioned by the Energy Efficiency Council, the VEET scheme can deliver additional economic benefits (Jacobs, 2015), which may reverse these conclusions about its cost-effectiveness. In particular, the Victorian Government assessments neglect some of the benefits related to VEET implementation, such as the lower need for new electricity capacity, the operating and maintenance cost savings from energy efficiency appliances and the financial benefits of reducing greenhouse gas emissions, as well as longer-term benefits of the energy savings.

The Energy Efficiency Council's report uses recorded data from the first years of the scheme's implementation, showing that homes and businesses that implemented VEET

saved energy by installing energy efficiency lights, showerheads and appliances. New jobs in Victoria due to VEET implementation should also be considered as a positive side effect, directly affecting its cost-effectiveness assessment. On the other hand, the report concludes that low-income suburbs appear to benefit disproportionately to other customers, which contradicts to VEET scheme's intention of distributing costs and benefits equally.

The Energy Efficiency Council also highlights that the benefits related to reduced electricity consumption, would have been larger if bigger participation in the VEET scheme had been achieved. An increase in participation would have led to more cost-effective implementation of the measures, since costs would have been allocated across more customers.

Overall the conclusions over the cost-effectiveness of the scheme, influenced by different assumptions used across different studies, have been controversial, emphasizing the need for more detailed analysis of the cost effectiveness of the scheme.

3.3.4.2 Other issues

Expenditures of conforming to the VEET Scheme targets arose for the obligated energy retailers are implicitly considered as operational costs and, where possible, are passed on to consumers by raising their electricity or gas prices. All households ultimately pay for the VEET scheme through their energy bills, as in Victoria's deregulated energy market the energy retailers are able to pass on the full costs for implementing the Scheme to their customers. The Victorian electricity market is a fully liberalized one and therefore the process above is not transparent.

3.3.5 Overall evaluation

The targets set for each of the first four years of the scheme have been met, in terms of certificates surrendered and registered that correspond to the retailers' liability under the Scheme. In the years 2009 to 2011 this meant that 2.7 million certificates were surrendered annually to the ESC and in 2012 to 2015, 5.4 million certificates.

The Scheme has been dominated by the installation of two measures since its inception: lighting and standby power controllers. Together the installation of these two measures account for 82 per cent of all VEETs registered under the Scheme prior to the end of 2012. Both of these products are low cost measures that have been 'free' to householders – the cost of supplying the appliance has been outweighed by the value of the certificates generated from their installation.

The Scheme has been predominantly taken up in the residential sector, with limited activity occurring in the business sector. In total, a little less than 150,000 certificates have been created for businesses implementing VEET activities in 2012. This accounts for approximately 1.9 per cent of all certificates created during 2012.

An analysis of the energy savings associated with scheme activities found that the impact of the VEET scheme on energy consumption has been significantly less than was previously expected. The analysis found that only 8 million tonnes of GHG abatement is attributed to the 16.7 million certificates created as of 31 December 2012, compared to the 16.7 million tonnes of GHG that was anticipated. This lowers the level of energy consumption saved as a result of the scheme and reduces the ability of the scheme to impact wholesale energy prices.

A cost benefit analysis (CBA) of the VEET scheme showed that it had delivered a net cost to the economy of $177.6 million; i.e. the cost of supplying energy to the economy has increased as a result of the scheme. This result suggests that the red tape costs of compliance and administration of the scheme, which are subsequently passed on to energy customers, have outweighed reductions in production costs associated with reduced energy consumption from the Scheme. However, other assessments using the same data, but different assumptions, reach opposite conclusions rendering the need for a thorough review of the cost-effectiveness analysis and the assumptions adopted to support the assessment.

3.4 Ontario, Canada

3.4.1 Policy objectives

The Energy Efficiency Obligation Scheme for electricity distributors in Ontario was introduced through a Directive adopted by the Minister on 31th March 2010 pursuant to sections 27.1 and 27.2 of the Ontario Energy Board Act (1998). The Directive authorized the Ontario Energy Board to amend the licences of all electricity distributors so they are obliged to implement energy conservation measures. Moreover, the Ontario Energy Board developed the Conservation and Demand Management (CDM) Code, finally approved on 12th November 2010, initiating of the obligation scheme (Ontario Energy Board, 2010).

The aim of the CDM Code was to establish specific obligations and requirements on licensed electricity distributors, who must comply with specified energy efficiency targets.

Specifically, the CDM Code required CDM Programs from 1st January 2011 to 31th December 2014 to achieve both of the following targets:

- 1,330 MW reduction of electricity peak demand.
- 6,000 GWh reduction of electricity consumption cumulatively over the four-year period.

Furthermore, the CDM Code established the framework clarifying all the conditions and rules to be followed by the obligated electricity distributors in implementing the Ontario Energy Board Approved CDM Programs and the fulfilment of the CDM targets. The Ontario Energy Board proposed updated guidelines in 2012 for the implementation of the obligation scheme for the period 2011-2024 (Ontario Energy Board, 2012).

3.4.2 Design of Obligations

The main design options of the obligation scheme in Ontario are presented in the following sections.

3.4.2.1 Sectoral scope

After the specification of the overall savings in peak electricity demand and electricity consumption by the CDM Code, the Ontario Power Authority proposed recommendations to the Ontario Energy Board regarding allocation of CDM targets among the licensed electricity distributors. According to these recommendations, the required electricity consumption reduction is based on each electricity distributor's share of total annual energy consumption by customer account type, utilizing available data from the most recent year. For peak electricity demand targets, the proposed target was based on each electricity distributor's average contribution to the top 10 system peak hours, utilizing the data from the most recent two available years. The two proposed allocation schemes were finalized after a consultation process including the obligated electricity distributors, utilizing as a basis for discussion the paper "*The Establishment of LDC Conservation Targets under the Green Energy Act – Target setting and allocation methodology advice from the OPA*".

The Ontario Energy Board received the proposed allocation scheme from the Ontario Power Authority and circulated it to the obligated electricity distributors in order to take into consideration their comments. The Ontario Energy Board assessed their comments and finalized the CDM targets with minor adjustments. Finally, the Ontario Energy Board

amended each electricity distributor's license to include the targets, as specified in Directive and permitted by section 27.2(7) of the Ontario Energy Board Act.

Implementation of Board-Approved CDM Programs began after the development of the initial Ontario Power Authority Province-Wide CDM Programs. Each licensed electricity distributor had to implement its own Board-Approved CDM Programs, Ontario Power Authority province-wide CDM Programs or a combination of the two. The province-wide CDM Programs were implemented by the Ontario Power Authority, but with a contract with each interested electricity distributor. All the Board-Approved CDM Programs had to be completed between 1st January 2011 and 31th December 2014.

Licensed electricity distributors had to deliver a mix of CDM Programs across consumer types in their service area, i.e. both peak electricity demand and electricity consumption for residential, commercial and industrial customers. The Ontario Power Authority programs focussed on industrial, commercial and institutional, residential and low income customers.

All measures, which could lead to the reduction of the electricity consumption and peak demand, were considered eligible, with the exception of:

I. Construction of new infrastructure or replacement of existing infrastructure.
II. Measures for the maximization of efficiency of new or existing infrastructure.
III. Measures associated with the Ontario Power Authority's Feed-in Tariff or Micro Feed-in Tariff Programs.

3.4.2.2 Obligated parties

All licensed electricity distributors with a CDM requirement are obligated parties. Electricity distributors not connected to the Independent Electricity System Operator-controlled grid (and whose rates are not regulated by Ontario Energy Board) are excluded from the obligation. Obligated parties and their allocated targets for savings in peak electricity demand and electricity consumption are presented in Table 10.

Table 10: Obligated parties and their allocated targets for savings for the period 2011-2014.

Eligible companies	Peak	Savings
Algoma Power Inc.	1.280	7.370
Atikokan Hydro Inc.	0.200	1.160
Attawapiskat Power Corporation	0.070	0.290
Bluewater Power Distribution Corporation	10.650	53.730
Brant County Power Inc.	3.300	9.850

Eligible companies	Peak	Savings
Brantford Power Inc.	11.380	48.920
Burlington Hydro Inc.	21.950	82.370
COLLUS Power Corporation	3.140	14.970
Cambridge and North Dumfries Hydro Inc.	17.680	73.660
Canadian Niagara Power Inc.	4.070	15.810
Canadian Niagara Power Inc. – Port Colborne distribution service territory	2.330	9.270
Centre Wellington Hydro Ltd.	1.640	7.810
Chapleau Public Utilities Corporation	0.170	1.210
Chatham-Kent Hydro Inc.	9.670	37.280
Clinton Power Corporation	0.320	1.380
Cooperative Hydro Embrun Inc.	0.340	1.120
E.L.K. Energy Inc.	2.690	8.250
ENWIN Utilities Ltd.	26.810	117.890
Enersource Hydro Mississauga Inc.	92.980	417.220
Erie Thames Powerlines Corporation	4.280	18.600
Espanola Regional Hydro Distribution Corporation	0.520	2.760
Essex Powerlines Corporation	7.190	21.540
Festival Hydro Inc.	6.230	29.250
Fort Albany Power Corporation	0.050	0.240
Fort Frances Power Corporation	0.610	3.640
Greater Sudbury Hydro Inc.	8.220	43.710
Grimsby Power Inc.	2.060	7.760
Guelph Hydro Electric Systems Inc.	16.710	79.530
Haldimand County Hydro Inc.	2.850	13.300
Halton Hills Hydro Inc.	6.150	22.480
Hearst Power Distribution Company Limited	0.680	3.910
Horizon Utilities Corporation	60.360	281.420
Hydro 2000 Inc.	0.190	1.040
Hydro Hawkesbury Inc.	1.820	9.280
Hydro One Brampton Networks Inc.	45.610	189.540
Hydro One Networks Inc.	213.660	1,130.210
Hydro Ottawa Limited	85.260	374.730
Innisfil Hydro Distribution Systems Limited	2.500	9.200
Kashechewan Power Corporation	0.070	0.330
Kenora Hydro Electric Corporation Ltd.	0.860	5.220
Kingston Hydro Corporation	6.630	37.160
Kitchener-Wilmot Hydro Inc.	21.560	90.290
Lakefront Utilities Inc.	2.770	13.590
Lakeland Power Distribution Ltd.	2.320	10.180
London Hydro Inc.	41.440	156.640
Middlesex Power Distribution Corporation	2.450	9.250

Eligible companies	Peak	Savings
Midland Power Utility Corporation	2.390	10.820
Milton Hydro Distribution Inc.	8.050	33.500
Newmarket - Tay Power Distribution Ltd.	8.760	33.050
Niagara Peninsula Energy Inc.	15.490	58.040
Niagara-on-the-Lake Hydro Inc.	2.420	8.270
Norfolk Power Distribution Inc.	4.250	15.680
North Bay Hydro Distribution Limited	5.050	26.100
Northern Ontario Wires Inc.	1.060	5.880
Oakville Hydro Electricity Distribution Inc.	20.700	74.060
Orangeville Hydro Limited	2.780	11.820
Orillia Power Distribution Corporation	3.070	15.050
Oshawa PUC Networks Inc.	12.520	52.240
Ottawa River Power Corporation	1.610	8.970
PUC Distribution Inc.	5.580	30.830
Parry Sound Power Corporation	0.740	4.160
Peterborough Distribution Incorporated	8.720	38.450
Port Colborne Hydro Inc.	0.0	0.0
PowerStream Inc.	95.570	407.340
Renfrew Hydro Inc.	1.050	4.860
Rideau St. Lawrence Distribution Inc.	1.220	5.100
Sioux Lookout Hydro Inc.	0.510	3.320
St. Thomas Energy Inc.	3.940	14.920
Thunder Bay Hydro Electricity Distribution Inc.	8.480	47.380
Tillsonburg Hydro Inc.	2.290	10.250
Toronto Hydro-Electric System Limited	286.270	1,303.990
Veridian Connections Inc.	29.050	115.740
Wasaga Distribution Inc.	1.340	4.010
Waterloo North Hydro Inc.	15.790	66.490
Welland Hydro-Electric System Corp.	5.560	20.600
Wellington North Power Inc.	0.930	4.520
West Coast Huron Energy Inc.	0.880	8.280
West Perth Power Inc.	0.620	2.990
Westario Power Inc.	4.240	20.950
Whitby Hydro Electric Corporation	10.900	39.070
Woodstock Hydro Services Inc.	4.490	18.880

3.4.2.3 Eligible parties

In addition to licensed electricity distributors, two additional parties are involved in the obligation scheme, the Ontario Energy Board and the Ontario Power Authority. The Ontario Energy Board oversees the scheme, verifying that the obligated distributors fulfil their

targets for both reduction of peak electricity demand and electricity consumption. The Ontario Power Authority is not an obligated party. It is responsible, first, for the evaluation of applications for distributor programmes and is authorized to suggest improvements when necessary. In these cases, it is also responsible for assessing the documentation relating to payments for the programmes by Independent Electricity System Operator. Secondly, it has responsibility for development and implementation of Province-Wide CDM Programs on behalf of interested electricity distributors through contracts with them.

3.4.2.4 Target metric

The measurement and verification of savings is performed by the electricity distributors according to the Ontario Power Authority's Evaluation, Measurement and Verification Protocols (EM&V) Protocols, as outlined in the CDM Code. The distributors estimates are evaluated by an independent third party selected from the Ontario Power Authority's approved list. The reviewer is required to use the Ontario Power Authority EM&V Protocols. The evaluation report, covering the period 1st January 1st to 31st December of the previous year, is submitted with electricity distributor's Annual Report by the 30th September. The electricity distributor has to facilitate any audit and provide the documentation requested.

3.4.2.5 Other issues

Various additional issues are discussed briefly in the following sections.

Firstly, electricity distributors have to apply the Ontario Power Authority's Cost-Effectiveness Test for programmes submitted for approval, except in the following cases:

I. a pilot program
II. a low-income program
III. an educational program.

The Cost-Effectiveness Test has to use assumptions from Ontario Power Authority's Measures and Assumptions Lists.

Each electricity distributor must submit a *CDM Strategy* for their allocated CDM targets. This must include:

I. A detailed description of the implementation plan for the target.
II. A description of each proposed CDM Program, including its name, duration, aims, target customers and projections for budgets and outcomes.

III. Confirmation that CDM Programs are offered to all types of customers in each distributor's service area, according to the composition of the customer base.
IV. A discussion of the administrative and procedural issues of the programs.
V. Justification of CDM programs to low income customers.

The *application* from the electricity distributors for their Programs must include:

I. An evaluation plan for each program, according to the Ontario Power Authority's Evaluation Measurement &Verification Protocols.
II. A cost-benefit-analysis of each program according to the Ontario Power Authority's Cost Effectiveness Tests.
III. Detailed explanation of the program's objectives and implementation method.
IV. Presentation of the types of customers targeted by the program.
V. Projected number of participants in the program.
VI. Projected peak demand savings and electricity consumption savings.
VII. Projected annual budget for each program separately.

Another crucial issue is the procedure to avoid *duplicating* existing Ontario Power Authority province-wide Programs. Distributor CDM Programs must have different:

I. Customer incentive levels for products or services.
II. Qualification requirements to receive incentives or services.
III. Technology specifications for technologies.
IV. Marketing approaches for promoting customer incentives or services.
V. Budgets for delivering customer incentives or services.

All the electricity distributors have an obligation to submit an *Annual Report* to the Ontario Energy Board by 30th September of each year. The Annual Report covers the period from 1st January to 31th December of the previous year. The Annual Report provides an overall review of the activities undertaken to achieve the specified CDM targets for both Board-Approved CDM Programs and Ontario Power Authority-Contracted Province-Wide CDM Programs.

Each electricity distributor has the opportunity to apply for a *performance incentive* for the implemented CDM Programs. An electricity distributor can request a performance incentive only in relation to its contribution to the CDM Programs. A distributor has to provide verified results for both electricity savings and peak electricity demand savings at the time of its application to the Ontario Energy Board for a performance incentive. The verification must be completed by an independent third party evaluation as set out above. An electricity

distributor can request a performance incentive once it meets 80% of each of its CDM targets. Performance incentives cannot be requested for performance that exceeds 150% of the target. The electricity distributor's performance incentive is calculated according to its entire portfolio of Board-Approved CDM Programs and Ontario Power Authority-Contracted Province-Wide CDM Programs.

The Ontario Energy Board evaluates applications and approves performance incentives based on the methodology established by the CDM Code. Once a distributor achieves 80% of both of its CDM targets, the performance incentive is calculated from its performance against the consumption and peak demand targets, as set out in Table 11.

Table 11: Performance incentives for different performance ranges.

Performance ranges			Performance incentive	
Category	From	Up to	¢/kWh	$/kW
1	80%	100%	0.30	13.50
2	100%	110%	0.40	20.25
3	110%	120%	0.75	33.75
4	120%	130%	1.05	47.25
5	130%	140%	1.35	60.75
6	140%	150%	1.80	81.00

In addition, the guidelines in the CDM Code include a Lost Revenue Adjustment Mechanism to compensate electricity distributors for lost revenues due to non-forecasted results from CDM programs (Ontario Energy Board, 2012).

The *accounting treatment* of CDM programs uses a costing methodology detailed in the Appendixes of the CDM Code.

3.4.3 Results of Obligations

3.4.3.1 Savings

According to the results obtained up to the end of 2013, the cumulative energy savings from the obligated electricity distributors were 5,139.1 GWh. This figure corresponded to 85.7% of the total 2011-2014 energy consumption target.

Table 12 shows the breakdown by year of programme implementation and savings delivery. The cumulative contribution from programs implemented in 2011 was 40% of the overall target. Smaller cumulative savings result from programmes in later years, largely due to the smaller number of delivery years. The current status implies that a very successful scheme is required in 2014 to deliver the gap to the target of 860.9 GWh.

Table 12: Achieved annual energy savings from CDM programs over the period 2011 to 2013 (Source: Ontario Energy Board, 2014a).

Implementation period	Annual results (GWh)								Cumulative 2011-2014	% of target
	2011	%	2012	%	2013	%	2014	%		
2011	606.9	10.1%	603	10.1%	601.0	10.0%	582.3	9.7%	2,393.1	40%
2012	18.7		503.6	8.4%	498.4	8.3%	492.6	8.2%	1,513.3	25%
2013	1.7		44.4		603.3	10.1%	583.4	9.7%	1,232.8	21%
Verified Net Cumulative Energy Savings 2011-2014									**5,139.1**	**86%**
2011-2014 Cumulative CDM Energy Target									**6,000**	

In total, 20 electricity distributors fulfilled or exceeded their target by 2013, while additional 22 electricity distributors achieved 80% of the target. These 42 electricity distributors represent approximately 60% of the total electricity demand of Ontario.

Table 13: Achieved cumulative net energy savings from CDM programs by type of program (Source: Ontario Energy Board, 2014a).

Program	2011-2014 Cumulative Savings (kWh)	% OF 2011-2014 Cumulative Savings
Consumer program	900,058,189	17.5%
Business program	2,758,523,766	53.7%
Industrial program	184,732,989	3.6%
Home Assistance program	57,949,913	1.1%
Aboriginal program	3,218,789	0.1%
Pre 2011 program completed in 2011	1,015,756,510	19.8%
Other	11,715,850	0.2%
Adjustment to 2011 Results	80,864,121	n/a
Adjustment to 2012 Results	126,287,857	n/a
2011-2014 Total Cumulative Net Savings (kWh)	**5,139,107,980**	
% of Target	**85.7%**	

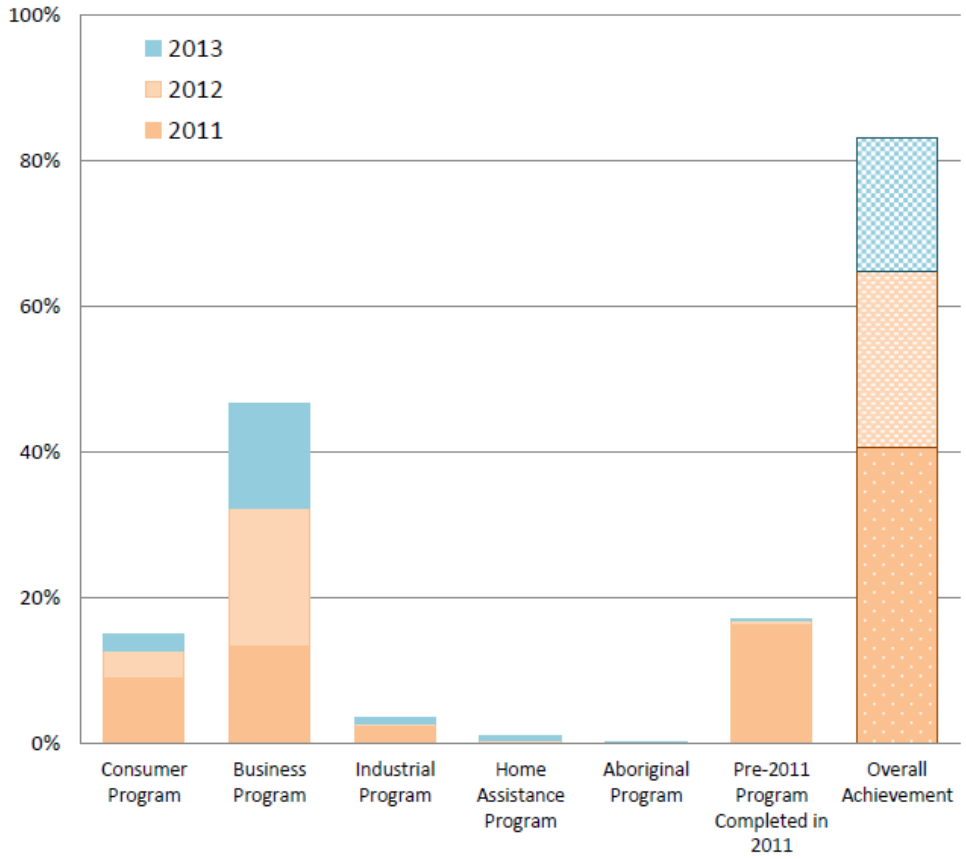


Figure 3: Achieved cumulative net energy savings from CDM programs by type of program and year of implementation (Source: Ontario Energy Board, 2014a).

The cumulative energy savings for each type of program are presented in Table 13. The Business and Consumer Programs are the largest programs, contributing 2759 GWh and 900 GWh respectively. The same data are presented in Figure 3 as a percentage of the total target, showing that the Business Program contributes approximately to 50% of the savings.

3.4.3.2 Other issues

The reduction in peak electricity demand results from the energy savings in the CDM programs as well as demand response programs. As they are not cumulative, it is essential to assess the fulfillment of the target from total savings on 31th December 2014.

To present some indicative results a scenario was assessed, by the Ontario Power Authority, which includes peak electricity demand savings from all energy efficiency programs until the end of 2014 and assumes that peak demand savings from demand response programs persist for only one year. According to this scenario, electricity distributors achieved27% of the peak electricity demand target for 2014 (approximately 359 MW). The Business program contributes more than half of the total achieved savings (Table 14).

Table 14: Peak Demand Savings from CDM Programs by type of program for Scenario 1 (Source: Ontario Energy Board, 2014a).

Program	Scenario 1: 2014 Peak Demand Savings (kW)	% of Scenario 1: 2014 Peak Demand Savings (kW)
Consumer program	85,506	23.8%
Business program	199,449	55.5%
Industrial program	8,101	2.3%
Home Assistance program	2,904	1.0%
Aboriginal program	267	0.1%
Pre 2011 program completed in 2011	48,967	13.6%
Other	5,996	1.7%
Adjustment to 2011 Results	1,797	n/a
Adjustment to 2012 Results	6,180	n/a
2011-2014 Total Cumulative Net Savings (kW)	**359,166**	
% of Target	**27.0%**	

An additional analysis (Scenario 2) was performed, including not only the peak electricity demand savings from all years' efficiency programmes, but also assuming persistence of the effects of demand response programs. With these assumptions, the Ontario Power Authority calculates that the electricity distributors achieve 48.1% of the peak electricity demand savings target for 2014 (approximately 639 MW), with Consumer, Business and Industrial programs having almost equivalent contributions (Table 15).

Table 15: Peak Demand Savings from CDM Programs by type of program for Scenario 2 (Source: Ontario Energy Board, 2014a).

Program	Scenario 2: 2014 Peak Demand Savings (kW)	% of Scenario 2: 2014 Peak Demand Savings (kW)
Consumer program	178,582	27.9%
Business program	223,928	35.0%
Industrial program	170,645	26.7%
Home Assistance program	2,904	0.5%
Aboriginal program	267	0.04%
Pre 2011 program completed in 2011	48,967	7.7%
Other	5,996	0.9%
Adjustment to 2011 Results	1,797	n/a
Adjustment to 2012 Results	6,180	n/a
2011-2014 Total Cumulative Net Savings (kW)	**639,265**	
% of Target	**48.1%**	

Taking into account the peak electricity demand savings that were projected at the end of 2014, only one electricity distributor achieved the allocated peak electricity demand savings target by 2013. Two distributors exceeded the 80% of the allocated peak electricity demand targets after their completion of 2013 CDM programs.

Table 16 presents the net incremental peak electricity demand savings by different types of programs in 2011, 2012 and 2013, including the peak electivity demand savings in 2014 for Scenario 2.

Table 16: Incremental Net Peak Demand Savings for 2013 for Scenario 2 (Source: Ontario Energy Board, 2014a).

Program	Net Annual Incremental Savings			2014 Savings Scenario 2
	2011 Savings	2012 Savings	2013 Savings	
Consumer program	49,681	72,377	116,886	178,582
Business program	64,617	98,211	107,261	223,928
Industrial program	57,098	75,141	166,395	170,645
Home Assistance program	2	566	2,361	2,904
Aboriginal program	n/a	n/a	267	267
Pre 2011 program completed in 2011	44,945	3,251	772	48,967
Other	n/a	2,304	3,692	5,996
Adjustment to 2011 Results	n/a	1,406	641	1,797
Adjustment to 2012 Results	n/a	n/a	6,260	6,180
Peak Demand Savings (kW)	**216,343**	**253,256**	**404,536**	**639,265**

3.4.4 Other Issues

3.4.4.1 Distributional issues

The implementation of conservation and demand management programs in Ontario province is financed by consumers who pay the Hourly Ontario Energy Price or have signed a retail contract. According to the guidelines for the implementation of the CDM Code, the electricity distributors can integrate the costs of their programs into prices only if these programs are approved, passing the cost-effectiveness test (Ontario Energy Board, 2012).

The mechanism for financing is through the Global Adjustment charge on electricity bills (Independent Electricity System Operator, 2015). The Global Adjustment represents the difference between the regulated consumer price and the rates paid to regulated and contracted electricity generators. It includes costs of implementing energy efficiency programs. It varies on a monthly basis in order to represent the changes in both regulated price and contract terms. It is different for specific types of customers.

Class B customers, who have a peak demand of over 50 kW and under 5 MW, pay the sum of the wholesale electricity price and the Global Adjustment rate. Class B consumers, who are billed by the Local Distribution Companies, pay the Global Adjustment using one from the three available rates (1st Estimate, 2nd Estimate and Actual Global Adjustment rate) according to their billing cycle. Class B Independent Electricity System Operator market participants pay the Global Adjustment based on the Actual Global Adjustment rate at the end of each month.

For Class A customers, who have an average hourly peak demand of 5MW or higher, the payment of the Global Adjustment rate depends on their energy use during peak hours. For example, in the case that a customer is responsible for 1% of electricity demand during the five highest peaks of the year on average, the individual Global Adjustment rate will be equal to 1% of the total Global Adjustment costs.

Regulated Price Plan customers pay an electricity rate set by the Ontario Energy Board combining both the market price for electricity and the Global Adjustment.

Total spending for the CDM Programs is considered as crucial figure. Specific information about the total budget for the implementation of the CDM program up to 2013 is shown in Table 17, including spending for 2011, 2012 and 2013 by different types of CDM programs.

Totally, $612.3 million were spent in the period from 2011 to 2013. The contribution of the Business Program was the highest with $348.6 million, while in the Consumer Program $194.8 million were spent. Moreover, the investments in 2013 were higher in comparison to the first two years.

Table 17: CDM spending by type of program during the period 2011-2013 (Source: Ontario Energy Board, 2014a).

Program	2011	2012	2013	Total
Consumer program	49,893,144$	48,610,411$	96,326,179$	194,829,734$
Business program	127,315,855$	94,417,579$	126,837,880$	348,571,314$
Industrial program	6,915,605$	11,633,659$	27,074,097$	45,623,361$
Home Assistance program	457,911$	3,677,417$	16,176,229$	20,311,557$
Aboriginal program	n/a	n/a	87,651$	87,651$
Total CDM spending	**184,582,515$**	**158,339,066$**	**266,502,036$**	**609,423,617$**
			Adjustments	**2,879,165$**
			Total 2011-2013 spending	**612,302,783$**

3.4.5 Overall evaluation

Evaluation of the CDM programs shows that the current scheme can be considered as successful in relation to reducing electricity consumption. By the end of 2013, the obliged electricity distributors had achieved 5,139 GWh of cumulative energy savings, which represented 86% of the overall energy savings target of 6,000 GWh. The corresponding savings in the peak electricity demand were equal to 639 MW of demand savings leading to a fulfillment of a 48% of the peak demand savings target of 1,330 MW.

In total, 42 distributors exceeded 80% of their electricity consumption target for the period 2011-2014. Obliged electricity distributors are confident that they will fulfill their energy target, while they expressed their caution about their capability to deliver the peak electricity demand target. Currently, only one distributor achieved at least 100% of the allocated peak demand target, while two others achieved at least 80%. According to the electricity distributors, the main reason for their inability to fulfill the later target was that it was too ambitious. It will be important to assess the extent of fulfillment of the target after the completion of the obligation scheme.

Significant investments were made during the period 2011-2013 (612 million $), with the Business and Consumer programs received the majority of this funding.

The Minister issued a new Directive on 26th March 2014, authorizing the Ontario Energy Board promote electricity conservation and demand management and natural gas demand side management (DSM), as foreseen in the sections 27.1 and 27.2 of the Ontario Energy Board Act. According to the new requirements the electricity distributors must implement CDM programs between 1st January 2015 and 31th December 2020. A significant difference from the previous scheme is the fact that the CDM programs must be designed in order to achieve only reductions in electricity consumption. Each electricity distributor will remain able to fulfill their obligations through Province-Wide Distributor CDM Programs, operated by the Ontario Power Authority, their own CDM Programs or a combination. Moreover, each electricity distributor has to make available the details and the obtained results of Local Distributor CDM Programs to other obliged distributors upon request.

In order that lost revenues CDM Programs do not act as a disincentive to Distributors to meet their CDM Requirement, the Ontario Energy Board has developed guidelines for the period 2015-2020 (Ontario Energy Board, 2014b).

Another new point in the new Directive is that the Ontario Energy Board must establish a DSM policy framework for regulated natural gas distributors.

The Ontario Energy Board must ensure the fulfillment of the following objectives:

I. The duration of the DSM Framework will span a period of six years starting from 1st January 2015.
II. The DSM Framework must mobilize the implementation of all cost-effective DSM and align the DSM efforts with the CDM efforts.
III. The Gas Distributors must design and implement DSM programs with Province-Wide Distributor CDM Programs and Local Distributor CDM Programs for electricity and natural gas customers.
IV. The Gas Distributors must design and implement low-income DSM Programs with low-income Province-Wide Distributor CDM Programs or Local Distributor CDM Programs.
V. The Ontario Energy Board must review and publish the verified or audited results of each Gas Distributor's DSM programs on annual basis.
VI. A study of the achievable potential study for natural gas efficiency in Ontario should be conducted every three-years, with the first study completed by 1st June 2016.
VII. The DSM framework must implement activities aiming to reduce natural gas consumption, including financial incentive programs and education programs.
VIII. The lost revenues resulting from DSM programs should not act as a disincentive to Gas Distributors in order to undertake the necessary DSM activities.

3.5 India

India's National Action Plan on Climate Change (2008) is a comprehensive policy framework to achieve national growth objectives (strengthened energy security, reduced energy deficit and enhanced global competitiveness of Indian industries) with climate change mitigation and adaptation targets. This framework consists of four strategies, where, in terms of energy efficiency, the National Mission for Enhanced Energy Efficiency (NMEEE) is the most relevant. Within the NMEEE there are four main initiatives, the Market Transformation for Energy Efficiency, the Framework for Energy Efficient Economic Development, the Energy Efficiency Financing Platform, and the Perform Achieve and Trade Scheme (PAT). The PAT is also part of the previous Energy Act of 2003 (EA 2003). PAT is, in short, a market based mechanism to enhance the cost effectiveness of improvements in energy efficiency in energy-intensive industries and large facilities, through certification of energy savings that can be traded (Ministry of Power 2012).

3.5.1 Policy objectives

The PAT scheme targets a reduction of 26 million tonnes of CO2 eq by 2015, thus contributing to the national targets of 20-25% reduction in carbon intensity from 2005 levels by 2020. The targets are mandatory for 478 facilities, which have 60% of India's GHG emissions (on a 3007 baseline). For the first cycle of the programme (2012-2015), PAT is expected to save 6.6 million tonnes of oil equivalent (toe). The facilities included face a general objective to improve energy efficiency by 1-2% per year.

3.5.2 Design of Obligations

Under the PAT requirements, there are specific legal mandates for obligated entities (IETA 2013). All entities must:

- submit a report on energy consumption to the Designated Authority of the State and to the Bureau of Energy Efficiency (BEE);
- establish an energy manager responsible for submitting annual energy consumption returns to the Designated Agencies and BEE;
- comply with prescribed energy conservation standards;
- purchase certificates (ESCerts) to avoid defaulting on compliance obligations, in return for which they have the ability to receive ESCerts that can be sold on a market if the compliance obligation is exceeded;
- allow monitoring and verification by Designated Energy Auditors (DENAs);
- if non-compliant must pay a fee of Rs. 10 lakhs; and
- submit to regulation by BEE and process management by Energy Efficiency Service Ltd. (EESL).

3.5.2.1 Sectoral scope

The PAT scheme is based on the initial Energy Conservation Act (2001), which targeted energy use reduction in energy intensive industries. Facilities covered by PAT are called "Designated Consumers," and the list of these facilities is published annually by BEE. These industries account for 25% of the GDP and about 45% commercial energy use in India. Energy intensive industry covers around 54% of the total energy consumption (data from 2007-2008, Bertoldi et al. 2013).

3.5.2.2 Obligated parties

The obligation in PAT falls on energy intensive industries within 8 sectors of the Indian economy, named as Designated Consumers (DCs in the Energy Conservation Act 2001). These sectors with the respective number of DCs are presented in Table 18.

Table 18: Companies per Sector in the Indian PAT Scheme

Sector	Minimum annual energy consumption for the DC (toe)	Number of DCs
Thermal power	30000	144
Iron and Steel	30000	67
Cement	30000	85
Fertilizers	30000	29
Aluminium	7500	10
Paper and Pulp	30000	31
Textile	3000	90
Chlor-Alkali	12000	22
Total		478

Source: BEE_PAT_Booklet

3.5.2.3 Eligible parties

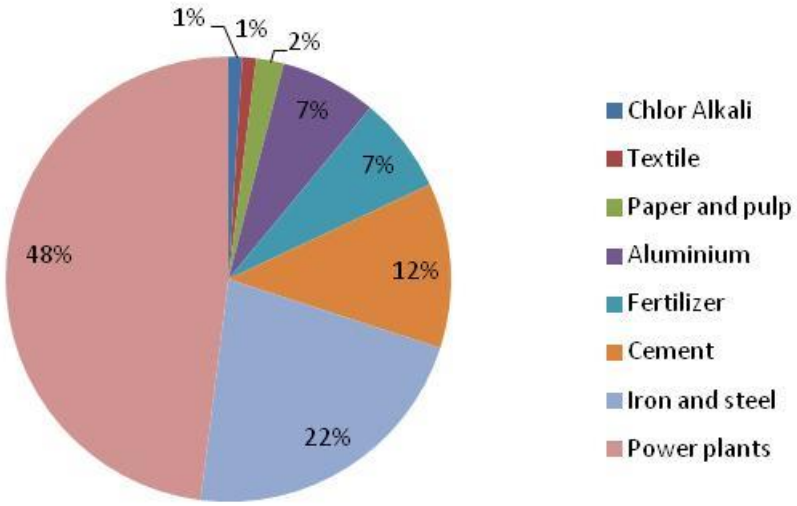
The PAT scheme addresses these specific industries and has no flexibility mechanisms to include further sectors.

3.5.2.4 Target metric

The targets are individual for obligated actors and are calculated as a percentage reduction in their annual specific energy consumption, normalized according to specific parameters, such as the capacity utilization (as measured for instance by the quantity of products sold yearly) (Bertoldi et al. 2013). The overall targets of approximately 10Mtoe are allocated on a sectoral basis related to the sector's annual energy consumption. Furthermore the individual targets (originating from the sectoral targets), are savings targets for all DCs given the sector are allocated based on the percentage target for the DC having the lowest normalized SEC (or in other words the most energy efficient DC as a reference). The higher target on other DCs in the same sector is calculated from the percentage target multiplied by the ratio of the DC SEC with the Best SEC. The initial percentage target value for the best SEC (DC) is selected

so that the total savings target for all DCs in the sector is the overall target assigned to the sector (Dhingra 2011). The baselines are determined from the April 2007-March 2010 average. The allocation of the targets is presented in Figure 4 for the first period (2012-2015) of the PAT scheme.

Figure 4: Sectoral Shares of targets in the Indian PAT Scheme 2012-15



The calculation methodology explained above aggregates the energy inputs (electricity, thermal power, natural gas, oil etc) used in the manufacturing process in each plant and the boundary of a manufacturing plant includes both its process and its physical boundaries (Bhattacharya et al 2012). Using these limits, the baseline of SEC can be extracted and the targets assigned. This method facilitates the comparison of energy intensities within plants in each sector, while taking into account the potential expansion of the production capacity of each plant, and it also acknowledges the energy efficiency measures taken in the past as well as those that will be taken in the future. All DCs must achieve their plant specific targets within three year compliance periods. Double counting in total energy consumption can be achieved by excluding thermal power sector and considering it separately in the target calculation, since power plants supply also electricity to other DCs (Bhattacharya et al. 2012).

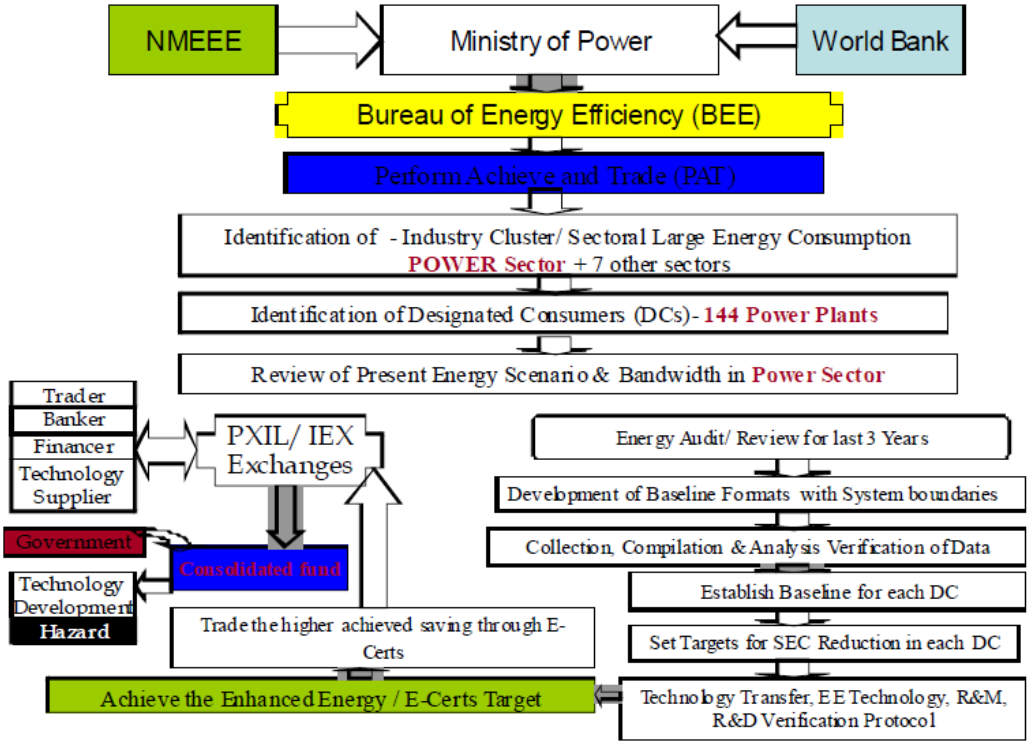
DCs are required to provide plant level data for baseline SEC assessment and to monitor and report on SEC and allow verification. The measurement and verification (of both consumption and energy savings achieved in the target year) are carried out by the independent Designated Energy Auditors (DENA). The Government develops the baseline and allocation system, establishes the trading platform, provides monitoring and verification protocols, and sets up an accreditation system for verifiers. Based on the outcomes of the

DENA measurements, the Central Registry issues energy savings Certificates (ESCerts) to the DC's that have exceeded their obligation. DCs can subsequently trade ESCerts among themselves through bilateral contracts or on the platforms of the two existing power trading exchanges IEX and PXIL, and BEE has also set up a registry and exchanges for the trading of ESCerts. BEE hopes to enable cross-sectoral use of ESCerts. Companies that purchase ESCerts do so in order to achieve compliance obligations and avoid noncompliance penalties. BEE issued guidelines and regulations in March 2012, and the issuance and trading of ESCerts began after April 2013. To create market liquidity and price discovery before the market is launched, some ESCerts were auctioned ex-ante, other ESCerts allocated freely to companies, and individual facility targets set. Rules regarding banking are still to be determined (IETA 2013). DCs that do not reach their targets face penalties calculated on the current price of energy savings in the markets (Bertoldi et al. 2013). Penalties are estimated to a Maximum of Rs. 10,000 and Rs. 1,000 for every additional day of default. The penalty is INR 10 lakhs and measured in terms of the market value of tonnes of oil equivalent. The cost of energy was determined to be INR 10,154 per tonne of oil for 2011-2012. A newly established public company (Energy Efficiency Services Ltd) administers the trading.

The ESCert are equivalent to 1 MToe of energy savings, which is also the unit for determining savings. The lifetime of ESCerts also affects their price, and this signifies that shorter lifetimes of certificates could distort market prices as the market will respond to short term price fluctuations. BEE has considered the option of banking to reduce the risk of high price fluctuations and provide a steadier signal to the market and build confidence towards savings.

The standard process of the PAT scheme on an industrial/power plant is presented in Figure 5 (Kumar and Agarwala 2013).

Figure 5: Administrative process for the Indian PAT Scheme



3.5.3 Results of Obligations

There is no official evaluation of the PAT scheme, given that its trial period is still ongoing. The design phase included extensive consultation with DCs to improve awareness and preparedness of industries for the obligations and trading issues.

3.5.3.1 Savings

Based on preliminary evaluations, the costs of achieving the target in all DCs could exceed 5.4 billion US dollars (IETA 2013). Such an amount will have serious implications for the industry, therefore PAT required a lengthy design process and preparation phase. In the absence of an official evaluation thus far, the targets to be achieved are 26 MtCO2 in the end of the first phase. From industrial insights, in cases where energy efficiency investments are not viable, DCs have adopted RE options (solar & wind) to achieve SEC targets. Waste heat recovery has been adopted primarily by cement sector, but the adoption remains low due to high capex. Furthermore, certifications like ISO 50001 have been adopted to increase awareness and improve stakeholders' energy efficiency approaches.

3.5.3.2 Other issues

A main issue that has been mentioned during the initial phase of the PAT scheme is that the system and methodology are considered complicated and they need to account for large differences in levels of energy efficiency within sectors. India thus far did not have any experience with benchmarking on market-based systems (IEPD). A potential problem is that the ESCerts are issued ex-post (after savings being verified). This does not allow trading to take place and therefore does not generate price signals for energy efficiency investments (Bhattacharya and Kapoor 2012). The absence of real trading requires the active role of the government to maintain a competitive price of energy savings (and eventually also a minimum price for RECs). This could be arranged by regulation of the ESCert market, with government purchase or set aside of ESCerts when the price reaches a floor limit.

3.5.4 Other Issues

From the industrial point of view (Energetica India) there is some information on how the PAT scheme is perceived by the market players. Primarily, the lack of trading with price clarity hinders decisions on investments and a potential oversupply of ESCerts will reduce the rate of investments, with limited project based funding at low interest rates for energy efficiency projects. Furthermore, current recessionary trends have put pressure on the top and bottom lines of DCs. Low capacity utilization, inconsistent quality and unreliable availability of coal are also major impediments for PAT, in addition to lack of skilled labour, leading to inefficient operations and poor energy performance. In terms of market capacity, the lack of financing agencies and performance contracting together with the limited number of credible ESCOs and the lack of specific performance guarantee and implementation support by the OEMs, renders the EE projects high risk, so that top management is reluctant to have profit sharing agreements with third parties.

3.5.5 Overall evaluation

The first phase of PAT scheme was initially envisaged to run from 2011 and the obligations were originally calculated on the total annual consumption 10 Mtoe below the average annual consumption values registered in the years between 2007-2010 (Bertoldi et al. 2013). However, the implementation phase was less stringent and the scheme was launched in 2012 reducing the number of DCs to 478 and the total amount of energy to be saved to 6.6 Mtoe. Recommendations for the PAT scheme from industry (Energetica India) are that:

- Strong monitoring and reporting system can build confidence and facilitate linkage to international carbon markets and global EE funds.
- Baselining and target setting in Cycle II could be more transparent and collaborative.
- BEE could help DCs develop measurement and verification capabilities for PAT scheme to be robust.
- If Cycle II targets are stringent, this would need substantial capex, but India does not have credible EE debt financing institutions, which should be a priority.
- The depth (number of companies) and breadth (number of sectors) of the PAT scheme needs to be increased by decreasing the threshold for selection and including other sectors like railways and electricity T&D.
- BEE should publish success stories to encourage adoption of EE measures among DCs
- DENAs should play a more active role beyond data collection and provide energy performance improvement measures.

3.6 Energy Efficiency Obligations in Other Countries

There is some evidence of use of EEOs or related concepts in Brazil, China and South Korea. Basic material about energy efficiency obligations and similar schemes in these countries has been presented and analysed by RAP in various documents and presentations e.g. (The Regulatory Assistance Project, 2012). While schemes in these countries may be of some interest, none appears to be more ambitious or well-developed than some of those operating in Europe. Only Brazil has a policy which requires energy companies to provide energy efficiency measures to customers.

3.6.1 Brazil

Since 1998 Brazil has enforced the collection of 1% from utilities' annual revenues and directed these funds to energy efficiency and energy R&D activities (De Martino Jannuuzzi, 2005). This is known as the utilities' Energy Efficiency Programme (EEP) – a national public interest fund regulated by the Brazilian Electricity Regulatory Agency (ANEEL). This program is a mix of control and funding mechanism. Control because the electric utilities have 1% of their revenues regulated and funding because these resources are used to promote the utilities EEP and R&D activities.

The EEP started in the mid-nineties with the power sector reform (privatizations and implemented changes in the management, organization and ownership of the utilities). In 1998, ANEEL established rules which defined more clearly the amount of annual investment,

procedures for submission, approval and verification of utilities' EEP. The percentage of the fund which is required to be spent on energy efficiency measures (as opposed to R&D and planning) has varied from 90% in 1989-99, to 50% from 2000 to 2015, with the exception of 25% in 2006 ((Broc et al., 2012?; REEP, Undated). Originally, utilities were allowed to use up to 65 % of their share in supply-side measures, thereby reducing their technical and commercial losses. Legislation passed in 2000 restricted applications to end-use measures such as air conditioning systems in public and commercial buildings or energy efficient engines in industry.

From 1997 until 2011, various types of projects and end uses have been introduced or prohibited. However, the most significant change was the decision that a minimum of 50% (and since 2010, 60%) of the investments should be performed in low income communities and households with social tariffs. These low-income programs mainly consist of donation of compact fluorescent lamps and refrigerators (Broc et al., 2012?).

3.6.2 China

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 (IEA, 2013).

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 (RAP, 2012)

3.6.3 South Korea

South Korea does not have an energy efficiency obligation scheme.

The *Rational Energy Utilization Act* states that energy utilities must establish and execute an annual DSM investment plan "to improve the efficiency in the production, conversion, transport, storage and utilization of the energy, and the reduction of the demand, etc." The 1997 Basic Plan for Rational Use of Energy includes in its goals: reducing energy imports, reducing production costs through reduced energy use, minimising carbon dioxide emissions, developing an energy efficiency socioeconomic structure, and strengthening DSM in the power sector. Because of the lack of quantitative energy saving targets, the Korean energy utility DSM investment scheme is strictly not an energy efficiency obligation scheme. However, it is an example of how energy utilities may be obligated to carry out load management and energy efficiency programmes without establishing quantitative energy saving targets. (RAP, 2012)

The government has recently published a new energy strategy (MOTIE, 2014). The headline policies suggest that the electricity saving target is expected to be met via electricity price reform and taxation, not an energy efficiency obligation. There is also mention of expanding energy efficiency projects for vulnerable households. The Korean government controls electricity prices, which are kept artificially low to support the country's industry. Deregulation of the electricity market and more market-oriented pricing of energy are two important components of current reforms (Growth Analysis, 2014a, b).

4 Conclusions

The diversity of designs and results of EEO policies outside Europe is very large. In all cases, policy design is influenced by the specific economic and political context of the jurisdiction and the design is strongly affected by the governance of energy industry. It would therefore be unwise to draw universal conclusions that can be transferred to other jurisdictions. However, there are some general conclusions that can be drawn, from which broad recommendations can be deduced.

The stated immediate policy objective of EEOs is invariably the reduction of energy demand, either absolutely or below the business as usual trend. There is a range of broader policy objectives that can underpin this objective, including economic, environmental, energy security goal, industrial policy goals and a combination of all of these. The metric of energy saving (final energy, primary energy, peak demand, carbon etc) provides some insight into the main driver, but is also influenced by history and evaluation issues, so is not necessarily a reliable indicator of all policy goals. There is evidence that the breadth of benefits of energy efficiency allows policy stability even when the primary goal changes. In some cases in the USA, the is an explicit comparison between energy efficiency and supply, with the targets determined with respect to cost effectiveness of energy efficiency and the concept of energy efficiency as a 'preferred resource'.

The design of EEOs reflects both the stated policy goals and the institutional and market framework of the jurisdiction. In most of the cases we have examined outside Europe, their use has been in privately owned, regulated utilities, but with a variety of levels of competition and types of market. In the USA states examined, there is partial (Massachusetts) or no (California) retail competition and a mixed system of energy utilities dominated by large privately owned utilities. Regulation incentivizes utilities to undertake energy efficiency programmes through design of price controls rather than quantitatively specified obligations. In Victoria, there is a fully competitive retail market with the EEOs placed on retail companies that are not price regulated. Ontario is in an intermediate position, with a competitive retail market are EEOs on the distribution utilities.

These jurisdictions design, deliver and evaluate EEOs through electricity and gas utilities (distribution, retail or bundled companies). EEOs are therefore limited to the regulated energy markets of gas and electricity rather than being more broadly based across a wider group of fuels. Design is intended to incentivise delivery that is cost effective. In the case of the US states examined this includes explicit consideration of the cost effectiveness of EEO programmes in comparison to new supply, with price regulation adjusted through

'decoupling' to ensure utility profits are consistent with this goal. In Ontario, the distribution companies have a performance incentive with a similar aim. In competitive retail markets in Victoria, where as in Europe fixed quantity EEOs are used, it is assumed that retail competition incentivizes efficient delivery. Only in Victoria is cost effectiveness in doubt. We conclude that EEOs are a viable policy instrument across a range of ownership and regulatory structures, including all those compliant with EU electricity and gas regulation.

In these jurisdictions, EEOs are not restricted to specific sectors. And, in all cases, there is either no restriction on the range of technologies or a wide scope of prescribed technologies. However, the use of other policies and cost effectiveness drivers tend to focus the use of EEOs to specific areas. In practice, in all cases the predominant relate to energy use in existing buildings (residential and non-residential), in particular fabric and heating system improvement for gas, and HVAC, lighting, appliance and standby power control for electricity.

India has a very different approach with EEOs placed on industrial energy consumers, of which electricity generation companies form the largest, but far from only, sector. Smaller energy users are outside the system. This very different focus appears to relate to India's position as a newly industrializing country. Its relevance to the EU may therefore be limited, but it does show the feasibility of extending EEOs far beyond regulated network utilities.

In all the cases we have examined, the savings are significant. This should not be interpreted to mean this is a universal conclusion or even the norm, as we have deliberately selected examples seen to be successful; there clearly are cases of less well-designed and less ambitious EEOs. The different metrics used across different jurisdictions (gas and electricity; energy and carbon; annual and cumulative; annual and lifetime) make comparison of scale very difficult. However, is all case we estimate that the scale of the obligations across the regulated sectors is ~1% demand reduction annually, i.e. of the same order of magnitude of the requirements of Article 7 of the EU Directive. Overseas experience is therefore consistent with the view that EEOs can, as intended, play a significant or dominant role in the scale of energy efficiency improvement mandated by Article 7.

As with any policy instrument, EEOs raise other issues for policy makers. In the jurisdictions where EEOs are placed on gas and electricity utilities, the energy efficiency measures benefit some end users and lead to increased retail costs for the utilities, which can be expected to fall on the broader group of utility customers, where through explicit price regulation or market forces. In other words, EEOs raise energy prices to some extent and redistribute resources from the whole customer base to programme beneficiaries. The extent to which these impacts are problematic depends on the social and political context as well as specific

design issues. In many cases, there are programmes focused on low income households, funded out of EEOs or otherwise, that address the most obvious potential inequalities. In India, both the costs of investment and the savings benefits accrue to the individual obligated company. Trading of white certificates is intended to provide flexibility and economic efficiency.

In practice, all the jurisdictions we have examined use EEOs as part of a broader package of energy efficiency policies, recognizing that EEOs may not be the most efficient or effective way to deliver R&D, improved efficiency products or community engagement. The consensus of experts is that product and building standards play an important role in energy efficiency policy as a whole and cannot realistically be substituted by EEOs. Most EEOs are designed in such a way that savings are only credited from a baseline determined by the relevant product standard (or market average performance) so that standards and EEOs are generally additional. In addition, there is a consensus that R&D and information programmes are complements to support for individual measures, but that these cannot be easily funded by EEOs are the savings are more difficult to evaluate.

We also found concern amongst experts about the usefulness of EEOs for future challenges, even those highly supportive of EEOs in jurisdictions where they are used successfully. Essentially the concerns arise from two issues. The first is that, as low cost energy efficiency measures are used and energy efficiency programme costs rise, this will be reflected in energy prices and cross-subsidies, which may become politically problematic (even where still cost effective). The second concern is that whilst some energy companies are well-placed to deliver energy efficiency, especially low cost and straightforward measures, they are not necessarily the best placed organizations to undertake major building refurbishment and therefore that implementing energy efficiency programmes in this way may restrict the innovation that will be needed.

Based on this overseas experience, the recommendations for policy makers in the EU using and considering EEOs are as follows:

- EEOs should set ambitious goals, at least after a learning phase, i.e. at a level of the order of magnitude of 1% annually.
- EEOs can be used in a variety of market structures, but the details of design need to reflect this structure.
- Obligated utilities should be either required or incentivized effectively, i.e. with penalties or incentives that make non-delivery less profitable than delivery.
- EEOs should be designed to focus on delivering benefits over and above those that will result from minimum standards.

- EEOs should not be used alone, but as part of policy packages that include minimum standards, support for innovation and consumer engagement.
- Policy makers should continue to investigate innovative approaches to delivery using actors other than energy companies.

There are some other areas of policy, where some EU member states are using EEOs more widely than the other jurisdictions analysed in this report, e.g. more widely than buildings and for fuels other than oil and gas. Non-EU experience has nothing useful to say about these areas.

5 Acknowledgements

We are grateful for the information provided by the following interviewees: Carl Blumstein, Director California Institute for Energy and Environment; Ed Vine, Lawrence Berkeley National Laboratory; Rob Woolley, Manager VEET, Essential Services Commission of Victoria; and anonymous senior member of staff of the California Public Utilities Commission.

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