Oakley Greenwood

Stocktake and Assessment of Energy Efficiency Policies and Programs that Impact or Seek to Integrate with the NEM:

Stage 1 Report

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1. Executive summary

1.1. Study background and purpose

The objective of the *Power of Choice* review that was commenced by the Australian Energy Market Commission (AEMC) in March 2011 in response to a request from the Ministerial Council on Energy (MCE), is to identify opportunities for consumers to make informed choices about the way they use electricity, and to provide incentives for network operators, retailers and other market participants to invest efficiently to capture the value of flexible demand.

As part of the *Power of Choice* review the AEMC commissioned this study, *Stocktake and Assessment of Energy Efficiency Policies and Programs.* The Stocktake and Assessment was undertaken to address a specific requirement within the MCE's terms of reference, which was to "investigate the potential for energy efficiency [programs] and policies that impact on, or seek to integrate with, the NEM to promote efficient DSP in the stationary energy sector". More specifically, the Stocktake and Assessment is study is to:

- Describe the range of programs and policies which are considered to "impact on or seek to integrate with the NEM";
- Provide a stocktake of those energy efficiency programs and policies that impact or seek to integrate with the NEM currently in place, including details of their objectives, scope, design features and outcomes;
- Assess the effectiveness and cost-efficiency of programs and policies identified; and
- Identify those energy efficiency programs and policies (and practices) considered as best practice to promote efficient demand-side participation (DSP)1 in the NEM, including the potential for such programs, policies and practices to be integrated within the NEM.

1.2. Study approach

The study was undertaken in the following six tasks:

- Task 1 – A high-level outline of the range and potential of energy efficiency programs and policies to promote DSP in the stationary energy sector, and the development of a set of criteria to select the particular programs and/or policies to be included in the cost-effectiveness assessment to be undertaken in Task 4 (see below);
- Task 2 – A high-level overview of international energy efficiency programs and policies, utilising existing up to date information and evidence where possible;

1 For the purpose of the Power of Choice Review the AEMC has defined DSP as "the ability of consumers to make informed decisions about the quantity and timing of their electricity use, which reflects the value that they obtain from using electricity services".

- Task 3 – A stocktake of the existing regulatory arrangements for energy efficiency programs and policies that impact on or seek to integrate with the NEM, such as those that place obligations on market participants (i.e. generators, retailers and distributors);
- Task 4 – An assessment of the costs (direct, indirect) and benefits (including avoided costs) of the energy efficiency programs and policies identified in the stocktake for all market participants (including consumers) and institutions and any wider societal benefits against the National Electricity Objective (NEO);
- Task 5 – Based on the preceding tasks, identification of best practice model/s regulatory arrangements for energy efficiency measures/policies that seek to promote efficient investment in, and use of DSP, in the electricity market; and
- Task 6 – An analysis of the identified best practice model/s for energy efficiency as compared to other policies that seek to promote efficient investment in, and use of, DSP in the electricity market (e.g. solar feed in tariffs).

The Stocktake and Assessment is being conducted in two Stages. This Stage 1 report addresses Tasks 1 through 3 above. Tasks 4 through 6 will be addressed in the Stage 2 Report, which is expected to be delivered to the AEMC in late March.

1.3. Key findings

The benefits of energy efficiency include:

- The ability to produce the same level of output or to enjoy the same level of amenity at lower cost;
- The ability to produce more output or to enjoy increased levels of amenity for the same cost; and
- The ability to reduce negative externalities.

More specifically, increased utilisation of energy efficiency can:

- Reduce bills for energy consumers,
- Reduce capital and operating costs for companies that generate and transport electricity, which may reduce upward pressures on electricity supply costs, and
- Reduce greenhouse gas emissions.

A large number of studies have demonstrated that current levels of investment in energy efficiency are far below that which would be economically efficient. This has been attributed to a variety of barriers that impede consumers from making investments that would provide benefits to themselves and to the wider economy at large. The barriers that have most often been cited as being responsible for this effect include: under-supply of information that has 'public good' characteristics, information asymmetry, split incentives, external benefits that are not explicitly valued in the pricing of electricity, lack of access to of competing uses for capital, and behavioural, organisational and cultural factors that skew consumer decision-making.

In response state and Commonwealth governments have initiated a large number of energy efficiency policies and programs over the past 20 years whose objectives have been to remedy and overcome these barriers. These programs generally fall into one or another of four basis types:

- Performance standards, including:
  - Building codes
  - Minimum energy performance standards (MEPS)
  - Training and accreditation of energy efficiency product and service providers
- Information programs, including:
  - General information regarding energy efficiency measures, their applicability and potential savings
  - Audits and other types of customised information
  - Referral databases of skilled practitioners
  - Demonstration programs
- Incentive programs, including:
  - Tax and payment system mechanisms, such as tax credits, accelerated depreciation, sales tax exemptions, etc.,
  - Rebates,
  - Low interest loans, and
  - Incentive tariffs[2], such inclining block tariffs, time-of-use tariffs, energy efficiency and peak demand reduction rebates, and dynamic pricing such as Critical Peak Pricing.
- Obligation programs, in which a particular market entity is required to ensure that a specified amount of end-use energy efficiency is undertaken. These programs tend to have the following three key features:
  - a target for energy efficiency improvement
  - an obligated party (or parties) that must meet the target
  - a measurement and verification system that defines the energy savings activities that can be used to meet the target, their value, and how the fact that the activities have been undertaken is to be confirmed[3].

2 Note, however, that tariffs and other pricing arrangements would not be directly offered by government, but the electricity industry can be required by governments to offer such arrangements.

There have also been a number of studies undertaken or commissioned by Government or other organisations to assess the potential for enhanced uptake of economically efficient energy efficiency and its likely impact on consumers, the electricity sector and the Australian economy in general.

A 2005 Productivity Commission study concluded that the level of improvement in energy efficiency that would be achieved through measures that are cost effective from the end user's perspective was relatively modest, but that information failures and split incentives did comprise significant barriers to the uptake of cost-effective energy efficiency measures, and therefore justified the use of Government measures such as the requirement for mandatory energy efficiency labelling. By contrast, the study felt that minimum energy performance standards might not always meet the criterion of being privately cost effective, and a sufficiently robust case had not been made at that time for the imposition of a national energy efficiency target and tradable obligations.

In 2008, the Department of Finance and Deregulation reviewed the 62 then-existing Commonwealth climate change programs for their appropriateness as either transitional or complementary measures to the Carbon Pollution Reduction Scheme (CPRS)[4], an emissions trading scheme that the Commonwealth government had announced it intended to implement as the centrepiece of Australia's climate change program. The report found that 31 of the programs reviewed were, or with modification could be, complementary to the CPRS, while the remainder were either potentially useful as transitional instruments to the CPRS and should be terminated after that transition, or were neither complementary nor transitional, and therefore should be terminated in the near term. The study also concluded that information provision and ensuring proper consumer protection continued to constitute extremely important areas for government action, but that Government support should be technology neutral rather than prescriptive. The study also emphasised the importance of energy pricing and particularly the cost reflectivity of electricity pricing as sound economic means for encouraging economically efficient investment in energy efficiency.

More recently, in 2010, the Prime Minister's Task Group on Energy Efficiency was charged with identifying "options for introducing mechanisms to deliver a step-change improvement in Australia's energy efficiency by 2020 and place Australia at the forefront of OECD energy efficiency improvement by 2020"[5]. The study was undertaken within a policy context in which implementation of the CPRS had been delayed, and neither smart meter deployment nor more cost-reflective electricity pricing had significantly progressed. The study recommended, among other things that an aspirational national target be set to improve energy efficiency by 30% by 2020, and that a national obligation program be used as a centrepiece measure for achieving that target. The obligation would be placed on electricity retailers to achieve a specified amount of end-use energy efficiency each year, and that this obligation would "replace existing and planned state energy efficiency schemes and be phased down as a carbon price matures" [6].

3 Department of Climate Change and Energy Efficiency and Department of Resources, Energy and Tourism, *Issues Paper: National Energy Savings Initiative*, December 2011, p 7.

4 Mr Roger Wilkins, AO, *Strategic Review of Australian Government Climate Change Programs*, Department of Finance and Deregulation, Commonwealth of Australia, July 2008.

5 Prime Minister's Task Group on Energy Efficiency, op. cit., p 201.

6 Ibid., p 2.

The approach recommended by the Task Group was received significant corroboration by a subsequent study undertaken in 2011 by the Grattan Institute. The study assessed the effectiveness and cost of four different types of government programs aimed at increasing energy efficiency and/or reducing greenhouse gas emissions: market mechanisms, grant tendering schemes, rebates, and energy efficiency standards.

The study found that market mechanisms scored best overall across the criteria that had been selected. While market mechanisms have a higher cost per tonne of CO^2 abated than energy efficiency standards and regulations, they were found to deliver emissions reductions faster than standards and regulations can. They were also found to be both more effective and to cost less than either grant tendering schemes or rebates[7].

In Stage 1 of the *Stocktake and Assessment* we therefore focussed on market mechanisms, and more specifically, obligation programs. This reflected the conclusions that had been reached over the course of the studies summarised above, the fact that three NEM jurisdictions – NSW, South Australia and Victoria – had implemented such programs, and the Commonwealth Government had begun assessing the potential benefits in establishing a National Energy Saving Initiative based on and superseding those programs.

The Stage 1 study has identified the following characteristics regarding the three state-level energy savings initiative programs and the Commonwealth's Energy Efficiency Opportunities program:

- All three of the state-based programs commenced in 2009 and have been established in legislation. The Victorian Energy Efficiency Target (VEET) and the South Australia Residential Energy Efficiency Scheme (REES) have both been established to run in 3-year cycles. The VEET has legislative authority to be in place until 1 January 2020. The regulations authorising the REES expire on 31 December 2014, but require a review to be undertaken by the end of 2013 to consider whether the scheme should be continued.. The NSW Energy Saving Scheme (ESS) was set targets through 2020, and the Commonwealth's Energy Efficiency Opportunities (EEO) program is funded through June 2017.

- All three of the state-based programs have set specific annual targets for energy efficiency improvement, though the targets themselves vary significantly across the three states, and all three have established penalties that apply if the obligated party(ies) do not meet their applicable target. The penalty levels in VIC and SA are materially higher than the initial carbon price that is scheduled to go into effect in July 2012. The NSW penalty price is only marginally higher than the initial carbon price.

- All three of the state-based programs have placed obligations on energy retailers to achieve specified levels of end-use energy efficiency annually. The NSW scheme applies to electricity retailers only. The VIC and SA schemes apply to retailers of both electricity and gas.

7 Daley and Edis, *Learning the hard way: Policies to reduce emissions*, p. 5.

- The SA scheme targets efficiency improvements only in the residential sector. It is also the only one of the schemes that requires that a specific proportion of the energy efficiency improvements be undertaken in properties inhabited by disadvantaged households. The VIC scheme started out focussed entirely on the residential sector, but has recently (in its second three-year cycle) expanded to include energy efficiency improvements in small non-residential facilities. The target in the NSW scheme can be met by energy efficiency improvements in any customer sector. The Commonwealth's EEO program is exclusively focused on quite large companies.

- The VIC and NSW schemes use tradable certificates in order to (a) harness the power of the market to identify the least-cost means for meeting the target, and (b) build the level of skills and capabilities available in the market to deliver energy efficiency products and services, thereby addressing the barriers that the lack of these skills and capabilities pose. The SA REES does not use tradable certificates, but the regulations ddo allow energy retailers to transfer energy credits between one another.

- To date, all three of the state-based programs have achieved all or very close to all of their annual targets; penalty prices have almost never had to be paid by obligated parties.

- The obligation in the Commonwealth's EEO program is on large consumers of energy (those that consume more than 0.5 petajoules (PJ) of energy per year. Initially the program only applied to end users of energy, but has subsequently been expanded to include electricity generators and transmission and distribution businesses of gas and electricity. The EEO program does not require that these end-use and other businesses undertake any specified amount of energy efficiency activity. Rather, it requires them to:

    - undertake an assessment of the various measures that would improve energy efficiency in their processes and facilities

    - report on those measures that would achieve a 3-year payback or less

    - provide a plan as to what actions if any they intend to take with regard to those measures.

One of the primary areas of interest for the Commission with regard to these programs is their impact on the electricity market. The ways in which these programs affect the electricity market have to do with their impacts on:

- The amount of electricity consumed

- The level of greenhouse gas emissions

- The level of peak demand on the generation sector and the various transmission and distribution systems

- The costs incurred by the electricity sector in administering the scheme and any other costs associated with the administration of the programs that are collected through electricity charges or prices.

The three state-based schemes have estimated their impacts on the electricity market in different ways:

- The Victoria Department of Primary Industries estimated that the VEET was expected to decrease wholesale electricity prices on average by around 2.2 per cent below business as usual, annually, over the period 2009 to 2011.
- IPART has reported that the impact of the ESS on electricity price has been calculated to be less than 1%.
- ESCOSA has stated that the REES costs that have been approved for pass-through in 2011-12 had the effect of increasing a typical residential standing contract customer's annual bill by $12.55 (electricity) and $2.62 (gas).

The Victorian estimate would appear to be net of program costs; it is not clear as to whether the NSW and SA estimates are prior to or net of the energy consumption and peak demand impacts of the programs.

Stage 2 of the Stocktake and Assessment will undertake an assessment of the impact of these programs on the NME in terms of the specific factors listed above.

2. Introduction

2.1. Study background and purpose

The Australian Energy Market Commission (AEMC) was requested by the Ministerial Council on Energy (MCE) to undertake the third in a series of reviews of demand side participation (DSP) in the National Electricity Market (NEM). The objective of the *Power of Choice* review that was commenced by the AEMC in March 2011 is to identify opportunities for consumers to make informed choices about the way they use electricity, and to provide incentives for network operators, retailers and other market participants to invest efficiently to capture the value of flexible demand. The MCE's Terms of Reference (ToR) for the *Power of Choice* review directs the AEMC to specifically consider the following key issues:

- the market frameworks needed to maximise the value to consumers from services enabled by new technologies (such as smart grids/smart meter and load control capability)
- the effectiveness of available regulatory arrangements, such as retailer obligation schemes, for increasing demand-side energy efficiency; and
- how the operation of price signals can be made more efficient, including relevant aspects of the tariff setting process and the use of incentives to reduce supply-side operating and capital expenditures.

This present study has been undertaken to address a specific requirement within the MCE ToR related to the second dot point above, which was to "investigate the potential for energy efficiency [programs] and policies that impact on, or seek to integrate with, the NEM to promote efficient DSP in the stationary energy sector". More specifically, this study is to:

- Describe the range of programs and policies which are considered to "impact on or seek to integrate with the NEM";
- Provide a stocktake of those energy efficiency programs and policies that impact or seek to integrate with the NEM currently in place, including details of their objectives, scope, design features and outcomes;
- Assess the effectiveness and cost-efficiency of programs and policies identified; and
- Identify those energy efficiency programs and policies (and practices) considered as best practice to promote efficient demand-side participation (DSP)[8] in the NEM, including the potential for such programs, policies and practices to be integrated within the NEM.

2.2. Study approach and organisation

The study was undertaken in the following six tasks:

8 For the purpose of the Power of Choice Review the AEMC has defined DSP as "the ability of consumers to make informed decisions about the quantity and timing of their electricity use, which reflects the value that they obtain from using electricity services".

- Task 1 – A high-level outline of the range and potential of energy efficiency programs and policies to promote DSP in the stationary energy sector, and the development of a set of criteria to select the particular programs and/or policies to be included in the cost-effectiveness assessment to be undertaken in Task 4 (see below);
- Task 2 – A high-level overview of international energy efficiency programs and policies, utilising existing up to date information and evidence where possible;
- Task 3 – A stocktake of the existing regulatory arrangements for energy efficiency programs and policies that impact on or seek to integrate with the NEM, such as those that place obligations on market participants (i.e. generators, retailers and distributors);
- Task 4 – An assessment of the costs (direct, indirect) and benefits (including avoided costs) of the energy efficiency programs and policies identified in the stocktake for all market participants (including consumers) and institutions and any wider societal benefits against the National Electricity Objective (NEO);
- Task 5 – Based on the preceding tasks, identification of best practice model/s regulatory arrangements for energy efficiency measures/policies that seek to promote efficient investment in, and use of DSP, in the electricity market; and
- Task 6 – An analysis of the identified best practice model/s for energy efficiency as compared to other policies that seek to promote efficient investment in, and use of, DSP in the electricity market (e.g. solar feed in tariffs).

2.3. Scope and organisation of the report

This Stage 1 report addresses Tasks 1 through 3 above. Tasks 4 through 6 will be addressed in the Stage 2 Report, which is expected to be delivered to the AEMC in late March.

More specifically:

- Section 3 below briefly discusses the range of energy efficiency programs and policies that are commonly used to promote DSP in the stationary energy sector, and the set of criteria used to select the particular measures and/or policies to be included in the quantitative assessment of cost-effectiveness to be undertaken in Stage 2;
- Section 4 provides an overview of international energy efficiency measures and policies that conform to the criteria developed in Task 1;
- Section 5 describes four energy efficiency programs that have been implemented by governments to encourage the installation of energy efficiency measures and that, by doing so, may have an impact on the NEM.

3. Overview of energy efficiency programs and policies

A large number of programs and policies focussing on energy efficiency have been implemented in Australia and elsewhere. This section of the report

- discusses the rationale for such programs and policies,
- provides an overview of the various types of energy efficiency programs and policies that are available and that have been implemented,
- discusses the ways in which such programs and policies may impact the NEM, and
- presents the criteria used to select the programs and policies that have been included in this stocktake and assessment from the large number of energy efficiency programs and policies that have been implemented in Australia.

3.1. Rationale for the implementation of energy efficiency programs and policies

Government initiated programs and policies to encourage energy efficiency – as interventions into the energy market – are most often undertaken (and generally considered only to be justified) when there is some sort of barrier to end-use energy consumers (essentially all households, businesses and institutions) making investments in energy efficiency at an economically efficient level.

These barriers can relate to market failures, where the market, acting on its own, is unable to overcome the barrier, and therefore some type of intervention into the market is required. Environmental externalities, such as greenhouse gas emissions, and other externalities are an example of such market failures. Others include the under-supply of information that has 'public good' characteristics, information asymmetry, and bounded rationality[9].

However, other barriers that are not the result of market failures *per se* can also impede economically efficient investment. While many of these barriers might be successfully resolved by market forces over time, that is unlikely to happen except in the long term. The *Report of the Prime Minister's Task Group on Energy Efficiency* [10] categorised the material barriers that impede the economically efficient levels of investment in energy efficiency on the demand side into the following three broad groups that span both market and non-market failures:

- Lack of information and skills, and uninformed decision-making – this includes the under-supply of information that has public good characteristics, skill gaps, split incentives and behavioural, organisational and cultural factors;
- Externalities that distort prices for energy and/or energy efficiency products or services; and

9 Useful discussions of these market failures in relation to energy efficiency can be found in (a) the Productivity Commission, *The private cost effectiveness of energy efficiency*, 2005, and (b) *The Garnaut Climate Change Review: Final Report*, 2008.

10 Prime Minister's Task Group on Energy Efficiency, *Report of the Prime Minister's Task Group on Energy Efficiency*, Department of Climate Change and Energy Efficiency, Canberra, July 2010.

- Regulatory and planning practices[11].

There is a large body of literature about the barriers to energy efficiency that is easily accessible, and review of that literature is beyond the scope of the present study. Suffice it to say that the presence of these barriers has long been accepted, and they form the basis for the development and implementation of government program and policy interventions. The elimination of these barriers – to the extent that they result in more economically efficient levels of investment in energy efficiency – can provide significant benefit to consumers and society. These benefits can take the following forms:

- The ability to produce the same level of output or to enjoy the same level of amenity at lower cost;
- The ability to produce more output or to enjoy increased levels of amenity for the same cost; and
- The ability to reduce negative externalities.

More specifically, increased utilisation of energy efficiency can:

- Reduce bills for energy consumers,
- Reduce capital and operating costs for companies that generate and transport electricity, which may reduce upward pressures on electricity supply costs, and
- Reduce greenhouse gas emissions.

3.2. Typology of programs and policies

A number of different types of programs and policies have been used by government to mitigate or remove the applicable market and other barriers, and thereby achieve higher levels of economically efficient investment in energy efficiency. The programs and policies can be categorised into the following broad groups:

- Performance standards, including:
  - Building codes
  - Minimum energy performance standards (MEPS)
  - Training and accreditation of energy efficiency product and service providers

11 *Report of the Prime Minister's Task Group on Energy Efficiency*, pp 32 – 34.

Performance standards ensure that buildings and energy-consuming equipment and appliances are designed and constructed/manufactured in a way that balances the overall cost-effectiveness of their first (i.e., purchase) cost and their on-going (i.e., operating and maintenance costs, the former of which is highly dependent on their energy efficiency). This avoids situations in which consumers may incur higher lifetime use costs for buildings, appliances and other equipment that cost less – and are therefore more attractive – to purchase, but that cost significantly more to operate, thereby erasing their initial cost advantage over time.

Training and accreditation can be seen as serving a similar purpose with regard to the personnel that specify, install, maintain and repair this equipment. Competent professional and trade personnel are critical for consumer confidence and proper operation and performance of the measures installed.

- Information programs – Information programs can be used to address (in whole or in part) various information barriers, including lack of awareness, information asymmetries, bounded rationality and behavioural, organisational and cultural factors. Most simply, they seek to make consumers aware of the benefits they can obtain through energy efficiency and how to do so. A number of different types of information programs and policies can and have been used, including:

  - General information regarding measures, their applicability and potential savings – This type of information can be provided in a wide range of formats and can address a wide range of topics. At the most general level, these types of programs seek to make consumers aware of the opportunities they have for increasing their energy efficiency, the monetary savings and other benefits that can be obtained from doing so, and the specific energy efficiency measures and actions that can deliver those savings. General information programs can be addressed to any customer segment.

    For residential customers such general information programs will typically address how changes the consumer can make to their behaviour, the energy using appliances and equipment they use, and the way they use their appliances and equipment can save them money, reduce the impact they have on the environment, and possibly provide other benefits. This information can be provided in a variety of formats, most typically including printed brochures and booklets, and electronic formats such as websites and video clips.

    For non-residential consumers, general information is likely to address an even wider range of topics. In addition to the impact of behaviour, equipment selection and equipment use on energy use and costs, information directed at business customers will often also address benchmarking, and best practice. Waste minimisation and operational optimisation are likely to receive specific attention as well. The formats used will also be primarily print and electronic, but will likely include more technical information.

    For all types of consumers, information on the various types of technologies that may be applicable to their end use requirements is very commonly included in information programs.

- Audits and other types of customised information and advice - These types of programs seek to provide information that is tailored to the individual consumer (rather than the typical consumer within the given sector). Audits can either be conducted by a trained third party, or can be self-guided. The level of tailoring allows more specific recommendations that take into account the particulars of the consumer's situation and needs, and provide a much more definitive assessment of the costs and benefits of specific energy efficiency actions and behaviours. Audits that are conducted by a third party also include a means for helping the consumer move from having more information to taking action, which can reduce transaction costs for the consumer.

- Referral databases of skilled practitioners - By helping consumers locate qualified professional and trade personnel, these types of programs help address skill gaps and reduce transaction costs. They are particularly effective when combined with accreditation programs.

- Demonstration programs - Demonstration programs allow consumers to see installations of energy efficiency equipment and in some cases also allow them to speak with their peers about the practical, day-to-day requirements, impacts, costs and performance of the equipment. This can be very effective in addressing behavioural, organisational and cultural factors that affect decision making.

- Incentive programs - Incentive programs can address several types of barriers. They can address externalities that distort the price of energy (and therefore the benefits of energy efficiency); certain regulatory and planning practices such as those that serve to reduce the cost-reflectivity of electricity pricing, and consumer decision-making processes by making the benefits of energy efficiency investments more material. Financial incentives can be provided in several forms, including:

  - Tax and payment system mechanisms, such as tax credits, accelerated depreciation, sales tax exemptions, etc.,

  - Rebates,

  - Low interest loans, and

  - Incentive tariffs[12], such inclining block tariffs, time-of-use tariffs, energy efficiency and peak demand reduction rebates, and dynamic pricing such as Critical Peak Pricing.

- Obligation programs - In an obligation program, a particular market entity is required to ensure that a specified amount of energy efficiency is undertaken in the facilities of consumers. These programs tend to have the following three key features:

  - a target for energy efficiency improvement

  - obligated parties that must meet the target

12 Unlike the other programs and policies discussed in this section, tariffs and other pricing arrangements would not be directly offered by government, but the electricity industry can be required by governments to offer such arrangements.

- a measurement and verification system that defines the energy savings activities that can be used to meet the target, their value, and how the fact that the activities have been undertaken is to be confirmed[13].

Obligation programs can be effective in addressing the following key barriers:

- improving the materiality and adequacy of energy efficiency returns
- improving the prioritisation of energy efficiency in consumer decision-making,
- improving access to capital (due to improved returns),
- reducing split incentives,
- closing skill gaps, and
- removing or at least reducing information barriers[14].

Obligation programs come in two basic types. In one, each obligated party is required to undertake all the energy efficiency required to meet its target itself, or to directly employ agents to do so on its behalf. In the other, obligated parties can purchase energy efficiency (usually in the form of certificates that document the fact that a specific quantum of energy efficiency has been achieved) from one another. Both types of obligation programs create a market for energy efficiency. The former creates a competitive market for the supply of energy efficiency achievements to meet the target in which each obligated buyer will seek to minimise its total cost of meeting its obligation. Where buyers can trade with one another, there is more scope for the market mechanism to reduce costs across all buyers.

3.3. Motivations for and experience with energy efficiency programs and policies in Australia

Australian governments have used energy efficiency programs and policies for a number of years. The original motivation for such programs was to reduce energy costs for consumers, but by the mid- to late 1990s, environmental concerns - and particularly the desire to reduce greenhouse gas emissions became an increasingly important reason for undertaking these programs.

Large scale reviews have been undertaken from time to time of the impact, cost-effectiveness and policy justifications for these programs. In 2005 the Productivity Commission reviewed the case for the use of programs that encouraged actions that are cost-effective from the end-use consumer perspective as a means for reducing greenhouse gas emissions - the so-called 'no-regrets' initiatives[15]. The Commission's view was that

13 Department of Climate Change and Energy Efficiency and Department of Resources, Energy and Tourism, *Issues Paper: National Energy Savings Initiative*, December 2011, p 7.

14 Ibid., pp 60 - 61.

15 Productivity Commission, *The Private Cost Effectiveness of Energy Efficiency*, Australian Government, August 2005.

- "the scope for achieving environmental gains through increasing the uptake of only those energy efficiency improvements that are privately cost effective appears to be modest at current and expected energy prices"[16];
- other barriers - particularly information failures and split incentives - were of significant importance in retarding the take-up of these measures and therefore warranted increased attention in policies and programs;
- as such, information initiatives such as mandatory energy efficiency labelling constitute the most appropriate form of government policy intervention while minimum energy performance standards might not always meet the criterion of being privately cost effective; and
- a sufficiently robust case had not been made at that time for "the imposition of a national energy efficiency target and tradeable obligations"[17].

In 2008, the Department of Finance and Deregulation reviewed the 62 then-existing Commonwealth climate change programs for their appropriateness as either transitional or complementary measures to the Carbon Pollution Reduction Scheme (CPRS)[18], an emissions trading scheme that the Commonwealth government had announced it intended to implement as the centrepiece of Australia's climate change program. The report found[19], among other things, that:

- Of the 62 programs reviewed:
  - 9 were complementary to the CPRS, addressed an appropriate objective, did not require alteration, and were recommended to be continued as they were;
  - 22 were complementary but might need some modification, and in any case should be continued as part of the core business of the department charged with coordinating and delivering the government's climate change program, rather than as a discrete program;
  - 15 were deemed to be transitional only (and in some cases requiring modifications to be so), and the need for them being superseded with the implementation of the CPRS; and
  - 16 were found to be either not complementary to or superseded by the CPRS, or not the least cost means of achieving their stated objective, and therefore recommended to be terminated[20].

16 Ibid.
17 Ibid.
18 Mr Roger Wilkins, AO, *Strategic Review of Australian Government Climate Change Programs*, Department of Finance and Deregulation, Commonwealth of Australia, July 2008.
19 Ibid., pp 2 - 7.
20 Ibid., pp 208 - 227.

- Greenhouse gas mitigation policy and program development should be undertaken by a single Commonwealth government department with the full agreement and cooperation of the State governments, and that the State governments should take the lead in climate change adaptation activities;

- Government program and policy intervention should be structured to address relevant market failures, be designed to achieve their objectives at least cost, and incorporate all other accepted principles of good policy design;

- Information provision and ensuring proper consumer protection remain extremely important areas for government action and, while the use of standards and disclosure "can be a useful way of complementing the market and overcoming high transaction costs . . . Governments need to be careful to properly assess the costs and benefits of prescribing standards and proscribing goods [as such actions] could simply raise economic costs and remove choice without adding to the reduction of carbon"[21];

- Some measures that seek to accelerate the take-up of energy efficiency – including energy efficiency targets and obligations – may be inconsistent with least-cost abatement as they may bias action to energy efficiency where lower cost abatement options may exist. However, there is a case for Government action to assist households and businesses to make investments in energy efficiency in the short to medium term. Such assistance should be broad based and technology neutral. The tax and payment system (rather than technology-specific rebate programs) should be used to mitigate the barrier posed to energy efficiency investments by the need for up-front capital. In addition, special attention is warranted to the barriers and particular needs of lower income households; and

- Additional attention needs to be paid to energy pricing and particularly its cost reflectivity as these are likely to have as significant an impact as an emissions trading scheme on emissions reductions, and also have the potential to improve the productivity and efficiency of the economy.

More recently, in 2010, the Prime Minister's Task Group on Energy Efficiency was charged with identifying "options for introducing mechanisms to deliver a step-change improvement in Australia's energy efficiency by 2020 and place Australia at the forefront of OECD energy efficiency improvement by 2020"[22]. Given this charge, and within the context in which implementation of the CPRS had been delayed, and neither smart meter deployment nor more cost-reflective electricity pricing had significantly progressed, the Task Group identified five foundation measures that would be required in order to achieve the step-change being sought. Three of these were relevant to the present study:

- the setting of "an aspirational national energy efficiency target of improving our primary energy intensity by 30 per cent between now and 2020";

- "establishing a transitional national energy savings initiative [that is, an obligation for energy retailers to ensure that a specified amount of end-use energy efficiency is undertaken each year] that would replace existing and planned state energy efficiency schemes and be phased down as a carbon price matures"; and

21 Ibid, p 3.

22 Prime Minister's Task Group on Energy Efficiency, op. cit., p 201.

- "providing a stronger enabling environment for energy efficiency innovation by improving information, data and analysis"[23].

The Task Group cited the following factors as reasons for its reliance on the combination of an energy efficiency target and an energy saving initiative:

- It would help prepare consumers for and shield them (at least to some extent) against the price rises associated with the future introduction of a carbon price;
- It would lower the overall cost of meeting a given emissions reduction target; and
- It would restrain growth in energy consumption, thereby helping to meet a given emissions reduction target[24].

The Task Group also recommended that the NEM continue to explore means to effectively balance investment decisions, by supporting consideration of both demand and supply options and ensuring that the most cost-effective solutions are supported in all cases[25].

Most recently, in early 2011 the Grattan Institute reviewed the costs and impacts of over 300 energy efficiency policies and programs that had been implemented by the Commonwealth and State governments since 1997, and focused on reducing greenhouse gas emissions associated with electricity generation or the combustion of fossil fuels for heating and industrial production. According to the Grattan Institute report, these programs, in total, have accounted for over 80% of the greenhouse gas emissions abatement that has occurred to date in Australia[26].

For the purpose of the analysis, and to inform future policy and program design decisions, the Grattan Institute report grouped the programs and policies into the following four categories:

- market mechanisms, in which government sets a binding target for emissions or electricity from lower emission fuels but leaves it up to private firms as to how best to meet the target;
- grant tendering schemes, in which government funds individual projects, prior to their construction, which it believes are likely to reduce emissions or advance clean energy technology;
- rebates, whereby government provides an amount of money to individuals and businesses to purchase specified products that reduce greenhouse gas emission; and
- energy efficiency standards, through which government sets minimum levels of energy efficiency that products such as refrigerators or light globes must meet in order to be sold[27].

The assessment considered:

23 Ibid., p 2.
24 Ibid., pp 52 - 53.
25 Ibid., p 167.
26 John Daley and Tristan Edis, *Learning the hard way: Policies to reduce emissions*, The Grattan Institute, Melbourne Energy Institute and Grattan Institute seminar, Melbourne, 30 March 20111, p 2.
27 John Daley and Tristan Edis, *Learning the hard way: Australian policies to reduce carbon emissions*, The Grattan Institute, Melbourne, April 2011, p 5.

- The cost effectiveness of the program in terms of its cost to the government budget and its cost and benefit to private individuals and companies. Costs below $20 per tonne were regarded as good; costs up to $50 were deemed to be acceptable, and costs in excess of $50 were seen as 'questionable' unless they were accompanied by substantial benefits in the form enhanced capacity to abate emissions in the future. Costs above $100 were deemed to be too expensive;

- The size of the abatement provided, which was essentially a measure of the degree to which the policy or program could "substantially" reduce emissions in by 2020;

- Speed and scalability: whether the measure can reduce emissions quickly and whether it can be expanded to meet more challenging targets over time; and

- Risk and quality: whether the emissions reductions are secure or could be reversed by an adverse event (such as fire burning down trees)[28].

The study found that market mechanisms scored best overall across the criteria that had been selected. While market mechanisms have a higher cost per tonne of CO^2 abated than energy efficiency standards and regulations, they were found to deliver emissions reductions faster than standards and regulations can. They were also found to be both more effective and to cost less than either grant tendering schemes or rebates[29]. The market mechanisms assessed in the study included the Renewable Energy Target (RET), the NSW Greenhouse Gas Abatement Scheme (GGAS, the precursor to the NSW Energy Saving Scheme), and the Queensland Gas Electricity Credits Scheme (GECS).

3.4. How energy efficiency programs and policies are likely to impact or seek to integrate with the NEM

3.4.1. Possible impacts

Government energy efficiency programs and policies can have several types of impacts on the NEM, including:

- Reduction in the amount of electricity consumed - This is a very likely outcome of energy efficiency programs and policies that seek to increase energy efficiency (for example, the replacement of standard light globes with high efficiency lamps and fixtures); reduce energy consumption through the avoidance of waste (an example of which would be the installation of occupancy controls to turn off lights when there is no one in the space to be lit); or encourage (or require) consumers to switch from one type of energy source to another (for example, the ban on electric storage water heaters).

28 Ibid.

29 Daley and Edis, *Learning the hard way: Policies to reduce emissions*, p. 5.

- Reduction in greenhouse gas emissions – This is frequently the explicit goal of government energy efficiency programs and policies. The amount by which greenhouse gas emissions are reduced by an energy efficiency measure is dependent upon (a) the amount of electricity that is not consumed due to the measure, and (b) the carbon intensity of electricity generation (which is dependent on the mix of fuels that are used to generate electricity at those times when the energy efficiency measure is reducing consumption) and the loss factor of the electricity delivery system during the time electricity consumption is reduced. While a reduction in greenhouse gas emissions changes an output of the NEM it does not at present directly change the operation of the NEM. Once a carbon price is in place certain reductions in greenhouse gas emissions – particularly those that reduce the greenhouse gas emissions of NEM generation plant – will have an impact on NEM operations in two ways: first, plants with lower carbon intensity will be advantaged in the dispatch merit order, and second, the increase in electricity price will reduce electricity consumption (though its impact on peak demand will vary depending on how the carbon price is reflected in the price seen by consumers).

- Reduction in peak demand – Energy efficiency measures that reduce electricity consumption during periods of high aggregate consumer electricity demand will also reduce peak demand. The replacement of an old, inefficient air conditioner with a high-efficiency model is an example. However, it is also the case that some energy efficiency measures may not have any (or only limited) effect during times of peak demand, because the electricity they save all occurs in periods other than those in which aggregate demand is quite high. An example would be the installation of high-efficiency street lighting, the impact of which would be felt only at night.

- Impacts on average electricity prices and average electricity bills – The impact of any energy efficiency program or policy on average electricity prices or the average electricity consumer bill will depend on (a) the extent to which the energy efficiency measures undertaken as a result of the program or policy reduce electricity consumption in peak demand and other periods, and (b) the costs of the programs themselves. Further detail on the factors that determine whether and the extent to which energy efficiency programs and policies are likely to reduce average electricity prices of the average consumer bills is presented in Sections 3.4.3 and 3.4.4 below.

3.4.2. Forecast impacts of selected energy efficiency programs and policies on the NEM

The programs and policies discussed in Section 3.2 above and Section 3.5 below have primarily been undertaken because of their ability to reduce greenhouse gas emissions and help consumers save money on their electricity bills. In the case of the market mechanisms that have been implemented, there has also been a desire to build the market for, and capability of, private sector firms to deliver energy efficiency.

The potential for these policies and programs to reduce the capital and operating costs of companies that generate and transport electricity, thereby putting downward pressure on electricity supply costs, has been explicitly cited as an objective (or intended outcome) of a few of these programs. The Prime Minister's Task Group on Energy Efficiency has undertaken preliminary modelling of a National Energy Saving Initiative – essentially a national-scale version of the types of energy efficiency certificate schemes that have been implemented in New South Wales, Victoria and South Australia – that suggests that such a program could[30]:

- Reduce the average household 2020 electricity bill by $87 to $180, with larger savings for households that implement energy efficiency measures due to the program;
- Lower total electricity demand in 2020 by between 3% and 7%;
- Reduce electricity peak demand in 2020 by as much as 1,400 MW[31];
- Reduce capital costs required through 2040 for electricity generation and transmission by somewhere between $3.5 billion and $12 billion[32]; and
- Lower 2020 electricity prices in the National Electricity Market by between 1% and 6%, and reduce electricity generator profits by between $600 million and $1.5 billion over the period 2012 and 2020.

Similarly, the Victoria Energy Efficiency Target (VEET) program estimated that it would produce a 2.2% decrease in wholesale electricity prices in Victoria[33].

While price impacts are of significant importance, energy efficiency programs and policies may have other impacts on the NEM as well. For example, such programs and policies may affect the reliability of the NEM as measured by the frequency and duration of outages in the generation, transmission and distribution portions of the electricity supply chain.

In addition, the impact of these programs and policies on the relative proportion of different types of generation plant and the relative proportion of different fuels used in generating the electricity delivered to consumers may also be of interest beyond their impact on the price consumers pay for electricity.

As noted above, the energy efficiency programs and policies that have been implemented in Australia within the past ten to fifteen years have primarily been concerned with the reduction of greenhouse gases. As a result, the following section concentrates on the impact of these programs and policies on price. The Stage 2 Report will provide a more comprehensive assessment of the impacts of a select group of these programs on the NEM.

30 Prime Minister's Task Group on Energy Efficiency, op. cit., pp 221 - 225.

31 It is not clear from the Prime Minister's Task Force report whether this reduction occurs in the NEM or nationally (i.e., including the southwest integrated electricity system (SWIS) of Western Australia.

32 Note that this estimate includes avoided capital costs for gas transmission pipelines, but does not include capital cost reductions due to deferred electricity distribution augmentation.

33 DPI, *Cost Benefit Assessment*, September 2008. Retrieved from Proposed Victorian Energy Efficiency Target Regulations: http://www.dpi.vic.gov.au/energy/environment-and-community/energy-efficiency/energy-saver-incentive-scheme/veet-statement/cost-benefit

3.4.3. Electricity demand, consumption and pricing

In order to consider how energy efficiency programs and policies could impact the NEM it is useful to briefly review how electricity consumption and peak demand affect the costs and pricing of the three primary links in the electricity supply chain - generation, networks (transmission and distribution), and retailing.

Generation market peaks, energy demand and wholesale market prices

Generators in the NEM provide price bids every five minutes, and can offer different prices for different levels of output (electricity production) in each such five-minute period. The Australian Energy Market Operator (AEMO) dispatches specific electricity generators based on their bid prices in order to provide the lowest total cost for meeting the aggregate market demand forecast for the that next five-minute period, allowing for the operating limits and capability of generation and network plant and equipment. The dispatch price is determined for each five-minute period by the last (i.e., highest) bid that the AEMO needs to accept to meet all forecast load within the period.[34]

Wholesale prices are then charged to retailers and other entities that purchase electricity directly from the wholesale market every 30 minutes based on the time-weighted average of the five -minute dispatch prices within each 30-minute period.

Generators bid a price that they are willing to be paid if called upon to produce electricity by AEMO in each five-minute period. Generators are permitted to bid anywhere from negative prices to very high prices. Generators may also bid a number of prices for different levels of output, for example a coal generator that wishes to avoid being shut down for a short period overnight might bid a negative price for the lowest output the particular unit can operate at without being shut down, and a higher price for higher levels of output. However, for most times of the year Generators have an incentive to bid the flexible part of the output of their units at the short-run operating cost of the plant[35].

When there is more than enough generation capacity available to meet aggregate forecast consumer demand in the next bid period, bid prices will closely resemble the short-run marginal cost of each generator, and the dispatch price will closely resemble the short-run marginal cost of the last generator needed to meet the forecast load (i.e., the generator of those dispatched that has the highest short-run marginal cost). That dispatch price allows those generators with marginal costs below that level to recoup a contribution to their capital cost and an economic profit.

If a generator offers a price that is significantly above its short-run marginal cost during such periods it runs the risk of not being dispatched and earning no revenue at all for that time.

34 Strictly speaking, a five-minute dispatch price is set for each region (state) of the NEM using specialised optimisation software.

35 The major component of the short-run operating costs of fossil-fuelled generation plants are fuel costs. Other short-run operating costs include the manpower and non-fuel materials needed to operate and maintain and that vary with the amount of electricity produced by the plant.

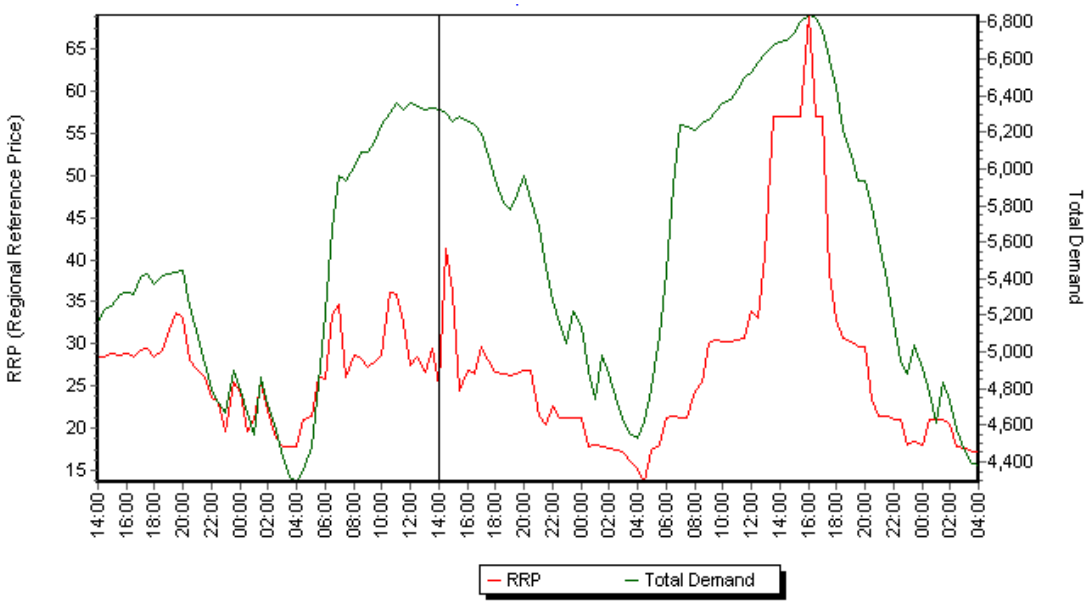
As demand increases, plants with higher short-run operating costs are dispatched but it is only when demand reaches a level where only one or very few generators of the available generators are not already running at full capacity that the market clearing price is likely to significantly exceed the short-run operating cost of the last generator dispatched. This is because these generators must bid prices above their short-run costs in order to recover their operating and annual capital costs in the very limited time they will be used. As a result the wholesale energy price can rise to many times the short run cost for these short periods – such as during the height of summer. This higher cost also reflects the increasing probability of there not being sufficient capacity to meet demand – which would be the case if the peaking generators did not invest.

A balance between supply and demand is achieved when wholesale price is sufficient to attract enough generators to ensure consumer demand is met. Too little investment would mean prices would be high for longer, thereby encouraging more investment, and too much investment would mean prices would not rise high enough for long enough to cover the costs of additional investment.

As a result, wholesale prices vary throughout the day, and can be very different by day of the week, month, and season. In general, the higher the demand – or more accurately, the higher the demand relative to available capacity – the higher the wholesale price.

Figure 1 on the following page, which is reproduced from the *Issues Paper: National Energy Savings Initiative*, shows how the wholesale price of electricity can change over the course of a few days. The 'Regional Reference Price' represents the wholesale market price within a jurisdiction.

Figure 1: Wholesale price over a day in Victoria (30 Minute Demand and Price period 13/11/2011 14:00 to 16/11/2011) 04:00



Source: Department of Climate Change and Energy Efficiency and Department of Resources, Energy and Tourism, *Issues Paper: National Energy Savings Initiative*, December 2011, p 73.

The two and a half day period shown here is typical in the following respect: the wholesale price of electricity generally follows the shape of the curve of customer demand for electricity. But the relationship is not exact. Note for example that (a) the highest price on the 14th did not occur at the time of highest demand, and (b) the prices on the 15th were significantly higher than those on the 14th for similar levels of demand.

Sustained high prices in the wholesale market create an investment signal for additional generation in the market. When additional capacity enters the market it puts downward pressure on wholesale price – because there is now more capacity available, thereby adding competition to generators bidding to be dispatched. However, such downward pressure is likely to be temporary. In the event that consumer demand for electricity continues to grow (which has generally been the case), it will reduce the amount of generation capacity that is available in proportion to aggregate consumer demand, which will then begin to put upward pressure on price once again[36].

Network capacity and operating costs, and prices

Transmission and distribution networks – the poles and wires that transport electricity from the generators to the consumers – need to have sufficient capacity to deliver all of the electricity required at the time that aggregate demand from customers is highest, that is, at the time of peak demand. Because different parts of the network serve different sets of customers, peak demand from the network perspective is essentially a local matter and is based on the area and specific set of customers served by that part of the network. These areas and the number of customers within them can be relatively large – for example, a significant proportion of a state when areas served by different parts of the transmission system are being considered – or relatively small, such as the area served by a local zone substation with the distribution system.

36 The Prime Minister's Task Group on Energy Efficiency stated that one of the impacts of the implementation of a National Energy Saving Initiative (NESI) was that "Wholesale prices fall due to the creation of a supply surplus (demand growth is slowed but capacity increases as a result of the Renewable Energy Target) and the deferral of investment in relatively expensive new thermal capacity" (op cit,, p 224). As discussed above, an over-supply of capacity can be expected to exert downward pressure on wholesale electricity price until such time as the overhang is absorbed by year-on-year growth in energy demand, and is therefore likely to be a temporary impact. The cost of complying with the Renewable Energy Target (RET), however, does not affect the wholesale market price of electricity. Rather, it is retailers who are required to ensure that the RET is met, they incur the cost of doing so, and presumably will seek to recoup those costs in the retail price they charge to consumers. In summary, while the NESI and the RET are likely to reduce wholesale electricity prices, the impact of the former is likely to be temporary (until a new balance is struck between demand and supply), and the latter transfers the cost of producing electricity from the wholesale part of the supply chain to the retail part. It should also be noted that the capital cost of renewable electricity generation plant at present is generally higher than that of conventional generation plant – and particularly so as compared to the types of plants that are built to meet electricity demand at peak times. The operating costs of renewable energy plants are lower than those of traditional plants, and they do not emit greenhouse gases. It is precisely those characteristics that gave rise to the RET, which requires that a certain amount of electricity is purchased from renewable energy generators, thereby allowing them to recoup their higher capital costs, and society to benefit from the fact that the electricity they produce does not produce and greenhouse gas emissions.

Therefore, network businesses have to ensure that each part of their system has sufficient capacity to meet the peak demand of the customers within that area. In practice, networks are required to have more capacity available than the exact amount needed to meet the likely peak demand of consumers[37]. This allows the network to meet all consumers' electricity needs even if an element of the network is out of service due to a breakdown, or requires maintenance.

As the demand of customers within an area grows, the network business will need to invest in additional capacity to maintain the same level of reliability of supply. Furthermore, the decision to make the investment has to be made in enough time to allow the additional capacity to be in place by the time it is expected to be needed.

Network businesses also need to replace equipment as it reaches the end of its useful life.

While networks do have operating and maintenance costs, these are significantly smaller than the capital costs incurred when new capacity is added to meet growing demand or to replace old equipment.

Transmission and distribution networks forecast their capital investment requirements and operating costs on a five-year cycle for approval by the Australian Energy Regulator (AER). Once the regulator reviews and sets an approved level of capital and operating cost expenditure for the network business, those costs are included in the tariffs that the network business charges to retailers. Retailers will either pass the applicable network tariff through directly to the consumer, or will seek to recover the network tariff through an all-in price that they charge to the consumer.

Retail costs and their impact on prices

Retailers deliver electricity to customers at prices that are set for a period of time – generally a year. Although network charges are relatively stable within a year, the retailer's cost to purchase energy from the wholesale market is volatile – as we have seen earlier. Retailers manage the financial risks of volatile wholesale energy costs by purchasing financial hedge contracts. Most of these contracts are provided by Generators.

The amount of its capacity that a Generator contracts with Retailers also influences Generator bids. Generally speaking, the more capacity that is contracted, the more conservatively the generator will bid as once it has entered into the contract the Generator becomes exposed to financial risks if it is not dispatched when the market price is above the price agreed between Retailer and Generator.

A range of different types of financial hedge contracts is available. Where overall generation capacity is limited and energy prices are likely to be high, contract prices go up. In addition, energy prices are generally high during times of peak demand. This is because the generation capacity needed to supply those peaks will only run for a relatively few hours of the year. During the time they run they not only need to receive revenue to meet operating costs, but also their capital costs.

37 The reliability standards that determine how much spare capacity the network needs to carry in each area are set by government or regulators.

Retailers' forecasts of these costs over the coming year or two will affect the prices they offer customers seeking market contract offers. Where retail electricity prices are regulated, forecast wholesale market prices and forecast contract prices are generally taken into consideration in setting the regulated retail tariff price.

Retailers will also seek to recover their operating costs in the prices they charge to consumers. These costs include their staffing and the costs of the systems used for billing and call centres. Where government policy – such as mandated energy efficiency activities like the white certificate schemes – increases costs, Retailers will seek to recover those costs. Further, where electricity prices are subject to regulation, as is still the case in most of the NEM jurisdictions with regard to residential customers – the regulator overseeing those prices will take explicit account for any such costs in setting retail electricity tariffs.

3.4.4. Factors determining the direction and extent of the impact of energy efficiency programs and policies on electricity prices and other aspects of the NEM

Section 3.4.1 above briefly described the impacts that energy efficiency programs and policies could have on aspects of the NEM's operation. These include:

- Reductions in the amount of electricity consumed
- Reductions in greenhouse gas emissions
- Reductions in peak demand
- Program costs.

This section provides a brief discussion of how those impacts are likely to affect the NEM, the unit price consumers pay for electricity, and the size of consumers' electricity bills.

Reductions in the amount of electricity consumed

As noted above, measures that reduce the amount of energy consumed – which would include energy efficiency improvements, conservation and fuel switching – will reduce the aggregate fuel costs incurred by generators in their production of electricity, and will certainly reduce the bills of the consumers that undertake the measures. However, it is only where such measures reduce the cost of one or more fuels on a per-unit basis (which might occur if the total volume of that fuel used by electricity generators changed significantly) that it will reduce the average wholesale electricity price that is an input to the price paid by all consumers.

Where the reduction in the amount of electricity consumed does not change the per-unit price of fuel paid by electricity general, such consumption reductions will, in the first instance, reduce only the bills of the consumers that installed energy efficiency measures. It will not affect the per-unit price of electricity in the wholesale market, so will have no effect on the wholesale energy portion of the bills of consumers that do not install the targeted energy efficiency measures. It may, however, tend to increase the per-unit price charged by networks for transport and delivery of electricity to the consumer. This is because most of the costs of the networks are fixed – they relate to the capital cost of the networks rather than variable operating costs, such as fuel cost. When consumption decreases it puts upward pressure on the price the network business need to charge for the remaining units of electricity consumption in order to recover their largely fixed costs over that smaller volume of unit sales of electricity[38].

In the second instance – when the reduction in electricity consumption is sufficient to reduce the unit-cost incurred by generators – it will produce additional electricity bill reductions for consumers that have installed energy efficiency measures, and will also exert some downward pressure on the bills of all other consumers (to the extent that it has lowered the cost of fuel used to provide the electricity generated for all consumers). However, this reduction in electricity consumption will continue to exert an upward pressure on the average prices charged by networks, as it will still result in a smaller sales base over which to spread the largely fixed costs of the network. In fact, to the extent that the magnitude of electricity consumption reductions would have to be greater in order to produce a per-unit change in the price generators pay for fuel, the upward pressure on network average prices would also be greater.

Reductions in greenhouse gas emissions

As noted above, a reduction in greenhouse gas emissions changes an output of the NEM, but does not at present directly change the operation of the NEM. Nor does it at present reduce the cost charged to consumers – whether or not they have installed energy efficiency measures. Once a carbon price is in place, certain reductions in greenhouse gas emissions – particularly those that reduce the greenhouse gas emissions of NEM generation plant – will have an impact on NEM operations. Specifically, (a) the addition of the carbon price will provide a price advantage to plants with lower carbon emissions, and (b) more generally, the carbon price will have an upward pressure on electricity price which will exert a corresponding (but smaller) downward pressure on consumption. As also noted above, the degree to which that downward pressure is felt by customers in peak demand vs other periods will be dependent on how the carbon price is reflected and seen in the prices consumers pay – particularly with regard to the time dimension (if any) on which carbon price is differentially reflected in consumer prices..

38 This effect is a by-product of the fact that networks recover the majority of their costs by charging consumers for the amount of electricity they consume, despite the fact that the majority of network costs are fixed rather than variable. If networks moved to a different charging basis, this outcome could be largely mitigated.

Reductions in peak demand

Reductions in peak demand can reduce capital costs incurred across the electricity supply chain which can exert a significant impact on electricity prices in the wholesale market, and in the transmission and distribution of electricity to consumers. Peak demand in the various NEM jurisdictions can rise very steeply but generally only on a relatively few occasions per year, lasting in aggregate for less than 100 hours in most years (i.e., less than 1% of the time). Absent a demand-side alternative these periods of very high demand require that the electricity supply industry builds (and incurs the capital cost of) sufficient generation, transmission and distribution capacity to deliver the electricity required by consumers at this time. As noted earlier, generators built to meet these peaks do not generally run for many hours per year, and as a result need to amortise and recover their capital costs as well as their short-run operating costs over a relatively small output. This makes their bid price when they do run very high, which is one of the primary causes of volatility in wholesale market electricity prices. Similarly, transmission and distribution companies must also install capacity that will be used for only very short periods.

Although these costs relate almost exclusively to the very few hours per year during which this capacity is needed, the pricing practice of most networks and retailers result in these costs being spread over all of the electricity purchased by customers. As a result, the vast majority of consumers do not get a price signal that reflects the very high cost that consumption at certain times imposes on the electricity supply system and that the electricity supply industry must therefore recoup.

Reductions in peak demand can reduce the amount of infrastructure needed to meet aggregate consumer demand. The avoidance (or at least deferral) of the cost associated with additional infrastructure will reduce the aggregate cost of electricity supply and therefore have a downward impact on prices.

Energy efficiency programs and policies - to the extent that they reduce peak demand - will assist in obtaining these benefits. It should be noted that this study is focussing on energy efficiency as distinct from demand response. Demand response entails the ability to reduce demand upon request. This is different from energy efficiency which, to the extent it reduces consumption at time of peak demand does passively, as a function of its normal operation, rather than responding to a request or a specific set of conditions.

Therefore, the proportion of the total reduction in electricity consumption produced by any energy efficiency measure that is achieved in periods of peak demand as compared to other times will determine whether that energy efficiency measure is likely to have an overall upward or downward impact on average electricity prices and the size of an average consumer's electricity bill. Energy efficiency measures that produce a greater proportion of their total energy savings during periods of peak demand will tend to put greater downward pressure on electricity price[39].

39 It is worth noting that the fuels used (at least at present) during periods of higher demand are also those that are more costly (e.g., gas vs coal). This contributes further to the relative cost-effectiveness of energy efficiency at peak times.

There is one important difference, however, regarding the relative efficacy of peak demand reductions with regard to the generation as compared to the network parts of the electricity supply value chain. The vast majority of the generation capacity in the NEM is connected to the high voltage transmission system, which allows it to meet consumer demand across a relatively large geographic area, typically large portions of one or more states. This means that demand reduction anywhere within that area can reduce the capacity required in generation and transmission to meet aggregate consumer peak demand.

By contrast, distribution systems are built to meet the requirements of the consumers within smaller geographic areas, often as small as a country town, a suburb or even a part of a suburb. This requires that for demand reductions to be effective in reducing (or at least deferring) capital expenditure, those demand reductions need to occur within the area served by that portion of the distribution system.

As a result, the demand reduction that occurs as a result of the actions of a particular customer can reduce generation and transmission requirements anywhere within a relatively large area, but will not assist in reducing the capacity requirements of the distribution network outside its relatively immediate surroundings.

To the extent that an energy efficiency measure reduces the volatility in aggregate consumer demand for electricity (particularly in peak demand) it can also reduce the probability of a demand-related failure of the electricity supply system. This can translate into a benefit in two ways: it can decrease the probability of certain types of power failures, which are a source of inconvenience and cost to the consumers they affect, and it can also reduce the amount of electricity infrastructure that is maintained to meet consumer demand when maintenance is required on various parts of the system or in the event that a part of the system is forced out of service unexpectedly.

Program costs

The costs of administering the costs of these programs are generally recovered are either recovered through an uplift on the network charge, though costs explicitly incurred by Retailers in complying with programs will generally be recovered in Retail prices, including allowances for such costs in regulated retail tariffs. The AEMC has estimated that the energy efficiency and demand-side programs that have been implemented by state governments currently account for anywhere from 0.3% to 6% of the total price paid by residential electricity consumers[40]. Any reductions in consumers' bills must be considered net of such costs.

Summary

The combination of these factors will determine the aggregate impact of any energy efficiency measure, policy or program on the NEM. Stage 2 will quantify the costs and impacts of a set of energy efficiency programs and policies with regard to these factors. In addition to assessing the impacts and costs and benefits of those programs and policies with regard to the NEM, the analysis will estimate the impact of those programs and policies on wholesale market price and reliability of electricity supply. The following section describes the criteria that were used to select those energy efficiency programs and policies to be included in the Stage 2 assessment.

40 AEMC, Final Report: Possible Future Retail Electricity Price Movements: 1 July 2011 to 30 June 2014, 25 November 2011, p 17.

3.5. Criteria used in selecting the programs and policies included in the stocktake and assessment

As indicated above there are a number of different types of programs and policies that can be used to encourage energy efficiency and programs, a large number of such programs and policies have already been implemented in Australia, and several significant studies of their performance against objectives and cost-effectiveness have been undertaken.

The intent of this study is slightly different: it is to assess the impact of such programs on the National Electricity Market, rather than to assess their performance or cost-effectiveness with regard to their own objectives. However, the large number of these programs and policies required that some means be developed for selecting those to be included in the stocktake and assessment to be undertaken in this study.

In its Issues Paper entitled *Power of choice - giving consumers options in the way they use electricity*, the AEMC recommended that the energy efficiency measures and policies to be considered should include those that place direct obligations or incentives on NEM participants. Working from this starting point, the following criteria for determining which energy efficiency policies and programs to include in this study, in priority order, were developed in consultation with the AEMC:

- Highest priority – Programs and policies initiated by a government body or as a result of a government policy that directly seek to promote energy efficiency and that put obligations on electricity market participants for carrying out the program in whole or in part. These types of programs were prioritised most highly because they use market mechanisms, which have been shown to provide the most effective and least-cost means of achieving results quickly, and because the Commonwealth government is considering the implementation of a national program of this type.
  - Programs and policies that focus on greenhouse gas reductions, but do so by explicitly seeking to address energy efficiency are included in this group (assuming they also meet the criteria of being initiated by a government or as a result of a government policy, and involve an obligation on some part of the electricity supply chain).
  - Highest priority programs should also include some level of target or required level of achievement.
  - Examples of programs that fall into this category include the Victorian Energy Efficiency Target (VEET), the South Australian Residential Energy Efficiency Scheme (REES), and the NSW Energy Saving Scheme (ESS), all of which were agreed with the AEMC to be included in the assessment.
- Second level of priority – Programs or policies initiated by a government body or as a result of a government policy such as described above but that do not set a definite target or achievement level, but do require participation by some portion of the electricity industry.
  - An example would be the Commonwealth Energy Efficiency Opportunities (EEO) program, but only because it now includes members of the electricity supply industry if their electricity consumption is high enough for them to be included in the program.

- The various feed-in tariffs might be examples here, as they are legislated by state governments and require participation by the electricity supply industry, although they don't impose targets.
- Another example here might be state license conditions that require retailers to provide information to consumers on their bills about the level of their consumption and/or associated greenhouse gas emissions in comparison to previous years or their neighbours, and information on how they can reduce their consumption/emissions.

- Third priority - Programs that address energy efficiency but do not have targets or put any obligation on electricity industry firms to play a role. Examples include
  - The VIC EREP, which has been brought to the attention of the AEMC for consideration, and which places no obligations on any market participant, but does set outcome requirements on end users that exceed specified energy or water consumption levels, based on the results of a facility/process audit
  - Building codes and minimum energy performance standards (MEPS) for end-use appliances and equipment
  - Most energy information and greenhouse GAS programs, such as the VIC black balloons project.

Based on these criteria and consultation with the AEMC, and the level of resource available for the study, the following programs and policies were selected for detailed coverage in the Stocktake & Assessment:

- The Victoria Energy Efficiency Target (VEET) Scheme
- The NSW Energy Saving Scheme (ESS)
- The South Australia Residential Energy Efficiency Scheme (REES)
- The Commonwealth's Energy Efficiency Opportunities (EEO) program

Section 4 below provides a description of these programs and policies. A detailed assessment of their cost-effectiveness and impact on the NEM and cost-effectiveness from the perspective of the NEM will be presented in the Stage 2 report.

Section 5 describes programs that meet these criteria that have been implemented in overseas jurisdictions.

4. Stocktake of selected existing Australian energy efficiency policies and programs

We have examined the following programs in this section:

- Victorian Energy Efficiency Target (VEET)[41]
- NSW Energy Saving Scheme (ESS)
- SA Residential Energy Efficiency Scheme (REES)
- Energy Efficiency Opportunities (EEO)

In the following sub-sections, we describe each of these briefly. More detailed information on the programs can be found in section 4.5 below (Program Details).

4.1. Victorian Energy Efficiency Target (VEET)

The VEET commenced at the start of 2009, having been legislated two years earlier under the *Victorian Energy Efficiency Target Act 2007.* Victoria's Essential Services Commission had been chiefly responsible for developing the scheme, and went on to administer it. The VEET is marketed to the public in Victoria as the Energy Saving Incentive (ESI).

The scheme requires energy retailers to acquire and surrender a volume of certificates, in proportion to the volume of energy they sell to residential customers. These certificates are tradable, and are created whenever approved energy efficiency measures are taken. Typically, these measures are carried out by contractors, who then sell the certificates to the retailers.

The VEET scheme has the following stated aims

- Reduce greenhouse gas emissions
- Encourage the efficient use of electricity and gas
- Encourage investment, employment and technology development in industries that supply goods and services which reduce the use of electricity and gas by consumers

Its target is to save 2.7MtCO_2-e each year in the first three years of its operation. In its second three-year phase, the scheme will expand to cover the small- and medium-size enterprise sector, and its annual target will be doubled.

4.2. NSW Energy Saving Scheme (ESS)

The ESS commenced in July 2009, having been enacted through the *ESS Rule* of 2009. NSW's Independent Pricing and Review Tribunal (IPART), which also regulates the state's electricity sector, was made responsible for operating the scheme.

41 The VEET is marketed to the public as the Energy Saving Incentive.

The ESS, like the VEET, is a white certificate scheme. It requires energy retailers to acquire and surrender a volume of certificates, in proportion to the volume of energy they sell to customers. All sectors (commercial, residential and industrial) are covered, although the scheme only applies to electricity sales, and not to gas. These certificates are tradable, and are created whenever approved energy efficiency measures are taken. Typically, these measures are carried out by contractors, who then sell the certificates to the retailers.

The principal objective of the ESS is to create a financial incentive to reduce the consumption of electricity by encouraging energy savings activities.[42] In the first year the energy savings target has been set to 0.4% of total electricity sales and will increase gradually to 4% by 2014. In the first four years of the ESS's operations, it is estimated that 8.5 million megawatt-hours (MWh) of electricity will be saved

4.3. SA Residential Energy Efficiency Scheme (REES)

The REES commenced in January 2009, having been established by the South Australian Government in 2008. SA's Essential Services Commission (ESCOSA) was made responsible for administering the scheme.

The REES places direct obligations on electricity and gas retailers, requiring them to perform both household energy audits and achieve electricity or gas consumption savings in the premises of residential customers (and hence greenhouse gas emissions reductions). The specific target for each retailer is set in proportion to its volume of sales to residential consumers.

The SA Government's stated objectives of the REES are[43]:

- to improve energy efficiency and reduce greenhouse gas emissions within the residential sector
- to assist households prepare for likely energy price increases arising from policies
- to reduce greenhouse gas emissions
- to reduce total energy costs for households, particularly low income households.

The program has several independent targets. With regard to greenhouse gas reductions, the programs' targets rise from an annual reduction of 155,000 tCO2-e in its initial year of operation, to 410,000 tCO2-e in 2014. However, the program also sets specific targets regarding (a) the proportion of its energy savings target that each retailer must achieve in premises occupied by low income/vulnerable consumers, and (b) the number of energy audits that each retailer must undertake on premises occupied by low income/vulnerable consumers.

Unlike the VEET and the ESS, the REES does not use tradable certificates. The regulations do allow energy retailers to transfer energy credits to other retailers, however.

42 IPART, *Introduction to the Energy Savings Scheme*, 2010, p.1
43 ESCOSA, *Report on the Administration of the REES*, 2011, p.7

4.4. Energy Efficiency Opportunities (EEO)

The EEO program commenced in July 2006, having been established by the Energy Efficiency Opportunities Act of the same year. The scheme is administered by the commonwealth department of Resources, Energy and Tourism.

Under the scheme, large energy users are required to assess their energy use and report publicly on the results of the assessment and the business response. Decisions on energy efficiency opportunities remain at the discretion of the business.

The EEO program has, as its objectives:[44]

- improving the identification and uptake of cost effective energy efficiency opportunities;
- enhancing productivity;
- reducing greenhouse gas emissions;
- improving financial outcomes for program participants; and
- facilitating greater scrutiny of energy use by large energy consumers.

The EEO Program does not mandate implementation of any identified opportunities, and therefore does not set quantified savings targets.

4.5. Program Details

Table 1 on the following pages sets out the key characteristics of the programs introduced above.

44 DRET, *Energy Efficiency Opportunities Program - 2010 Report*

Table 1: Comparison of key features of four Australian energy efficiency policies and programs

	Victorian Energy Efficiency Target (VEET)	NSW Energy Saving Scheme (ESS)	SA Residential Energy Efficiency Scheme (REES)	Energy Efficiency Opportunities (EEO)
Design				
Specific objective	Greenhouse gas reduction	Electricity use reduction and control of electricity costs	To improve energy efficiency and reduce greenhouse gas emissions within the residential sector To assist households prepare for likely energy price increases arising from policies To reduce total energy costs for households, particularly low income households.[45]	Energy use reduction
Delivery mechanism	A white certificate scheme, which obliges energy retailers to create (or acquire) surrender certificates in proportion to the amount of energy they supply. Certificates can only be created through approved energy saving activities.	A white certificate scheme, which obliges energy retailers to create (or acquire) surrender certificates in proportion to the amount of energy they supply. Certificates can only be created through approved energy saving activities.	There is no specific requirement within the REES pertaining to how gas and electricity retailers should ensure that energy savings measures are taken up, The retailers tend to use financial and other incentives, but are not required to do so.[46] Retailers can elect to undertake the energy efficiency activities and/or energy audits themselves or to engage the services of third-party contractors to undertake the activities on their	Large energy users are required to assess their energy use and report publicly on the results of the assessment and the business response. Decisions on energy efficiency opportunities remain at the discretion of the business.

45 Note: The REES has a separate target for the provision of energy audits to priority group (i.e. disadvantaged). We have not focused on this aspect on the REES here.

46 ESCOSA, *Report on the Administration of the REES*, 2010, p.16

	Victorian Energy Efficiency Target (VEET)	NSW Energy Saving Scheme (ESS)	SA Residential Energy Efficiency Scheme (REES)	Energy Efficiency Opportunities (EEO)
			behalf.	
Obligated parties	Retailers with more than 5,000 customers. GreenPower sales are not excluded from the retailer's calculation.	All electricity retailers and customers who purchase energy directly from the NEM. GreenPower sales are not excluded from the retailer's calculation.	Retailers with more than 5,000 residential customers. Retailers are required to submit their implementation plans to ESCOSA, and subsequently report on their results. Accredited GreenPower sales are excluded from the retailer's calculation.	Corporations using more than 0.5 petajoules (PJ) of energy per year[47]
Certificate tradability	Certificates can be freely traded between registered participants. A certificate surplus can be carried over into future years, but a certificate shortfall cannot be made up in future years.[48]	Certificates can be freely traded between registered participants. A certificate surplus can be carried over into future years, and a certificate shortfall (of up to 10%) can be made up in future years without penalty.[49]	There are no certificates produced, and therefore no market, for the energy savings produced from REES's prescribed activities. However, trading amongst retailers is permitted.[50]	N/A
Prices and penalties	The shortfall penalty rate (which retailers must pay if they fail to surrender sufficient certificates) is	The shortfall penalty rate (which retailers must pay if they fail to surrender sufficient certificates) is	There is a base penalty of $10,000 for failing to meet a target; and $70 per tonne not abated by undertaking	Civil penalties apply for non-compliance, up to a maximum fine of

47 As part of the recent Clean Energy Future policy package, the EEO will be expanded to include energy generation, transmission and distribution, and major Greenfield and expansion projects. A voluntary scheme for medium sized energy users will also be established.

48 DCC, DRET, *Issues Paper: National Energy Savings Initiative*, 2011, p.45

49 DCC, DRET, *Issues Paper: National Energy Savings Initiative*, 2011, p.45

50 ESCOSA, *Annual Report, 2010-2011,* p.4. Retrieved from http://www.escosa.sa.gov.au/library/111101-AnnualReport_2010-11.pdf

	Victorian Energy Efficiency Target (VEET)	NSW Energy Saving Scheme (ESS)	SA Residential Energy Efficiency Scheme (REES)	Energy Efficiency Opportunities (EEO)
	currently set at $41.23 per tCO2-e[51]	currently set at $23.99 per tCO2-e[52]	energy efficiency activities; and $500 per audit not undertaken.[53]	$110,000, per offence.[54]
Governance arrangements	The scheme is governed by the VEET guidelines (which are written by the ESC). The ESC also maintains registers of products approved for use in the various categories of prescribed activities, and is responsible for administering the scheme, including setting a shortfall penalty rate for liable electricity and gas retailers that fail to achieve their stipulated share of the scheme target.[55]	The ESS is established in NSW through an Act of the NSW Parliament.[56] IPART administers and regulates the scheme: this includes assessing applications, accrediting parties to undertake eligible activities and to create certificates, monitoring participant compliance and performance, and managing the online Registry which records the registration, transfer and surrender of ESCs.[57]	The REES is given statutory effect through Parts 2AA of the Electricity (General) Regulations 1997 and Gas Regulations 1997 (the Regulations) which were made on 21 August 2008. The REES is operated by Essential Services Commission of South Australia.[59]	The scheme was established through the Energy Efficiency Opportunities Act 2006. The scheme is administered by the department of Resources, Energy and Tourism.

51 DCC, DRET, *Issues Paper: National Energy Savings Initiative*, 2011, p.45
52 DCC, DRET, *Issues Paper: National Energy Savings Initiative*, 2011, p.45
53 ESCOSA, *Report on the Administration of the REES*, 2010, p.7
54 DRET, *Energy Efficiency Opportunities > Frequently Asked Questions,* 2011. Retrieved from http://www.ret.gov.au/energy/efficiency/eeo/faq/Pages/default.aspx
55 ESC, *Frequently Asked Questions*. Retrieved from Victorian Energy Efficiency Target: https://www.veet.vic.gov.au/Public/Public.aspx?id=FAQs
56 The Electricity Supply Act 1995 (the Act) sets out the functions and responsibilities given to IPART to ensure compliance by Scheme Participants (as Scheme Regulator). It also sets out IPART's functions as Scheme Administrator.
57 IPART, *Introduction to the Energy Savings Scheme*, 2010

	Victorian Energy Efficiency Target (VEET)	NSW Energy Saving Scheme (ESS)	SA Residential Energy Efficiency Scheme (REES)	Energy Efficiency Opportunities (EEO)
		Audits of ESC creation are periodically conducted by the ESS audit panel.[58]		
Scope				
Energy source	Electricity and gas	Electricity	Electricity and gas	Any
Locations	Victoria	New South Wales	South Australia	Australia-wide
Sectors	The scheme currently covers the residential sector. It will expand to the small-and-medium sized enterprise sector[60] from 1 January 2012 (i.e. in the program's second three year phase), at which point the whole-of-scheme target will be increased accordingly.[61]	The scheme covers electricity sales to residential, commercial and industrial sectors. However, for some large electricity users, classified as emissions intensive trade exposed industries, a proportion of their electricity consumption will be partially exempt from the ESS.[62]	The scheme applies to Residential customers only.	The scheme currently covers any corporation using more than 0.5 PJ per year. Generators and network businesses have historically been exempt. DRET is currently undertaking a review of this exemption.[63]
Applications	The ESC maintains a register of two dozen Prescribed Activities which	Activities which may generate ESS certificates are known as Recognised	The Minister for Energy set the initial list of eligible energy efficiency	Opportunities are defined as any potential change to a system, activity

59 ESCOSA, *Report on the Administration of the REES*, 2010, p.15

58 IPART, *The Energy Savings Scheme: Policies for PEPDEE Workshop*, December 2011, p.8. Retrieved from http://raponline.org/resource/IPART_Sniffin_EnergySavingsScheme_PEPDEE_Sydney_2011_DEC_12.pdf

60 Commercial sites which are covered by the Victorian EREP program will be excluded from the expanded VEET.

61 ESC, *Frequently Asked Questions*. Retrieved from Victorian Energy Efficiency Target: https://www.veet.vic.gov.au/Public/Public.aspx?id=FAQs

62 IPART, *Introduction to the Energy Savings Scheme*, 2010, p.1

63 DRET, *Energy Efficiency Opportunities > Frequently Asked Questions,* 2011. Retrieved from http://www.ret.gov.au/energy/efficiency/eeo/faq/Pages/default.aspx

	Victorian Energy Efficiency Target (VEET)	NSW Energy Saving Scheme (ESS)	SA Residential Energy Efficiency Scheme (REES)	Energy Efficiency Opportunities (EEO)
	are eligible to earn VEECs. These activities cover improvements to household efficiency in: • Water heating • Space heating • Air conditioning • Lighting • Refrigerators and other home appliances	Energy Savings Activities (RESAs) and are listed in the Energy Savings Scheme Rule of 2009 (the ESS Rule).	activities, but ESCOSA is responsible for maintaining and updating the list	or piece of equipment that: • is identified during an EEO assessment • is consistent with legal requirements such as OH&S • may result in energy savings projects with payback periods of 4 years or less. They do not include pre-existing energy efficiency projects, or energy savings which result from 'business as usual' production efficiencies.[64]
Timeline	The scheme commenced on 1 January 2009 and is legislated to continue in three-year phases until 1 January 2030[65]	The scheme commenced on 1 July 2009. Targets have been set out to 2020.	The scheme commenced on 1 January 2009 and targets have been set until the end of 2014. The regulations authorising the REES expire at the end of 2014, but require a review to be undertaken by the end of 2013 to consider whether the scheme should be continued.	The program took effect from 1 July 2006, and is funded out to 30 June 2017.
Effectiveness				
Targets	VEET has a target of 2.7 million	In the first year the energy savings	The targets for the first two phases of	The EEO Program does not mandate

64 DRET, *Energy Efficiency Opportunities > Frequently Asked Questions*. Retrieved from http://www.ret.gov.au/energy/efficiency/eeo/faq/Pages/default.aspx
65 ESC, *Frequently Asked Questions*. Retrieved from Victorian Energy Efficiency Target: https://www.veet.vic.gov.au/Public/Public.aspx?id=FAQs

	Victorian Energy Efficiency Target (VEET)	NSW Energy Saving Scheme (ESS)	SA Residential Energy Efficiency Scheme (REES)	Energy Efficiency Opportunities (EEO)
	certificates per year, from 2009 to 2011 (where each certificate is equivalent to one tCO2-e abated). In the second three-year phase, from 2012 to 2014, the target will be lifted to 5.4 million certificates per year. There are no separate targets for electricity and gas use reduction.	target (redeemable through surrendering ESCs) has been set to 0.4% of total electricity sales and will increase gradually to 4% in 2014, staying flat at this level until 2020. In the first four years of the ESS's operation, it is estimated that 8.5 million megawatt-hours (MWh) of electricity will be saved. As ESCs are quantified in terms of carbon dioxide equivalents (CO2e), the ESS is estimated to reduce around 9 million tonnes of carbon dioxide (the difference being due to a prescribed certificate conversion factor, currently 1.06)[66]	the scheme are set out below Year / Total reduction target (tCO2-e) / Energy audits 2009 / 155,000 / 3,000 2010 / 235,000 / 5,000 2011 / 255,000 / 5,000 2012 / 255,000 / 5,667 2013 / 335,000 / 5,667 2014 / 410,000 / 5,667 Note that the scheme expressly requires that a minimum proportion of greenhouse gas reductions (35%)[67], take place in priority group ((low income) households.	implementation of any identified opportunities, and therefore does not set quantified savings targets
Rationale for target	The target was set based on a	The ESS establishes legislated annual	The Minister with portfolio	N/A

66 IPART, *Introduction to the Energy Savings Scheme*, 2010
67 ESCOSA, *Report on the Administration of the REES*, 2010, p.34

	Victorian Energy Efficiency Target (VEET)	NSW Energy Saving Scheme (ESS)	SA Residential Energy Efficiency Scheme (REES)	Energy Efficiency Opportunities (EEO)
	government study of the potential for energy efficiency activities in Victoria, and the amount of greenhouse gas they were expected to abate.[68] The scheme target for future years will be set in three-yearly phases, and will be based on reviews of the scheme's overall performance.	energy savings targets	responsibility for energy sets the overall REES targets. ESCOSA apportions the overall target to the individual energy retailers.. The objective in the target setting is to capture as much of the energy efficiency opportunity thought to be available as possible, while keeping average customer bill impacts to an acceptably small level in each year.	
Energy Efficiency Assessment Method	Each approved energy saving activity has a deemed greenhouse gas reduction associated with it.	Each approved energy saving activity has a deemed energy use reduction for residential purposes. Commercial and industrial energy users can instead opt to measure actual energy use reductions.	Each approved energy saving activity has a deemed lifetime greenhouse abatement in a residential application.	
Results	Enough certificates were generated to meet the VEET target in 2010.[69]	In 2009, 278,157 ESCs were created; in 2010 759,866 ESCs were created.[70]	The REES in 2009 and 2010 delivered energy audits and deemed greenhouse gas reductions well in excess of its targets.[71]	Although the program does not have quantitative targets, the most recent reports notes that by the end of 2008-09, 199 corporations registered under the program had assessed 82% of their energy use and identified energy savings opportunities amounting to

68 DPI, *Fact Sheet - Estimated Impacts of Victorian Energy Efficiency Target Scheme*. Retrieved from http://www.dpi.vic.gov.au/energy/environment-and-community/energy-efficiency/energy-saver-incentive-scheme/fact-impacts

69 Note that the actual target for the year ended up at 2.52m certificates, rather than the intended target of 2.7m (ESC, 2011, p. 17)

70 Databuild, *ESS Cost Effectiveness Analysis Report,* October 2011, p.62. Retrieved from http://www.ess.nsw.gov.au/News_Events_and_Updates/ESS_Cost_Effectiveness_Analysis_Report

71 ESCOSA, *Report on the Administration of the REES*, 2010, pp.33-34

	Victorian Energy Efficiency Target (VEET)	NSW Energy Saving Scheme (ESS)	SA Residential Energy Efficiency Scheme (REES)	Energy Efficiency Opportunities (EEO)
				113.7 PJ of energy per year, or 8.3% of energy use assessed. By June 2009, 54% of these were adopted.[72]
Energy Market Impacts	The scheme is expected to decrease wholesale electricity prices on average by around 2.2 per cent below business as usual, annually, over the period 2009 to 2011.[73] This estimate was based on an assessment of deferred generation plant cost.[74] For gas, retail prices were expected to increase by 0.007 cents per MJ over the modelling period compared to business as usual On average, Victorian households were expected to be approximately $45 per annum better off under the VEET scheme. The scheme was also expected to stimulate several thousand new jobs in the energy services industries (e.g., energy auditing, installation of	The impact of the ESS on electricity price is reported to be less than 1%, according to IPART's CEO.[76] This was based on expected reductions in generation and network infrastructure spends, and the consequent impact on retail electricity prices. Some impact on wholesale electricity cost would therefore be expected also. However, this impact has not been quantified.	The approved pass through amounts in 2011-12 had the effect of increasing a typical residential standing contract customer's annual bill by $12.55 (electricity) and $2.62 (gas)[77]	No material energy market impacts were expected from the EEO program.

72 DRET, *Energy Efficiency Opportunities Program - 2010 Report*

73 DPI, *Cost Benefit Assessment*, September 2008. Retrieved from Proposed Victorian Energy Efficiency Target Regulations: http://www.dpi.vic.gov.au/energy/environment-and-community/energy-efficiency/energy-saver-incentive-scheme/veet-statement/cost-benefit

74 Estimates such as this are very difficult to validate post hoc.

	Victorian Energy Efficiency Target (VEET)	NSW Energy Saving Scheme (ESS)	SA Residential Energy Efficiency Scheme (REES)	Energy Efficiency Opportunities (EEO)
	products, sales of appliances)[75]			
Side-effects, problems and lessons learned	The department found a number of considerations to be important to the successful running of the scheme:78 • The market for certificates is an artificial, government-created one; the same government can therefore inadvertently affect or distort this market if it is not very careful about its announcements. • Consumers and the media can quickly turn hostile to programs such as the VEET, if they are seen as imposing unfair costs on households, or being open to rorting. These reputational risks need to be monitored.	The department found a number of considerations to be important to the successful running of the scheme:[79] • Striking a balance between the rigour of upfront assessment & on-going compliance audits • Encouraging applications from long-term / sustainable businesses • Tailoring the audit regime to the level of risk from the projects being audited • Having clear documentation and a website for the scheme • Improving the efficiency of the	ESCOSA lacked a formal relationship with, or ability to effectively monitor, the service providers who carried out the energy efficiency activities on behalf of the retailers. In this respect, it differed from the ESC in Victoria, which required all such providers to become accredited. That said, this lack of oversight did not cause any regular or serious issues - and indeed probably had its advantages, in lowering the administration costs of the program.	In retrospect, the EEO office found that:[80] • The program had made Industry Support Officers available, which was essentially a reflection of the program's focus to be collaborative, not enforcement/ compliance driven. However, in many cases this communication channel wasn't used • Some corporations went far beyond the necessary compliance requirements, incurring extra costs, due to having overestimated their non-compliance risk. • Some corporations "jumped" to the identification of EEOs, rather than

76 Cox, J. P., *Progress with GGAS & ESS and implications for Electricity Pricing*, April 2011. Retrieved from http://greenhousegas.nsw.gov.au/Documents/Speech-JimCox-29April2011.pdf

77 ESCOSA, *Annual Report, 2010-2011*, p.27. Retrieved from http://www.escosa.sa.gov.au/library/111101-AnnualReport_2010-11.pdf

75 DPI, *Fact Sheet - Estimated Impacts of Victorian Energy Efficiency Target Scheme*. Retrieved from http://www.dpi.vic.gov.au/energy/environment-and-community/energy-efficiency/energy-saver-incentive-scheme/fact-impacts

78 Williamson, A., *Follow-up questions on the VEET*, January 2012

79 IPART, *The Energy Savings Scheme: Policies for PEPDEE Workshop*, December 2011, p.10. Retrieved from http://raponline.org/resource/IPART_Sniffin_EnergySavingsScheme_PEPDEE_Sydney_2011_DEC_12.pdf

80 From email correspondence

	Victorian Energy Efficiency Target (VEET)	NSW Energy Saving Scheme (ESS)	SA Residential Energy Efficiency Scheme (REES)	Energy Efficiency Opportunities (EEO)
		application assessment process where possible, e.g. through pre-application workshops • Being responsive to changes in the market for energy efficiency products (e.g. growth in the commercial lighting segment)		following the data-driven EEO identification Framework. This led to some opportunities being overlooked, and others not realising their expected benefits. Many of these corporations have now recognised the problem, and intend to better address the EEO Framework in their 2nd five-year cycle.

5. Illustrative international examples

5.1. Introduction

This section provides a summary of selected energy efficiency programs and policies that have been implemented outside Australia. The reviews are not meant to be comprehensive, but rather to provide some understanding of what has been done elsewhere in order to gain insight into the motivations for the implementation of these programs and policies, their impacts, and whether they could contribute to the development of potentially applicable approaches for use in Australia.

The criteria that were used in selecting the programs included in this review were the same as those discussed in Section 3.5 above, namely:

- Of highest priority - programs initiated by a government body or as a result of a government policy that directly seek to promote energy efficiency and that put obligations on electricity market participants for carrying out the program in whole or in part. The highest priority here are programs or policies that focus on greenhouse gas reductions, but do so by explicitly seeking to address energy efficiency or energy conservation. Highest priority programs also included some level of target or required achievement.
- Of next priority - programs or policies initiated by a government body or as a result of a government policy such as described above, that do not set a definite target or achievement level, but do require participation by some portion of the electricity industry.
- Of third priority were programs that address energy efficiency but do not have targets or put any obligation on electricity industry firms to play a role.

Based on the criteria described above the following programs were chosen for the analysis:

- First priority:
  - California's First Energy Action Plan ('loading order') and California Public Utilities Commission (CPUC)
  - California's Energy Efficiency Risk Reward Mechanism
  - Italian White Certificates - Titoli Efficienza Energetica (TEE)
  - Texas Public Utilities Commission
  - Community Energy Saving Programme (UK)
- Second priority:
  - French National Energy Efficiency Action Plan (NEEAP)
  - CRC Energy Efficiency Scheme (UK)
- Third priority

- California's Building Energy Efficiency Standards
- New York State Energy Efficient Appliance Rebate Program
- End-use Efficiency and Energy Services Directive (ESD) - UK

Information gathered with reference to each international policy or program was sought with regard to the following topics from published sources:

- Description of the main features and operation of each policy and measure
- Specific goals of the measure (i.e., the definition of 'program success')
- Outcomes and lessons learned
- Identity of the relevant funding and administering body, and funding mechanism.

5.2. California's First Energy Action Plan ('loading order') and California Public Utilities Commission (CPUC)

5.2.1. Description of the main features

Energy Action Plan (EAP): The first Energy Action Plan (EAP) emerged in 2003 from a crisis atmosphere in California's energy markets. The state's three major energy policy agencies (the California Public Utilities Commission (CPUC), the California Energy Commission (CEC), and the Consumer Power and Conservation Financing Authority [established under deregulation and now defunct]) came together to develop one high-level, coherent approach to meeting California's electricity and natural gas needs.

Thus California established energy efficiency as its highest priority energy resource for procurement of new resources. Key legislation that established this priority are Assembly Bill 1890 (1996) and Assembly 995 (2000).

Loading Order: Under the key legislation, California has established a "loading order". The loading order was established to address California's future energy needs. It states that in meeting the energy needs, the electricity companies serving the state should first invest in energy efficiency and demand-side resources, followed by renewable resources, and only then in clean conventional electricity supply.

EAP II and Loading Order: EAP II continued the strong support for the loading order - endorsed by the Governor Arnold Schwarzenegger - that describes the priority sequence for actions to address increasing energy needs. The priority sequence is as follows:

- The loading order identifies **energy efficiency and demand response** as the State's preferred means of meeting growing energy needs.
- After cost-effective efficiency and demand response, the state rely is on **renewable sources of power and distributed generation**, such as combined heat and power applications.

- To the extent efficiency, demand response, renewable resources, and distributed generation are unable to satisfy increasing energy and capacity needs, and then the switch is towards supporting clean **and efficient fossil-fired generation**.

Concurrently, the bulk electricity transmission grid and distribution facility infrastructure must be improved to support growing demand centers and the interconnection of new generation, both on the utility and customer side of the meter.

Rationale for the Loading Order

The rationale for the specific resources included in the loading order was based on perceived benefits of those resources in terms of helping California balance its electricity requirements by managing generating resources and reducing demand. A summary of the benefits identified in the legislation of the various resources is presented below.

- Energy Efficiency – Using energy efficient buildings and equipment to decrease California's per capita electricity consumption reduces the state's need for new power plants and the associated environmental impacts. These measures also reduce the state's dependence on natural gas, thereby increasing the reliability of the electricity system.

- Demand Response – Demand response programs also reduce electricity consumption and are well established in California. These programs serve an important role in stabilizing the state's electrical grid. Some programs reduce or curtail electricity loads during times of high demand and emergencies. The programs include a variety of measures such as programs where the utility either shuts off specific equipment to reduce a business's electricity load, a business reduces its load to an agreed-upon level, or the utility cycles air conditioners.

  Demand response pricing programs provide financial incentives for customers to reduce their electricity loads when the demand for electricity is high. These price sensitive programs, like "dynamic pricing" and demand bidding, reflect more recent approaches in California to reducing demand during periods of peak load or high wholesale costs.

- Renewable Resources – Renewable resources provide fuel and supply alternatives that increase the diversity of fuel options used to provide electricity. Renewable resources also enhance energy security because the fuel supplies are usually local and therefore not affected by supply interruptions from outside California or the United States.

- Distributed Generation – Benefits from distributed generation include improved reliability and power quality, reduced peak demand, and system reliability. Distributed generation also offers efficiency gains by avoiding line losses (from the transmission of power over long distances from generator to consumer) and by using waste heat for making steam or heating and/or air conditioning

  These "combined heat and power" generating plants use fuel very efficiently. Because distributed generation reduces line losses, it can defer the need for new transmission and distribution infrastructure, reduce utility resource acquisition costs, and provide ancillary services such as voltage control.

California Solar Initiative

The California Solar Initiative (CSI) is overseen by the California Public Utilities Commission (CPUC) and provides incentives for solar system installations to customers of the state's three investor-owned utilities (IOUs): Pacific Gas and Electric Company (PG&E), Southern California Edison (SCE) and San Diego Gas and Electric (SDG&E). The CSI Program provides upfront incentives for solar systems installed on existing residential homes, as well as existing and new commercial, industrial, government, non-profit, and agricultural properties within the service territories of the IOUs.

The CSI Program has a budget of $2.167 billion over 10 years, and the goal is to reach 1,940 MW of installed solar capacity by the end of 2016. The goal includes 1,750 MW of capacity from the general market program, as well as 190 MW of capacity from the low income programs. The State has made a large investment in solar photovoltaic potential through the California Solar Initiative. This was a stand-alone solar program for consumers in 2007. The California Solar Initiative has a goal of 3,000 MW of PV in ten years.

5.2.2. Specific goals of the measure

- In EAP II, the State is committed to evaluate the potential for making 33% of the power delivered in California renewable by 2020.
- California utilities are now operating within a 2010-2012 program portfolio period, which is predicted to produce electricity savings of almost 7,000 GWh and natural gas savings of approximately 150 MMTh (goals expressed in gross, not net savings).

5.2.3. Key facts and results

- Strong progress in contracting resources that achieved 20% renewables in 2010
- Launch of interagency Renewable Energy Transmission Initiative
- Surge in applications lead to installation of solar photovoltaics in 2007
- Growing participation of utility-scale solar thermal in RPS solicitations
- Enrolment of 1,777 MW state-wide in emergency demand response programs and 1,106 MW in price-triggered demand response programs
- 2006-2008 - saving 4,097 GWh in net electricity savings and 44 million Therms (MMTh) of natural gas
- California electric utilities saved approximately 2,293,007 net MWh in 2009. This figure does not include a number of POUs, including Los Angeles Department of Water and Power
- Areas identified where improvement could be made include:
  - Examine adoption of load-management standards to establish a demand-response infrastructure

- Seek Legislative authorization for time-varying pricing for residential consumers
- Implement dynamic pricing rate design reform for all types of consumers
- Consider programs that utilize advanced metering, tariff, and other automated demand response infrastructure
- Develop a load impact and cost-effectiveness protocol for demand response programs

5.2.4. Administration and funding bodies

- California Public Utilities Commission (CPUC)
- California Energy Commission (CEC)RFP & proposal process conducted in Spring & Summer 2004 (see www.cpuc.ca.gov/PUBLISHED/RULINGS/35120.htm)
- CPUC administration decision adopted January 2005 (see www.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/43628.htm)
- Program selection and portfolio management is managed by the utilities with significant input from stakeholders through Program Advisory Groups For the 2006-2008 efficiency program cycle, California's investor-owned utilities (IOUs) invested $2.1 billion in efficiency programs

  California's utilities fund some of their programs and initiatives through resource procurement budgets and recover their costs through rate cases brought before the CPUC. California's utilities also collect a Public Goods Charge (PGC) on customer utility bills to fund utility energy efficiency programs. Public Goods Charge is California's name for a public benefits fund established in Assembly Bill 1890 in 1996. The PGC on electricity consumption is about 0.48 cents/kWh and covers energy efficiency, renewable energy and R&D. About 0.3 cents of this charge support energy efficiency programs. AB 995, which became law in 2000, extended the electric PGC through January 1, 2012. A natural gas PGC was created by AB 1002 in 1999 which funds cost-effective energy efficiency and other public purpose programs.

  For the 2006-2008 efficiency program cycle, California's investor-owned utilities (IOUs) had budgeted $2 billion for three years of efficiency programs and reported spending $316 million in 2006, $670 million in 2007, and $932 million in 2008.

  California utilities spent $756 million on electric efficiency programs in 2009. The Consortium for Energy Efficiency reports 2010 electric utility energy efficiency program budgets totalling $1.16 billion and natural gas program budgets of $338.8 million.
- Specific funding for the programs and activities was provided through:
  - EE statutory Public Goods Charge funding through rates: Approximately $289 million/year.
  - Additional EE Utility Procurement funding approved: $110 million in 2004 and $135 million in 2005

5.2.5. Reference sources

- http://www.cpuc.ca.gov/NR/rdonlyres/6C2310FE-AFE0-48E4-AF03-530A99D28FCE/0/ZNEActionPlanFINAL83110.pdf
- http://www.aceee.org/sector/state-policy/california
- http://www.epa.gov/statelocalclimate/documents/pdf/CA_EE_Overview_Motamedi.pdf
- http://www.cpuc.ca.gov/puc/energy/solar/aboutsolar.htm

5.3. California's Energy Efficiency Risk Reward Mechanism

5.3.1. Description of the main features

In October 2007, the California Public Utilities Commission (CPUC) established the Risk/Reward Incentive Mechanism (RRIM) to encourage the Investor-Owned Utilities (IOUs) to invest in energy efficiency.

The purpose of the RRIM is to offer incentives to the IOUs so as to encourage them to meet and exceed Commission goals for energy efficiency savings, and to extend California's commitment to making energy efficiency the highest energy resource priority.

Under the mechanism, rewards are earned or penalties incurred as a function of the IOU's success in achieving specified energy savings goals. More specifically, the magnitude of rewards and penalties is based on some share of the avoided costs that energy efficiency measures are determined to provide. The mechanism enables the utilities to earn rewards on energy efficiency investments in amounts comparable to what they would otherwise earn on the supply side.

The four major California energy utilities (IOUs), i.e., Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE), San Diego Gas & Electric Company (SDG&E), and Southern California Gas Company (SoCal Gas),receive incentives to achieve or surpass CPUC-adopted energy efficiency goals

Risk Reward Mechanism

Incentive rewards are earned as a percentage of the net benefits achieved due to deployment of energy efficiency measures, designated as the Performance Earning Basis (PEB). The shared savings rate (SSR) varies depending upon the extent of success in meeting or exceeding adopted goals, as follows:

- If the utility's programs realize savings greater than 85% but less than 100% of the energy efficiency goals, the SSR applied to the PEB is 9%.
- If the utility's programs realize savings greater than 100% of the energy efficiency goals, the SSR applied to the PEB is 12%.

- Savings between 65% and 84% were considered to be in the "deadband" range and a 0% SSR applied. Falling below 65% subjected the IOUs to penalties. There are two penalty provisions, and the greater of the two applies when savings fall to (or below) the 65% threshold. The "per unit" penalties are 5¢ per kilowatt-hour (kWh), 45¢ per therm and $25 per kilowatt (kW) for each unit below the savings goal.

- Maximum limits on incentive earnings and penalties for all IOUs were capped at $450 million for the 2006-2008 cycle.

5.3.2. Key facts and results

- In December 2010, the CPUC approved financial incentives to the IOUs for their work in contributing to the success of the state's energy efficiency goals for 2006-2008

- The CPUC established a minimum performance standard for these utilities, under which incentive earnings begin to accrue only if the utility energy efficiency portfolio achieves at least 85% of the CPUC's goals. According to CPUC all of the IOUs savings performance exceeded 85% of the adopted goals.

- By January 2009, just 15 months after it was adopted, the incentive mechanism had become so complicated, controversial, and ineffectual that it was suspended indefinitely.

5.3.3. Administration and funding body

The California Public Utilities Commission (CPUC) granted incentive payments of US$29.1 million to Pacific Gas and Electric Company, US$24.1 million to Southern California Edison, US$5.1 million to San Diego Gas and Electric Company, and US$9.9 million to Southern California Gas Company.

5.3.4. Reference material

- http://www.electricenergyonline.com/?page=show_news&id=146331

- http://www.cee1.org/eval/db_pdf/1344.pdf

- http://www.cpuc.ca.gov/NR/rdonlyres/A51D61E2-DF03-4D9B-BFDB-221109638165/0/ProposedEnergyEfficiencyRiskRewardIncentiveMechandEM_VActivities.pdf

- http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/128879.htm

5.4. Italian White Certificates - Titoli Efficienza Energetica (TEE)

5.4.1. Description of the main features

Italian White Certificates or Energy Efficiency Certificates are a market instrument introduced in Italy in January 2005 to promote energy efficiency through the dissemination of more innovative and efficient installations, systems and technologies in homes, the service sector and the industrial sector.

Italian White Certificates (are also known as TEE, acronym of the Italian legislative definition "Titoli Di Efficienza Energetica", meaning "Energy Efficiency Certificates")

Timing: In order to get the certification of savings and the recognition by the AEEG of the TEE, the time horizon of the investment associated to the project is:

- 5 years in general;
- 8 years for specifically identified "building shell" projects.

It is the most relevant domestic cross-sectoral initiative in Italy. It is an ambitious instrument to take advantage of Italy's energy efficiency potential aimed at promoting energy efficiency and delivering emissions reductions across all energy end users.

The mechanism is based on the obligation, imposed on electricity and natural gas distribution system operators (DSOs) with more than 50,000 customers, to meet specific targets, expressed as primary energy savings and increasing over the years.

In the Energy Efficiency Certificates Market:

- distributors can purchase certificates, if the savings achieved through their projects lie below their yearly target and they thus have purchase the missing certificates in the market in order to fulfil their obligation;
- distributors may sell certificates, if the savings achieved through their projects exceed their yearly target and they may thus make a profit by selling their surplus certificates in the market;
- ESCOs may sell the certificates that they have obtained through independent projects, as they are not required to fulfil any obligation and may thus make a profit by selling their certificates in the market.

Energy Savings (Quantified)

- The energy savings can be achieved through energy efficiency actions among end-users and are assessed using tons of oil equivalent (toe) as measurement unit.
- Cumulative targets for DSOs, were set at 200,000 toe in 2005, and then rose from 2.2 million toe in 2008 to 6.0 million toe in 2012.
- The DSOs can reach their target either by implementing energy efficiency solutions among end-users or by buying white certificate from other DSOs, Energy Services Companies (ESCOs) or companies that have an appointed energy manager as provided by Italian law 10/1991.

Regulating Bodies

The evaluation and monitoring of savings is entrusted to the Energy Regulatory Authority, which certifies the achieved energy savings and then authorises the GME (the Italian Electricity Market Operator) to issue "white certificates" in favour of distributors, their subsidiaries or Energy Service Companies (ESCOs) in a quantity equal to their certified savings.

In order to demonstrate that they have achieved the compulsory energy saving targets and avoid having sanctions imposed by the Authority, distributors are required to deliver a number of certificates corresponding to their compulsory target to the Authority on an annual basis.

Working of the Scheme (White Certificates)

A distribution system operators with more than 50,000 users or a company or institution that have appointed an energy manager in accordance with article 19 of law 10/916 – may apply for a White Certificate by presenting an energy efficiency project.

If the project satisfies the rules set by AEEG (the Italian Electricity and Gas Authority) and is approved by ENEA (the Italian Energy Agency) – whose task is to check that the project is technically and administratively sound –, the owner receives from Gestore Del Mercato Elettrico (GME) - the electricity market operator, on its account a number of White Certificates corresponding to the recognized saving (one White Certificate equals to one toe of savings).

Every party with white certificates on its account can then trade the certificates either on the real time GME market, which usually is held once a week, or through bilateral contracts registered on the GME's platform.

Non-obligated private sector firms can participate in the program as either (or both) creators or traders of certificates.

Energy savings are accredited on an ex post basis, i.e., only after they have been delivered.

In addition, the crediting lifetime (that is the period over which certificates can be generated by a project) is fixed at five years, with the exception of projects that reduce consumption for heating and air conditioning, whose crediting lifetime is currently set at eight years. Both elements significantly increase the stringency of the energy efficiency obligation when comparing the Italian system with other national schemes where lifetime (discounted) energy savings count against the targets.

The scope of white certificates trading is to allow obliged DSOs to obtain a white certificates amount sufficient to reach their targets.

The certificates must be presented to AEEG within by May 31st of the year that follows the obligation.

In the case of an insufficient number of certificates there are two possibilities:

- If the number of white certificates is at least equal to half the DSO's target, the DSO is not subjected to penalties, but the next year it must add these lacking white certificates to its target;
- If the number of white certificates does not reach half of the target, the distributor is fined and it has nevertheless to add the lacking white certificates to its target the next year. General criteria governing the quantification of the penalty set in advance, but no pre-defined unit penalty (e.g., euro/toe not saved). According to its institutional law (Law n. 481/95), for the purposes of carrying out its functions AEEG can levy fines ranging from a minimum of approximately €25,000 to a maximum of approximately €155 million

Types of White Certificates

- Type I, certifying the achievement of primary energy savings through projects reducing final electricity consumption;
- Type II, certifying the achievement of primary energy savings through projects reducing natural gas consumption;
- Type III, certifying the achievement of primary energy savings through projects other than those mentioned in points 1) and 2).

Significant savings (success factor)

The most significant 'savings' are obtained through the introduction of more efficient technologies in citizens' uses of electricity such as:

- the diffusion of compact fluorescent light bulbs in a domestic context (53%),
- the replacement of mercury vapour light bulbs with sodium vapour bulbs with incorporated feeder for public illumination uses (10.3%),
- industrial cogeneration (10%),
- the diffusion of flow shower heads and aerating nozzles for domestic uses (9.3%),
- district heating schemes (8.2%), and
- solar thermic energy (4%).

Areas of Improvement

- The five year fixed period has been a problem in that it does not provide long-term continuity for Energy Efficiency Obligations.
- One of the consequences of the three year extension of the obligations is that it is likely that Italy will need to look again at how the life time issues of the individual projects are addressed. For example, insulation measures which can save energy and carbon dioxide for at least 30-40 years are not awarded their full benefits under a scheme which only counts savings from a few years.

5.4.2. Specific goals of the measure

- Cumulative targets for DSOs were set at 200,000 toe in 2005, rose from 2.2 million toe in 2008 to 6.0 million toe in 2012.
- It is expected that one third of the expected carbon dioxide savings by 2012 will come from the White Certificate activities.

5.4.3. Key facts and results

- During 2007, the number of white certificates traded on the regulated market was 225,951 which included mostly Type I and Type II.
- The overall target allocated to obliged distributors for 2005 and 2006 was approximately equal to 468,000 tons of oil equivalent saved, roughly 60% of which allocated to electricity distributors and 40% to natural gas distributors. The amount of energy savings certified by AEEG exceeded this target by more than 90%. Type I certificates (electricity savings) accounted for 78% of the total issued, type II certificates (natural gas savings) for 18%, and type III (other fuels savings) for 4%.
- Saving grew, especially in the industrial and tertiary sectors, from 47% in total in year one to 81% in year five of operating this mechanism.
- In 2009, the certificates were traded at a value between 75 and 85 Euro per toe, whereas in 2010 the price reached 100 Euro per toe (average range 90-95 Euro per toe)
- Results of the analysis for the first five years of implementing the mechanism are positive equally in terms of cost-benefit ratio.
- Result of the first five years of operation of white certificates (January 2005 to 31 May 2009) is that the national electricity consumptions were down by 2% per annum (i.e. more than 7 billion kilowatts per hour 'saved' every year)
    - For instance the payment of incentives worth 531 million euros in the period 2005-2009 - through the tariff contribution fixed and updated by the Authority on electricity and gas bills - contributed to avoid the emission of 22.5 million tonnes of carbon dioxide and save around 8.5 million tons of oil equivalent (toe), equal to the annual production of a power plant with a capacity of more than 800 MW and to the annual consumption of a city with 2 million inhabitants.

5.4.4. Administration and funding body

The Minister for Productive Activities and the Minister for Environment, with a decree in 2001 (and with his updating in 2004), established the incentives for parties who have made energy efficiency measures (beneficiaries). They also established the duty to obtain a share of energy saving with interventions for energy efficiency for electricity and gas distributors (obligated parties).The latter are able to provide directly with interventions to efficiency with their customers. Alternatively they can buy White Certificates from intermediate dealer to produce the required allowances.

The Authority for Electricity and Gas (AEEG) determines the target of energy saving, Ministerial Decrees determine the term of incentives and the Energy Market Operator (GME) awards the certificates for each ton of oil equivalent saved (toe), in agreement with the price set by market fluctuations.

Cost recovery is:

- Designed and administered by: AEEG

- Level: 100 euro/toe; can be updated
- Eligible parties: obliged distributors
- Eligible costs: cost related to electricity and natural gas savings; up to the occurrence of the target; including costs of purchased certificates

5.4.5. Reference materials

- http://www.worldenergy.org/documents/white_certificate.pdf
- http://www.mercatoelettrico.org/en/mercati/tee/CosaSonoTee.aspx
- http://www05.abb.com/global/scot/scot316.nsf/veritydisplay/e110fa84d1260da0c12578640051514a/$file/italy.pdf
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- http://greenenergy.brezovo.bg/data/file/ITALIAN_REPORT_LEGAL_BASE_ITALY_ENGLISH.pdf
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5.5. Texas Public Utilities Commission

5.5.1. Description of the main features

The Texas Public Utility Commission oversees a set of statewide "standard offer" and market transformation programs that are available to customers in each of the investor-owned utilities' service territories.

The programs are funded through a systems benefits charge on transmission and distribution services and are administered by electricity retailers licensed to operate within the state.

In 2009 over $120 million was budgeted for energy efficiency and load management across all program types (including residential and low-income).

5.5.2. Specific goals of the measure (Energy Efficiency Goals):

In 1999 the Texas Legislature passed Senate Bill 7 (S.B. 7) mandated that at least 10% of an IOU's annual growth in electricity demand (required by customers in a given year) be met through energy efficiency programs each year. Eight years later, the Legislature passed House Bill 3693 (H.B. 3693) which raised the goals for energy efficiency to 20% of each utility's annual growth in demand by 2009, superseding the goals set by S.B. 7.

In 2010, the Public Utility Commission of Texas (PUCT) underwent a rulemaking process to modify Substantive Rule 25.181 which establishes procedures for meeting the previous legislative mandates. As a result, energy efficiency goals were set at 20% of a utility's annual growth in demand for 2011, 25% for 2012 and 30% for 2013.

During the 82nd Legislature in 2011, the goals for energy efficiency were modified once again. Senate Bill 1125 mandates that starting in 2013, each IOU must meet at least 30% of its annual growth in demand through energy efficiency by December 31 of each year.

Thus for a utility whose amount of energy efficiency to be acquired (based on 30% of load growth) is equivalent to at least four-tenths of one percent of the utility's summer weather-adjusted peak demand, the goal metric switches from a percentage of load growth to a percentage of peak demand. From that point on, the utility will be required to achieve a minimum demand reduction equivalent to 0.4% of peak demand each year.

Utilities are required to administer energy savings incentive programs, which are implemented through retail electric providers and energy efficiency service providers (EESPs).

Utilities achieve their energy efficiency goals through either standard offer programs (SOPs) or targeted market transformation programs (MTPs). Programs are made available to all customers, in all customer classes. This gives each customer a choice of a variety of energy efficiency alternatives.

MTPs are Strategic programs intended to induce lasting structural or behavioral changes in the market that result in increased adoption of energy efficient technologies, services, and practices. MTPs are designed so that costs should stay the same or go down over time due to education, awareness, and other capacity-building activities that change market behavior and infuse energy efficiency thinking into the normal course of business.

Major Programs offered by IOUs

IOUs are private, shareholder-owned companies ranging in size from small local operations to large multi-state holding companies. An IOU in a regulated area can offer all electricity functions from generation to retail sales, but in deregulated areas IOUs have been required to separate their generation functions from their transmission functions and their retail sales.

All of the state's Investor-Owned Utilities (IOUs) such as CenterPoint, AEP, Entergy, El Paso Electric, Xcel Energy, Texas-New Mexico Power and Oncor offer Commercial and Industrial Standard Offer Program, which provides incentives for contractors to implement energy efficiency measures in retrofits, renovations and new construction projects.

They also sponsor small commercial (less than 100-250 kW peak) standard offer programs, in which program-eligible contractors make retrofits to small facilities and receive incentives from the respective utilities, thereby subsidizing the rates at which they charge participants.

Candidate measures include high-efficiency lighting, air conditioning, heat pumps, air sealing, insulation, window film, and photovoltaic systems.

<u>CenterPoint</u>

CenterPoint offers additional programs of interest to its customers. One of the programs "The Commercial and Industrial Retro-Commissioning Program" is geared towards identifying low-cost peak demand savings. CenterPoint provides a qualified commissioning agent to commission customers' facilities in exchange for a commitment by the facility to invest at least $10,000 in recommended measures and complete the project within one year.

The Commercial LED Lighting Program offers 2011 incentive rates of $230/kW for on-peak demand savings and $0.14/kWh for 1st-year energy savings for installation of qualified lighting equipment[81].

- General Rules and Eligibility Requirements:
  - For Large C&I customers with peak demand of at least 100 kW at a single site or a combined peak demand of at least 250 kW at multiple sites, each project must provide a total estimated summer peak demand reduction of at least 20kW, or 120,000 kWh.
  - For Small C&I customers with peak demand of at most 100 kW at a single site or a combined peak demand of at most 250 kW at multiple sites, each project must provide a total estimated summer peak demand reduction of at most 20kW, or 120,000 kWh.
  - Retrofit and new construction projects
  - Incentives paid to Project Sponsors for verified demand and energy savings
  - Project Sponsors may be any company, contractor, or customer who installs energy efficiency projects
  - Project Sponsor may receive no more than 20% of the annual incentive budget
  - Similar sites with similar measures can be combined as one project
  - Measures should reduce demand and energy usage during peak period, defined as June 1 to September 30 between 1 P.M. and 7 P.M.
  - Savings must be achieved through increases in energy efficiency

81 Under the Standard Offer, incentives are paid for both energy and summer peak demand savings and are based on either deemed savings values or verified peak demand or energy savings. Eligible efficiency technologies include high-efficiency lighting, lighting controls, heat pumps, chillers, motors, variable speed drives, refrigeration units and custom measures. Some utilities, e.g., Xcel, allow certain renewable energy measures as well. Though incentive levels and eligibility requirements vary across the utilities in Texas, the basic program requirement is that customers have a minimum peak demand of 100-250 kW (depending on the utility). As required by state legislation, the utilities do not perform energy efficiency services, but instead contract with project sponsors, who may include service providers (e.g., national or local ESCOs or other contractors), commercial property developers, design/build firms, and individual customers who implement energy efficiency measures in their own non-residential facilities. Conservation measures are not prescribed, but together must provide at least 10 to 50 kW (depending on the utility) of summer peak demand savings per project. Incentive payments range from $100 to $200 per kW reduction (at peak) and $0.05 to $0.07/kWh of 1st-year energy savings.

- Installed measures must exceed minimum equipment efficiency standards
- Incentives
- $175 per kW reduction and $0.060 per kWh saved
- Initial payment of 40% will be made after measures have been installed and inspected
- Final payment of up to 60% will be made upon approval of Savings Report

El Paso Electric

Customers with over 100 kW of maximum demand are eligible for the Large Commercial Solutions Program, which provides technical assistance and cash incentives ($250 per reduced peak kW) for qualifying efficiency and peak reduction measures in new construction and retrofit projects, including lighting, air-conditioning and roofing.

Oncor

Oncor provides incentives to Service Providers who install approved energy efficiency measures in business, government, non-profit, and worship facilities in Oncor's service area.

These energy-saving projects must be approved by Oncor prior to starting. Once completed, Oncor verifies the savings and the Service Providers receive incentive payments based on the project's actual savings.

Service Providers, also called "Project Sponsors," can include:

- National or local energy service companies (ESCOs)
- National or local companies that provide energy-related services and products (consultants, contractors, and equipment providers)
- Individual customers that implement energy efficiency measures in their own facilities
- Retail electric providers

Incentives are available for both new construction and retrofit projects.

All incentives are paid on the kW and kWh saved and are verified through a measurement and verification (M&V) process.

Examples of projects that have been funded include:

- 1,200-ton chiller retrofit – $45,000 incentive
- A new 700,000-sq.-ft. school – $17,000 incentive for installing efficient lighting and cooling equipment
- A large office building – $74,000 incentive for qualifying lighting upgrades
- A new 125,000-sq.-ft. retail store – $50,000 incentive for efficient lighting and cooling equipment

- Traffic signal upgrade – $83,000 incentive for installing LED lights at 180 intersections

Austin Energy

Austin Energy offers a variety of programs for its non-residential customers including:

- "The Commercial/Business Rebates and Incentives Program" provides incentives for energy-efficient air conditioning, lighting, chillers, energy recovery ventilators, motors, variable speed drives, window treatments, building commissioning, reflective roofs, and custom measures in existing buildings and new construction projects.

- "The Building Tune-Up program" offsets the costs of implementing the Texas Engineering Experiment Station's Continuous Commissioning program, which typically results in 15%-20% annual energy savings.

- The Data Center Efficiency Rebate provides up to $200,000 in rebates toward the cost of retrofitted server virtualization, massive array idle disc (MAID) storage systems, uninterruptible power supplies, cooling towers, thermal energy storage and other custom technologies.

- The Small Business program provides a 30% bonus rebate in addition to the standard commercial rebate to qualified small to midsize and not-for-profit organizations for efficient air conditioning, lighting window tinting and roof coating. The Small Business Lighting program offers rebates of up to 70% of the installed cost.

Xcel (Southwestern Public Service Company)

Xcel offers several load management programs:

- "The Interruptible Credit Option" is available to customers who can maintain 500 kW of interruptible electric demand during June through September. Remuneration in the form of a monthly credit is based on the amount of reduction enrolled, the maximum annual hours of interruption and the advance notice needed, so it ranges widely (from $2.31 to $11.68 per kW of the controllable load). Interruption events are called due to capacity, contingency and/or economic constraints on the electric system.

- "The Peak Day Partners program" provides bill credit or direct payment for customers who voluntarily accept an offer to reduce electricity loads during peak events, which usually occur weekdays from June 1 through September 30. Customers must be able to reduce electricity load by at least 500 kW, and accept or decline offers to commit to a minimum load reduction for individual events via a secure internet-based system.

- "The Saver's Switch for Business" offers program participants an October bill discount of $20 per ton of enrolled air conditioning in exchange for customers allowing the utility to cycle the air conditioning on and off for 15- to 20-minute intervals during periods of peak electric demand in the summer. To be eligible, customers must have a central air conditioning unit with at least 5 tons of cooling capacity.

American Electric Power

Austin Electric Power offers a “Load Management Standard Offer Program” to its distribution customers that can curtail 500 kW or greater. Incentives in the program are based on verified demand savings that occur as a result of an interruption. AEP offers the program in all three of its service territories: Texas Central, Texas North, and SWEPCO.

5.5.3. Program expenditures and verified savings (2009) – success factors

Program expenditures and verified savings due to the Texas standard offers for the year 2009 are shown in Table 2 on the following page.

5.5.4. Key facts and results

Between 1999 and 2009, the utilities’ programs in Texas have produced 1,365 MW of peak demand reduction and 3,574 GWh of electricity savings. This translates to approximately 3,903 tons of NOx emissions reductions.

In 2009, nine Texas investor-owned utilities (IOUs) exceeded their state-wide legislative energy efficiency goals for the seventh year. The utilities achieved 559.8 gigawatt-hours (GWh) of energy reduction and 240 megawatts (MW) of peak demand reduction, which was 82% above their 132 MW goal. These energy savings correspond to an equivalent reduction of 827,409 pounds of nitrogen oxide (NOx) emissions per year.

The SB5 energy efficiency program funds were appropriated to a variety of Texas state agencies. The PUC received 7.5% of the funds for awards to electric utilities that provide service within counties designated by EPA as non-attainment or near non-attainment. For 2002 and 2003 the PUC awarded $3 million dollars in grants that resulted in energy savings of $900,000.

The SB7 program required electric distribution utilities to offset 10% of load growth through energy efficiency. Evaluations indicate that the 10% load growth goal is being exceeded. For 2004 the utilities reported $85 million in expenditures for SB7 energy efficiency projects to achieve this goal which also provided energy savings of $25 million. Program incentives for SB7, funded by transmission and distribution rates, are provided by the utilities through standard offer programs or targeted market transformation programs for implementation by energy services companies or retail electric providers.

5.5.5. Administration and funding body

The Public Utility Commission of Texas (PUCT) oversees a set of state-wide "standard offer" and market transformation programs that are available to customers in each of the investor-owned utilities' service territories

Table 2: Expenditures and verified savings from Texas standard offers (2009)

IOU	Funds Expended (US$)	Demand Savings (MW)	Energy Savings (MWh)
AEP-SWEPCO	3,075,156	9.6	17,879.8
AEP-TCC	12,585,140	26.1	63,256.3
AEP-TNC	1,376,849	3.3	8,418.8
CNP	25,345,473	76.1	125,427.2
ETI	7,870,000	13.7	33,970.0
EPE	3,379,110	5.8	17,908.0
Oncor	48,305,448	98.8	271,005.9
TNMP	2,419,823	4.1	11,407.0
Xcel	1,453,293	2.7	10,271.0
TOTAL	105,810,292	240.067	559,544.0

Source: (AEP-SWEPCO - American Electric Power-Southwestern Electric Power Company, AEP-TCC - American Electric Power-Texas Central Company, AEP-TNC- American Electric Power-Texas North Company, CNP - CenterPoint Energy Houston Electric LLC, EPE - El Paso Electric Company, ETI - Entergy Texas, Inc., TNMP - Texas-New Mexico Power Company)

5.5.6. Reference sources

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5.6. Community Energy Saving Programme (UK)

5.6.1. Description of the main features

The UK's Community Energy Saving Programme (CESP) came into force on 1st September 2009. British Gas launched the first 'live' CESP scheme in Walsall in January 2010. As of 30th September 2011 there were over 160 live CESP schemes

CESP targets households across Great Britain, in areas of low income, to improve energy efficiency standards, and reduce fuel bills. CESP promotes a "whole house" approach i.e. a package of energy efficiency measures best suited to the individual property.

It requires gas and electricity suppliers and electricity generators to deliver energy saving measures to domestic consumers in specific low income areas of Great Britain.

As far as measures are concerned, 26,112 CESP measures have been installed up to the end of June 2011, of which 45.1% are conventional heating measures and 51.5% are insulation measures. The most prevalent individual measure installed is external solid wall insulation, accounting for 24.4% of all installations to date; this may be as a result of the incentive placed on installing solid wall insulation. Solid wall insulation measures, are not well supported by other programmes for instance, they are not installed very frequently under the CERT. Solid wall insulation can make a very big difference on fuel bills and emission savings, and these benefits aim to make it a cost-effective CESP measure for the energy companies, and one which they will want to deliver in large numbers. Areas with predominantly solid wall homes are therefore attractive as targets for CESP activity.

Thus CESP provides incentives for the promotion of solid wall insulation, renewable heat generation technologies, micro CHP and replacement of G-rated boilers. It also incentivises a 'whole house' approach, where each dwelling receives more than one carbon saving measure

The benefits of the whole-house approach is that it will provide a valuable opportunity to inform the design of future energy efficiency schemes, and on a practical level companies will not have to return to properties after installing measures which should mean reduced disruption for householders. Whole house approach would incentivize the installation of multiple measures and remove the potential for gaming and marginal 'step effects' associated with adding low effectiveness measures.

Under the 'whole house approach', energy companies receive an incentive for installing multiple energy efficiency measures in the same property. Energy companies are also eligible for an 'area bonus' for targeting more than 25 per cent of properties in a particular area.

The programme is delivered through the development of community-based partnerships between Local Authorities (LAs), community groups and energy companies, via a house-by-house, street-by-street approach.

CESP (2009-2012) is a policy instrument designed to improve domestic energy efficiency standards across Great Britain in given geographical areas. The period runs from 1 October 2009 until 31 December 2012. It requires certain gas and electricity suppliers and electricity generators to meet a carbon emissions reduction target.

Under CESP, energy suppliers and electricity generators are required to achieve an overall carbon emissions reduction target. Energy suppliers and electricity generators are expected to work with local partners to help deliver the programme.

CESP has set an obligation on energy suppliers with 50,000 or more domestic customers to reduce carbon emissions. Electricity generators who have generated on average 10 TWh/yr or more over three years are also required to meet a carbon reduction obligation, by promoting a range of energy efficiency measures to domestic energy users. Bonuses will be offered as incentives for companies to deliver multiple measures to the same properties as well as serving multiple properties within the same targeted area

CESP runs from October 2009 to December 2012 and applies to the six main energy suppliers and the four independent energy generators.

5.6.2. Specific goals of the measure

The CESP is expected to deliver:

- up to £350 million of efficiency measures
- annual average fuel bill savings for households treated under the program of up to £300.

The overall target for the measures installed under the CESP is to reduce carbon emissions by approximately 19.25 $MtCO_2$ over their useful lifetimes.

5.6.3. Key facts and results

As at the end of June 2011, a total of 26,112 carbon saving measures had been installed across 12,703 dwellings in the 4,500 areas addressed by the CESP. Table 3 on the following page provides information on the breakdown of the measures installed by the six energy suppliers and eleven electricity generators that have obligations under the program.

The measures installed to date are expected to deliver total lifetime carbon reductions of 1.4 Mt CO_2., equal to approximately 7.2% of the overall CESP target of 19.25 Mt (lifetime) CO_2. 92.4% of the savings achieved to date is the result of activity on the part of the six energy suppliers with obligations under the program. By contrast, the aggregate savings to date resulting from activity undertaken by the eleven generators with obligations under the programs represents only 7.6% of total savings achieved to date.

Table 3: Number of measures delivered under CESP by six obligated energy suppliers and eleven electricity generators to the end of June 2011

Category of measure	Specific measure	Number installed
Insulation	Cavity wall insulation	453
	Loft insulation	2,185
	Internal solid wall insulation	293
	External solid wall insulation	6,367
	Draught-proofing	1,024
	Glazing	3,091
	Flat roof insulation	37
Heating	Replacement boiler	4,681
	Heating controls	5,512
	Fuel switching	1,588
District heating	District heating	150
Micro generation	Heat pumps	135

5.6.4. Key issues

CESP is considerably more complex than programmes such as the Carbon Emissions Reduction Target (CERT) for a number of reasons.

The primary aim of Carbon Emissions Reduction Target (CERT) is to reduce household carbon emissions by overcoming barriers to uptake of cost-effective energy efficiency measures such as insulation, heating and lighting, across all households. CERT, the third supplier obligation phase, was introduced in 2008 and is applicable to six main energy suppliers. On 30th July 2010, CERT was extended from March 2011 to December 2012 with a new higher target and significantly refocused around supporting insulation.

On the other hand, CESP (September 2009) was designed to be delivered through area-based schemes, with the twin objectives of significantly reducing the fuel bills of low income households and improving the energy efficiency of the existing housing stock in order to reduce CO2 emissions.

One of the key principles of CESP was to encourage a 'whole-house approach' to delivery. CESP was also designed to be geared towards 'hard-to-treat homes', particularly those that did not benefit from CERT, such as those requiring solid wall insulation.

This has resulted in CESP being a considerably more complex programme than CERT, for the following reasons:

- Under the CERT programme, obligated parties do not take on technically challenging projects where they are not cost effective. The incentives provided under CESP now make such projects commercially viable. However, evaluating the carbon emissions reductions for such properties has been difficult for both obligated parties and for Ofgem (Office of the Gas and Electricity Markets) because they do not fit the standard evaluation models.

- The structure of incentives under CESP is such that a "ratcheting" effect encourages the companies to do as much activity as possible in every house and in a specific area. The ratcheting effect is the result of the fact that the programme applies a 'whole house bonus' to the carbon emissions reduction score for the house score for each additional measure provided to a dwelling. An increase in carbon emissions reduction scores is also provided for all qualifying actions undertaken in a particular low super output area (LSOA), as long as more than 25% of the residential energy users within the area exceeds 25%.

  These incentives have encouraged the companies to consider carefully the way they plan their activity and potentially could have caused a delay in activity as the obligated parties prioritized their activity. In addition, schemes containing multiple measures must have each proposed measure approved prior to full scheme approval. Just 11 schemes were submitted by obligated parties between the programme start date of 1 October 2009 and 31 March 2010. As the parties have learned how to tackle this complexity the rate of submission has risen to average almost 18 per month in the six months to December 2010.

- Some measures that would have been marginal under the CERT are promoted under the CESP. While this will be beneficial for those consumers that receive these measures, it could undermine the carbon savings actually achieved by the CESP. In addition, suppliers have been using measures in their schemes that will give them the maximum coverage in an area.

- The complexity of the programme, involving adjustments to eligible measures scores, whole house bonuses, and area bonuses has made the process for evaluating emissions reductions difficult and complex for the obligated parties to deliver, and for Ofgem E-serve to administer.

5.6.5. Administration and funding body

The Department for Energy and Climate Change (DECC) is responsible for setting the overall CESP target and the policy framework.

CESP is funded by an obligation on energy suppliers and electricity generators. Energy suppliers have £350m of funding available through CESP to promote measures as a 'whole house' approach.

5.6.6. Reference sources

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5.7. French National Energy Efficiency Action Plan (NEEAP)

5.7.1. Description of the main features

The first French National Energy Efficiency Action Plan (NEEAP) has been elaborated as per Article 14(2) of the Directive 2006/32/EC of the European Parliament and of the Council of 5 April 2006 on energy end-use efficiency and energy services.

The Plan (NEEAP) describes the energy efficiency improvement measures that are aimed at achieving the following objectives:

- Achieving a minimum of 9% energy savings over the period 2008-16
- Decreasing energy intensity by 2% per year by 2015 and by 2.5% per year by 2030
- Reduce energy consumption by approximately 20% in service-sector construction and 12% in residential construction within 5 years, and by more than a third by 2020
- Transportation: Lower greenhouse gas emissions by 20% in the next 12 years.

Regulations implemented to improve energy efficiency

The following measures have been undertaken in the residential and services sectors:

- Energy performance assessments of new and existing buildings - In order to raise awareness amongst consumers of energy consumption, the obligation to provide an energy performance assessment on purchase, lease or construction of a building or part of a building has been introduced. The assessment consists of a label stating the building's estimated energy consumption and CO_2 emissions, as well as recommendations relating to both energy use and energy saving work.
- Thermal regulation for new constructions (RT 2005).

- The new thermal regulation improves the energy performance of new buildings by at least 15% compared to the RT 2000. It also evaluates the bioclimatic design of buildings to reduce their heating requirements and give better comfort in summer thus limiting the need to use air conditioning.
- It best takes into account renewable energies. For example, solar power is at the forefront as a reference system for producing domestic hot water for the dwellings.

- The High Energy Performance label for new constructions – A voluntary "high energy performance" (HPE) label (decree of 8 May 2007) consisting of 5 energy performance levels adds to the above-mentioned thermal regulation. These labels are given to constructions with energy consumption appreciably lower than the regulatory reference consumptions and which use renewable energy and heat pumps.
- Tax credits – The government has committed to improving the tax credit for main residence equipment expenses aimed at saving energy and developing renewable energies. This tax incentive guides individuals towards investing in equipment eligible for tax credit, satisfying the high performance criteria. For equipment improving energy efficiency, these rates are at present:
  - 40% to 50% for heat pumps, the principal end use of which is production of heat;
  - 25% to 40% for condensation boilers and insulation materials that are installed in a dwelling completed before 1 January 1977 and meet certain other conditions.
- Reduced VAT rate for heating networks.
  - Provisions aimed at promoting district heating networks
  - In accordance with the European VAT Directive agreement in February 2006, Law No 2006-872 of 13 July 2006 on national housing commitment establishes, in Article 76 thereof, a reduced rate of VAT at 5.5% on heating network subscriptions.
  - It also introduces a reduced rate of VAT on the supply of heat if this is produced from at least 60% biomass, geothermal energy, energy from waste or recovered energy.
- Clean vehicle Policy
  - The September 2003 clean vehicle plan adopted by the Government promotes the purchase of alternative, low CO_2 emitting vehicles and develops research to make technological advances.
  - A new consumption and CO_2 emissions label for new private cars has been compulsory since 10 May 2006.
- Tax credit for electric, NGV or liquefied petroleum gas (LPG) vehicles – New vehicles that run exclusively or otherwise on LPG, NGV or are electrically powered and emit less than 140 g of CO_2/km are eligible for tax credits.

- Conversion of vehicles to LPG - A tax credit is available based on the costs involved with LPG conversions of petrol vehicles under three years old and emitting, before conversion, less than 200 g/km of CO_2 in 2006, 180 g/km in 2007 and 160 g/km from 1 January 2008 to run on LPG

- Minimum boiler efficiency and periodic combustion plant inspections:

  - Low-wattage boilers (4kW to 400 kW) must comply with minimum efficiency levels when they leave the factory, before they are put on the market.

  - These boilers must bear the EC marking and come with an EC Certificate of Conformity

5.7.2. Specific goals of the measure

NEEAP (2008-2016) has set an energy savings target of at least 9%, i.e., 139 TWh (12 Mtoe) in buildings, transport and small industries. According to the European Directive that promotes the use of energy derived from renewable sources, the national target is to increase the share of renewables in final consumption to 23% by 2020.

NEEAP has an overall aim at reducing GHG emissions by a factor of 4 by 2020

5.7.3. Key facts and results

CO_2 emissions per unit of GDP (CO_2 intensity) decreased almost twice as fast as the total energy intensity over the period 1990-2009 due to substitutions of oil and coal by electricity, natural gas and biomass.

Fuel substitutions explain about 40 % of the CO_2 intensity reduction.

5.7.4. Reference sources

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- http://ec.europa.eu/energy/demand/legislation/doc/neeap/france_en.pdf

5.8. CRC Energy Efficiency Scheme (UK)

5.8.1. Description of the main features

The CRC ("Carbon Reduction Commitment") Energy Efficiency Scheme is a new regulatory incentive to improve energy efficiency in large public and private sector organisations. It is a mandatory scheme that commenced in 2010 and aims to improve energy efficiency and reduce the amount of carbon dioxide (CO_2) emitted in the UK. CRC affects large organisations in both the public and private sector.

The scheme is designed to tackle CO_2 emissions not already covered by Climate Change Agreements (CCAs) and the EU Emissions Trading Scheme.

Participating organisations have to monitor their emissions and purchase allowances, initially sold by Government, for each tonne of CO_2 they emit. The more CO_2 an organisation emits, the more allowances it has to purchase. So there is a direct incentive for these organisations to reduce their emissions.

CRC features a range of reputational, behavioural and financial drivers, which aim to encourage organisations to develop energy management strategies that promote a better understanding of energy usage.

Metrics to determine organisations table position.

The organisation's league table position is determined by performance in three metrics:

- **Early action metric:** 50% of the score is based on what percentage of the organisation's electricity and gas supplies is covered by voluntary automatic meter readings (AMR) in the year to 31 March 2011. The other half is based on the proportion of the CRC emissions certified under the Carbon Trust Standard or an equivalent scheme.
- **Absolute metric:** The percentage change in the organisation's emissions, compared to the average of the previous five years
- **Growth metric:** The percentage change in emissions per unit turnover, compared to the average of the previous five years (or number of years available until 2014/15).

The weighting of these three metrics changes over time. In the first year, early action will count for 100% of organisation's league table score. Over the first few years of the scheme, the early action metric will gradually fade in importance until the absolute and growth metrics receive 75% and 25% weightings respectively in 2014/15 and thereafter.

The scheme features an annual performance league table that ranks participants on energy efficiency performance.

Impacts

Organisations are using the CRC to build a business case for installation of Automatic Meters (AMR) that can recoup their costs in less than a year and will continue to deliver energy savings. (Automatic Meter Reading (AMR) meters measure gas and electricity supply not covered by traditional Half Hourly meters (HHMs). These meters give consumers data on how much energy has been used per hour or half-hour. CRC only covers AMR meters that are the main meters measuring the quantity of electricity or gas supplied to premises, and not sub-meters or clip-on devices. For CRC, AMR meters must be read remotely by customers. If an organisation has all its electricity and gas supply measured through AMR meters installed on a mandatory basis, it will score 50 per cent in the early action metric.)

The CRC has enabled carbon and energy-related officers to have an open dialogue with finance and resource teams in new ways as there was little incentive to do so in the past.

The CRC is also boosting demand from public and private sector organisations for energy efficiency goods and services, such as voltage optimisation equipment (a technology which reduces the voltages received by energy consumers in order to reduce energy use). Voltage optimisation can reduce electricity consumption by 10-20% and have a payback on investment of one to four years, depending on the energy intensity of a site and whether other energy saving measures have been undertaken.

5.8.2. Specific goals of the measure

- 34% reduction in GHG emissions by 2020, and at least 80% by 2050
- The CRC Energy Efficiency Scheme (CRC) was developed to tackle this mix of barriers and thereby to drive energy efficiency in large electricity users (outside the energy intensive industrial sector), covering both business and the public sector. By tackling these barriers, the scheme is estimated to save 11 $MtCO_2$ from the non-traded sector between now and 2022.

5.8.3. Key issues

Simplification of the CRC Energy Efficiency Scheme

Since the CRC scheme began in 2010, a number of aspects of the policy have been criticised by stakeholders. The Government is now considering a simplification of the CRC. In doing so; it is taking into account feedback from stakeholders, which has included:

- The effectiveness of the CRC framework for driving energy efficiency in large private and public sector organisations, in the light of wider policy developments in other areas such as the implementation of a carbon price floor, Electricity Market Reform, implementation of a Green Deal for business and the review of Climate Change Agreements, and company reporting of greenhouse gas emissions.
- The rules of the scheme are too complex, difficult to understand and costly for participants to administer; Aspects of the scheme overlap with other climate change/energy efficiency policies (e.g. EUETS, CCAs and greenhouse gas reporting); The scheme forces organisations to participate in ways which do not accommodate their natural business/energy management structures and processes
- Complexity of the CRC scheme and hence the administrative burden on organisations that are subject to the scheme and the administrators of the scheme (Environment Agency, the Scottish Environment Protection Agency and the Northern Ireland Environment Agency)

In response the Government has proposed a set of simplifications of the program, including:

- Reduce the number of fuels covered by the scheme
  - Under the current scheme businesses have to report on the emissions from 29 different fuels and the proposal is to reduce this to four: electricity, gas, kerosene and diesel for heating.
  - This will cover over approximately 95% of emissions captured under the CRC come while significantly reducing the administration burden of the scheme

- Move to fixed price allowance sales
  - Instead of establishing an emissions cap and holding annual auctions as proposed by the previous Administration, the proposal suggest that from the start of phase 2 in 2014 there should be two sales per year where the price of allowances is fixed.
  - This would remove the need for businesses to come up with auctioning strategies and give price certainty to help investment decisions. A lower price in the first sale will incentivise good energy management and reward those who successfully forecast energy use.
- Make qualification processes easier
  - To make qualification a one step process instead of two.
  - Previously businesses had to firstly prove they had a qualifying electricity meter and then declare they used a particular amount of electricity.
  - This would be abolished in favour of participants just having to prove they use a certain amount of electricity from the qualifying meter.
- Reducing overlap with other schemes
  - Any CCA or EU ETS site would be automatically exempt from the CRC scheme.

5.8.4. Future steps

- New carbon price - Starting in 2012, participants can have allowances from Government each year to cover their emissions in the previous year. This means that organisations that decrease their emissions can lower their costs under the CRC.
- Changes in how allowances are bought - The Government announced two important changes about buying allowances in October 2010:
  - The money raised from the sale of allowances will be retained by the Government rather than recycled back to CRC participants.
  - The first sale of allowances to cover emissions in fiscal year 2011/12 will be in 2012 rather than 2011.
  - The price of allowances was set at £12 per tonne of carbon dioxide in the 2011 Budget.

5.8.5. Administration and funding body

DECC has developed the CRC policy in partnership with the Scottish Government, the Welsh Assembly Government and the Department of Environment Northern Ireland

5.8.6. Reference sources

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5.9. California's Building Energy Efficiency Standards

5.9.1. Description of the main features

The Energy Efficiency Standards for Residential and Non-residential Buildings were established in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards are updated periodically to allow consideration and possible incorporation of new energy efficiency technologies and methods.

California's building efficiency standards (along with those for energy efficient appliances) have saved more than $56 billion in electricity and natural gas costs since 1978.

The Energy Commission adopted the 2008 changes to the Building Energy Efficiency Standards for a number of compelling reasons:

- To provide California with an adequate, reasonably-priced, and environmentally-sound supply of energy.
- To respond to Assembly Bill 32, the Global Warming Solutions Act of 2006, which mandates that California must reduce its greenhouse gas emissions to 1990 levels by 2020.
- To pursue California energy policy that energy efficiency is the resource of first choice for meeting California's energy needs.
- To act on the findings of California's Integrated Energy Policy Report (IEPR) that Standards are the most cost effective means to achieve energy efficiency, expects the Building Energy Efficiency Standards to continue to be upgraded over time to reduce electricity and peak demand, and recognizes the role of the Standards in reducing energy related to meeting California's water needs and in reducing greenhouse gas emissions.
- To meet the West Coast Governors' Global Warming Initiative commitment to include aggressive energy efficiency measures into updates of state building codes.
- To meet the Executive Order in the Green Building Initiative to improve the energy efficiency of non-residential buildings through aggressive standards.

Major changes from the 2005 version of the standards include:

- Changes to daylighting requirements

- Occupancy sensors required in certain areas
- Lighting power limits for indoor lighting have been reduced
- Demand response controls
- Outdoor lighting changes
- Sign lighting changes

5.9.2. Specific goals of the measure

It is estimated that the standards will save US$23 billion by 2013.

5.9.3. Administration and funding body

The standards are administered by the California Energy Commission. The Commission's work – in terms of developing and administrating the standards – is funded by general tax revenue.

5.9.4. Reference sources

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5.10. New York State Energy Efficient Appliance Rebate Program

5.10.1. Description of the main features

As part of the American Recovery and Reinvestment Act (ARRA), NYSERDA is eligible to receive $18.7 million to provide cash rebates to New York residents who purchase high-efficiency appliances.

On December 1, 2009, NYSERDA's plan for the State Energy Efficient Appliance Rebate Program, the Great Appliance Swap Out, was approved by the U.S. Department of Energy (DOE).

Under the approved plan, New York consumers who own their own appliances received rebates for purchasing certain energy-efficient refrigerators, clothes washers, freezers and dishwashers

Under the approved plan, consumers receive rebates for purchasing eligible appliances individually or in a bundle. Appliances that had earned the Energy Star® label qualified, which meant that they were up to 30% more efficient than standard models on the market. Consumers may receive a larger rebate by purchasing three eligible appliances that met standards issued by the Consortium of Energy Efficiency (CEE) that are higher than Energy Star standards.

Benefits of the program include:

- Energy Star appliances are up to 30% more efficient than standard models on the market.
- Under the approved plan, customers purchasing appliances qualified for a rebate of $75 for Energy Star qualified refrigerators, $75 for clothes washers and $50 for freezers.
- Rebates were also available for dishwashers when they were purchased as part of a three-appliance package (refrigerator, dishwasher, clothes washer), which qualified for a $500 rebate ($555 with documented recycling).

The program helped consumers save money on energy costs and provided a needed boost to retailers across New York, while reducing the environmental impact of older appliances.

The Great Appliance Swap-Out took place from February 2010 until those funds ran out in March 2011.

A total of 165,148 households participated in the Great Appliance Swap-Out, and 169,866 appliances were replaced with 57,365 Energy Star qualified appliances. The remaining 112,000 appliances were replaced with standard models which did not qualify to be ENERGY STAR appliances.

Participating households state-wide replaced, purchased and recycled the following types and numbers of appliances:

- **Refrigerators** – 80,638 replaced with 57,365 energy-efficiency models (71% of old ones recycled)
- **Clothes washers** – 82,616 replaced with 60,453 energy-efficiency models (73% of old ones recycled)
- **Freezers** – 4,242 replaced with 2,679 (63% of old ones recycled)
- **Dishwashers** – 2,370 replaced with 1,142 (48% of old ones recycled)

In September 2011 the Great Appliance Swap-Out was replaced by the Residential Appliance Rebate Program. The new $3 million rebate program is specifically designed to encourage the purchase of high-efficiency Energy Star® refrigerators and clothes washers. The program offers rebates of $350 for the purchase of high-efficiency refrigerators and $250 for the purchase of high-efficiency clothes washers that meet Consortium for Energy Efficiency (CEE) super-efficiency levels. Super-efficient appliances use significantly less electricity than the federal standard and are at the upper end of Energy Star efficiency levels. According to CEE, the refrigerator is the single biggest power consumer in most households, accounting for about 15% of residential electricity usage.

Super-efficient clothes washers also use less water than standard washing machines.

The rebates are awarded on a first-come, first-served basis for completed applications.

5.10.2. Specific goals of the measure:

The new $3 million rebate program is specifically for the purchase of high-efficiency ENERGY STAR® refrigerators and clothes washer

5.10.3. Key facts and results

- The Great Appliance Swap-Out program provided more than $16 million in rebates
- More than 1,000 retailers across New York State participated, promoting the sale of Energy Star products.

5.10.4. Administration and funding body

- The New York State Energy-Efficient Appliance Rebate Program (NYSEEARP) is administered by the New York State Energy Research and Development Authority (NYSERDA). NYSERDA, a public benefit corporation, offers objective information and analysis, innovative programs, technical expertise, and funding to help New Yorkers increase energy efficiency, save money, use renewable energy, and reduce their reliance on fossil fuels. Their professionals work to protect the environment and create clean-energy jobs. The corporation has been developing partnerships to advance innovative energy solutions in New York since 1975.
- The New York State Appliance Rebate Program is funded by The American Recovery and Reinvestment Act (ARRA) and U.S. Department of Energy's State Energy Program.

5.10.5. Reference sources

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5.11. End-use Efficiency and Energy Services Directive (ESD) - UK

5.11.1. Description of the main features

The Energy End-Use Efficiency and Energy Services Directive (ESD) was adopted in May 2006[82]. The ESD aims to enhance the cost-effective improvement of energy end use efficiency in EU Member States. Its provisions include a requirement for Member States to establish a national indicative energy saving target of 9% to be met by the end of 2016.

Under the ESD, the United Kingdom is required to meet an indicative national energy savings target for 2016 of 9% or 136.5 terawatt hours (TWh).

Operations/features aimed at the household sector

- Green Deal
  - The Green Deal is a market framework which will enable private firms in Great Britain to offer consumers energy efficiency improvements to their homes, community spaces or businesses at no upfront cost with repayments recouped through a charge made in instalments on their energy bill. The scheme is being established by the Coalition Government through the Energy Bill introduced to Parliament in December 2010 and should be available from late 2012.
  - Operating across all types of housing tenure, the Green Deal will operate alongside a new Energy Company Obligation and has the potential to improve the energy efficiency of most of the 26 million homes in the UK, whether they are built with cavity or solid walls.
- New build
  - From 2016 for homes and 2019 for non-domestic buildings, all new buildings in England will be required to be built to a zero carbon standard.
- Product standards and labelling
  - The UK has been working to adopt Minimum Energy Performance and labelling requirements for the first 21 priority products covered by the Ecodesign of Energy related Products Directive (ErP). Agreement has been reached on 13 products so far; the average annual net benefits of which will (by 2020) be £900m to UK consumers and Businesses.
  - Products covered include Televisions, Washing Machines, Fridges, Domestic Lighting and restricting Standby and off mode power consumption. Work continues on the remaining products, including Boilers, water heaters, ICT, Tertiary lighting and Commercial refrigeration and Freezers.
- Smart Meters

82 Note that this is the same Directive that motivated the implementation of the NEEAP in France.

- The Government's vision is for every home in Great Britain to have smart electricity and gas meters with In-Home Displays (IHD). The rollout of smart meters will play an important role in Great Britain's transition to a low-carbon economy.
- Over the next 20 years, smart meters are expected to deliver £7.3 billion net benefits to consumers, energy suppliers and networks. It is estimated that by 2020 the average domestic household with both electricity and gas ('dual fuel') will save an average £23 per year on their bills.

- Billing
  - Government will put consumers in control of their energy costs by ensuring energy bills tell them how to switch to the lowest tariff offered by the supplier and how their energy consumption compares with similar households.

Operations/features aimed at the business and public sectors

- Smart Meters
  - Non-domestic consumers will have real-time information on their energy consumption to help them control energy use, save money and reduce emissions. It is estimated that by 2020 the average small and medium non-domestic customer will save over £100 on their energy bill as a result of smart metering.

Operations/features aimed at the transport sector

- Improving the efficiency of new vehicles.
  - The EU introduced a New Car CO_2 Regulation in 2009 to establish a clear, long term framework for the development of lower emitting cars. The regulation has introduced mandatory targets for manufacturers for the CO_2 emissions of each new car sold in the EU.
  - This is set to achieve an average new car fuel efficiency target of 130 grams of CO_2 per kilometre (g CO_2/km) by 2012, with full compliance by 2015. There is a further provisional longer term target of 95g CO_2/ km by 2020, representing a 40% reduction on 2007 levels.
  - In the UK the average fuel efficiency of the new car fleet improved by 12% between 2007 and 2010.
  - The UK government is convinced that the introduction of Ultra Low Emission Vehicles (ULEVs) will play an increasingly important role in decarbonising transport in the longer term.
  - That is why the UK Government has confirmed a budget of over £400m over the lifetime of this Parliament (up to May 2015) to support a package of measures for the introduction of ULEVs. This includes funding for a consumer incentive; infrastructure; and research and development.

- The Plug-In Car Grant commenced in January 2011 to help both private consumers and businesses purchase an electric, plug in hybrid or hydrogen fuelled car. Buyers are able to receive a grant of 25% of the vehicle price, up to a value of £5,000.

Operations/features aimed at the Health sector

- The NHS Carbon Reduction Strategy.
  - The National Health Service (NHS) in England spends approximately £563m on energy each year. In the ten years to March 2010 energy efficiency of the NHS estate improved by 11.7 per-cent overall.
  - The NHS Carbon Reduction Strategy11 sets a target of reducing its 2007 carbon footprint by 10% by 2015. The strategy identified that around 60% of the carbon footprint of the NHS in UK was related to the goods and services procured.

5.11.2. Specific goals of the measure

By 2010 UK achieved almost 100TWh of savings, as noted in the "UK Report on Articles 4 and 14 of the EU End-use Efficiency and Energy Services Directive (ESD)"

5.11.3. Administration and funding body

The program is administered by the Energy Services Directive (ESD) and the UK National Energy Efficiency Action.

5.11.4. Reference sources

- http://ec.europa.eu/energy/efficiency/doc/uk_-_energy_efficiency_action_plan.pdf