

GLOBAL ENERGY EFFICIENCY STUDY

# Energy Efficiency Policy Case Studies

UNEP DTU Partnership

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**Date:** April 7, 2015



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Project name: Global Energy Efficiency Study DNV GL  
Report title: Energy Efficiency Policy Case Studies [Office Post 1]  
Customer: UNEP DTU Partnership [Office Post 2]  
Contact person: Miguel Rescalvo, Pablo Reed [Office Post 3]  
Date of issue: April 7, 2015 [Office Post 4]  
Project No.: Tel: [+00 000 000 000]  
Organization unit: KEMA Services Inc. [Enterprise No]  
Report No.: Pablo Reed, Ignacio Amunategui, Stephanie  
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D'Silva  
Rev.  
Document No.:

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## 1 STUDY BACKGROUND

DNV GL was commissioned by the UNEP DTU Partnership to deliver a set of case studies in different economic sectors for representative developed and developing countries. Each case study includes information on the type of Energy Efficiency policy instrument used, the associated energy savings and emissions reduction contribution of each, along with further information concerning the co-benefits, stakeholders, barriers, and enablers for implementation these programs faced during their execution phases.

The case studies will serve as research material which the client will then utilize to create a larger synthesis report which is being developed by different scientific groups and which will showcase climate change policies that are fundamental to limiting a global temperature rise of 2°C or less in the 21st century. This report has an international scope and is intended to be key technical input to global negotiations of a new international agreement on climate change during the Climate Change Conference of the Parties to be held in Paris, France in 2015. This is the first year such a report will not only include climate policy but will also focus on energy efficiency as a key area of action to curve GHG emissions.

## 2 STUDY OBJECTIVE

The objective of the project is to describe public policy measures and sectorial actions that have proven to be successful in improving energy efficiency in key sectors economies from different countries and regions around the world.

## 3 APPROACH AND METHODOLOGY

There were 4 major tasks associated with this project:

1. Development of a standardized template for the case studies
  - a. The template included various sections for the type of policy instrument examined, mainly: energy savings, emission reduction contribution, co-benefits, stakeholders involved in the policy, barriers and enablers to implement the policy.
2. Research

- a. The selection of policies and programs from various countries to be included was done in close collaboration with the client whenever possible, and was also based on the availability of information for each.
  - b. Together with other DNV GL staff and contacts in Asia, Europe, USA and Latin America, research information was then gathered on the best candidate case studies for energy efficiency policies from various regions across the globe, for which ultimately 25 cases were chosen.
  - c. Data was obtained from a variety of sources including annual and final evaluation reports, articles, programs websites, and other publicly available information. Whenever possible, personnel directly involved with the programs and other in-country stakeholders were also contacted for information.
3. Data Analysis:
- a. The DNV-GL team was then able to put together and synthesise all of the pertinent information that was attained for each case study, even providing qualitative information in cases where more quantitative data was either not found or not available.
4. Development of Individual case studies:
- a. The elaboration of the case studies was then conducted for the selected countries and sectors using the data analysis that was carried out in the prior step.
  - b. Drafts of these case studies were then shared with the client for feedback and to then arrive at final drafts.

## 4 CASE STUDY SELECTION

The case study countries, sectors, and categories of policies that were ultimately chosen to be included in the study were the following:

- Buildings Category
  - Germany
  - Arizona
  - Sweden
- Car Scrapping:
  - China
  - Germany
  - Egypt
- Voluntary Programs
  - Canada
  - Chile
  - Japan
- Standards and Labels
  - Australia
  - Fiji
  - Vietnam
- Demand Side Management
  - Austria
  - South Africa
  - Vietnam
- Financial Mechanisms
  - Turkey
  - Thailand
  - Austin, TX
- Broad Policy Frameworks
  - Indonesia
  - Spain
  - Peru
- Benchmarking in Industry
  - India
  - Malaysia
  - USA (Northwest)
  - Sweden

## 5 ENERGY EFFICIENCY IN BUILDINGS

<b>Title:</b>		
5.1 Germany's Energy Efficient Construction and Refurbishment (EECR) Program		
<b>Country:</b>	Germany	
<b>Sector:</b> Household/Buildings	<b>Stage:</b> In progress/On going	<b>Type of policy/practice/instrument:</b> Grants/Subsidies for Buildings
<b>Sub-sector (if applicable):</b> Not applicable	<b>Period:</b> 2009 Starting date End: not determined	

### Description

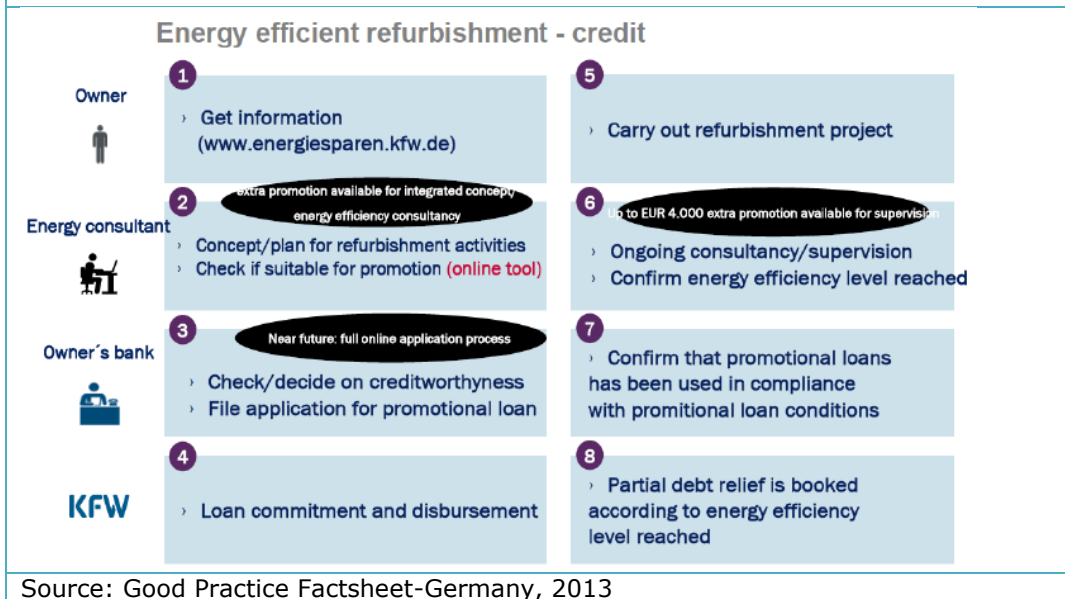
The Energy Efficient Construction and Refurbishment (EECR) programme provides soft loans or investment grant financing for energy efficient construction and refurbishment activities in residential buildings. All private investors within the residential building sector in Germany and housing companies with equal financing conditions are eligible for the programme. The Kreditanstalt für Wiederaufbau (KfW) bank promotes and implements the programme. Since its launch in 2001, the programme has become one of the 20 key elements of the "German integrated energy and climate programme".

A range of measures are eligible for support, including thermal insulation of outer walls, floors and roof, refurbishment of windows, installation of a ventilation system and replacement of heating systems. A combination of different measures is possible. There is no upper limit in the share of costs covered by the programme, though the maximum loan amount is EUR 50,000 per residential unit.

Germany's Energy Savings Ordinance (EnEv), which defines energy efficiency requirements for new and existing buildings, is used as a benchmark for determining the programme's energy efficiency criteria. To benefit from the programme, the project must result in energy consumption levels that are significantly below those required by the EnEv. For comparison, Germany's National Energy Efficiency Action Plan considers three benchmarks – 40, 55 and 70 percent reductions compared to the minimum levels required by the EnEv.

Applicants who do not target a deep retrofit of their building or housing unit, can access promotional loans for single measures such as windows, heating systems or insulation. Applicants who do not want to apply for a loan can apply for a grant for investment. The amount available is based on the same energy efficiency levels as for the loans, and calculated on the basis of the maximum loan amount applicable. It varies between 10 percent and 25 percent of the maximum loan amount of EUR 75,000.

Figure 1: Process of the scheme operation of the program EECR



In 2012 new 116,055 housing units and 242,312 existing (refurbished) housing units benefited from the programme.

**Actors**

Actor	Role
KfW	Manages the programme, including loan commitment and disbursement.
Federal Ministry of Building, Transport and Urban Development (BMVBS)	Provides the subsidy for the interest rate of the promotional loan.
Energy consultant	Checks that the construction or refurbishment project is properly design to achieve the expected efficiency levels.

**Barriers**

'Energy Concept 2050', Germany's long-term energy strategy for the period up to 2050, includes emission reductions in the range of 80 to 95 percent, compared to a base year. It is unclear whether the scope and resources of the EECR programme are consistent with this ambitious goal. While regional governments in Germany have to comply with federal laws, they are not required to implement federal programmes such as EECR. Furthermore, regional governments set their own energy policies: if energy efficiency is not a priority in a region, it is all the more unlikely that the programme receives support in that region.

**Enablers for implementation**

The mandatory involvement of an energy expert from the beginning of the application until completion of the construction or refurbishment project reduces the perceived financial risk and ensures consistent and ambitious performance levels.

Incentives for commercial banks, saving banks and insurance companies include the following:

- Reasonable margin: in the form of risk-premium and regular administration fees

- No refinancing cost: the refinancing is provided by KfW and customer needs can be fulfilled without providing liquidity
- Market creation: the maximum promotional loan amount covers only a share of the project and banks can thus offer their own financial products to finance the rest)
- No up-front cost: offering the promotional loans does not cause any up-front or additional cost to the on-lending institution
- Training and information: bank employees are trained on a regular basis (at no cost to the bank) with regard to product conditions and application processes
- Competition: a banks that chooses not to offer promotional loans may be at competitive disadvantage

## Funding

Type of funds	Implementation aspect it supports
<b>Domestic The Federal Ministry of Building, Transport and Urban Development and KfW</b>	Refinancing for the promotional loans is provided by KfW, via the capital market. The interest rate of the promotional loan is further subsidised by funds provided by the Federal Ministry of Building, Transport and Urban Development.

## Costs

	2010	2011	2012	2013
<b>Public funds (million Euro)</b>	1,400	950	1,420	1,500
<b>Commitment volume (million Euro)</b>	8,746	6,510	9,886	
<b>No. of housing units achieved with promotion</b>	952,803*	282,006	358,367	
<b>Volume of investment triggered</b>	21,330	18,427	26,978	

Source: KfW, Promotional programmes for energy efficiency in the housing sector. 2013

\*Estimate

## Energy savings and associated emission reductions

Energy saving (total)	Early action (1995-2007)	Initial program period (2008-2010)	Forecast (2008-2016)
CF <sup>1</sup> = 1    6.9 PJ	-	1.7 PJ	6.9 PJ

Source: BMWi 2011 and KfW 2010; Federal Statistical Office (FS5, R1-Z2006); Prognos model; techem 2009

## Benefits

Benefit	Description
<b>Reductions in energy demand</b>	Energy savings of 2,200 gigawatt
<b>Mitigation of greenhouse gases</b>	In 2010, CO <sub>2</sub> savings of 999,000 tons by year  In 2011, CO <sub>2</sub> savings of 542,100

<sup>1</sup> CF = Calculation formulae. See: Communication from the German Federal Government to the European Commission pursuant to Article 7 of Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency ([http://ec.europa.eu/energy/sites/ener/files/documents/article7\\_en\\_germany.pdf](http://ec.europa.eu/energy/sites/ener/files/documents/article7_en_germany.pdf))



		tons by year  In 2012 CO <sub>2</sub> savings of 770,000 tons by year
<b>Improvement in air quality</b>		Not applicable
<b>Macro-economic impacts</b>	<ul style="list-style-type: none"> <li>• Impacts on GDP</li> <li>• Trade balances</li> <li>• Energy prices</li> </ul>	Information not available
<b>Impacts on public budgets</b>	<ul style="list-style-type: none"> <li>• Reductions in operational and capital expenditure for the public sector.</li> <li>• Effects attributed to structural changes to the economy and changed economic activity due to investment in energy efficiency</li> </ul>	Positive effect for public budget due to tax income and social security contributions.
<b>Creation of jobs</b>		<ul style="list-style-type: none"> <li>• Investment activities and job creation</li> <li>• For 2010, no. of jobs created or preserved for 1 year</li> <li>• 286,000</li> <li>• For 2011, no. of jobs 251,200</li> <li>• For 2012, no. of jobs 370,000</li> </ul>
<b>Improvements in human health and well being</b>	<ul style="list-style-type: none"> <li>• Reduce risk of respiratory and cardiovascular diseases, allergies, arthritis and rheumatism with warmer, drier, more comfortable indoor environments resulting from improved building insulation</li> </ul>	Information not available
<b>Increased access to energy and reduced fuel poverty</b>		The program helps to reduce dependency on fossil fuels and has lowered the energy bills of 1.8 million households so far.
<b>Benefits to energy providers</b>	<ul style="list-style-type: none"> <li>• Reduced operating costs</li> <li>• System and network deferral</li> <li>• Increased reliability</li> <li>• Market price changes</li> <li>• Associated with marketing</li> </ul>	Information not available
<b>Other</b>		The program stimulates investors to go beyond legally defined energy efficiency standards, and advances research and development of new energy efficient technologies in the housing and construction sector (by providing market incentives for these technologies).

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<b>Title:</b>		
<b>5.2 Arizona Public Service Solutions for Business Program</b>		
<b>Country:</b>	USA, Arizona	
<b>Sector:</b> Commercial and Industrial Buildings/Non-residential	<b>Stage:</b> Ongoing yearly implementation since 2006	<b>Type of policy/practice/instrument:</b> Cash incentives, training, and energy information services.
<b>Sub-sector (if applicable):</b> large existing (retrofit), large new construction, small (retrofit), and schools (retrofit).	<b>Period:</b> (2006-present)	

**General Description**

The Arizona Public Services (APS) Solutions for Business programme was created by Arizona State authorities in 2006, to help achieve a state mandate to reduce energy use by 22 percent by 2020. Today the programme is overseen by the Arizona utility regulatory agency (Arizona Corporation Commission), which also reviews, amends and approves the annual programme portfolio of services.

The programme offers cash incentives, training and energy marketing services to help non-residential customers increase energy savings and reduce their demand for energy. Cash incentives support the implementing energy-saving equipment in both new constructions and existing buildings undergoing renovation; technical trainings and marketing services inform and promote efforts to improve energy efficiency. Eligible technologies include lighting, HVAC, refrigeration, motors, controls, and building envelope materials. Targeted building types include colleges and universities, schools, data centres, grocery stores, hotels and motels, restaurants, medical facilities, offices, industrial plants, retail shops, and warehouse facilities.

Custom incentives are paid at an annually set price per kilowatt hour saved (up to a percentage of incremental costs). Applicants are subject to an annual incentive cap. Eligibility is contingent on an analysis that demonstrates that social benefits exceed societal costs. Cash incentives are also available for technical studies and design assistance, based on a percentage of the incremental cost (up to a set amount, as approved by the regulatory agency).

Additionally, financing is available for energy efficiency projects through a partnership between Arizona Public Services and the National Bank of Arizona. It offers low interest rates to applicants who qualify for incentives from the Solutions for Business programme, and helps reduce barriers to participation. Financing is known to be a main barrier for business partaking in energy efficiency upgrades due to the large upfront cost of projects. Whether it is limited upfront cash or slow return on investment from the energy savings measures, financial constraints are a key barrier that the financing from the National Bank of Arizona looks to overcome.

Since its inception, the programme has disbursed about USD 74 million in incentives to more than 4,000 unique beneficiaries. Beneficiary projects currently represent more than USD 926 million in lifetime energy savings.

## Actors

Actor	Role
State Authorities (Arizona Public Service)	Programme administrator and sponsor
DNV GL (formerly Kema services)	Implements the program on behalf of APS, providing technical, marketing, outreach and application processing services
National Bank of Arizona	Provides financing services to programme participants
Trade Ally Contractors	Market the incentives directly to prospective programme beneficiaries

## Barriers

- The program reduces the initial investment associated with an energy-improvement project, but does not cover all direct project costs. This has deterred potential beneficiaries, which would have required additional financial assistance, compared to the programme's offering.
- Establishing and maintaining an educated market for energy efficiency measures and their associated incentives has proved to be a barrier. Technologies continuously change and staying abreast of the advances is a massive undertaking in itself. Nonetheless, programme incentives are revised annually, precisely to take account of this dynamic situation. While this is an essential undertaking in order to stay current, it can lead to customer confusion. To prevent this from happening, the programme offers training and energy information services. However, it is clear that a wider and cross-institutional awareness and informational campaign could have enlisted and incentivised more participants to join in with the programme. The traditional lack of informational and reach-out campaigns on the part of utilities puts in broader perspective the need for the above measures.

## Enablers for implementation

- One of the strongest enabling factors for the success of the programme was that the reduction of energy use by utilities was dictated by state law. As a result, utilities were forced to develop innovative programmes and projects that may aid them in reaching this goal. Arizona Public Service did not have the capacity to undertake this challenge on its own, and thus developed multiple partnerships. For example, it hired DNV-GL (formerly KEMA) to oversee all implementation and outreach aspects of the programme; it developed a Trade Ally programme to recruit contractors tasked to disseminate information about the programme; and partnered with National Bank of Arizona to enlist its financial expertise and resources.
- Beyond this, program sponsored training and outreach campaigns played a critical role in the successful dissemination and implementation of the programme. During the first three years, programme teams focused on the promotion of the incentives through coordinated outreach and events, as well as through the training for contractors who provided energy-related services or products. In general, the programme was able to design incentives in such a way that made energy savings affordable, attractive, and accessible to customers. In addition, training workshops were open to customers and industry professionals on a variety of programme-specific information, as well as specific energy related topics and technologies. Expanding the consumer education offerings was one key development that allowed the programme to grow in popularity. For example, Arizona Public Service collaborated with the Arizona chapter of the Association of Energy Engineers to conduct programme-sponsored trainings in which over 600 individuals have participated over the past two years.
- Under the partnership with the National Bank of Arizona various financing options with low interest rates were made available to customers who qualified for the incentives, and helped relieve some of the perceived risk and financial limitations of other potential participants.

- Over the last six years a focus on adjusting incentive levels, promoting new technologies, and targeted outreach to reach specific segments and technology goals have successfully increased participation in the programme.

### Funding and Costs

The programme's most recent budget (for 2012) amounts to USD 29.4 million. In 2012 the project had 3,400 applications, compared to 58 when the programme was launched in 2006. Programme beneficiaries pay Arizona Public Service for its services through the monthly bill (they pay USD 0.696 per kWh, compared to the standard fee of USD 0.001845 per kWh). Other offerings, including technical studies and design assistance, pay incentives based on a percentage of the incremental cost up to a set amount as approved by the regulating agency. In 2012, the measure paid 50 percent of the cost up to USD 10,000.

### Energy savings and associated emission reductions

Programme spending has increased over the years, as have the savings achieved. In 2012 annual energy savings were estimated at 274 GWh.

Performance	2010	2011	2012
Program Spending (actual, in USD)	19,753,000	23,763,000	31,715,000
Program Savings (net GWh)	174	185	274
No. of Participants (each year)	1,677	1,806	1,781

Projects implemented in 2011 were among the most cost-effective:

- Lifetime benefits of installed energy efficiency measures: \$148 million
- Estimated Societal effectiveness (benefit to cost): 3.0
- Program Cost per lifetime kWh saved: \$.00228 per kWh

### Benefits

Benefit	Description
<b>Reductions in energy demand</b>	Annual energy savings achieved have been estimated at 274 GWh for 2012.
<b>Mitigation of greenhouse gases</b>	Eliminated 7.56 million tons of CO <sub>2</sub> emissions in the period 2006 – 2013.
<b>Improvement in air quality</b>	Information not available.
<b>Macro-economic impacts</b>	<ul style="list-style-type: none"> <li>• Impacts on GDP</li> <li>• Trade balances</li> <li>• Energy prices</li> </ul> The program has paid upward of USD 73.5 million in incentives to more than 4,000 unique customers for implementing energy efficiency projects that represent more than USD 926 million in lifetime savings.
<b>Impacts on public budgets</b>	Information not available.
<b>Creation of jobs</b>	Hiring of local contractors for implementation – mainly the Trade Ally programme, which includes more than 250 members.
<b>Improvements in human health and well being</b>	Information not available.
<b>Increased access to energy and reduced fuel poverty</b>	Not relevant.
<b>Benefits to energy providers</b>	The programme is one component to

help Arizona Public Service reach the 22 percent energy reduction mandate. It also decreases the energy demand on energy providers. Incentives, training, and savings arising from reduced energy usage increases customer satisfaction. Arizona Public Service APS has been recognized as an industry leader.

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**Title:**

## 5.3 LÅGAN Programme – for the construction and renovation of low-energy use buildings

<b>Country:</b>	Sweden	
<b>Sector:</b> Building Sector	<b>Stage:</b> Ongoing	<b>Type of policy/practice/instrument:</b> Grants / Subsidies
<b>Sub-sector (if applicable):</b> Manufacturing Industry	<b>Period:</b> 2010 - 2015	

### General Description

The LÅGAN programme (*buildings with very low energy use*, in Swedish) promotes construction of low-energy use buildings and renovation of existing buildings. The programme offers financial assistance in exchange for documentation and dissemination of energy-use data and best practices. It further establishes a large network of suppliers, with a view to fostering a market for energy efficient buildings.

The programme is active in four areas:

- Communication: communicating the work of the program to target groups (potential clients, builders, consultants, etc.).
- Implementation: subsidising energy efficiency improvements and providing related resources, such as auxiliary tools needed for implementation of low-energy buildings.
- Knowledge sharing: disseminating information about the improvements implemented and the results of the evaluations conducted.
- Collaboration: foster cooperation at the national level and promote collaborative projects at the regional level.

The programme was introduced to facilitate compliance with both European Union and domestic goals for energy efficiency in buildings. European Union legislation (2010/31/EU) requires that all new public buildings are “near zero-energy buildings” by January 2019, and Swedish domestic targets call for a 20 percent reduction of energy use in buildings by 2020. Yet only 1 percent of buildings in Sweden are ‘low-energy use’ buildings. Indeed, the building sector accounts for a large share of heating and electricity demand in Sweden – about 30 percent of heating and 50 percent of electricity demand.

The LÅGAN programme was created by the Swedish Energy Agency in partnership with the Swedish Construction Federation. It provides support mainly to established initiatives and funds more than 25 percent of the total project costs. It is an inclusive programme, in that any building category can participate and any relevant technology can be used. Nonetheless, the programme stipulates that, for a new building to be considered ‘low-energy building’, its energy demand must be 25 percent below the requirements in current building regulations (Code BBR 20). Renovated buildings must meet current construction code standards.<sup>2</sup>

Other requirements for participation include:

- Include innovative elements, compared to other funded projects (for example, new technologies, underrepresented regions, underrepresented building categories, novel architectural approaches, or innovative energy supply systems).
- Have a clear environmental and energy profile for residential or commercial energy use.

<sup>2</sup> For detailed information on Sweden’s BBR energy management building code see: <http://www.boverket.se/globalassets/publikationer/dokument/2012/bbr-engelsk/bfs-2011-26-bbr-eng-9.pdf>

- Make a significant contribution to knowledge and experience sharing, and information dissemination.
- Provide technical solutions and concepts that are scalable and amenable to replication.
- Provide an evaluation of energy use and indoor environment.
- Accept that project results are reported in an online market review and results are made public.
- Meet new construction and renovation standards, such as demands for care, accessibility, fire requirements, and indoor environment conditions.

The programme set out to support three different categories of projects: demonstration projects (eight, covering both implementation and evaluation), collaborative projects (five, either regional or community partnerships), and implementation projects (at least twelve). The programme as a whole has approved support for 41 projects, of which 15 had been completed. The website (<http://www.laganbygg.se/>) provides web-based market overview and currently has detailed data on 150 buildings. This information serves as a presentation of best practices.

The programme has achieved and in some instances exceeded its goals. According to the mid-term programme evaluation, programme funds supported projects that would have otherwise not have occurred. Some of the projects exceeded their initial energy saving targets. The complete programme evaluation will be completed in 2015.

### Actors

Actor	Role
<b>Swedish Construction Federation (BI)</b>	BI is Sweden's trade association for construction companies with over 3,000 members, such as building and civil engineering companies. BI is responsible for national oversight and handles the administrative and program coordination.
<b>Swedish Energy Agency</b>	Government entity that is funding 40 percent of the programme – 22M SEK
<b>Region Västra Götaland</b>	Regional authority in Western Sweden. Funder – 1M SEK
<b>Formas</b>	National research funding organization in the area of environment, agriculture, construction and planning. Funder – 2.9M SEK
<b>The National Board of Housing, building and Planning</b>	National government agency that deals with construction regulations etc.
<b>The Danish Building research Institute</b>	Technical expert. Provides advisory and research in addition to working on international benchmarking of projects.
<b>Bostad AB Poseidon</b>	Municipal housing company.
<b>SP Technical Research Institute of Sweden</b>	Technical experts Research Institute in Sweden that has been involved in several projects.
<b>GreenBuilding and the Miljöbyggnad</b>	Certification systems used by the programme

Source: LÅGAN 2010.

### Barriers

Financial barriers are the main limiting aspect of the programme. Due to the scale of the projects, some developments need higher funding for it to be economically feasible to undertake. On the other hand, another issue the program has encountered is encouraging actors to actually ask for the funding. These are to opposing issues along the same topic of financial capability.

No analysis of project results (across building types or sectors) has been conducted, which hampers the programme's knowledge sharing objectives. Stakeholders consulted during the mid-



term review of the programme suggested that knowledge sharing cannot be achieved by simply posting online reports of completed projects and called for an analysis of lessons learnt.

The programme has not managed to reach all actors in the building sector: it is well known by key actors in the energy sector, but less so by contractors and property owners, for example. Similarly, the programme is better known in Sweden's west coast, in spite of its stated goal to provide full national coverage.

### Enablers for implementation

A driver for success was the Swedish Building Industry's involvement. As the trade organization for construction companies with over 3,000 members, BI not only has a wide reach, but also as a trusted organization among the industry has a powerful influencing ability. BI serves as a direct link between the programme and the market.

Key actors in the building sector valued the collaborative nature of the project, which allowed them to work closely with public authorities. Not least, they valued the new business opportunities brought about by the programme: in addition to the energy and financial savings inherent to every supported project, building sector actors increased their competitiveness and benefited from the branding element associated with the programme.

Additionally, strong legal requirements on a national and international level have created an impetus to move towards low energy buildings, such as the European target of NZEB 2018/2020 and Sweden's target of reducing energy use in residential and commercial buildings by 20% in 2020 and 50% in 2050.

### Funding

The total programme budget amounts to 60 million SEK (some 7 million USD). Programme funders include the Swedish Energy Agency (22 million SEK), the Västra Götaland regional government (1 million SEK), Formas, an organisation tasked to promote applied research (2.9 million SEK) and several industry sector actors.

### Costs

The program's budget is 60 million SEK.

### Energy savings and associated emission reductions

There is currently no available information that provides an indication of the environmental impacts from the program specifically. The evaluation will be completed in 2015.

However, the Swedish Energy Agency completed a report on the energy efficiency potential in the building sector presenting a prognosis on the effect of Sweden's current policy instruments. The Lagan programme is included as one of the many current policy instruments, which also includes the energy tax, building code, energy performance certificate, and other programmes/networks similar related to energy in the building sector.

With the current policy measures in place, the prognosis indicated that the average purchased energy for heating and hot water in the building stock would develop from:

126 kWh/m<sup>2</sup>, Atemp in 2011 to  
 120-122 kWh/m<sup>2</sup>, Atemp in 2020,  
 109-118 kWh/m<sup>2</sup>, Atemp in 2030,  
 100-114 kWh/m<sup>2</sup>, Atemp in 2040,  
 94-111 kWh/m<sup>2</sup>, Atemp in 2050,

### Benefits

Benefit	Description
<b>Reductions in energy demand</b>	With the current policy measures in place, the prognosis indicated that the average purchased energy for heating and hot water in the

<p><b>Mitigation of greenhouse gases</b> <b>Improvement in air quality</b></p>	<p>building stock would develop from: 126 kWh/m<sup>2</sup>, Atemp in 2011 to 120-122 kWh/m<sup>2</sup>, Atemp in 2020, 109-118 kWh/m<sup>2</sup>, Atemp in 2030, 100-114 kWh/m<sup>2</sup>, Atemp in 2040, 94-111 kWh/m<sup>2</sup>, Atemp in 2050,</p>	
<p><b>Macro-economic impacts</b></p>	<ul style="list-style-type: none"> <li>• Impacts on GDP</li> <li>• Trade balances</li> <li>• Energy prices</li> </ul>	<p><b>Market impacts.</b> Contribute to a broad national supply of retailers of products and services and secure demand.</p> <p><b>Infrastructure benefits.</b> Energy efficient new construction and retrofitting is being stimulated within the program.</p>
<p><b>Impacts on public budgets</b></p>	<ul style="list-style-type: none"> <li>• Reductions in operational and capital expenditure for the public sector.</li> <li>• Effects attributed to structural changes to the economy and changed economic activity due to investment in energy efficiency</li> </ul>	<p>No information available.</p>
<p><b>Creation of jobs</b></p>	<p>The programme, by virtue of being run by the Swedish Construction Federation, is Sweden’s construction trade organization and boasts 3,000 members. The new low energy buildings provide additional work for the organization members.</p> <p>It also provides knowledge and capacity building. LÅGAN focuses on supporting development of ideas by evaluating and disseminating information from demonstration projects, which have an important contribution to the spread of experience and knowledge. Dissemination of projects is through a web-based market review of building development. Projects participating shall contain an assessment of energy use, including information spread.</p>	
<p><b>Improvements in human health and well being</b></p>	<p>Reduce risk of respiratory and cardiovascular diseases, allergies, arthritis and rheumatism with warmer,</p>	<p>No information available.</p>

	drier, more comfortable indoor environments resulting from improved building insulation	
<b>Increased access to energy and reduced fuel poverty</b>	No information available.	
<b>Benefits to energy providers</b>	<ul style="list-style-type: none"> <li>• Reduced operating costs</li> <li>• System and network deferral</li> <li>• Increased reliability</li> <li>• Market price changes</li> <li>• Associated with marketing</li> </ul>	No information available.

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## 6 CAR SCRAPPING SCHEMES

<b>Title:</b>		
6.1 Chinese Car Scrapping Scheme		
<b>Country:</b>	China	
<b>Sector:</b> Transport	<b>Stage:</b> Finalized	<b>Type of policy/practice/instrument:</b>  Financial incentives
<b>Sub-sector (if applicable):</b>	<b>Period:</b> 2009 – 2010	

### Description

In response to the global financial crisis in 2008, the Chinese government developed a fiscal stimulus package that rivaled that of the United States as one of the largest at \$648bn, approximately 13 percent of China’s GDP. The stimulus package dedicated 33 percent to green endeavors – a total of \$214bn. China, while on one hand has exacerbated environmental issues by heavily pushing for economic and industry growth, has also significantly invested in green measures and innovative solutions to tackle environmental concerns. China’s car scrapping scheme, introduced in January of 2009, was one of the environmental measures implemented through the stimulus package.

China’s car scrapping scheme offered a rebate between \$450 (CNY 3000) and \$900 (CNY 6000) for scrapping an older vehicle or any car that did not meet the emissions standards and replacing it with a more efficient one, with the goal of removing 2.9 million polluting vehicles from the roads. Additionally, the government introduced a 5 percent sales tax reduction for cars with engine sizes less than 1.6 litres. This was a 50 percent cut from the original tax of 10 percent.

**Table 1: Green Elements in China’s Stimulus Package**

GREEN ELEMENTS IN CHINA’S STIMULUS PACKAGE		
Measure	Description	Budget
Car scrapping	China made a 5% reduction in sales tax on new cars with engine sizes less than 1.6 litres	\$400m
R&D for alternative energy vehicles		\$1.5bn
Energy efficiency (Mainly grid and rail)	2009-2010	~ \$179bn
Nature conservation/management		\$30bn
<b>TOTAL</b>		<b>\$214bn</b>

Source: Pollitt, 2011

Aside from the scrapping scheme, the government introduced a subsidy of \$1.5bn for alternative energy cars in an interest to encourage the mass production of electric cars.

The program had a slow uptake. In many cases the incentive amount was lower than what one could get in the market to resell the old vehicle. By the end of 2009 only 100,000 new vehicles were purchased through the program. The government increased the rebate value in 2010 to between \$800 (CNY 5000) and \$2900 (CNY 18000).

Despite the initial hiccup, the sale of cars with less than 1.6 litre engines has almost tripled since 2008.

There was a wide range of eligible 'scrap' vehicles including old minivans, small and mid-size trucks and other mid-size passenger cars that no longer meet the government emissions standards. The program incentivized two categories: old vehicles six years or older and Yellow Label vehicles. Yellow Label vehicles are cars that do not meet the Guo 1 emission standards (equivalent to the Euro 1 emissions standards) for gasoline vehicles and Guo 3 (equivalent to Euro 3) for diesel vehicles. Additional incentives (up to CNY 5000) were provided for rural purchases of light trucks and mini-vans.

After the increase in incentive in 2010, the Chinese government went on to subsidize 459,000 vehicles totaling in 6.41bn CNY (\$1.04bn). The new vehicles had to comply with the Guo 3 standard. The Ministry of Commerce reported that the most subsidies went to passenger cars (46.4 percent), followed by large/medium buses (20.7 percent) and small/micro trucks (17.2 percent).

The specific categories and subsidies were the following:

Type of vehicle	Subsidy
<b>Old vehicles (6+ years)</b>	13,000 Yuan for medium trucks
	9,000 Yuan for light trucks
	6,000 Yuan for mini-trucks
	11,000 Yuan for medium-sized passenger vehicle
<b>Yellow Label</b>	18,000 Yuan for heavy duty trucks
	13,000 Yuan for medium trucks
	9,000 Yuan for light trucks
	6,000 Yuan for mini-trucks
	18,000 Yuan for large load buses
	11,000 Yuan for medium-sized passenger cars
	7,000 Yuan for small passenger vans
	5,000 Yuan for mini-buses
	18,000 Yuan for 1.35 liters and above sedans
10,000 Yuan for 1-1.35 liters (not inclusive) engine sedans	
6,000 Yuan for one liter engine and below sedans.	

Source: own table with information from Marshall and Po, 2011

It's important to be said that the Chinese scenario was different than their global counterparts. The stimulus package, and thus the cars scrapping scheme, came around during a time that although there was a global economic crisis and the automobile industry did face a significant decrease in export demand, China's economy was not in recession and incomes were in fact growing. This situation changes the real impacts of the scheme. A typical assumption is that people use money that would have otherwise been saved away. However, because the Chinese economy was not suffering, this assumption is not completely accurate. The scheme may have instead diverted money from other spending towards automobile purchases. For this reason, Pollitt's report for the European Commission presents an alternative scenario that considers half the money coming from reductions in other spending. This is considered in the benefits section below.

### Actors

Actor	Responsibilities
<b>Ministry of Commerce</b>	<ul style="list-style-type: none"> <li>In charge of organizing and guiding the program. The Ministry of Commerce was the main guiding arm for the</li> </ul>

	implementation of the scheme.
<b>Ministry of Public Security</b>	<ul style="list-style-type: none"> <li>Responsible for registration of automobiles</li> </ul>
<b>Ministry of Finance</b>	<ul style="list-style-type: none"> <li>Responsible for funding of the program</li> </ul>
<b>Ministry of Environmental Protection</b>	<ul style="list-style-type: none"> <li>Responsible for automobile identification and inspection</li> </ul>
<b>Recycling Facilities</b>	<ul style="list-style-type: none"> <li>Government-approved recycling facilities bought and scrapped the old vehicles. They provided the customer with a recycling certificate to be used as proof for imbursement of rebate.</li> </ul>

### Barriers

The car scrapping scheme was originally supposed to end in 2009, however, regulators decided to extend the program for another year. The extension of the scheme was critiqued because critics felt that the incentive was too low and the program did not garner enough interest. As mentioned above, by the end of 2009 only 100,000 vehicles went through the program. As part of a solution, the government extended the program for another year and increased the incentive amount. The success of car scrapping schemes is often dependent to the size of the incentive. The initial incentive amount offered by the Chinese government was too low, especially when people could receive a higher resell value for the old cars in the market.

Even with the higher incentive amount provided from the scheme, there remained competition from auto dealer's trade-in offers that detracted people from participating in the scrapping program. Car dealers incentivize trade-in of old vehicles, which made the subsidy from the program less financially enticing. Providing higher incentives across the board, rather than a varying scale, or partnering with the auto dealers to eliminate the practice could have helped alleviate this issue. Data indicates that 2 million vehicles in China should be recycled annually; however, 300 thousand of these vehicles remain on the road.

Another barrier was the varying emissions standards and regulatory enforcement in the different regions of China. Emissions standards, while on paper since 1992, were not enforced until 2000 when the Ministry of Environmental Protection mandated compliance to Guo 1 (Euro 1 emissions standard). As of 2007, the Ministry of Environmental Protection required compliance to Guo 3 (Euro 3). Even so, enforcement differed drastically throughout China. For example, Beijing adopted the Guo 4 standard (Euro 4) in 2008, while other regions, particularly in rural areas, barely regulated any emissions standards. In fact, used cars that were banned from Beijing due to enforcement of the standard were often sold to rural areas where requirements were not regulated. The difference between the standards is significant, for example, a Guo 3 vehicle emits 44 percent less CO<sub>2</sub> per mile travelled and 70 percent less NO<sub>x</sub> per mile travelled than a Guo 1 car.

The procedure for receiving the incentive was long and complicated requiring several steps and different organizations. First they had to ensure that the new vehicle met the requirements categorized by the Exchanging Second-Hand Vehicles for New Ones legislation. They then had to go through five different government entities to gain approval and receive the rebate: government-approved recycling facility, Ministry of Environmental Protection for inspection, Ministry of Public Security for registration, Ministry of Commerce for approval, and Ministry of Finance for the funds. There was also added confusion because some cities had local scrapping programs that were different to the national one and hence confused people on requirements and incentive returns. For example Beijing and Guangzhou had their own local programs that focused on the elimination of Yellow Label vehicles.

### Enablers for implementation

A key enabler to the success of policies in China is their ability to development and implement projects rapidly. The swift response to the global crisis on behalf of the Chinese government, with large investment largely in the beginnings of 2009, contributed to an added 4 percent to GDP – the 4 percent coming from the green measures of the stimulus package.

The stimulus package dedicated 33 percent of funds to green measures. Additionally, the National Development and Reform Commission announced that none of the financial stimulus would go to resource-intensive industries or polluters. The government support and subsequent ‘green’ funds established under the package set the stage for the success of the car scrapping scheme as a national priority.

Another vital component of the scheme was the cooperation among the various administrative agencies. There were various government actors each taking on a specific role which required coordination between the national departments to implement the program. For example, the Ministry of Finance was responsible for the funds, the Ministry of Public Security handled the new vehicle registrations, and the Ministry of Environmental Protection handled inspections. There was also coordination between China’s central and local governments. Managing the different national and local scrapping programs required careful vertical coordination, especially since participants could participate in only one or the other.

Lastly, the implementation was further supported by stronger enforcement from the Department of Environmental Protection. As mentioned above, emissions regulations had been established in the early 90s but they did not become relevant until the 2000s when they became mandatory. By 2009, enforcement of the emissions regulations had become more engrained, particularly in the cities of China.

### Funding

Type of funds	Implementation aspect it supports
<b>Domestic (Ministry of Finance)</b>	The funding for the car scrapping scheme came from the Chinese government’s national financial stimulus package.

### Costs

When the scheme started off in 2009, \$400 million was set aside from the stimulus package for the car scrapping scheme. However, the government extended the program in 2010 and increased the subsidy amount. From January 2010 to December 2010 the car trade subsidies equalled \$1.04bn (6.41bn CNY).

### Energy savings and associated emission reductions

The car scrapping scheme had minor impacts on energy savings and emissions reductions. The scheme reduced CO2 emissions by .16 percent in 2009 and .20 percent in 2010. However, these reductions were short term due and offset by the developments in China’s power sector. Similarly, energy demand was reduced by .31 percent in 2009 and .54 percent in 2010 but these savings were short term as well because the increased economic activity outweighed the benefits of the efficient cars.

As mentioned previously, there is an alternative scenario that takes the Chinese economic situation and calculates the money used for the car purchase as half from savings and half from reductions in other spending. This scenario presents an even smaller impact: .08 percent in 2009 and .09 percent in 2010 of CO2 reductions and .15 percent in 2009 and .27 percent in 2010 for energy consumption.

Yellow Label vehicles, which were one category of removal within the national program and a main focus of the local schemes, contribute a disproportionate amount of emissions. In 2009, 17 percent of the vehicles on the road were classified as Yellow Label and responsible for over 50 percent of emissions from China’s car fleet. The Ministry of Environmental Protection released a similar evaluation in 2012 – 16 percent of vehicles are Yellow Label contributing 64 percent of

NOX and 56 percent of CO2 from all the vehicles in the nation. This suggests that little has changed in regards to the removal of Yellow Label vehicles from the roads.

**Benefits**

Benefit		Description
<b>Reductions in energy demand</b>		<p>Reduced energy consumption by .31 percent in 2009 (alternative scenario with reduced additional spending .15 percent in 2009).</p> <p>However, the long term impacts on energy demand were zero due to the rapid development in China's power sector.</p>
<b>Mitigation of greenhouse gases</b>		The scheme reduced CO2 emissions by .16 percent (alternative scenario with reduced additional spending .08 percent)
<b>Improvement in air quality</b>		No information available.
<b>Macro-economic impacts</b>	<ul style="list-style-type: none"> <li>• Impacts on GDP</li> <li>• Trade balances</li> <li>• Energy prices</li> </ul>	<p>The car scrapping scheme had an immediate economic impact adding .41 percent on to GDP in 2009 – 2010 (alternative scenario of reduced additional spending equals .20 percent on to GDP).</p> <p>The green measures of the stimulus package created an immediate boost to GDP at around 4 percent for 2009-2010. The green measures include energy efficiency improvements to mostly rail infrastructure and electricity grids, the car scrapping scheme, the subsidy in alternative energy cars, and other environmental improvements and reduction of pollution. Rail infrastructure was the largest part of the stimulus package.</p>
<b>Impacts on public budgets</b>	<ul style="list-style-type: none"> <li>• Reductions in operational and capital expenditure for the public sector.</li> <li>• Effects attributed to structural changes to the economy and changed economic activity due to investment in energy efficiency</li> </ul>	The speed with which the Chinese government enacted the programs and investment projects from the stimulus plan had positive effects to GDP. In terms of stimulating economic growth in the automobile industry, the funds did have immediate economic impacts. The incentive amount was not



		<p>considerably high, so government investment was minimal, and the automobile industry averted collapse.</p> <p>However, energy related savings and reductions of emissions was minimal and it is argued that a higher investment would be needed to have real influence in removing polluting vehicles and replacing with more efficient ones.</p>
<b>Creation of jobs</b>		<p>There was a small boost to employment (.21 percent) associated with the green measures, however, China is unique in that the state finds jobs for people so the impacts would be associated more so with movement between sectors rather than a change in total employment.</p> <p>The car scrapping scheme contributed .01 percent towards job creation in 2009 (0 percent in alternative scenario with reduced additional spending).</p>
<b>Improvements in human health and well being</b>	<ul style="list-style-type: none"> <li>• Reduce risk of respiratory and cardiovascular diseases, allergies, arthritis and rheumatism with warmer, drier, more comfortable indoor environments resulting from improved building insulation</li> </ul>	No information available.
<b>Increased access to energy and reduced fuel poverty</b>		Not applicable.
<b>Benefits to energy providers</b>	<ul style="list-style-type: none"> <li>• Reduced operating costs</li> <li>• System and network deferral</li> <li>• Increased reliability</li> <li>• Market price changes</li> <li>• Associated with marketing</li> </ul>	Not applicable.

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**Title:** 6.2 Umweltprämie: German Car Scrapping Scheme

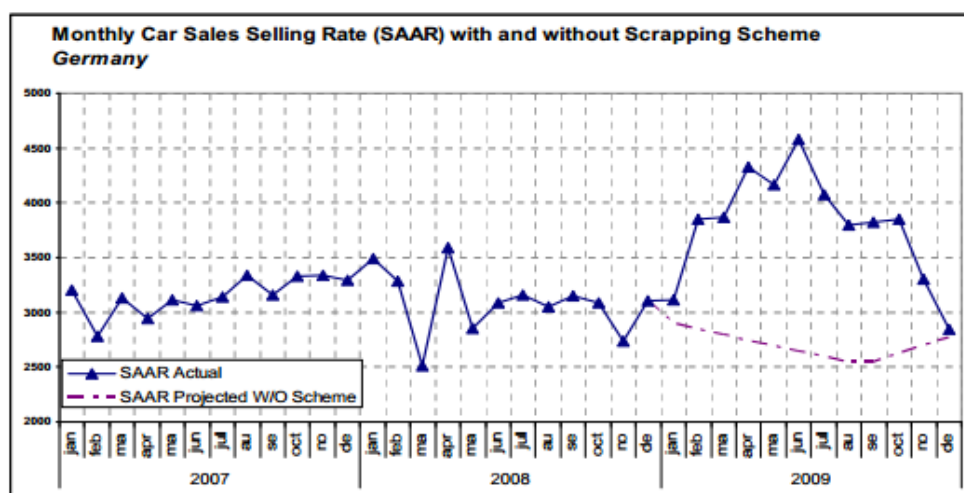
<b>Country:</b>	Germany	
<b>Sector:</b>	<b>Stage:</b> Finalized	<b>Type of policy/practice/instrument:</b>
Transport		Grants/Subsidies
<b>Sub-sector (if applicable):</b>	<b>Period:</b> 2009	

**Description**

In response to the 2008 economic crisis, several countries in the European Union (EU) adopted car scrapping schemes in 2009 as a method to provide demand side stimulus to the economy and the fledgling automobile industry. Germany became one of the thirteen countries to implement a car scrapping scheme. The German government provided an incentive of €2,500 for scrapping a vehicle over 9 years old and purchasing a new or one-year old replacement. Germany offered the highest incentive out of the EU programs, and successfully incentivized approximately two million vehicles. Due to the popularity of the program, the government increased the funding from €1.5 billion to €5 billion.

The objective was two-fold: economic and environmental. The primary goal was to achieve economic stability, with environmental and safety paybacks as added benefits. One, the scheme sought to replace old passenger vehicles associated with high emissions with new, more efficient vehicles. Secondly, it was designed to fight the negative effects of the global recession such as the decline of domestic car sales and to preserve the jobs at manufacturing facilities, auto dealerships, and other professions associated with the automobile industry. Due to the implementation of the scheme, German car producers were able to avoid production-stops, in particular for small cars. The total unit sales in Germany grew by 18% from January to April in comparison to 2008. This helped alleviate the steep decline (40%) of export sales. IHS Global Insights estimates that 1.14 million cars were bought that otherwise would not have been purchased.

**Figure 1: Monthly Car Sales Selling Rate with and without Scrapping Scheme in Germany**



Source: IHS Global Insight, 2010

From the environmental perspective, the scheme was non-targeted, meaning that there were no specified environmental criteria mandated by the program. The new vehicles did have to satisfy the Euro 4 emissions standard, however, this was already an EU requirement. The program did provide a tax rebate if new vehicles met a Euro 5 or Euro 6 standard.

The conditions for participation were as follows:

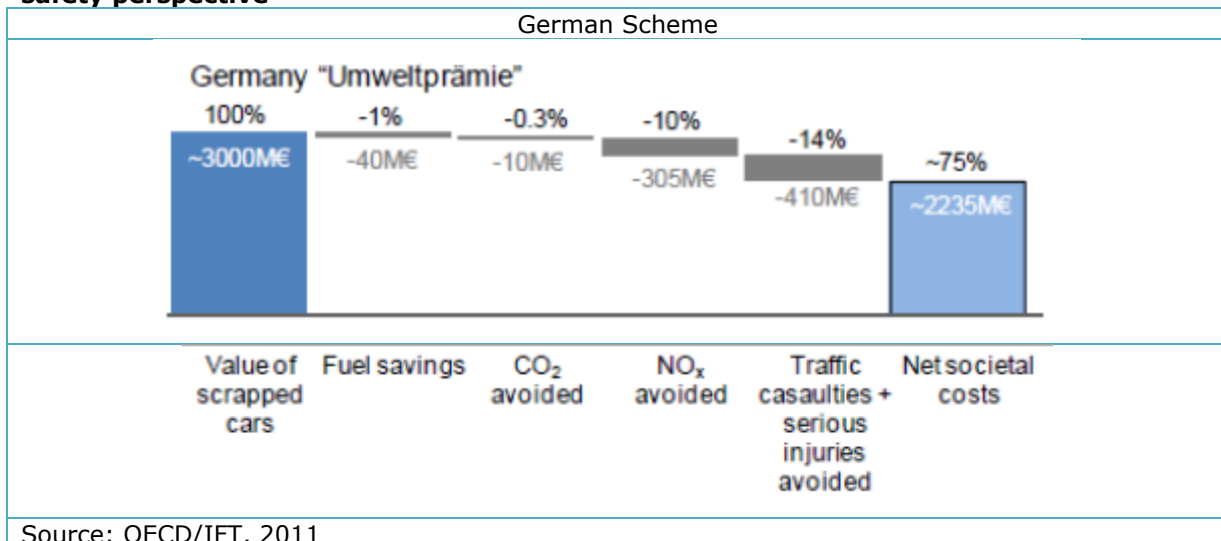
**Table 1: Conditions to achieve incentive**

Precondition		Other features	Incentive
Old car	New car		
<ul style="list-style-type: none"> <li>Minimum age of nine years</li> <li>Car registered to the applicant for at least one year</li> </ul>	<ul style="list-style-type: none"> <li>Fulfil emission standard Euro 4<sup>3</sup></li> <li>New car or vehicle registered with another person or company for not more than 14 months (Jahreswagen)<sup>4</sup></li> </ul>	<ul style="list-style-type: none"> <li>Private consumers only</li> <li>Short notice of policy</li> </ul>	<ul style="list-style-type: none"> <li>€2,500 per car</li> </ul>

Source: Bockers, Heimeshoff, Muller, 2012

As a non-target scheme, it was digestible and more accessible to consumers. Around 640,000 cars would not have been purchased without the scheme – meaning 40% of the cars purchased in 2009 would otherwise not have been purchased.<sup>5</sup> However, from an emissions reduction perspective, the cost effectiveness of the program is calculated to not be as effective.

**Figure 2: The cost-effectiveness of the scheme from an emissions reduction and traffic safety perspective**



Source: OECD/IFT, 2011

The figure above depicts the cost-effectiveness of the program in delivering lowering emissions and increased safety results, demonstrating benefits quantified representing only around 25% of the estimated costs. The CO<sub>2</sub> reduction from 2010 cumulatively to 2025 is approximately 200 thousand tonnes, amounting to a value of less than €10 million.

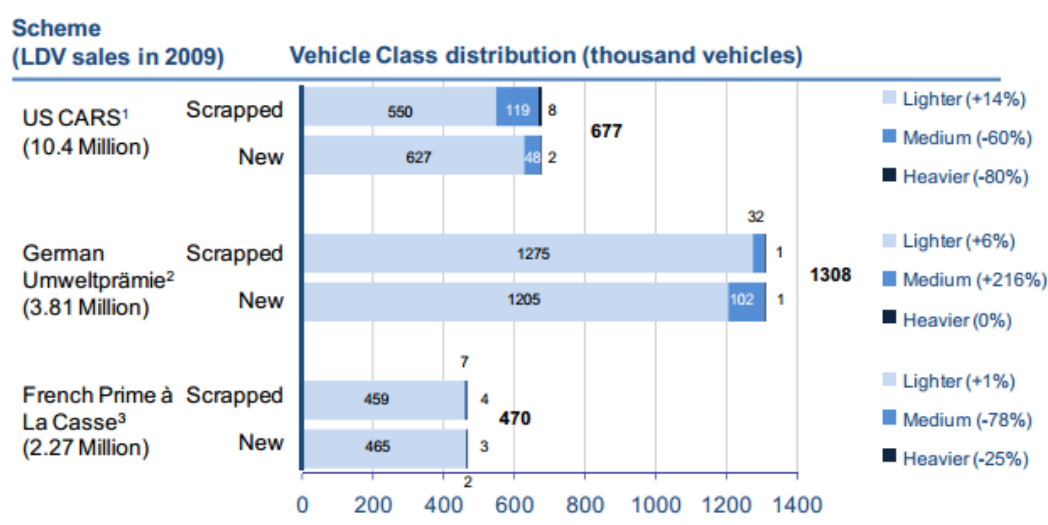
One visible trend was the “class” shift from lighter vehicles to medium ones. There was an increase of consumers trading in smaller vehicles for larger ones. Medium-sized vehicles contribute to higher CO<sub>2</sub> emissions than their lighter counterpart, and thus the increase of medium-sized vehicles on the road decreased the schemes overall potential of emissions reductions.

**Figure 3:**

<sup>3</sup> Euro 4 emissions norm was mandatory for all new car registrations in the EU since 2006

<sup>4</sup> Jahreswagen – a vehicle previously owned by the motor industry or distribution network, and carrying a strict definition

<sup>5</sup> Leheyda and Verboven; 2013



Source: OECD/ITF, 2011

Despite the class shift, overall this program mainly benefited the demand for mini and small cars, with 84% of newly registered cars fitting in the smaller categories. The new vehicles registered were approximately 90% petrol, 10% diesel.

Table 2 below demonstrates the actual total sales, average fuel consumption, total sales of domestic, and total sales of foreign cars as well as the estimated changes in these variables due to scrapping scheme based on the counterfactuals for specification.

**Table 2: Impacts of removing scrap schemes on total sales, fuel consumption, and brands:**

Total car sales		Average fuel consumption		Domestic brands		Foreign brands	
Actual (million)	% change	Actual (liter/100 km)	% change	Actual (million)	% change	Actual (million)	% change
3.63	-17.64	5.99	0.56	2.10	-25.97	1.52	-19.61

Source: Table based on Leheyda and Verboven, 2013.

**Actors**

Actor	Role
<b>Federal Office of Economics and Export Control (BAFA)</b>	The government agency responsible for the administration of the program
<b>Owner/Buyer</b>	Private car owners/buyers could receive an incentive for scrapping an old vehicle and replacing it with a new one. The owner/buyer had to provide evidence their old vehicle was of at least nine years old, and the replacement vehicle had to be new or maximum 14 months old with specified pre-ownership in Germany.
<b>Banking Sector</b>	Approximately 70% of new car purchases received financing; therefore the banking sector played a major role in the successful roll out of the scheme.
<b>Car Manufacturers &amp; Dealerships</b>	Both domestic and international automobile manufacturers benefited from the scheme. The mini and small vehicle categories particularly benefitted from the program.

## Barriers

According to the empirical evaluation of the German Accelerated Vehicle Retirement program, the results suggested that the policy had been successful in creating additional demand for new cars during the policy period. The overall effect of the German car scrapping was particularly positive for the two market segments – small and upper small segments. Even though, the car scrapping became very successful in terms of supporting the demand for new cars, during the implementation the program faced different issues:

**Financing:** The program started on 14 January 2009 and was supposed to end either upon exploitation of its budget or on 31 December 2009 whichever occurred first. The very stringent approach to timing conditions proved to be a bit impractical. The budget was exhausted almost in the middle of the program, the government decided to extend, for the positive impact on new car.

**Timing:** The very stringent approach to timing conditions proved to be a bit impractical, especially for sales of very popular new cars with delivery lead times. As a result, the timing requirements for the new/used car purchase and the incentive premium application on the one hand, and the new/used car registration and the old car scrapping on the other, were separated and ultimately set as follows:

Item	Start Date	End Date
New/Used Car Purchase & Incentive Premium Application	14-Jan-2009	31-Dec-2009
New/Used Car Registration & Scrapping of Old Cars	14-Jan-2009	30-Jun-2010

Source: IHS Global Insight, 2010

These issues were solved in order to achieve the primary objective of the program.

## Enablers for implementation

The German car industry holds an influential role inside and outside of Germany due to its dominance as a key player within the global car industry as well as to the German economy. The car scrapping scheme was strongly supported by leading politicians in Germany, and this support was instrumental in enabling the success of the program's outcomes. Additionally, the Verband deutscher Automobilindustrie (VDA), the German automobile industry interest group, has a wide and powerful reach uniting car manufactures and the component suppliers.

Launched under the name, Umweltprämie - 'Environmental bonus,' the dual economic and environmental component made it equally enticing to the German population. While several economists and lobbyists opposed this fiscal intervention as favoritism of the automobile sector, it remained popular within the leading political circles.

The structure and the incentive amount were also leading factors in ensuring success. The structure was simple and clear to understand. This eliminated confusion and encouraged participation. In addition, the incentive of €2,500 was the most generous out of the EU countries. The incentive amount is a key determining factor for success, and such was proved by the popularity and fund extension of the program.<sup>6</sup>

## Funding

Type of funds	Implementation aspect it supports
Domestic	<p>An incentive of €2,500 was provided by the German government for scrapping a vehicle over 9 years old and purchasing a new or one-year old replacement.</p> <p>The scrapping scheme funds come from Angela Merkel's €50 billion economic stimulus plan which includes improvements to roads, rail</p>

<sup>6</sup> Leheyda and Verboven, 2013

network, schools, and universities.

**Costs**

The budget for the program amounted to €1.5 billion– equivalent to 600,000 new cars. In March of 2009, the German government increased the scheme to €5 billion. The new budget was enough for approximately two million new and used cars.

**Energy savings and associated emission reductions**

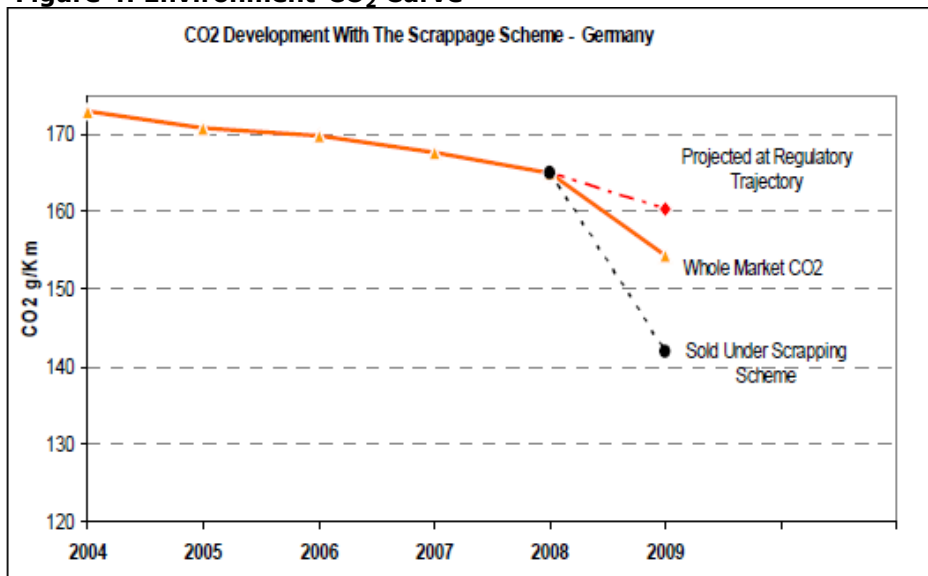
The environmental results of the program in 2009 were as follows:

Environment-CO <sub>2</sub>	
2009	
<b>Total CO<sub>2</sub> reduction-annual (tonnes CO<sub>2</sub>) and Cumulative CO<sub>2</sub> Abatement</b>	-540,819

Source: IHS Global Insight, 2010

The scrapping scheme did successfully push the market towards more efficient vehicles. Figure 4 demonstrates the average CO<sub>2</sub> emissions based on total new cars registered in 2009 versus the incentivized vehicles. The whole market averaged at 154.5 g/km CO<sub>2</sub> emissions; whereas the incentivized new car registrations were lower at 142g/km CO<sub>2</sub> emissions.

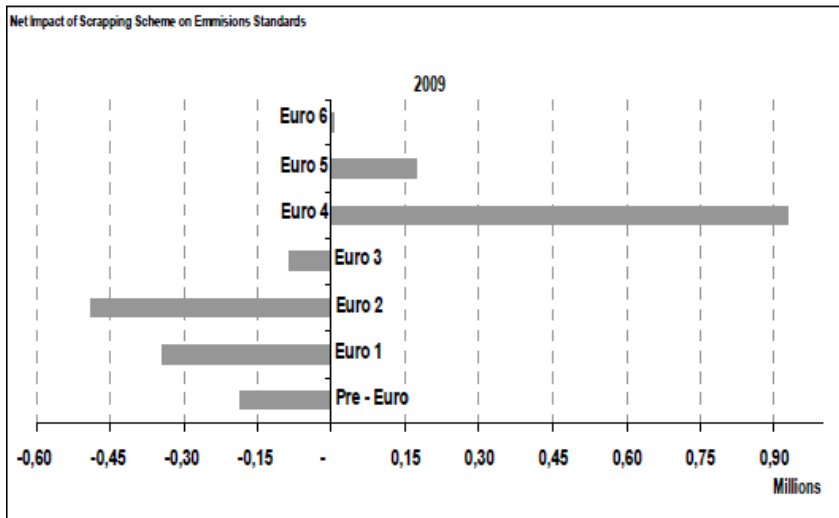
**Figure 4: Environment-CO<sub>2</sub> Curve**



Source: IHS Global Insight, 2010

Additionally, Figure 5 characterizes the influence of the scheme on emissions standards. As mentioned, vehicles purchased after 2006 were required to meet the Euro 4 standard. However, the scheme did speed up the process of removing vehicles of lower standards and replacing them with vehicles of Euro 4 and higher. The data shows that 98% of the cars scrapped were only complying with a Euro 2 standard or worse, indicating that it did successfully remove lower standard vehicles from the roads.

**Figure 5: Environment –Euro Norm Impact**



Source: IHS Global Insight, 2010

**Benefits**

Benefit		Description
<b>Reductions in energy demand</b>		Improved average fuel economy by 0.6%
<b>Mitigation of greenhouse gases</b>		Reduction of CO <sub>2</sub> from 2010 – 2030 period equals approx. 200 kTonnes  Reduction of NO <sub>x</sub> from 2010 – 2020 period equals approx. 32k Tonnes
<b>Improvement in air quality</b>		The scheme accelerated the elimination of vehicles below the Euro 4 standard – 98% of the vehicles scrapped were Euro 2 standard or lower.
<b>Macro-economic impacts</b>	<ul style="list-style-type: none"> <li>• Impacts on GDP</li> <li>• Trade balances</li> <li>• Energy prices</li> </ul>	<p>HIS Global Insight (2010) calculates the overall net impact of the scheme on the German economy as 3,530 M Euros, % GDP: 0.15.</p> <p>In regards to trade balances, non-targeted schemes typically have a larger stimulating effect on domestic car purchases. In the case of Germany it is suggested that domestic production was more positively impacted (See Table</p>



Benefit		Description
		2). However, there is also evidence that car imports increased during the scheme because small and economical cars are mostly produced by foreign manufacturers or outside of Germany. Korean, Italian, and French markets were positively affected from the increased purchase of small and economical vehicles.
<b>Impacts on public budgets</b>	<ul style="list-style-type: none"> <li>• Reductions in operational and capital expenditure for the public sector.</li> <li>• Effects attributed to structural changes to the economy and changed economic activity due to investment in energy efficiency</li> </ul>	<p>IHS Global Insight (2010) indicates that the scheme's Incremental value impact on public finance was -1,070 M Euros.</p> <p>While the incremental value on public finance was impacted negatively, the incremental value on demand equalled to 4,600 M Euros, bringing the overall net impact to 3,530 M Euros.</p>
<b>Creation of jobs</b>		The automobile industry in Germany employs 800,000 people, about 2% of the working population. The scheme preserved jobs within the industry which otherwise would have had a detrimental impact.
<b>Improvements in human health and well being</b>	<ul style="list-style-type: none"> <li>• Reduce risk of respiratory and cardiovascular diseases, allergies, arthritis and rheumatism with warmer, drier, more comfortable indoor environments resulting from improved building insulation</li> </ul>	<p>Injury reduction of 1.02% in 2010</p> <p>Approx. 20 avoided fatalities in 2010</p>
<b>Increased access to energy and reduced fuel poverty</b>		Not Relevant.
<b>Benefits to energy providers</b>	<ul style="list-style-type: none"> <li>• Reduced operating costs</li> <li>• System and network deferral</li> <li>• Increased reliability</li> <li>• Market price changes</li> <li>• Associated with marketing</li> </ul>	Not Relevant.

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**Title:**

## 6.3 Egypt Vehicle Scrapping Incentive and Recycling Program

<b>Country:</b>	Egypt	
<b>Sector:</b> Transport	<b>Stage:</b> In progress	<b>Type of policy/practice/instrument:</b>  Financial Incentive
<b>Sub-sector (if applicable):</b> Not applicable	<b>Period:</b> 2009	

### Description

In the period of 1981-2013, the transport sector in Egypt faced several challenges: gasoline and diesel fuel consumption increased at an average growth rate of about 5%, public transport had limited capacity, high levels of air and noise pollution, and inadequate financial resources. These conditions prompted the Egyptian government to develop and promote policy reforms in energy efficiency. One of the main issues that contribute to Egypt's energy inefficiency in the transport sector, and consequently the culprit of pollutant emissions, is the existence of a significant number of old vehicles still in circulation, characterized by low efficiency engines and poor maintenance.

The old vehicle scrapping and recycling program (OVSRP) was launched in 2009, with the objective to modernize the taxi fleet, minibuses, trailer truck and buses, and also reduce greenhouse gas emissions through the scrapping and replacement of old vehicles. Also, the program supports the enforcement of the Traffic Law no.121 of 2008, which dictates that all vehicles of mass transport 20 years old or older would not be granted licenses to operate.

The owners of the vehicles might volunteer their vehicles for scrapping and recycling, in exchange for financial incentives that would be used towards the purchase of new vehicles from participating vehicle dealers, under a monitored process.

The OVSRP is considered as the first United Nations Framework Convention on Climate Change (UNFCCC)'s transport-based implemented Clean Development Mechanisms (CDM) project worldwide, which is financially supported by the World Bank Carbon Fund. In specific, this program was designed under a Program of Activities (PoA) with a life-span of up to 28 years, comprised of individual Component Project Activities (CPAs), each lasting up to 10 years.

The program was designed under the features of a public private partnership (PPP) which means that costs, benefits and risks are shared between different stakeholders. The main stakeholders involved in the PPP are the following: three commercial banks, five vehicle companies, and an advertising firm and an insurance agency as private sector partners.

Under the program, vehicles greater than 20 years old are replaced with new vehicles which employ modern technologies that are more energy efficient, less polluting, and safer. About 90% of the 86,000 taxis in the region were over twenty years old, so the first phase of the program targeted taxis. Subsequent phases of the program will consider other transportation vehicles such as minibuses, buses, and trucks. All eligible new replacement vehicles are pre-approved by the Ministry of Finance, in agreement with the respective vehicle dealer. On the other hand, the substitution of vehicles is very clearly defined. There is only a choice between 5 fuel-efficient models. The average specific fuel consumption of new taxi vehicles is estimated at 9.4 liters per 100 km. In Egypt the five models that taxi drivers can choose from are assembled within the country. The vehicle scrapping and replacement happens at two designated sites. All program activities are carried out at these locations - representatives from the bank and from the five auto dealerships are on site.

According to a Prime Ministerial decree, the Ministry of Finance is authorized to disburse a subsidy of up to EGP 5,000 (USD 911) per eligible surrendered vehicle. This amount may be less, in the event: a) the vehicle is determined to be non-operational by the on-site engineer inspector; or b) in the event financial resources are insufficient to continue offering the full subsidy.

The steps to apply to the program are the following:

- Step 1: Application for Bank Loan
- Step 2: Designation of New Vehicle
- Step 3: Old Vehicle Inspection and Scrapping
- Step 4: Ministry of Finance Issuance of Subsidy Check
- Step 5: Participating Advertising Agency (Optional)
- Step 6: Bank Loan Final Approval
- Step 7: Receipt of New Vehicle
- Step 8: Licensing of New Vehicle and Final Document Processing
- Step 9: Advertising Application

The program will remain active for 28 years, replacing 45,000-50,000 taxis during the first phase. Then, pending approvals, taxis and other mass transport vehicles in other regions will be replaced in later phases. The first phase will reduce emissions by an estimated 1.3 –2.3 million tons CO<sub>2</sub>e over 10 years. The project is supported by carbon financing, which supports development of a recycling facility for the scrapped vehicles.

The total number of scrapped and recycled vehicles through the program implementation during the period (April 2009 to the end of 2013) accounted for more than 49,000 vehicles.

The Designated Operational Entity (UNFCCC accredited Clean Development Mechanism auditing firm) is responsible for validating the PoA and the first CPA was Tüv Nord.

### Actors

Actor	Responsibilities
The Ministry of Finance (MoF)	<ul style="list-style-type: none"> <li>• Coordinate and manage all activities.</li> <li>• Provides vehicles owners with payments for surrendered eligible vehicles.</li> <li>• Ensuring that obsolete old taxis are scrapped according to the prevailing environmental regulations and standards in order to avoid their re-use part of them</li> <li>• Bear new vehicles sales tax on behalf of vehicle’s owners</li> <li>• Exempts customs on imported components of vehicles</li> <li>• Guarantees given loans from banks against default in selected cases</li> <li>• Working with the World Bank Carbon Finance Unit to leverage carbon finance to support the development of a recycling facility that would ensure scrapped vehicle are permanently taken off the roads.</li> </ul>
The Ministry of Interior (MoI)	<ul style="list-style-type: none"> <li>• Providing land for processing/scrapping and recycling sites, as well as managing vehicle inspection and new vehicle licensing</li> <li>• Provides security and monitoring services for processing, scrapping and recycling sites</li> </ul>
The Ministry of Environment (MoE), EEAA and the CDM Awareness and Promotion Unit	<ul style="list-style-type: none"> <li>• Program development and monitoring of CDM project including issuing letter of approval of the program and its participation in achieving sustainable development</li> <li>• Program supervision from an environmental perspective such as emissions monitoring and issuing an environmental management plan at the scrapping and recycling site</li> <li>• Giving environmental approval for participating private sector entity to operate the scrapping and recycling facility</li> </ul>
The World Bank Carbon Finance Fund	<ul style="list-style-type: none"> <li>• Supporting the subsidy provided by the MoF. The incentive is essential in allowing people to scrap and purchase new vehicles, as well as</li> </ul>

	<ul style="list-style-type: none"> <li>ensure vehicles permanently taken off the roads</li> <li>Working with the Ministry of Finance to leverage carbon finance to support the development of a recycling facility</li> <li>Securing partners willing to buy carbon credits</li> </ul>
Banks National Bank of Egypt Banque Misr Bank of Alexandria	<ul style="list-style-type: none"> <li>Provide low-interest loans to eligible vehicle owners</li> <li>Provide branch office representative at scrapping and intermediate storage site in order to facilitate loans for eligible vehicle owners.</li> </ul>
The Vehicles Manufacturing Companies or auto dealers [Daewoo Egypt Aboul Fotouh (Speranza), Ghabbour Auto (Hyundai), Al Mansour Auto (Chevrolet), Al Amal (Lada & BYD), Wagih Abaza (Peugeot)]	<ul style="list-style-type: none"> <li>Prepare vehicles for mass transport use (e.g. install meters and paint exteriors).</li> <li>Provide up to 3 year warranty on vehicles.</li> <li>Provide the necessary routine maintenance.</li> <li>Guarantee loans against default as they repossess the vehicles and pays the loans to the bank.</li> <li>Buying old taxi licenses.</li> <li>Provide branch office representative at scrapping site to facilitate purchase of new car</li> </ul>
Insurance companies	<ul style="list-style-type: none"> <li>Providing insurance for the new vehicles at a discounted interest rate. The insurance companies provide insurance at an interest rate of 3.25% as opposed to the prevailing market rate of 6.35%.</li> </ul>
Advertising firms	<ul style="list-style-type: none"> <li>Using taxis as advertising space, to help reduce owners' payments.</li> </ul>

## Barriers

The OVSRP program has faced several challenges, related to the social aspects of the program, the following obstacles were identified:

**Lack of detailed information about the program procedures:** A lack of clear detailed information was the most important problem that the program might face. The procedures for purchasing were not clear to most of the beneficiaries. The Ministry of Finance already has a website to provide the necessary information. However, most of the taxi owners interviewed have never used a computer and know nothing about the website.

**Delay in delivering the new vehicles:** Due to the high demand on some types of cars, the factories can't fulfill the demand needs.

**Problems related to maintenance:** Based on the legislations and the guidelines of the program, vehicles must be maintained by the official certified car agencies and their corresponding car centers. Any maintenance by a private mechanic is not allowed. However, the certified car agency might be overcrowded or expensive.

In conclusion, the challenges and barriers which exist and might negatively affect the program effectiveness, sustainability and replications in the future are the following:

- Failure of some stakeholder such as advertising agency and taxi vehicles owners to fulfill their commitments,
- Rapid growth of the program which created increased service demand that was not expected by maintenance companies,
- Culture differences of taxi vehicles owners who are used to carrying out their vehicles' maintenance service at local maintenances shops,
- Degree of lack of coordination amongst different stakeholders,
- Waiting times for getting new vehicles.
- Political instability and economic growth decline.

## Enablers for implementation

The main drivers for the successful implementation of the program were:

**The Characteristics of Program Design and Set up:** One of the key elements of the success of the program was the building up of strong and effective partnerships between different stakeholders in the framework of the PPP. Also, key parties have voluntarily signed a cooperative agreement to participate in the program as well. Flexibility in the design, that allows periodic changes to be made on the program, proved to be effective. For example, the program is designed so as to cluster subprojects under the heading of OVSRP. Taxis in the Greater Cairo Area were the initial focus, and as the program implementation progressed, additional ‘projects’ have been and will continue to be added, such as expanding the program to other regions and to other old vehicles such as minibuses, buses, and trucks.

The utilization of one-stop-shop approach that helps old vehicles owners to scrap, and recycle old vehicles, get loans for purchasing new and fuel-efficient ones; moreover, the insurances and licenses in one site within a simple, effective and transparent scheme procedure. Therefore, high levels of program participation rates have been achieved.

Careful program planning, close monitoring in addition to partners meeting before program implementation, proved to be essential for ensuring better coordination among different stakeholders, keeping detailed records for project activities through its database, and for performing random surveys to estimate fuel saving and GHGs emissions reductions.

**The Package of Incentives Provided by Different Stakeholders:** The MoF provides a grant of LE 5000 for each scrapped vehicle; support the costs of scrapped vehicles, sales tax for new vehicles, custom duties fees for the components of new manufactured vehicles. Also, provides the necessary guarantee for loans from local banks.

Local Banks provide loans for old taxi owners to purchase new vehicles of a maximum LE 70 thousands for 60 installments over 5 years period with an interest rate of 7.5% compared to 9% as prevailing market interest rate.

Vehicles Manufacturing Companies and Suppliers offer lower prices for new vehicles (25%-30% less than market price), provide spare parts and the maintenance for new vehicles at reduced cost (a discount of 30% is given to spare parts).

The Insurance Company provides insurance against theft, fire, and accidents at an interest rate of 3.25% compared to 6.25% as prevailing market interest rate.

The Advertising Agency that has an exclusive right to advertise on new vehicles pay a monthly advertising cost of LE 550 for 5 year period for the benefit of taxi vehicles owners.

**Environmental, social, economic benefits:** The full impacts of the program are detailed in the benefits section below.

### Funding

Type of funds	Implementation aspect it supports	Amount (USD)
<b>Multi-lateral</b> The World Bank- Carbon Finance Fund	Financing	620.24 million
<b>Co-financing- Domestic funds</b> The Ministry of	Subsidy	

The MoF's total direct investment is estimated at USD 52 million, across all participating groups in the program such as banks, vehicles manufacturing companies, advertising firm, insurance companies, and recycling facility.

### Costs

Total project cost for the 2010-2018 period is estimated at US\$620.24 million (EGP3.48 billion), which includes the participant costs, incentives, subsidies, tax and custom waivers, program coordination and monitoring, and the preparation of the recycling plant (See Table 1).

**Table 1. Estimated cost 2010-2018**

	No. Of Vehicles	Per Vehicle (\$)*	Total (US\$m) (2010-18)
	49,000		
Max. Govt. Subsidy per vehicle**		911	44.64
Tax and Custom Waivers <sup>+</sup>		2,674	131.03
Vehicle price after discounts		8,833	432.82
Annual Program Coordination & Monitoring <sup>+</sup>			0.05
Recycling Site Preparation**			11.70
<b>Total Estimated Project Cost</b>			<b>\$620.24</b>

\* Based on US\$1=5.61 EGP (Egyptian pounds)

\*\* World Bank (2010). Carbon Finance Assessment Memorandum (CFAM)

+ UNFCCC (2009). *Egypt Vehicle Scrapping and Recycling Program*. CDM SSC-POA-DD Ver. 01. Oct. 6 '09

Source: Good practices in city energy efficiency, 2010

### Energy savings and associated emission reductions

Total fuel saving and GHGs emissions reduction estimated at about 0.6 million tons of oil equivalent and 1.7 million tons of CO<sub>2e</sub> over 10 year's period.

Overall emissions reductions from participating taxis in the Greater Cairo Region are expected to be 1.3 to 2.3 million tons CO<sub>2e</sub> from 2010 through 2019.

### Benefits

Benefit	Description
<b>Reductions in energy demand</b>	29% as of 2009 (~2,214 TJ)  Reduction of fuel consumption based on reported fuel efficiencies of the old and replacement vehicles; every vehicle replacement will save an estimated 13,508 litres of gasoline, and 15,099 m <sup>3</sup> of CNG over a 10-year period.
<b>Mitigation of greenhouse gases</b>	Overall emissions reductions from participating taxis in the Greater Cairo Region are expected to be 1.3 to 2.3 million tons CO <sub>2e</sub> from 2010 through 2019.

		Reduction of CH <sub>4</sub> and N <sub>2</sub> O emissions over the program period.
<b>Improvement in air quality</b>		<p>Improvement of air quality in the Greater Cairo Region. The GHG emissions expressed as CO<sub>2</sub>e is 25 percent less than the old taxis.</p> <p>The 49,000 participating vehicles in the program are expected to reduce air pollution by about 1 percent per year, which accounts for about USD 8.5 million.</p>
<b>Macro-economic impacts</b>	<ul style="list-style-type: none"> <li>• Impacts on GDP</li> <li>• Trade balances</li> <li>• Energy prices</li> </ul>	<p>Upgrade taxi fleet in addition to public transport buses and minibuses in later phases of program implementation. Upgrading urban transport will directly affect economic development in terms of reduced commuting time, increased productivity, and income generated from tourism.</p> <p>An annual fuel subsidy saving of about LE 399 million gained as a result of the operation of new efficient vehicles.</p>
<b>Impacts on public budgets</b>	<ul style="list-style-type: none"> <li>• Reductions in operational and capital expenditure for the public sector.</li> <li>• Effects attributed to structural changes to the economy and changed economic activity due to investment in energy efficiency</li> </ul>	<p>An annual fuel subsidy saving of about LE 466 million will be achieved by the scrapping of 49 thousand old taxi vehicles and replacement of new, energy efficiency vehicles.</p>
<b>Creation of jobs</b>		<p>Providing job opportunities in the different phases of the program: retirement-replacement activities, vehicle assembly, finance, insurance, scrapping and recycling, and vehicle inspection.</p> <p>10,500 direct new jobs and 1,000 indirect new jobs created in the form of drivers and staff at vehicle factories, car maintenance facilities, and car scrapping companies.<sup>7</sup></p>

7

<http://cdm.unfccc.int/filestorage/Q/P/J/QPJESG841BW9INDRUFYZA3005HLX7K/PoA%202897%20AFDB%20Report.PDF?t=VnN8bmxmZHN6fDDQCbwOieVNPXGtUJL5cZTu>



		Raising the income of taxi owners by about 40 percent, including at least 25 percent women, and taxi drivers by 100 percent through the creation of additional vehicles operation shifts and reduction of vehicles fuel consumption and maintenance costs (each taxi owner is expected to get an average monthly income of LE 1500 compared to LE 900 for the old taxi). <sup>8</sup>
<b>Improvements in human health and well being</b>	<ul style="list-style-type: none"> <li>• Reduce risk of respiratory and cardiovascular diseases, allergies, arthritis and rheumatism with warmer, drier, more comfortable indoor environments resulting from improved building insulation</li> </ul>	<p>The reduction of air pollution and GHG emissions caused by old taxis is expected to result in reduced number of diseases associated with pollution such as bronchitis, lung cancer, and heart disease.</p> <p>Reduction of overall poverty rate. It is expected that the poverty level will be reduced to 10 percent in 2020 from 21.6 percent in 2010.</p>
<b>Increased access to energy and reduced fuel poverty</b>		
		Not relevant.
<b>Benefits to energy providers</b>	<ul style="list-style-type: none"> <li>• Reduced operating costs</li> <li>• System and network deferral</li> <li>• Increased reliability</li> <li>• Market price changes</li> <li>• Associated with marketing</li> </ul>	Not applicable.

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## 7 VOLUNTARY PROGRAMS

Title:

### 7.1 Voluntary action to reduce industrial energy use per unit of production in Canada

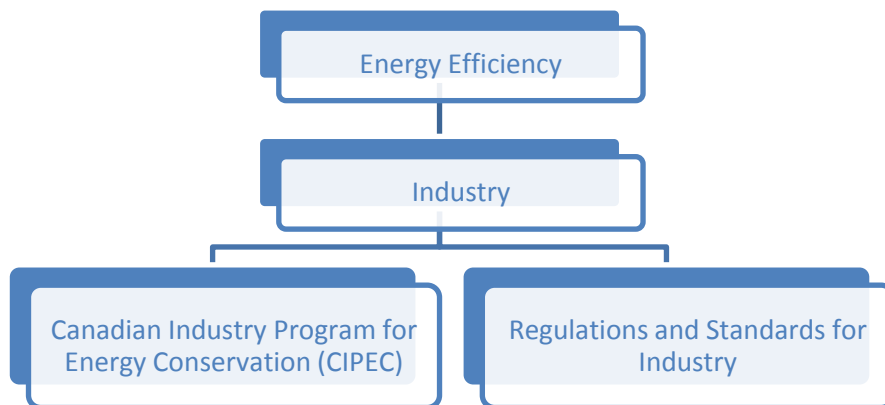
<b>Country:</b>	Canada	
<b>Sector: Energy efficiency general policies and development strategies</b>	<b>Stage:</b> ongoing	<b>Type of policy/practice/instrument:</b> Government-private agreement, Institutional capacities, incentives, financing
<b>Sub-sector (if applicable):</b>	<b>Period:</b> permanent	

#### General Description

##### The Canadian Industry Program for Energy Conservation (CIPEC)

CIPEC is a partnership between private industry and the federal Government, which aims to promote and improve Canada's industrial energy efficiency and reduce greenhouse gas emissions from energy use in the industrial sector. It includes more than 1,400 companies and trade associations, encouraging energy management best practices through dialogue and collaboration by the use of an Executive Board, Task Force Council and sector task forces.

The CIPEC leads the Canadian federal government's efforts to improve industrial energy efficiency in Canada through voluntary collaboration between industry and government. Delivered by the Industrial Programs Division of Natural Resources Canada's Office of Energy Efficiency (OEE), CIPEC was established in 1975 to promote energy efficiency within Canadian industry as a means of reducing energy use per unit of production, thereby improving the economic performance of Canadian industry, and helping Canada meet its climate change objectives. The programs' hierarchy is described on the chart below.



Although founded by the Federal Government, CIPEC's goals are only based on voluntary cooperation by the private sector. Initially developed for the mining and manufacturing sectors of Canada, CIPEC expanded its reach in 2001 to include the energy producing and construction sectors. CIPEC is organized by an Executive board, Sector task forces for each of the industrial sectors that participate in CIPEC and a coordinating Task force council and one of its main products is the publication of its annual report, which shares industrial energy use trends and successful energy efficiency experiences.

CIPEC sector task forces set targets and develop action plans for improving energy efficiency for its 25 industrial sectors based on their share information and identification of common needs and

best practices. The task forces are made of more than 50 industrial associations and more than 1,400 firms. Some of these firms become leaders of their task force in order to help turn CIPEC targets into action by making a commitment to establish and work toward energy efficiency targets. In return, these companies gain access to products and services to help manage their energy use more efficiently.

CIPEC's Secretariat services are provided by the Industrial Programs Division of the Office of Energy Efficiency. Industry Officers provide support to CIPEC Leader companies and work with CIPEC task forces to take care of organizational activities, such as coordinating informational meetings, publishing energy efficiency guidebooks and developing and delivering customized energy management workshops. The Secretariat is also responsible for coordinating the provision of technical support, such as benchmarking of energy intensity for various sectors. To this day, 43 specific benchmarking guides have been created by CIPEC's private companies and associations and are available for all its members.<sup>9</sup>

CIPEC offers its member companies a series of benefits, which can be divided on information access and financial assistance. On the information side, CIPEC provides:

- (a) Assistance on the Energy Management Practices Report
- (b) Guidance of the ISO 50001 Energy Management Systems Standard

Additionally, CIPEC member companies are eligible to financial assistance via the ecoENERGY Efficiency for Industry Financial Assistance, which provides funding of up to 50 percent of eligible costs to a maximum of \$40,000 for:

- (a) Implementing Energy Management Projects, which provides cost-shared assistance to support the implementation of the ISO 50001 Standard in industrial facilities; and
- (b) Conducting Process Integration and Computational Fluid Dynamics Studies. CIPEC provides financing to help reduce the cost of hiring a technical firm to conduct this type of assessment.

It is important to state that the OEE has parallel programs to CIPEC that are mandatory in nature, such as the Regulations and Standards for Industry, which is in charge of (1) setting minimum energy performance standards (MEPS) for certain industrial energy-using products, (2) of setting regulations to eliminate the least-energy-efficient products from the market and (3) enable voluntary labelling programs, such as Energy Star.

A recent addition to these standards is the implementation of the Canadian version of the ISO 50001 Energy Management Systems standard that will help establish the necessary processes to take a systematic approach to reduce energy consumption and intensity. Like most international standards, the nature of the ISO 50001 is voluntary. However, Canada is exploring the possibility of making it mandatory.

## Results

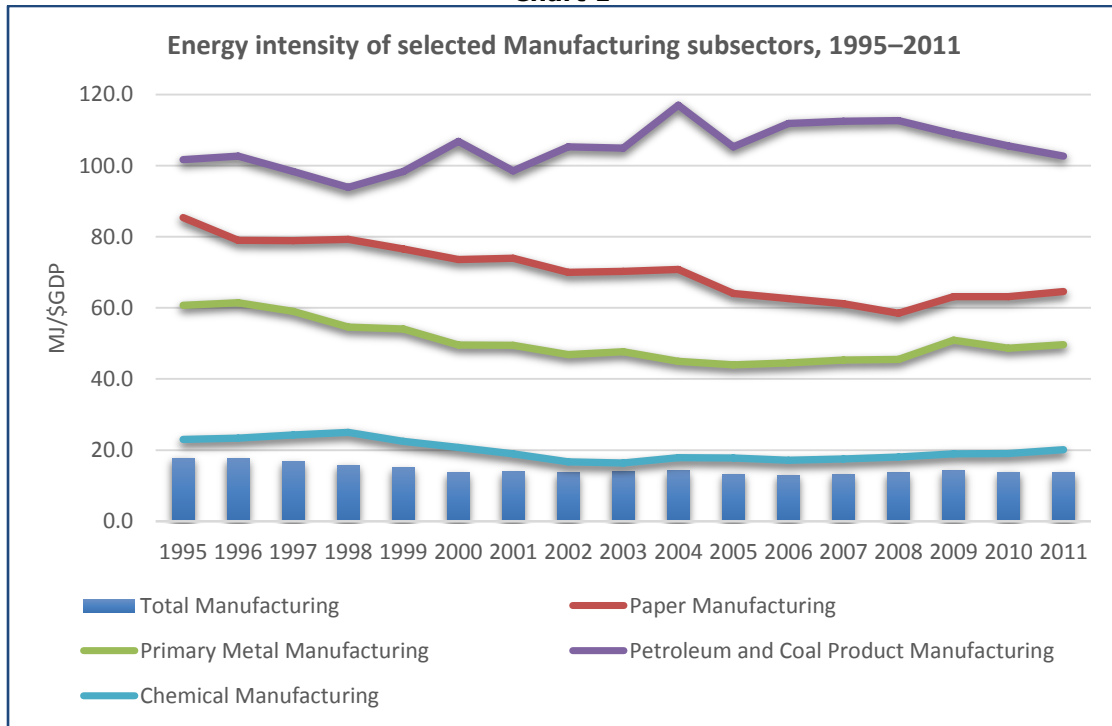
Canada's effort to improve energy efficiency in industry is done through a combination of mandatory and voluntary programs, standards and certifications. This way, the published results for CIPEC are aggregated numbers of the combined efforts without an accurate estimation from a regulated baseline. A disaggregation is done however between the increase on economic output and the lowering of the energy intensity achieved by the sectors, industries and firms associated to CIPEC with those of the entire economy of the country.

According to the 2011 Industrial Consumption of Energy survey, Canada's Manufacturing sector used 12.4 percent less energy from 1995 to 2011 (2,492 petajoules (PJ) down to 2,184) and its production went up 14.3 in the same period—\$140.3 to \$160.3 billion. This means that the sector's overall energy intensity decreased 23.3 percent, from 17.8 Megajoules per \$ (MJ/\$GDP) to 13.6 MJ/\$GDP (Charts 1 and 2). Finally, from 2010 to 2011, both energy consumption and output increased for this sector, but the latter at a faster rate, causing a slight decrease in energy intensity.

<sup>9</sup> Natural Resources Canada website. Energy Efficiency Division. CIPEC Benchmarking Guides: <http://www.nrcan.gc.ca/energy/efficiency/industry/technical-info/benchmarking/5171>

A couple of examples illustrate this trend in the Manufacturing sector. In three of the four subsectors, energy consumption and energy intensity decreased. Only the Petroleum and Coal Product subsector had a slightly larger increase in energy use than output, which caused a modest increase in energy intensity. Also, the Paper Manufacturing subsector production decreased 19.2 percent from 1995 to 2011, but then its energy consumption had an even bigger reduction, going down 38.9 percent<sup>10</sup>.

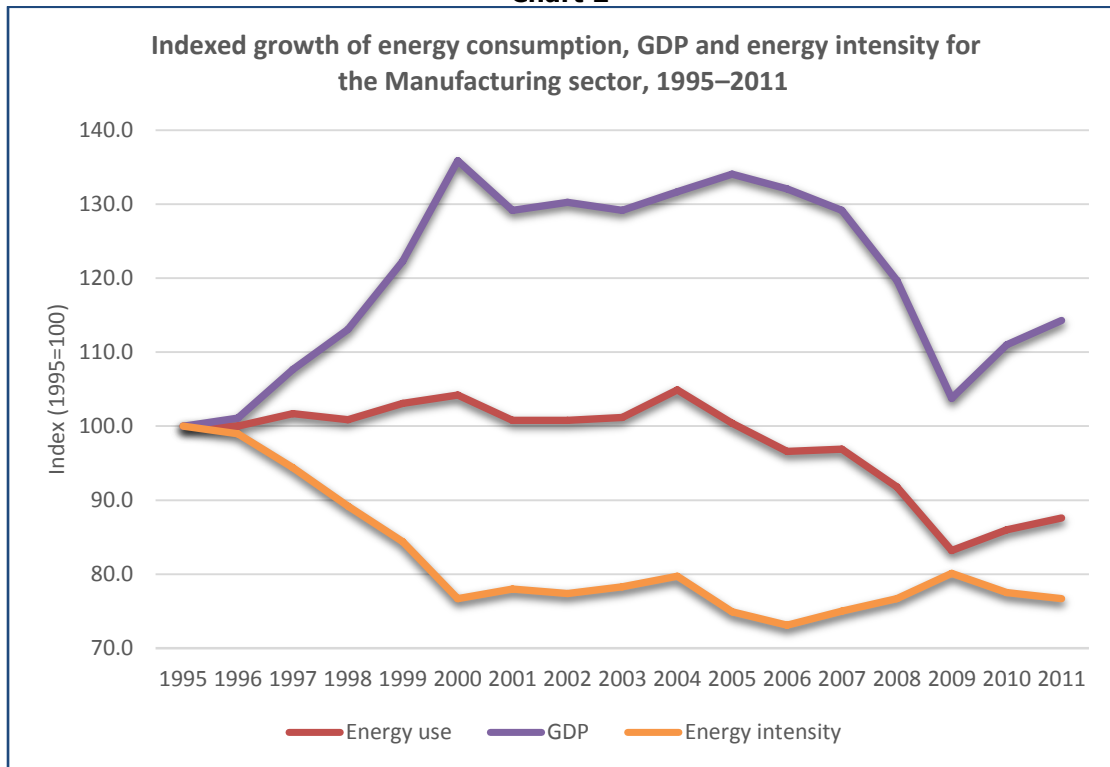
**Chart 1**



Source: Elaboration based on Natural Resources of Canada. Industrial Consumption of Energy (ICE) Survey Summary Report of Energy Use in the Canadian Manufacturing Sector 1995–2011

<sup>10</sup> Natural resources of Canada. Industrial Consumption of Energy (ICE) Survey Summary Report of Energy Use in the Canadian Manufacturing Sector 1995–2011

Chart 2



Source: Elaboration based on Natural Resources of Canada. Industrial Consumption of Energy (ICE) Survey Summary Report of Energy Use in the Canadian Manufacturing Sector 1995–2011

**Actors**

The most relevant actors are:

Actor	Role
CIPEC Executive Board	The Executive board conducts a top-down direction at the association, task force and company levels and its main role is to provide guidance and technical information to the members of the program to promote voluntary action on reducing industrial energy use per unit of production. The board has regular teleconferences and meetings throughout the year and share their activities and information via minutes and presentations that are available to all members. The board’s 12 members are all volunteers with experience in energy efficiency and work at senior management level in their respective firms. They are drawn from across the 21 CIPEC sectors.
Industrial Programs Division of the Office of Energy Efficiency	Provides support to all members of CIPEC by acting as the organization’s Secretariat, which is in charge of organizational aspects, such as coordinating informational meetings, publishing energy efficiency guidebooks and developing and delivering customized energy management workshops. This division is also responsible of providing technical support, such as coordinating the setting of benchmarking of energy intensity for various sectors. <sup>11</sup>
CIPEC Sector Task Forces: Industry Sectors	Set targets and develop action plans for improving energy efficiency

<sup>11</sup> Refer for the General description for more information on benchmarking

Actor	Role
<p>Trade Associations Participating in CIPEC</p> <p>Industrial r companies members of the Canadian Industry Program for Energy Conservation (CIPEC)</p>	<p>in more than 25 industrial sectors. More than 50 trade associations and hundreds of companies come together to form the task forces. Task force member companies and associations, via the Task Force Council meet regularly to share information, exchange ideas to improve energy efficiency, reduce greenhouse gas emissions and identify common needs and best practices.</p> <p>Participate in the CIPEC, as a vehicle to reach more 5000 Canadian companies that they represent.</p> <p>Fourteen hundred companies of 22 industrial sectors are members of CIPEC. The role of these companies is to comply with the commitment to increase energy efficiency by implementing, with their own budget, the suggested measures and technologies by CIPEC. By joining, these companies gain access to products and services to help manage their energy use more efficiently.</p>

**Barriers**

CIPEC is based on voluntary participation form private industrial companies to a government led strategy that includes market recognition and financing. Also, the ESCO businesses play an important role to provide services to the companies committed to CIPEC. However, there are significant barriers affecting the business and particularly the Energy Performance Contracting (EPC). These are:

- Lack of comprehensive knowledge of energy efficiency by the companies that the ESCOs are trying to sell their services, missing that way, an opportunity to reduce costs and gain market competitive advantages
- Access to adequate financing for energy efficiency projects, specially through the ESCO provision of technical, managerial and financial services
- Taxation. Income tax rescheduling, sales tax recovery, accelerated depreciation and other specific requirements that can make feasible energy efficiency projects and specifically the EPC market, are the usual barriers to spread the energy efficiency implementation throughout the industrial sector

**Enablers for implementation**

The main enablers to implement the CIPEC are:

- Strong commitment at high levels, on both government and private industry sectors.
- Financing is available for all companies in Canada that engage in energy efficiency practices, regardless of being a member of CIPEC. However, the program facilitates the information of different financing opportunities to its member companies through workshops, bulletins and the annual report.
- Tax incentives and exemptions are in place, such as capital cost allowance system (CCA), in order to claim the cost of equipment. The CCA system can be used by a company that uses energy efficiency equipment related to an energy performance contract (EPC) with an ESCO. If the company later decides to purchase that equipment, then that user can

generally claim capital cost allowance (CCA) on the capital cost of the property. Although this type of tax incentives and exemptions are available with no restrictions to all the firms in Canada, CIPEC disseminates and advises its member companies on how to better use these tax instruments.

### Costs and Financing

Financial Assistance for Industry, though no further information was available on this topic.

### Emission reductions

There are no figures available on the emissions reductions achieved directly from the CIPEC results on energy efficiency and clean energy developments. Nevertheless, information about total Canadian GHG emissions, per-capita and per-GDP and industrial and construction emissions show a clear reduction trend.

### Benefits

Benefit	Description
<b>Reductions in energy demand</b>	Information not available in public sources
<b>Mitigation of greenhouse gases</b>	Information not available in public sources
<b>Improvement in air quality</b>	Information not available in public sources
<b>Macro-economic impacts</b> <ul style="list-style-type: none"> <li>• Production</li> <li>• Value Added</li> </ul>	The energy efficiency plans have an important effect on productive sectors in terms of production and value added and cost reductions, although there were not estimates available to show that impact
<b>Impacts on public budgets</b> <ul style="list-style-type: none"> <li>• Reductions in operational and capital expenditure for the public sector</li> <li>• Effects attributed to structural changes to the economy and changed economic activity due to investment in energy efficiency, renewable energy</li> </ul>	
<b>Creation of jobs</b>	
<b>Improvements in human health and well being</b> <ul style="list-style-type: none"> <li>• Reduce risk of respiratory diseases, with more comfortable indoor environments resulting from the absence of combustion gases</li> </ul>	N.A.
<b>Increased access to energy and reduced fuel poverty</b>	N.A.
<b>Benefits to energy providers</b>	



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1. Government of Canada. Natural Resources Canada, Canadian Industry Program for Energy Conservation (CIPEC). <http://www.nrcan.gc.ca/energy/efficiency/industry/cipec/5153>
2. CIPEC Annual Report 2013 Natural resources of Canada. Industrial Consumption of Energy (ICE) Survey Summary Report of Energy Use in the Canadian Manufacturing Sector 1995–2011
3. Natural Resources of Canada .CIPEC. INCOME TAX ISSUES RELATED TO ENERGY PERFORMANCE CONTRACTING. An Understanding of Tax Rules Could Help With Your Energy Efficiency Initiatives.
4. Glenda Taylor & Philip B. Jago, Natural Resources Canada. Canadian Industry Program for Energy Conservation: The Voluntary Approach to Improving Industrial Energy Efficiency in Canada. 2005
5. World Resources Institute CAIT database and World Bank data bank

<b>Title:</b>		
7.2 Clean Production Agreements in Chile		
<b>Country:</b>	Chile	
<b>Sector:</b> Multisectorial	<b>Stage:</b> Finalized <sup>12</sup>	<b>Type of policy/practice/instrument:</b> Voluntary agreement
<b>Sub-sector (if applicable):</b>	<b>Period:</b> 1999 - 2009	

### Description

Chile's National Cleaner Production Council was created by law in 1998. It is defined as a forum for dialogue and joint action between public and private sector actors, to disseminate and establish an environmental management approach that emphasises pollution prevention, rather than pollution clean-up. The Council seeks to increase the competitiveness of domestic industry, with a focus on small- and medium-sized enterprises.

The Council is a public-private entity, with a management board including representatives from seven public agencies, six sectorial associations and one from the Workers Central Union.<sup>13</sup> Governmental representatives are appointed by the President and usually replaced when government changes.

So-called 'voluntary agreements' are the Council's main instrument to achieve its goals. Through these covenants companies and public authorities agree on a set of voluntary goals, procedures, incentives and mechanisms to improve the environmental performance of the industry concerned, as well as to increase its competitiveness and the efficiency of its procedures. The covenants have also played a role in conflict resolution. The agreements are signed by the relevant business association, the individual company(ies), and the relevant public agencies. The text contains specific deadlines for meeting the goals sought.

To support the Council's work, Chile's National Institute of Standardisation developed four norms, which govern the development, implementation and certification of compliance of the agreements. These norms concern specifications (NCh 2797); diagnosis, monitoring and control, final assessment and certification of compliance (NCh 2807); requirements for auditors final evaluation (NCh 2825); and vocabulary applied to the certification system (NCh 2796).<sup>14</sup>

From creation of the agreement to conclusion, a typical process entails the following steps: diagnosis (study of gaps), negotiation, signature, initial evaluation of facilities, implementation of measures, final audit, and validation by public agencies and certification according to Chilean norms.<sup>15</sup>

By 2010 the Council had carried out cost-benefit analyses and assessed the environmental impact of 19 of its initial 54 agreements. The 19 agreements concerned had been entered into with the following sectors or subsectors of the economy: foundries (first agreement), construction (in Santiago de Chile, the capital), pork production, salmon and trout production, wineries, handmade bricks (one regional producer established in the city of Puente Alto), pisco and pisco grape production and processing, foundries (second agreement), regional sawmills and remanufacturing industry (Bio Bio and Araucania), regional frozen foods processing plants (Bio Bio), pig production industry, industrial solid waste management (by regional chemical companies in Valparaiso), fruit and vegetables processing industry, fast-food restaurants, inner-city industrial sector (San

Some 'cleaner production agreements' are currently active. However, this analysis focuses on the results of 19 agreements already finished.

<sup>13</sup> Central Única de Trabajadores, in Spanish.

<sup>14</sup> NCh stands for 'Norma Chilena' (Chilean norm, in English).

<sup>15</sup> If applicable, an agreement will be subject to a specific norm, which are listed under Chile's National Institute of Standardisation <http://www.inn.cl/ventas/normas/portada/>

Bernardo), beach tourist restaurants (in the city of Concon), local food and lodging firms (in Easter Island), cured meat producing and processing, and egg production.

### Actors

Actor	Role
National Cleaner Production Council	The Council oversees all aspects related to the implementation of the agreements. In addition, it conducts complementary activities (related to technology dissemination and information sharing).
Ministries: <ul style="list-style-type: none"> <li>economy</li> <li>environment</li> <li>energy</li> </ul>	These ministries are part of the board and their role, according to the law, is to approve cleaner production policies, regularly monitor compliance with these policies, provide guidance, make decisions on new initiatives, and develop long term strategies in support of the agreement process.
Other government agencies: <ul style="list-style-type: none"> <li>Production Development Corporation</li> <li>Agriculture and Livestock Service</li> </ul>	When required by the Council, these agencies provide staff time and complementary resources under specific bilateral agreements, special agreements or specific initiatives. Some of these complementary contributions can be in the form of additional technical and financial assistance, such as feasibility studies, pre-investment activities, training courses, audits, site visits and development of technical studies and manuals related to activities performed by clean production firms.
Industrial associations: <ul style="list-style-type: none"> <li>National Society of Agriculture</li> <li>Confederation of Production and Commerce</li> <li>National Corporation for Exporters</li> </ul>	The associations provide technical assistance and establish communications with their respective members. It hires consultants to support the implementation of the agreement at the level of each participating firm. Funding is provided jointly by the associations and the state government.

### Barriers

Uncertainty about expectations on the part of both public and private actors is the main barrier to implementation of the agreements. Companies lack certainty about future public policies, notably whether or not financial support and incentives for the programme will continue to be available, and whether or not future administrations will increase the stringency of environmental regulations. In turn government agencies are hesitant to provide financial information and disburse funds for firms they see as too small, lacking expertise or having no history of implementing similar programmes.

Another barrier is the weakness of regulations. Chile used to have few regulations in this area, which discouraged firms from adopting new technologies and innovative forms of production. At present regulations are perceived as constraining innovation, because they are overly prescriptive, from the point of view of industry.

Limited access to new technologies represents a further barrier to implementation of the agreements. The Chilean market for cleaner technologies is neither well developed nor dynamic: supply is limited and cost analyses scarce. As a result, small- and medium-sized industries find it difficult to evaluate among technology options. This is one of the main reasons for including cost analyses in the agreements.

### Enablers for implementation

Through its work with the Production Development Corporation, the Council seeks to promote business interests, notably improving efficiency and productivity as a means of increasing the competitiveness of industry. It effectively plays a mediator role, helping forge consensus between the interests of industry and those of government. This mediation takes place particularly during the negotiation stages of the agreement.

Trade associations play a key role by supporting the implementation of the agreements among their member firms. As trade associations represent a large number of companies, their input helps lower transaction costs significantly. For instance, the negotiations to sign agreements for winemakers, bakers and honey producers, involved more than 200 companies. Doing so would have been next to impossible without the participation of the trade associations.

Shortly after the creation of the Council two consecutive ministers of economy strongly supported cleaner production policies, created the required institutions and secured the necessary budget for funding the agreements. This was instrumental in getting the concept to work. In turn, the head of the Confederation on Production and Commerce made it mandatory for its member associations to participate in the agreements.<sup>16</sup>

### **Funding**

The funding for each agreement is provided jointly by the industrial associations, the NCCP and the government. The rules of the Cleaner Production Fund set the maximum and minimum share that the Council can contribute to each agreement, as well as the maximum amount (in absolute terms) that the Council can contribute to any given agreement. Based on these rules, the Council allocates its budget. Shares range from 20 to 80 percent with a maximum amount of USD 120,000. The Council feel that funds are used more effectively when it contributes larger shares to a smaller number of agreements (usually focusing on the industrial associations that have with fewer funds).

Each actor contributes financial and human resources as follows:

- The Council contributes with financial resources, and provides staff time. Other public agencies contribute with staff time only. The staff time provided by the Council is often more important than the combined staff time provided by all other agencies. The Council finances the sustainability diagnosis of the implementing sector, internal audits, technical assistance, training, certification, impact study and overall coordination. However, this financial assistance does not cover the acquisition of technology.
- Industrial associations contribute with financial resources at the time of negotiating the agreement. Funding levels are specified in the final text of the agreement.
- Individual firms contribute with human and financial resources for the implementation of the agreement. Funding levels are note specified in the final text of the agreement.

### **Costs**

In the period 1999-2009 Council costs amounted to USD 38 million.<sup>17</sup> These costs correspond to the 54 agreements that the Council had entered into up till 2009. Costs incurred by other public agencies have not been valued.

By one estimate, private investments associated with the 19 agreements being documented amounted to USD 53 million. This includes both financial and human resources spent at the development and implementation levels of the agreements by both sectorial associations and individual companies.

### **Energy savings and associated emission reductions**

The Australian Carbon Reduction Institute estimated the reductions of 16 agreements (out of the 54 that had been implemented and certified from 2002 to 2010). The results show that the activities in those 16 sectors contributed to reducing just over 4 million tonnes of CO<sub>2</sub>e (that is, an average annual reduction of 31.6 KtCO<sub>2</sub>e by each of the agreements).

A study conducted in 2013 identified a total of 76 agreements signed to that date, 45 of which were in the stage of diagnosis and expected to be finished before 2016. Extrapolating the above

<sup>16</sup> CPC is the umbrella association that unites the 6 largest economic production sectors in the country: agriculture, mining, manufacturing, construction, retail and banking.

<sup>17</sup> To calculate this estimate, the figures were expressed in 2010 prices and then converted from CLP to USD using a 500 to 1 exchange rate.

annual emission reduction rate, those agreements would result in a total reduction of about 7.0 Mt CO<sub>2</sub>e in the period from 2012 till 2016.

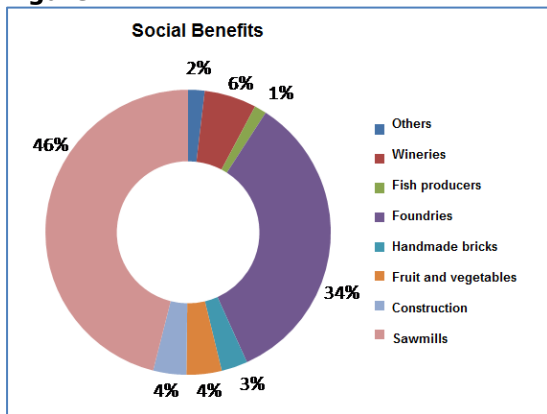
**Benefits**

With a view to determining a cost-benefit ratio, starting in 2005 each agreement had to incorporate an internal evaluation of its environmental and economic benefits. However, not all possible social benefits were included in this evaluation. For this reason the Council requested an external evaluation of the 19 agreements referred to above.<sup>18</sup>

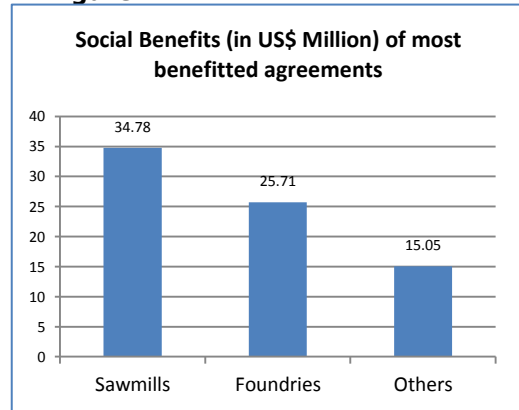
The net present value of the agreements was estimated at USD 397 million over the seven-year performance period. These benefits are in addition to the private return on investment by the companies that implemented the agreements. The latter was evaluated at USD 213 million, bringing the total benefits (social and private) to USD 610 million.

Figure 1 shows the percentage of social benefits per sector. Figure 2 shows the percentage of social benefits of the three sectors with the highest social benefits and Figure 3 shows the percentage of the social benefits of the other sectors.

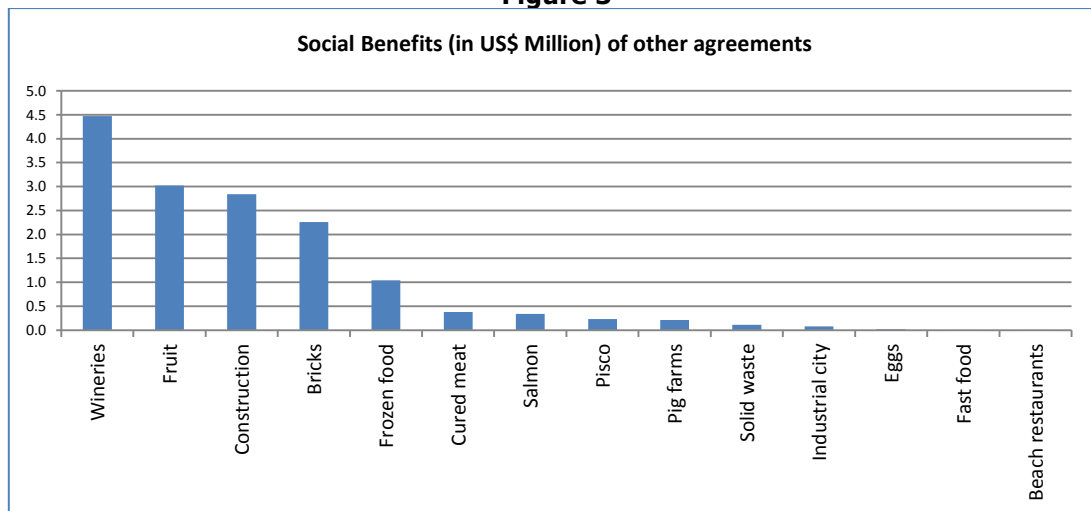
**Figure 1**



**Figure 2**



**Figure 3**



<sup>18</sup> Study on the impact of 19 cleaner production agreements, Faculty of Economics, Central University of Chile. January 2011.

Benefit		Description
<b>Reductions in energy demand</b>		Unknown
<b>Mitigation of greenhouse gases</b>		18.3 million tons of CO <sub>2</sub> <sup>19</sup>
<b>Improvement in air quality</b>		
<b>Macro-economic impacts</b>	<ul style="list-style-type: none"> <li>• Impacts on GDP</li> <li>• Trade balances</li> <li>• Energy prices</li> </ul>	Unknown <sup>20</sup>
<b>Impacts on public budgets</b>	<ul style="list-style-type: none"> <li>• Reductions in operational and capital expenditure for the public sector.</li> <li>• Effects attributed to structural changes to the economy and changed economic activity due to investment in energy efficiency</li> </ul>	Unknown <sup>21</sup>
<b>Creation of jobs</b>		There is no official estimation of jobs created derived from the implementation of the agreements. The Council only points out to the increase of work for consulting firms and technology providers, but there is no estimate available. <sup>22</sup>
<b>Improvements in human health and well being</b>	<ul style="list-style-type: none"> <li>• Reduce risk of respiratory and cardiovascular diseases, allergies, arthritis and rheumatism with warmer, drier, more comfortable indoor environments resulting from improved building insulation</li> </ul>	There is no focus on this matter in the making of the agreements, neither estimates of the impact of these on human health and wellbeing. If any, the impact must be indirect. <sup>23</sup>
<b>Increased access to energy and reduced fuel poverty</b>		There is no focus on this matter in the making of agreements, neither estimates of the impact of these on access to energy and reduced poverty. If any, the impact must be indirect. <sup>24</sup>
<b>Benefits to energy providers</b>	<ul style="list-style-type: none"> <li>• Reduced operating costs</li> <li>• System and network deferral</li> <li>• Increased reliability</li> <li>• Market price changes</li> <li>• Associated with marketing</li> </ul>	There is no focus on this matter in the making of agreements, neither estimates of the impact of these on benefits to energy providers. If any, the impact must be indirect. <sup>25</sup>

<sup>19</sup> Please refer to the Energy savings and associated emission reductions section.

<sup>20</sup> This information was provided by NCCP's Executive Director

<sup>21</sup> Id.

<sup>22</sup> Id.

<sup>23</sup> Id.

<sup>24</sup> Id.

<sup>25</sup> Id.

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- Interview: Juan Ladrón de Guevara, Executive Director, National Council for Clean Production. October 16<sup>th</sup> and November 10<sup>th</sup>, 2014 and March 5<sup>th</sup>, 2015
- United Nations Environment Programme, "CPA NAMA Recognition".

**Title:**

## 7.3 Keidanren Voluntary Action Plan on the Environment

<b>Country:</b>	Japan	
<b>Sector: Industry</b>	<b>Stage:</b> Finished	<b>Type of policy/practice/instrument:</b> Voluntary Instrument
<b>Sub-sector: Chemical</b>	<b>Period:</b> 1997-2012	

### Description

#### Background and objectives

The Keidanren Voluntary Action Plan (from now on, the Plan) was a non-binding environmental commitment, adopted by the Japanese Business Federation Nippon Keidanren. Its objective was to promote practical and effective efforts to counter global warming within the business community. These actions were embodied in the Keidanren Action Plan on the Environment (Section on Global Warming Measures) that was announced in the month of June 1997.

This plan was part of a more comprehensive initiative by Nippon Keidanren called, "Declaration on Voluntary Action of Japanese Industry Directed at conservation of Global Environment in the 21st Century" that was presented a year earlier as an invitation to the private sector to commit to integrated environmental voluntary action plans based on the "Ten-Point-Environmental Guidelines for the Japanese Enterprise Operating Abroad", which had been published in 1991<sup>26</sup>

Although the original goal of the Plan in 1997 was to achieve a "reduction of CO<sub>2</sub> emissions from participating industries in the industrial and energy conversion sectors in the year 2010 to below the levels of 1990", by 1998 the Plan changed its goal to "achieving the target level as an average over the five years of the Kyoto Protocol first commitment period (2008–2012)" aiming at contributing the overall achievement of Japan's Kyoto Protocol commitment.<sup>27</sup>

#### Membership

The Plan was originally created with the commitment of 37 industries, including manufacturing, energy, distribution, transport, construction, trade, and insurance and by 2012, 114 industries were part of the Plan, which represented 50% of total emissions in Japan, 20% of the commercial sector and 80% of emissions from the industrial and energy conversion sectors.

#### Monitoring and reporting

Each participating firm sets its own targets and depending on their line of production, each firm could choose any of the following indicators: CO<sub>2</sub> emissions; CO<sub>2</sub> intensity; energy consumption and energy intensity. The companies were also allowed to use both, domestic and Kyoto Mechanisms credits to supplement their reduction efforts.<sup>28</sup> This voluntary regulation might seem too soft for outsiders. However, in Japanese business culture is very important to demonstrate their peers that the company can set high standards and targets. Setting too low standards or failing to reach their targets can greatly affect the image and prestige of the company.

#### Compliance and enforcement

<sup>26</sup> The Ten-Point-Environmental Guidelines was published by Keidanren in collaboration with The World Bank and The UN Development Programme.

<sup>27</sup> 6% reduction from the 1990 level during the first commitment period

<sup>28</sup> All individual voluntary targets and measures can be found in this website:  
<http://www.keidanren.or.jp/english/policy/pol058/>



In order to improve the transparency, credibility and probability of target achievement with regards to these voluntary action plans, the government, via the Ministry of Economy Trade and Industry (METI), conducted periodic follow-ups in the form of advisory councils, following the guidelines of the Kyoto Protocol Target Achievement Plan.

The action plans of the 41 industries under the jurisdiction of METI were evaluated and verified in seven industry-specific working groups. The outcomes of each working group were reported for follow up to the Plan.<sup>29</sup>

### Example

A successful initiative of the Keidanren Action Plan was carried out by the chemical industry, which achieved significant savings on energy through energy efficiency actions, and can thus serve as an example for similar sectors at the international level.

The Japan Chemical Industry Association (JCIA) adopted the first action plan by implementing energy efficiency activities with the target of reducing the energy input per unit of output in 2010 to 90% that of 1990<sup>30</sup>, the measures also helped develop process technologies related to energy conservation and environmental harmony.

The Plan contemplates 4 major activities, labelled PDAC cycles, for each industry sector:

Activities	Description
<b>Plan</b>	<ul style="list-style-type: none"> <li>Setting of targets, measures, mitigation actions, energy efficiency activities and social commitments</li> <li>Updating targets and measures on a periodical basis</li> </ul>
<b>Do</b>	<ul style="list-style-type: none"> <li>Implementation of the action and participated in international cooperative schemes</li> </ul>
<b>Action</b>	<ul style="list-style-type: none"> <li>Additional measures for further actions to reduce CO<sub>2</sub></li> <li>Public disclosure of the follow-up results through the Internet and other means</li> </ul>
<b>Check</b>	<ul style="list-style-type: none"> <li>Periodical review for each year of implementation by a third-party evaluator and Government Councils - Ministry of Economy Trade and Industry (METI)</li> </ul>

In 2007, JCIA updated its 2012 target and measures:

- Decrease of energy intensity to an average of 80% compared to 1990 levels.
- Publish a technology handbook for energy and environment conservation for the Japanese chemical industry and share it with other industries in developing countries through participation in international cooperative schemes.
- Develop and disseminate new materials for energy conservation on an ongoing basis.
- Create guidelines for energy conservation activities in the commercial sector—corporate and administrative buildings, stores, etc.
- Develop energy conservation activities in the residential sector in order to create public awareness for energy conservation.

Keidanren included these voluntary emission reductions within the mitigation reports of the Japanese Government for compliance with the Kyoto Protocol.

Even though the program initially created targets for reduce emission reductions, the activities to achieve these objectives included specific energy efficiency targets within the process. The measures set to achieve these energy efficiency targets were:

- Recovery of waste energy: using waste heat and cool energy, to convert waste fluid, oil and gas into fuel, heat storage, etc.
- Rationalization of process: process conversion, system change, catalyst change, etc.

<sup>29</sup>

[http://www.meti.go.jp/english/policy/energy\\_environment/global\\_warming/voluntary\\_approach/pdf/summary\\_documents\\_01.pdf](http://www.meti.go.jp/english/policy/energy_environment/global_warming/voluntary_approach/pdf/summary_documents_01.pdf)

<sup>30</sup> <http://www.keidanren.or.jp/english/policy/pol058/g09.html>

- Efficiency improvement of facilities and equipment.
- Improvement of operational methods: condition change of pressure, temperature, flow, reduction of the number of operating units, advanced control, reuse/recycle, etc.
- Fuel conversion

Since the Keidanren Plan was scheduled to end in 2012, the Japanese business community has announced continuing their efforts to address climate change by reducing their own CO<sub>2</sub> emissions through a new project called "Low Carbon Society" and several industrial sectors have declared their intentions to participate.

### Actors

Actor	Role
<b>Industrial associations and private companies</b>	<ul style="list-style-type: none"> <li>• Setting its own targets and indicators based on a voluntary commitment.</li> <li>• Implementation of the necessary actions to reach the targets with no external assistance.</li> <li>• Report their emission reductions.</li> </ul>
<b>Nippon Keidanren</b>	<ul style="list-style-type: none"> <li>• Invite industrial organizations and industrial associations to be part of the voluntary action plan.</li> <li>• Publish the companies' targets and their level of compliance to be shared with the rest of the business community in an annual report in order to give firms a strong incentive to comply.</li> </ul>
<b>Ministry of Economy trade and Industry (METI)</b>	<ul style="list-style-type: none"> <li>• The role of METI was to review and provide feedback on the progress to achieve the targets set by each firm through advisory councils.</li> <li>• Reviewed the annual reports using the general guidelines of the Kyoto Protocol and presented the aggregated information to the UNFCCC, as part of Japan's emission reductions commitment.</li> </ul>

### Barriers

The main barrier was the difficulty to identify new actions for energy efficiency due to all actions already implemented; to overcome this barrier the JCIA published the best practices for energy efficiency measures in the chemical sector.

A significant barrier for the implementation of the voluntary plan was until 2011, when the Great East Japan earthquake had several impacts in the country like the power shortage problem, in specific for the chemical sector the production was 8 points less than the previous year, and the energy intensity increase one point reducing the possibility to reach the target.

### Enablers for implementation

The main enabler for the implementation of this program was the regulation set within the Energy Conservation Act of Japan, that required improvements in energy intensity of 1% or more annually, and the necessity of having an energy manager to implement energy efficiency measures within its management structure as well.

Another enabler for the implementation of the program was the support given by the government to the industry sector operations in the form of permanent energy audits through the Energy Conservation Centre of Japan, free of charge, under the Plan. In addition, guidelines with best practices were also published for companies involved with the program.

The Plan was voluntary, however an annual review was carried out and the results of the same were published publicly. A sanction was not contemplated if a company did not reach its intended target. However these results were published on a "shame list", which affects the overall image of the company, which is extremely important in the business community of Japan.

The targets and measures included in the action plan for the chemical sector were based on regulatory binding requirements, thus reducing potential barriers for accomplishing its targets.

**Funding and Costs**

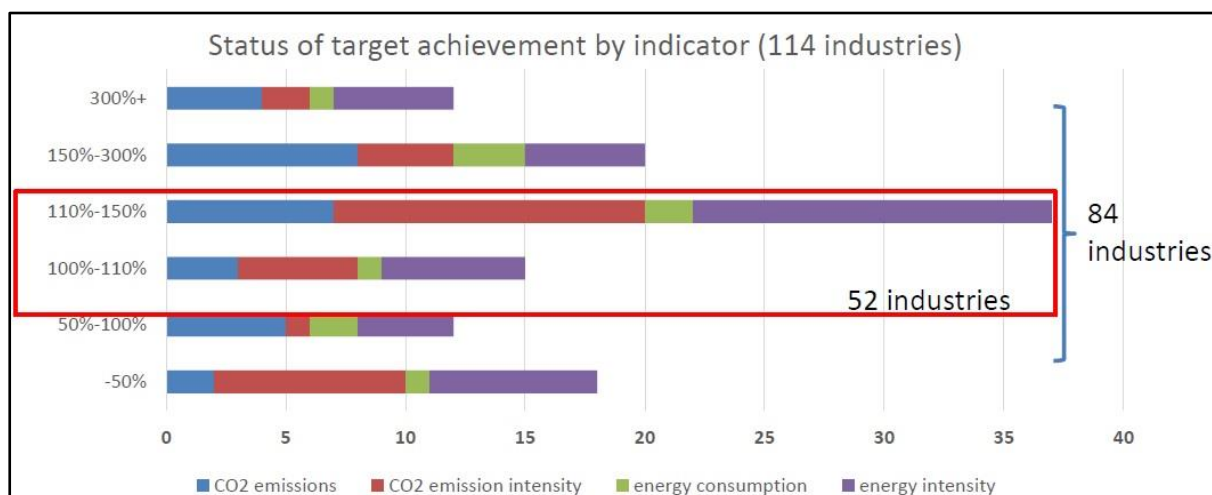
The Keidanren Voluntary Action Plan avoided higher costs from future government regulations because of the improvements made through these voluntary action plans, where the chemical and other sectors were able to set their own targets.

The investment for the implementation of the voluntary action plans was made by each individual company, yet the costs of implementation have not been made public.

**Energy savings and associated emission reductions**

Of the 114 industries that formulated action plans, 84 of them achieved their targets. Thirty eight industries enhanced their targets due to the reviews in the follow-ups. Targets were overachieved by 52 industries, 26 of which had enhanced their targets in the follow-up process.

The following table shows the target achievement under the Voluntary Action Plan



Source: Compiled by the Institute of Energy Economics, Japan (IEEJ) based on responses from industrial organizations to FY2012 questionnaire survey, FY2013 Government follow-up material.

The following table shows the targets, indicators and results of some of the action plans adopted by 8 industries that are part of the Voluntary Action Plan. These industries account for approximately 90% of total emissions from the 54 participating industries in the industrial and energy conversion sectors.<sup>31</sup>

Examples of Action Plans	Target indicator	Target level (2008-2012 average) (against 1990 levels)	Average annual performance for 2008-2012 (against 1990 levels)
Federation of Electric Power Companies of Japan	CO <sub>2</sub> emission intensity	approx. -20%	-2.60%
The Japan Iron and Steel Federation	Energy consumption	-10%	-10.70%
Japan Chemical Industry Association	Energy intensity	-13%	-15%
Petroleum Association of Japan	Energy intensity	-13%	-15%
Japan Paper Association	Energy intensity	-20%	-24.80%

<sup>31</sup> Amortization of emission credits issued under the Kyoto Protocol were considered in calculating CO<sub>2</sub> emissions and CO<sub>2</sub> emission intensity for 2009 and 2010.

	CO <sub>2</sub> emission intensity	-16%	-21.70%
Japan Cement Association	Energy intensity	-3.8%	-4.40%
4 Electrical and Electronics Associations	CO <sub>2</sub> emission intensity	-35%	-48%
Japan Automobile Manufacturers Association/Japan Auto-Body Industries Association	CO <sub>2</sub> emissions	-25%	-40%

As stated in the Description section, the chemical industry provides a good example of one of the industries that achieved its target based on three indicators, energy consumption, energy intensity and CO<sub>2</sub> emissions. The results are shown on the following tables.

Table 1	1990	1997	1998	1999	2000	2001	2002	2003	2004	2005
Energy Consumption (kl) <sup>32</sup>	2,674	2,973	2,863	2,961	2,91	2,773	2,802	2,808	2,867	2,881
Energy Intensity (Index)	1	0.94	0.94	0.92	0.91	0.92	0.9	0.88	0.87	0.86
CO <sub>2</sub> emissions (MM tons)	6,352	6,89	6,643	6,915	6,908	6,582	6,703	6,774	6,845	6,801

Table 2	2006	2007	2008	2009	2010	2011	2012	2012 compared to	
								1990	2010
Energy Consumption (kl)	2,858	2,901	2,639	2,620	2,717	2,584	2,485	-7.1%	-3.8%
Energy Intensity (Index)	0.84	0.84	0.88	0.85	0.83	0.84	0.84	-16%	1.2%
CO <sub>2</sub> emissions (MM tons)	6,671	6,783	6,110 <sup>33</sup>	5,938 <sup>3</sup>	6,133 <sup>3</sup>	6,135 <sup>3</sup>	5,997 <sup>3</sup>	-5.6 <sup>34</sup>	-2.3 <sup>35</sup>

(10,000t-CO<sub>2</sub>; 10,000kl crude oil)

Taking into account the data from the table, the energy consumption on 2012 went down 7.1% compared to 1990 and the energy intensity had a reduction of 16%.

### Benefits

Benefit	Description															
<b>Reductions in energy demand</b>	7.10% on 2012 compared to 1999															
<b>Mitigation of greenhouse gases</b>	5.6% on 2012 compared to 1999															
<b>Improvement in air quality</b>	Additional to the voluntary plan, the chemical sector also set a voluntary management criteria for air and water pollution, the results are: <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Emissions</th> <th>2004</th> <th>2011</th> </tr> <tr> <td></td> <td colspan="2" style="text-align: center;">1,000 tons/year</td> </tr> </thead> <tbody> <tr> <td>SOx</td> <td>50.98</td> <td>30.14</td> </tr> <tr> <td>NOx</td> <td>98.14</td> <td>66.78</td> </tr> <tr> <td>Dust</td> <td>4.34</td> <td>2.6</td> </tr> </tbody> </table>	Emissions	2004	2011		1,000 tons/year		SOx	50.98	30.14	NOx	98.14	66.78	Dust	4.34	2.6
Emissions	2004	2011														
	1,000 tons/year															
SOx	50.98	30.14														
NOx	98.14	66.78														
Dust	4.34	2.6														

<sup>32</sup> kl = kilo liters of crude oil

<sup>33</sup> Excluding carbon credits

<sup>34</sup> With carbon credits the reduction is -9.3%

<sup>35</sup> With carbon credits the reduction is -4.6%

		COD	23.19	17.52
		Nitrogen	27.85	23.37
		Phosphorous	0.82	0.66
<b>Macro-economic impacts</b>		No information available.		
<b>Impacts on public budgets</b>	<ul style="list-style-type: none"> <li>• More government spending by participating on revisions and working groups.</li> <li>• Less government spending from fewer audits and regulatory work.</li> </ul>	The evaluation and verification of the action plans were conducted by public-private working groups, which demanded man/hours from METI, but it helped avoid higher costs from diminishing the need for audits and future research and regulation from the government.		
<b>Creation of jobs</b>		Not available		
<b>Improvements in human health and well being</b>	<ul style="list-style-type: none"> <li>• Reduce risk of respiratory and cardiovascular diseases, allergies, arthritis and rheumatism with warmer, drier, more comfortable indoor environments resulting from improved building insulation</li> </ul>	Analysis on direct benefits of this nature stemming from the program have not been analysed		
<b>Increased access to energy and reduced fuel poverty</b>		NA		
<b>Benefits to energy providers</b>	<ul style="list-style-type: none"> <li>• Reduced operating costs</li> <li>• System and network deferral</li> <li>• Increased reliability</li> <li>• Market price changes</li> <li>• Associated with marketing</li> </ul>	No information available.		

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## 8 STANDARDS AND LABELS

<b>Title:</b>		
8.1 Australia's Energy Rating Label		
<b>Country:</b>	Australia and New Zealand	
<b>Sector: Electrical Appliances</b>	<b>Stage:</b> Ongoing	<b>Type of policy/practice/instrument:</b> Standards and Labels Scheme
<b>Sub-sector (if applicable): NA</b>	<b>Period:</b> 2000-2030	

### Description

The Energy Rating Label programme is a mandatory scheme operated by the so-called E3 committee, a multinational board consisting of from state, territory and federal government agencies from both Australia and New Zealand. The scheme requires that a range of appliances offered for sale in both Australia and New Zealand display and energy rating label that shows both the energy efficiency level of the device and its energy consumption. This information allows consumers to compare across appliances and provides an incentive for manufacturers to improve the performance of the appliances they produce. Appliances currently covered by the scheme include refrigerators, freezers, clothes washers, dish washers, air conditioners and televisions.

The current label being employed has five key components<sup>36</sup>:

- A **six-star rating**, which indicates the energy efficiency of the appliance, with more stars corresponding to greater efficiency. This star rating is calculated using an algorithm that takes into account energy consumption and volume or capacity. Star rating algorithms provide a geometric progression of stars (that is, a fixed percentage reduction in energy per additional star). The previous label that was employed used a fixed kWh reduction per star, which made it harder to achieve a higher star rating.
- The **make and model of the appliance**.
- The **annual energy consumption** measured in kWh per year. This figure is based on tested energy consumption (measured against relevant standards) of the appliance and information about the typical use of the appliance in the household.
- The **standard against which the appliance is tested**. Different appliances are tested against different standards, which generally correspond with international standards. Australian Standards define the test procedures for measuring energy consumption and set minimum performance criteria that appliances must meet before they qualify for labelling. Check tests are regularly conducted against these standards by accredited laboratories on behalf of state and territory governments.
- A **link to the Energy Rating website** where the energy consumption of different models of appliances can be compared.

The Australian and New Zealand governments work together and in consultation with industry to determine appropriate minimum energy performance standards for products and appliances. Before a product is included in the programme, it undergoes a rigorous assessment to determine whether the benefit to the community outweighs any cost associated with its regulation. The minimum energy performance standard for each product is generally equivalent to international best practice standards or a more stringent standard developed specifically for Australia or New Zealand. Products are considered for inclusion within the program on the basis that the community will benefit from their regulation.

<sup>36</sup> <http://www.energyrating.gov.au/about/energy-rating-labels/>

One of the evaluation studies conducted on the programme examined how including information on the greenhouse gas emissions associated with the appliance can also make a difference. Relevant literature suggests that there is a core set of consumers that are primarily motivated by environmental concerns and that including information about greenhouse gas emissions and/or other environmental information would be a good way of reaching these consumers. For this reason, the programme is actively considering incorporating more information in relation to greenhouse gas emissions on the label itself or on the program’s website.

The programme is also considering further exploring the use of endorsement labels in tandem with their other activities. Endorsement labels are effectively a ‘seal of approval’, where products displaying an endorsement label are generally in the top 10 to 40 percent of products in terms of energy efficiency. These products usually meet or exceed established criteria for energy consumption and/or energy efficiency put forth, and the effects of placing an endorsement label on an energy label can influence the decision to purchase an energy efficient appliance.

### Actors

Actor	Role
<b>National Framework for Energy Efficiency and the Select Council on Climate Change</b>	Australian federal agencies and institutions that oversee implementation of the programme.
<b>Equipment Energy Efficiency (E3) Programme</b>	The main entity in charge of executing the labelling scheme.
<b>Minimum Energy Performance Standards</b>	The entity that specifies the minimum level of energy performance that appliances, lighting and electrical equipment must meet or exceed before they can be offered for sale or used for commercial purposes.
<b>Manufacturers</b>	Businesses that are subject to the labelling scheme legislation and thus have to develop their products accordingly.

### Barriers

The programme has faced all traditional barriers associated with standard and labelling schemes – most notably split incentives and bounded rationality. Split incentives occur when one party pays another party for a good or service, but the parties have different incentives. Bounded rationality refers to the concept that individuals and firms may not always make perfect or optimum decisions as their knowledge and processing abilities are limited: they apply their rationality only after having greatly simplified the choices available to them.

One more barrier that has prevented the programme from perhaps even greater acceptance has been the inclusion of operating costs on the label. The literature on the topic supports the potential merits of including operating costs on energy labels as an effective mechanism to induce behavioural change. However, it is difficult to provide meaningful and precise information about energy costs (this would require a number of assumptions regarding the use of the appliance and the price of electricity, which varies regionally and over time) and there is potential for confusion between operating costs, operating savings and even purchase costs. The programme is currently exploring the possibility of including information about operating costs in future label designs.

### Enablers for implementation

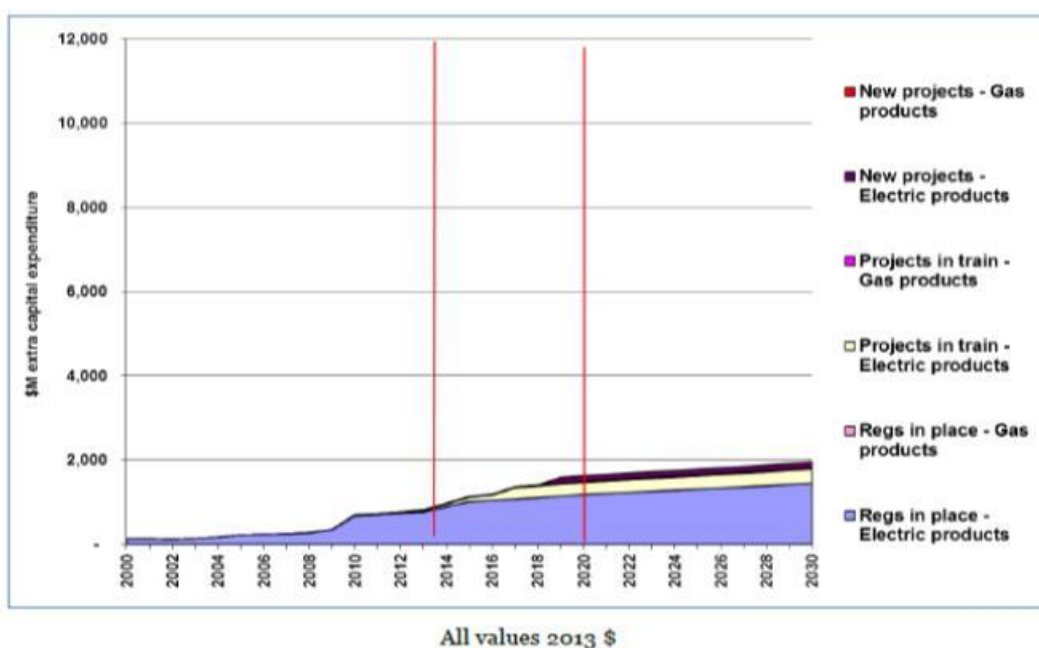
- A considerable amount of time and effort has gone into ensuring that the **label design** is appropriate. To have a discernible impact on consumers’ choices and behaviour, a label needs to present information that is useful, and otherwise costly to obtain, in a format that can be readily understood by consumers. Results from a recent programme evaluation strongly indicate that the current label design is working and trusted.



- The labelling scheme was supplemented with a set of **minimum energy performance standards**. The standards specify the minimum level of energy performance that a selected appliance must meet before it can be offered for sale or used for commercial purposes. Standards are now mandatory for a range of products in Australia and New Zealand, and their role is crucial, especially in cases where, despite the information on the label, the consumer still doesn't necessarily consider energy efficiency in the purchasing decision.

**Funding and Costs**

The cost of the programme has been estimated at nearly of AUD 5.1 billion (USD 3.9 billion) over the period of 2000-2013. Key cost items include increased product capital cost, product testing and development costs. Government administration and check-testing account for a very small share of total costs (generally less than 1 percent), and the cost impact of additional measures is negligible, since the E3 administrative infrastructure is already in place.



The figure illustrates annual costs compared with a reference for all energy labelling and minimum energy performance standard programmes up to 2030.<sup>37</sup>

**Energy savings and associated emission reductions**

Since 2000 the programme has saved over 314 PJ of energy, which would have cost end users about AUD 15.4 billion (USD 11.8 billion), in 2013 prices. It is estimated that the cost of the measures was nearly AUD 5.1 billion (USD 3.9 billion) over the period, for a net benefit of AUD 10.3 billion (USD 7.9 billion) at a benefit-cost ratio of 3. Emission reductions from energy savings reached 86.8 Mt CO<sub>2</sub>e, at an effective cost of AUD 119 (USD 91) per tonne of CO<sub>2</sub>e avoided.

Estimated impacts, costs and benefits for the programme, 2000-2013<sup>38</sup>

<sup>37</sup> Taken from: Commonwealth of Australia (Department of Industry). "Impacts of the E3 Program: Projected Energy, Cost, and Emissions Savings." March 2014. Available at: [www.energyrating.gov.au](http://www.energyrating.gov.au) <http://www.energyrating.gov.au/resources/program>

<sup>38</sup> Taken from: Commonwealth of Australia (Department of Industry). "Impacts of the E3 Program: Projected Energy, Cost, and Emissions Savings." March 2014. Available at: [www.energyrating.gov.au](http://www.energyrating.gov.au) <http://www.energyrating.gov.au/resources/program>

	Energy unit	Energy saved 2013	Energy saved 2000-13	PV of Benefits \$M (a)	PV of Costs \$M (a)	NPV Net benefit \$M (a)	Benefit/cost ratio	Mt CO <sub>2</sub> -e saved 2013	Mt CO <sub>2</sub> -e saved 2000-13	\$/tonne CO <sub>2</sub> -e saved
<i>Electricity</i>	<i>GWh</i>	<i>13,786</i>	<i>85,696</i>							
	<i>PJ</i>	<i>49.6</i>	<i>308.5</i>	<i>\$15,228</i>	<i>\$4,936</i>	<i>\$10,292</i>	<i>3.1</i>	<i>13.4</i>	<i>86.4</i>	<i>-\$ 119</i>
<i>Gas</i>	<i>PJ</i>	<i>1.6</i>	<i>6.1</i>	<i>\$147</i>	<i>\$129</i>	<i>\$18</i>	<i>1.1</i>	<i>0.1</i>	<i>0.4</i>	<i>-\$ 49</i>
<i>Total</i>	<i>PJ</i>	<i>51.3</i>	<i>314.4</i>	<i>\$15,375</i>	<i>\$5,065</i>	<i>\$10,310</i>	<i>3.0</i>	<i>13.5</i>	<i>86.8</i>	<i>-\$ 119</i>

(a) 2013 \$, Undiscounted.

Estimates for the programme's impacts over the period of 2014-2030 are as follows:

- The program is projected to save about 546 PJ of end-use energy between 2014 and 2020, and 2,021 PJ of end-use energy between 2014 and 2030, of which about 92 percent correspond to electricity.
- The present value of the projected net benefits of programme measures is about AUD 57.4 billion (USD 43.4 billion) over the period 2014-30 and using a 7 percent discount rate.
- The overall benefit-cost ratio of the programme is about 4.6 (4.5 for energy efficiency measures).
- The programme is projected to avoid about 129 million tonnes of CO<sub>2</sub>e between 2014 and 2020, and 433 million tonnes of CO<sub>2</sub>e between 2014 and 2030, of which about 98 percent is from electricity use.
- For those measures targeting energy efficiency use, and hence also impacting on emissions, the effective (negative) cost per tonne avoided is AUD 118 (USD 90). The emissions savings are at negative cost because the measures are cost-effective in their own right.
- About 14 percent of the emissions savings to 2030 (60.1 Mt CO<sub>2</sub>e) come from measures in place today.
- About 4.5 percent of the emissions savings to 2030 (19.6 Mt CO<sub>2</sub>e) come from new measures.

## Benefits

Benefit	Description
<b>Reductions in energy demand</b>	Since 2000 the programme has saved over 314 PJ of energy. It is expected to save about 546 PJ of end-use energy between 2014 and 2020, and 2,021 PJ of end-use energy between 2014 and 2030.
<b>Mitigation of greenhouse gases</b>	Since the year 2000 emission reductions from energy savings amount to 86.8 Mt CO <sub>2</sub> e, at an effective cost of AUD 119 (USD 91) per tonne CO <sub>2</sub> e avoided. The program is then projected to avoid about 129 million tonnes of CO <sub>2</sub> e between 2014 and 2020, and 433 million tonnes of CO <sub>2</sub> e between 2014 and 2030.
<b>Improvement in air quality</b>	No available information.
<b>Macro-economic impacts</b>	<ul style="list-style-type: none"> <li>• Impacts on GDP</li> <li>• Trade balances</li> <li>• Energy prices</li> </ul> Since 2000, the program has saved over 314 PJ of energy, which would have cost end users about AUD 15.4 billion (USD 11.8

		billion), in 2013 prices.
<b>Impacts on public budgets</b>	<ul style="list-style-type: none"> <li>• Reductions in operational and capital expenditure for the public sector.</li> <li>• Effects attributed to structural changes to the economy and changed economic activity due to investment in energy efficiency</li> </ul>	It is estimated that the cost of the measures was nearly AUD 5.1 billion (USD 3.9 billion) over the period, for a net benefit of AUD 10.3 billion (USD 7.9 billion) at a benefit-cost ratio of 3.
<b>Creation of jobs</b>		No available Information.
<b>Improvements in human health and well being</b>	<ul style="list-style-type: none"> <li>• Reduce risk of respiratory and cardiovascular diseases, allergies, arthritis and rheumatism with warmer, drier, more comfortable indoor environments resulting from improved building insulation</li> </ul>	Increase in the number of informed consumers, which has translated in favourable behavioural changes (in energy efficiency and climate change terms) in the population.
<b>Increased access to energy and reduced fuel poverty</b>		No available information.
<b>Benefits to energy providers</b>	<ul style="list-style-type: none"> <li>• Reduced operating costs</li> <li>• System and network deferral</li> <li>• Increased reliability</li> <li>• Market price changes</li> <li>• Associated with marketing</li> </ul>	No available information.

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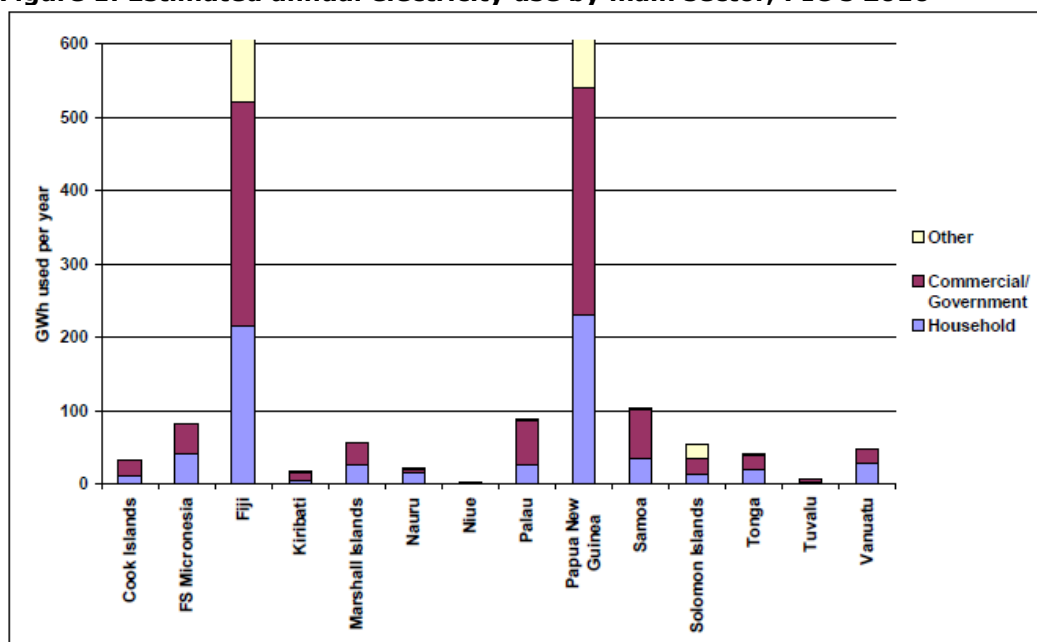
## 8.2 Fiji’s Minimum Energy Performance Standards and Labelling Program (MEPSL)

<b>Country:</b>	Fiji	
<b>Sector: Electrical Appliances</b>	<b>Stage:</b> Ongoing	<b>Type of policy/practice/instrument:</b> Standards and Labels Scheme
<b>Sub-sector (if applicable): NA</b>	<b>Period:</b> 2000s - ongoing	

### Description

Fiji, as with other Pacific Island Countries (PIC), is heavily reliant on imported fuel. The volatility of oil prices has historically left a chain reaction of adverse impacts on the economy such as increasing the inflation rate, decreasing real household income, and creating negative effects on trade. Additionally, with climate change and the particularly negative outcomes to Small Island States, emphasis has been placed on the reduction of GHG. Even with Fiji’s renewable energy efforts, oil is expected to be the main source of energy in the near-to-medium term.

**Figure 1: Estimated annual electricity use by main sector, PIC’s 2010**



Source: George Wilkenfeld and Associates Pty Ltd, 2011

To help reduce the demand on imported fuels, Fiji has implemented a Minimum Energy Efficiency Standards and Labelling scheme (MEPSL). Minimum Energy Performance Standards (MEPS) are one of the most common energy efficiency measures implement by governments worldwide. As suggested, MEPS create standards that must or should, depending if the program is mandatory or not, be met in terms of energy efficiency performance. Energy labelling compliments MEPS schemes for higher effectiveness. The labelling component serves as the consumer-facing method to inform the buyer of the energy performance of appliances. The intention is to influence the consumer’s decision-making on the purchase. Together, they serve as a “push” (via standards) and “pull” (via labelling) mechanism to drive markets towards greater efficiency of appliances. As of 2012, Fiji became the only PIC that has made the system mandatory.

The first traces of a labelling system in Fiji began in 1996, with a voluntary labelling pilot program starting in 2002. Fiji adopted the standards implemented by Australia and New Zealand's<sup>39</sup> (ANZ) Equipment Energy Efficiency (E3) program. This adoption was beneficial on two fronts. For one, it is the least costly method as the information and infrastructure was already in place in ANZ. Additionally, it is the most efficient option since the majority of appliances imported into Fiji are from ANZ.

A 2006 study concluded that a voluntary system was ineffective<sup>40</sup>. Cost and limited product availability of energy efficient appliances were two determining factors that limited the success of the voluntary system. At the 2011 Pacific Islands Forum meeting, there was a significant focus on energy efficiency for countries in the Pacific and the Australian government committed to supporting a standards and labelling program for the region. This initiated the formation of the Pacific Appliance and Labelling and Standards Program (PALS). The Secretariat of the Pacific serves as the regional entity that supports the implementation of PALS in the manner that is most relevant to each individual member PIC.

Fiji serves as an example in the PALS initiative as the only member to have implemented a mandatory system. In Fiji, appliances are required to be compliant to Australia and New Zealand's FS/AS/NZ standards. Evaluation of Fiji's program will provide best practices for the rest of the region. Currently, Fiji's MEPSL system covers freezers and refrigerators, with plans to expand to other appliances in the near future. With 95% of Fijian households owning a refrigerator, it was a clear target. At the time of implementation, refrigeration attributed to more than half of the electricity demand in households.

### Actors

Actor	Role
<b>Fiji Department of Energy (FDOE)</b>	The government entity responsible for the development of MEPSL scheme, publicizing the program, and overseeing it in Fiji. FDOE monitors and facilitates the import and sales of the refrigerators and freezers. FDOE established a Demands Side Management (DSM) unit responsible for these tasks.
<b>Fiji Revenue and Customs Authority</b>	Assist the FDOE with the compliance and monitoring of imported appliances.
<b>Secretariat of the Pacific Community (SPC)</b>	This is the main regional entity in charge of implementing the PALS scheme. They work with each individual PIC on the development of overall country energy plans, including MESPL goals, as well as providing technical assistance. A representative sits on the PALS Regional Steering Committee.
<b>Australian Government</b>	Since September 2011, the Australian government has committed to support a standards and labelling system in the Pacific by contributing AU\$3 million over a three year period (2012 – 2015). A representative also interacts with the program through the PALS regional steering committee.
<b>PALS Regional Steering Committee</b>	The committee provides regional coordination through policy level advice and guidance. Included in the committee are one representative from SPC, one from the Australian government, and three from the PICs that serve as representatives for the region. The Committee assists PICs to develop and implement the program.
<b>Manufacturers</b>	Stakeholders whose industry is responsible for the manufacture and sale of electric appliances, and which is now subject to the labelling scheme legislation, where evidence suggests that the scheme has already played a role in encouraging manufacturers to produce more energy efficient products.
<b>Consumers</b>	The consumers are the people who buy the end product, and whose behaviour the labelling scheme is trying to influence. Information provided to them through the label helps them purchase an appliance

<sup>39</sup> See case study on Australia and New Zealand's Energy Rating Program for more information.

<sup>40</sup> GWA (2006) The Costs and Benefits of Energy Labelling and Minimum Energy Performance Standards for Refrigerators and Freezers in Fiji, George Wilkenfeld and Associates for the Australian Greenhouse Office, February 2006.

	and how helpful different types of information may be used in their decision making process.
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## Barriers

The challenges in implementing a standards and labelling scheme are twofold. For one, the energy efficient appliances are more expensive. Continued education and messaging of the long-term benefits needs to be communicated to the general public to increase awareness and understanding. An additional challenge is fostering continued progress in the MEPSL program into reaching other appliances. Currently the MEPSL in Fiji only monitors refrigerators and freezers, and while it was initially necessary to only address a few items while the program was still in its infancy, continue success in energy savings and reduction of GHG would require the inclusion of other appliances, especially as populations in the Pacific are expected to increase by 25% in the next ten years.

Additionally, prior to implementation, several baseline studies were conducted with the intention of informing the development of MEPSL. They found that one of the key challenges was the general lack of data. For example, one study found limited customs data – the number of units imported, market channels, or country of manufacture – this limits the ability to achieve quantifiable data as well as the accuracy of recommendations. Now, the Fijian Department of Energy works closely with the customs agency to collect this information and monitor incoming products. The 2013- 2020 Fiji National Energy Policy lists the development and implementation of an energy information database as a priority goal.

Finally, financing is a key barrier. The costs to administer such a program require resources and capacity. This is an ongoing challenge, particularly if there are plans to extend the program’s requirements to other appliances.

## Enablers for implementation

The formation of the PALS program, with financial support from the Australian government and oversight from the PALS Regional Steering Committee, was a key element to empowering progress towards energy efficiency in the region. It created an enabling environment for the PICs to pursue a MEPSL. The PICs are at different levels in their energy efficiency development and the establishment of a unifying program provides support as well as healthy competition among the countries, with Fiji leading the way.

A MEPSL program, as discussed above, is a common policy that governments will pursue to push markets towards energy efficient appliances. Over fifties countries have a MEPSL system in place. Furthermore, because Australia and New Zealand already established their own system, which underwent years of planning and research, it made it an easier leap for PICs such as Fiji. This reduced cost and increased efficiency to adopt the already tried and tested scheme. Also, the well-established data from ANZ’s program suggests it will be a success in other regions, particularly since Fiji imports mostly from those two countries.

Additionally, energy efficiency is a core area of focus under the 2013 – 2020 Fiji National Energy Policy. Key priorities under energy efficiency include:

- Increase public education and awareness of energy efficiency. Targeted campaigns will provide information about the range of technologies available. For the MEPSL programme in particular, the goal is to increase public awareness campaigns and conduct market research on appliance purchases.
- Extend the current MEPSL to all imported appliances and industrial equipment that contribute to the country’s energy demand. A system to prevent false energy labelling will be put into place.
- Develop and implement an energy information database to obtain verifiable data so energy savings can be verified.

Including the MEPSL as a priority area for the long-term energy efficiency policy of Fiji demonstrates the government’s intent on supporting the success of the programme.

## Funding and Costs

The main costs associated with the development of the Fijian MEPSL include:

- Administrative costs: maintaining the cost of salaries for government staff and expenses related to administering the program such as product registration service or compliance staff.
- Establishing a database of refrigerators and freezers.
- Marketing of the program to manufacturers, retailers, and the public to make sure they are informed of the mandatory labelling.
- Compliance checks.

The Australian government funds the PALS Program, providing AUD\$ 3 million from 2012 – 2015.

Additionally, the cost of purchasing a more efficient appliance would be passed down to the general public. However, even with this additional cost, the energy savings and fuel import savings of such a program greatly outweigh the price increase of the appliances. A 2004 study<sup>41</sup> indicated that the cost/benefit ratio of imposing an MEPSL scheme on refrigerators and freezers in Fiji is between 1:4 and 1:10.

## Energy savings and associated emission reductions

A 2011 report<sup>42</sup> assessed the costs and benefits of a MEPSL program in the Pacific and determined that it is more costly to import fuel than it is to import more efficient appliances. This evaluation calculated that by 2025 a standards and labelling system could save the Pacific:

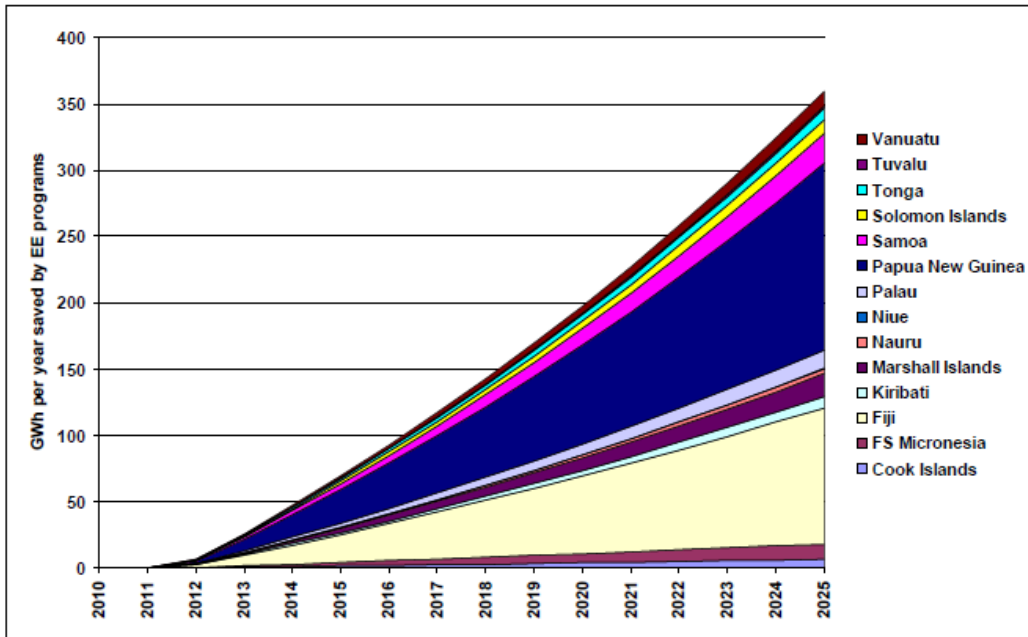
- USD\$525 million in fuel, generation and maintenance
- 630 million litres of diesel
- 1.7 million tonnes of emissions

The following figure depicts the project electricity savings by country. Fiji would account for approximately 29% of the savings.

### Figure 2: Projected electricity savings from energy efficiency measures, by PIC

<sup>41</sup> FDOE (2004) Appliance Labelling Programme for Refrigerators and Freezers in Fiji, Final Report, prepared for the Fiji Department of Energy, June 2004.

<sup>42</sup> GWA (2011). The Costs and Benefits of Introducing Standards and Labels for Electrical Appliances in Pacific Island Countries: Final Report. George Wilkenfeld and Associates Pty Ltd, Sydney.  
<http://www.spc.int/edd/en/download/finish/11-reports/627-appliance-labelling-and-meps-for-pacific-island-countries-final>



Source: George Wilkenfeld and Associates Pty Ltd, 2011

Table 1 below demonstrates the the electricity savings by sector and end use for the 13 PICs, with refrigeration energy savings accounting for about 27%.

**Table 1: Projected electricity savings 2010-25, by end use**

	GWh saved in 2025	GWh saved 2010–2025	Share of energy saved 2010–2025
Res refrigerators & freezers	72	450	14.8%
Res air conditioners	73	389	16.7%
Res lighting	52	348	15.0%
Res other	0	0	0.0%
Comm/govt refrigeration	24	171	7.3%
Comm/govt air conditioning	65	458	19.7%
Comm/govt lighting	73	509	21.9%
Comm/govt other	0	0	0.0%
<b>Total</b>	<b>359</b>	<b>2,326</b>	<b>100.0%</b>

Source: George Wilkenfeld and Associates Pty Ltd, 2011

**Benefits**

Benefit	Description
<b>Reductions in energy demand</b>	The value of projected electricity savings for Fiji during the 2010-2025 is calculated between \$152.6M - \$233.6M undiscounted depending on oil price (\$69.1M – \$105.7 net present value discounted by 7% for each year).
<b>Mitigation of greenhouse gases</b>	Projected value from



		2010 -2025 for Fiji: 576 kt CO <sub>2</sub> -e avoided
<b>Improvement in air quality</b>		No available information.
<b>Macro-economic impacts</b>	<ul style="list-style-type: none"> <li>• Impacts on GDP</li> <li>• Trade balances</li> <li>• Energy prices</li> </ul>	Reduction of energy prices is projected as a significant benefit to the implementation of the energy savings measures in the PICs. Avoidance of future fuel costs accounts for between 81% and 88% of the benefit depending on oil price.
<b>Impacts on public budgets</b>	<ul style="list-style-type: none"> <li>• Reductions in operational and capital expenditure for the public sector.</li> <li>• Effects attributed to structural changes to the economy and changed economic activity due to investment in energy efficiency</li> </ul>	There is currently a staff of six that works for the Department of Energy's Demand Side Management unit. Financial capacity is a barrier in Fiji and as part of the 2013 – 2020 National Energy Policy there is an increased focus on creating an environment to encourage private investment and development assistance in energy efficiency measures. While private investment in a MEPSL programme is not relevant, it could suggest that more public funds would be available.
<b>Creation of jobs</b>		No available Information.
<b>Improvements in human health and well being</b>	<ul style="list-style-type: none"> <li>• Reduce risk of respiratory and cardiovascular diseases, allergies, arthritis and rheumatism with warmer, drier, more comfortable indoor environments resulting from improved building insulation</li> </ul>	Not applicable.
<b>Increased access to energy and reduced fuel poverty</b>		Not applicable.
<b>Benefits to energy providers</b>	<ul style="list-style-type: none"> <li>• Reduced operating costs</li> <li>• System and network deferral</li> <li>• Increased reliability</li> <li>• Market price changes</li> <li>• Associated with marketing</li> </ul>	Not applicable.

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**Title:**

### 8.3 Vietnam Energy Efficiency Standards and Labelling Program

<b>Country:</b>	Vietnam	
<b>Sectors:</b> Commercial, public and residential; industrial and transportation	<b>Stage:</b> Implemented	<b>Type of policy/practice/instrument:</b> <ul style="list-style-type: none"> <li>• Voluntary labelling program Information Based strategies: Product Labelling</li> <li>• Minimum efficiency performance standards program (MEPS) Directive based strategies: Ambient / emissions standards</li> </ul>
<b>Sub-sector (if applicable):</b>	<b>Period:</b> 9 years since the start of the labelling program and 2 years since the MEPS started (January 2013)	

**Description**

The Government of Vietnam implemented an Energy Efficiency Standard and Labelling program (EES&L), which included Minimum Energy Performance Standards (MEPS) for appliances and equipment alongside a program of two types of Energy Labelling, comparative and endorsement labels.

**Origins**

The Energy Efficiency and Conservation (EE&C) office and Vietnam’s National Energy-Efficiency Program (VNEEP I) were both established by law for four years starting in 2006. Both of these programs started working on voluntary labelling in 2006, but the announced ending of the VNEEP I in 2010, limited the reach of the program. A second version, the VNEEP II was launched in 2011. Only then the EES&L program was formalized with the passing of the Law on Energy Efficiency and Conservation in 2011. That law allowed the establishment of an institutional setup, where the EE&C office became formally a part of the Department of Science and Technology/ Energy Conservation Office within The Ministry of Industry and Trade (MoIT). Also, after the official creation of the voluntary labelling program (EES&L) in 2011, mandatory labelling and MEPS came into force in 2013 for a first set of products and in 2014 for a second one. Mandatory MEPS is being implemented this year.

The EES&L has five targets for the labelling program:

1. Home appliances
2. Office equipment
3. Industrial equipment
4. Cars and vans (7 seats or less)
5. Specialized equipment (public lighting, large air conditioning units, etc.)

The following table shows the timing of entrance for each of the group of equipment to be labelled.

Vietnamese Appliance Regulations					
Appliance	2011	2012	2013	2014	2015
Lighting, air-conditioners, top loading washing machines, rice cookers and fans	Voluntary labelling		Mandatory labelling*		Mandatory MEPS

Refrigerators, front-loading washers, televisions	Voluntary labelling			Mandatory labelling	
Industrial equipment: Electric motor with capacity lower than 20 kW and Three-phase transformer	Voluntary labelling		Mandatory labelling		Mandatory MEPS
Office and commercial equipment: desk computer, printer, photocopier, fax machine and computer monitors; commercial refrigerator	Voluntary labelling			Mandatory labelling (commercial refrigerator only)	Mandatory MEPS

\* This step included the dephasing of incandescent lightbulbs > 60W

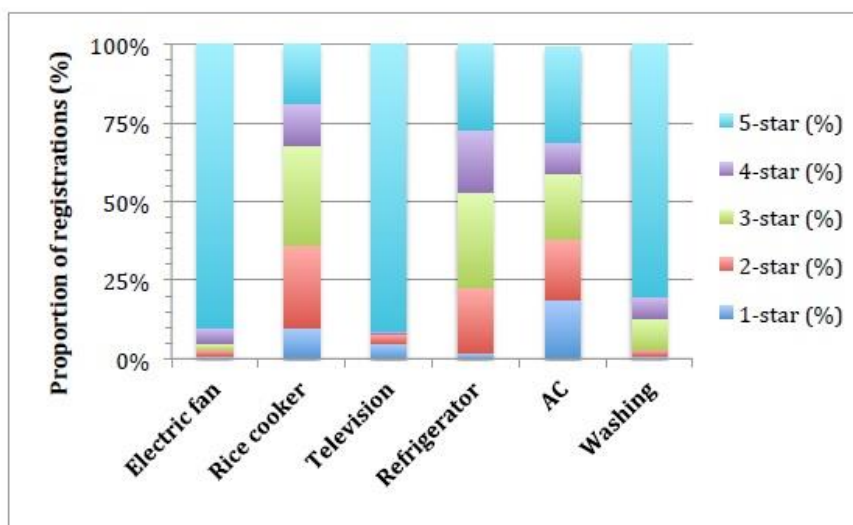
**Overall Monitoring Verification & Enforcement Structure (MV&E)**

The legal basis for the EES&L program is contained in the Law on Energy Efficiency and Conservation of 2011, which requires that prescribed electrical equipment must be registered before it can be sold. Therefore, manufacturers and importers are required to register the claimed performance of all products covered by the program before they can be sold. For MEPS, an application for registration must include a third party certification of compliance with the relevant performance criteria. The Government verifies claims by check testing samples of products on the market and retail outlets, using a selection process that aims to identify the products that are more likely to fail. The introduction of voluntary labelling as a precursor to mandatory schemes seems to have been an important influence on manufacturers, prompting them to improve their products in advance of the introduction of the policy.

**Results of the program as of 2014**

Over 4,000 products had been registered by March 2014, in compliance with the mandatory labelling and MEPS programs. An analysis of the products registered in compliance with the mandatory comparative 1-5 star labelling showed the following distribution of energy efficiency performance by model:

**Efficiency performance of products registered by March 2014**



Source: Michaelis, Charles. Lifting the label: evaluating the real impact of energy labelling in Vietnam

## Actors

Actor	Role
The Department of Science and Technology/ Energy Conservation Office of The Ministry of Industry and Trade (MoIT)	<p><b>Regulation (MV&amp;E)</b> By law, the MoIT is required to establish the monitoring, verification and enforcement of both, the mandatory labels and the MEPS.</p> <p><b>Education/Information</b> Ensuring that industry understands the requirements of the programs through holding workshops and having a specialist member of staff responsible for raising awareness with industry. Meetings are also held with industry associations to discuss the requirements of the programs.</p> <p><b>Program Implementation</b> The Department of Science and Technology/ Energy Conservation Office of the MoIT is in charge of implementing projects like the ones from the UNDP and the Australian government.</p>
General Directorate of Energy	<p><b>Political accountability</b> The authority with the overall responsibility for the EES&amp;L program is the General Directorate of Energy. The MoIT, via the Science, Technology and Energy Efficiency Department is responsible for its implementation.</p>
Certification agencies	<p><b>Certification</b> Private firms can apply to be certification agencies by complying with the requirements established by the MoIT.</p>

## Barriers

The government of Vietnam faced significant barriers to develop and implement the energy efficiency standards and labeling policy in the country. These barriers can be identified in four groups:

### Policy and regulation framework barriers

- There was no experience in implementing mandatory regulations in the field of energy efficiency that would be a base for the minimum energy performance standards (MEPS)
- A lack of policy framework and an absence of a comprehensive roadmap for the on efficiency standards and labeling policy
- Difficulties in the negotiations between manufacturers and stakeholders: Policymakers did not have experience negotiating with equipment manufacturers to increase their efficiency levels

### Institutional barriers

- Lack of integrated institutional approach to the energy efficiency standards and labeling implementation: The implementation of this policy in Vietnam was started by an ad hoc institutionalism.
- Due to the lack of clear regulatory framework and mandate, there is a lack of regular testing for performance of end-use equipment.
- Lack of training programs on energy efficiency standards and labeling framework and implementation: There are not sufficient training courses or modules covering the step-by-step process of building up this type of policies.

- Lack of accredited testing laboratories: The accredited labs can test energy efficiency for most, but not all products.

#### Market barriers

- The market was not aiming at energy efficient equipment, making a harder entrance for the labelling program.
- There was a limited or no market monitoring and sampling due to lack of manpower and funds.
- Lack of knowledge about the benefits of these types of policies among sellers and buyers.

#### Information and awareness barriers

- Insufficient public awareness about energy-saving equipment

### Enablers for implementation

Besides the efforts of members within the MoIT and its Department of Science and Technology/ Energy Conservation Office, which have made a great effort to both push for legislation and establish an adequate institutionalization for energy efficiency, we should mention two international organizations that without their help, it would have been very difficult for the EES&L program to ever exist.

**Australian government:** A fundamental aspect that needed to be addressed in order to implement an energy efficiency standards and labelling program in Vietnam, was to acquire enough technical assistance from other countries and international organizations with that know-how. This was the case of the Australian Government Department of Industry and Science, which provided technical assistance to the government of Vietnam aiming at the implementation of the Energy Efficiency Standards and Labelling Program (VEESL). The key elements of this technical assistance are described in the funding section.

**UNDP:** The UNDP implemented a project named, Barriers removal to the cost-effective development and implementation of energy efficiency standards and labeling (BRESL), which goal is to remove technical barriers and setting energy benchmarks for appliances in the commercial and residential sectors. The project lasted 5 years (2009-2014) and helped Vietnam to create the appropriate enforcement policy for the MEPS. Additionally, BRESL helped Vietnam to implement guidelines for both types of labels, comparative and endorsement energy labels.

### Funding

Type of funds	Implementation aspect it supports
<b>Multi-lateral (UNDP funded project implemented by MoIT)</b>	The UNDP's project, BRESL was funded by the GEF for the amount of USD 650,000 and the Government provided in-kind co-funding estimated in USD 3,085,000. The project's key targets were: <ul style="list-style-type: none"> <li>• Establishment of the legal basis for EES&amp;L and assisting with the development of regulations for the targeted products.</li> <li>• Building of institutional and individual capacity to secure on-the-ground implementation of EES&amp;L, including establishment of regional working groups for each of the targeted products.</li> <li>• Information and technical assistance for local product manufacturers to help them develop energy efficient products and realize profit opportunities from energy efficient products.</li> <li>• Regional cooperation activities towards regional harmonization of energy efficiency standards and labels.</li> </ul>

<p><b>Bilateral project with Australia (AusAID funded project)</b></p>	<p>The Australian Agency for International Development (AusAID) financed the Australian Department of Industry and Science technical assistance program for a total of US\$1.94 million. This program consisted in a range of activities designed to build capacity; set and enforce standards; test appliances; and monitor and evaluate the MEPS and Labelling program. The key elements of this program were:</p> <ul style="list-style-type: none"> <li>• Funding an expert role in the Ministry of Industry and Trade (MOIT) to assist in the implementation of the VEESL program;</li> <li>• Providing information on international standards to the Vietnam Standards and Quality Institute (VSQI);</li> <li>• Reviewing and contributing to standards as they were developed and supported international consultation to ensure that test and performance standards were consistent with international best practices and appropriate to local circumstances;</li> <li>• Contributing to the design and implementation of the online registration system and provided resources to assist in the processing of applications;</li> <li>• Working with MoIT to develop a robust enforcement regime consisting of compliance surveys and verification testing, facilitating compliance and establishing relevant enforcement policies, procedures and staff manuals;</li> <li>• Supporting the development of local test capacity and technical and commercial skills in laboratories through training, using different types of analyses;</li> <li>• Assisting the development of initiatives to communicate the MEPS and labelling program to manufacturers, installers, retailers and consumers;</li> <li>• Establishing modelling, research and evaluation activities to identify the financial, energy and carbon savings resulting from the MEPS and labelling program; and</li> <li>• Carrying out a feasibility study to evaluate the costs and benefits of improving the local manufacture of efficient appliances and equipment.</li> </ul>
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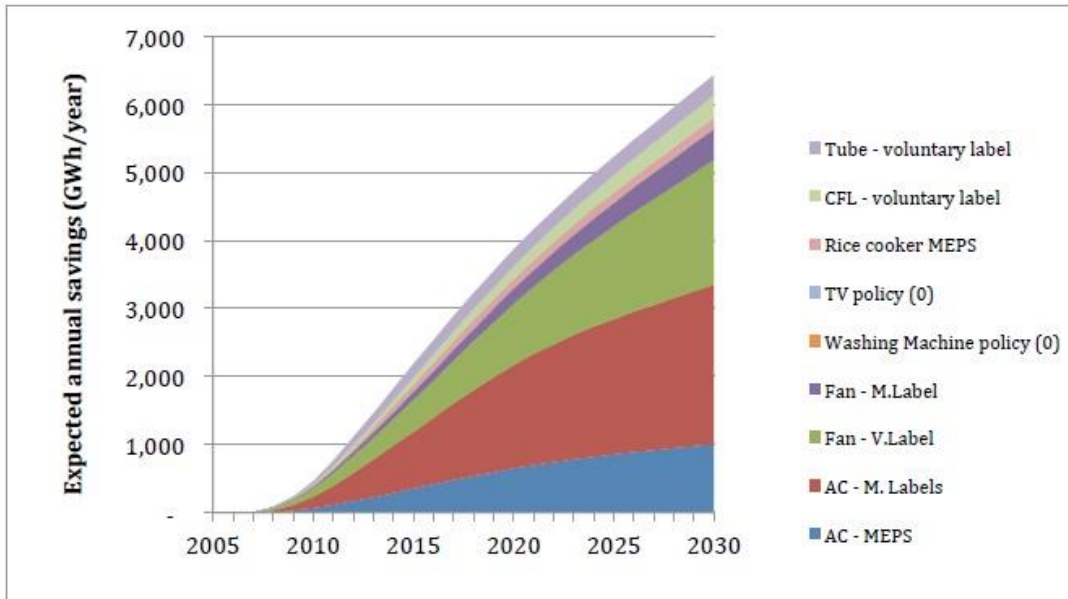
**Costs**

No information available

**Energy savings and associated emission reductions**

According to Charles Michaelis, a researcher at the Databuild Research and Solutions, Ltd, in the UK, the contribution to annual and cumulative electricity savings that will be made by the current levels of MEPS and energy labels have been estimated to be around 6,000 GWh/year, by the year 2030. The cumulative energy savings by then are expected to be over 70 TWh. These energy savings translate to over US\$440 million, which represents, approximately US\$13 for every household in 2030. The chart below shows the estimated contribution by the policy to future energy savings from 2013 to 2030.

**Estimated total annual electricity savings for selected products to 2030**



**Benefits**

Benefit		Description
<b>Reductions in energy demand</b>		No available information.
<b>Mitigation of greenhouse gases</b>		Our own estimate is that the impact on GHG emissions reduction is 2.64 million ton CO <sub>2</sub> <sup>43</sup> only from some selected household appliances.
<b>Improvement in air quality</b>		N/A
<b>Macro-economic impacts</b>	<ul style="list-style-type: none"> <li>• Impacts on GDP</li> <li>• Trade balances</li> <li>• Energy prices</li> </ul>	The only economic figure available is an estimation of US\$440 million of savings for the households for the entire period, representing approximately US\$13 per household by the year 2030, but only from some selected household appliances.
<b>Impacts on public budgets</b>	<ul style="list-style-type: none"> <li>• Reductions in operational and capital expenditure for the public sector.</li> <li>• Effects attributed to structural changes to the economy and changed economic activity due to investment in energy</li> </ul>	The biggest impact on public budget is the one associated to electricity savings from more efficient public lighting systems. However, there is no estimation

<sup>43</sup> According to the International Energy Agency (IEA), the emission factor for the electricity grid in Vietnam was 0.4130283 kgCO<sub>2</sub>/kWh in 2011. With the assumption that Vietnam keeps that emission factor for its electricity, the total amount of electricity saved (6,400 GWh) by the year 2030, would mean that this program has an impact of 2.64 million tons of CO<sub>2</sub>.



	efficiency	of the impact of that item.
<b>Creation of jobs</b>		N/A
<b>Improvements in human health and well being</b>	<ul style="list-style-type: none"> <li>• Reduce risk of respiratory and cardiovascular diseases, allergies, arthritis and rheumatism with warmer, drier, more comfortable indoor environments resulting from improved building insulation</li> </ul>	N/A
<b>Increased access to energy and reduced fuel poverty</b>		N/A
<b>Benefits to energy providers</b>	<ul style="list-style-type: none"> <li>• Reduced operating costs</li> <li>• System and network deferral</li> <li>• Increased reliability</li> <li>• Market price changes</li> <li>• Associated with marketing</li> </ul>	N/A

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## 9 DEMAND SIDE MANAGEMENT

<b>Title:</b>		
<b>9.1 Austria Smart Metering and Informative Billing</b>		
<b>Country:</b>	Austria	
<b>Sector: Smart Metering</b>	Stage: Ongoing	<b>Type of policy/practice/instrument:</b>  Public Information/Education/DSM
<b>Sub-sector (if applicable):</b>	<b>Period:</b> 2012-2019	

### Description

Driven by recent European Union legislation, such as the Energy Services Directive and the Third Energy Package<sup>44</sup>, a majority of countries in Europe have either implemented, or are about to implement, legal frameworks that will require the installation and use of smart meters. The goal is that, through the metering system, customers will be better informed about their energy consumption patterns, which in turn may spark behavioural changes that will translate into energy savings.

Such is the case in Austria, where parliament passed a new Electricity Act in November of 2010, which allowed the Minister of the Economy to introduce the use of smart meters by decree, and where regulators would then be responsible for defining the data requirements and general logistical details of a national smart metering system. While the reasons behind the push for such a system and its accompanying legislation were manifold, its main objectives are increasing the information available to customers, and increasing efficiency both in terms of energy use and billing.

In early 2012 the Minister of Economy issued a decree outlining a mandatory timetable for the implementation of smart metering services in Austria. The decree adhered to a proposal published earlier by E-Control, the Austrian energy regulator, which outlined the mandatory information that should be made available to customers equipped via a smart meter system. According to this decree, the vast majority of the system, and its corresponding smart meters, would be implemented and distributed in 2016 and 2017, with national electric network operators having to equip at least 95 percent of all metering points by the end of 2019.

Key aspects of the programme include:

- The Minister of Economic Affairs, under the Electricity Act, had to conduct a cost-benefit-analysis for the implementation of smart metering and establish a general business case for such a system, before the relevant decree could be issued. His office then had to consult with the Energy Regulatory Authority, as well as with customer protection bodies and the Austrian Data Protection Commission, before arriving at the final language and stipulations to be included in the decree.
- Network operators will be required to meter the consumption of customers, and will have to store these data for billing, customer information, and other energy efficiency purposes.
- Network operators will also have to provide the metered data and customer information to customers on an internet platform. Data is to be provided online on a daily basis; at the latest, one day after metering occurs.
- Network operators have to ensure that all smart meter system operations comply with relevant Austrian data and customer protection laws.
- Electricity distributors must send their customers information about their actual consumption and related costs on a monthly basis, either electronically or on paper.

<sup>44</sup> <http://eur-lex.europa.eu/browse/summaries.html>

- The Energy Regulatory Authority has and will continue to re-evaluate the requirements for information to be included to customers and to relevant databases.

The smart meters have to meet certain pre-established criteria:

- They need a bi-directional communication-connection.
- They must provide be able to to both meter and save meter counts, average power values or energy consumption in 15-minute interval periods. They also have to be able to save the values for daily energy consumption.
- They must save all metered data for at least 60 days within the metering date. In case of network failures or possible disconnections from the grid the meter has to be able to save all data, so as to ensure a complete reconstruction of all relevant data history.
- They must be able to expoert all data via communication ports at least once a day. All the data for one day has to be transferred at the latest by 12:00 (noon) on the following day.

Also included in the Ministry’s decree were the requirements set out to accomplish the relevant reporting associated with the implementation of the metering system. These requirements were deemed mandatory as part of an annual report, which includes such items as the following:

- latest implementation project plans,
- advances with the implementation process,
- costs,
- notable experiences during implementation,
- development of customers’ energy consumption databases, network situation, and data protection.

One of the most innovative early adopters of smart metering in Austria was a municipal energy supply company in Feldkirch (Stadtwerke Feldkirch), in the province of Vorarlberg. Stadtwerke Feldkrich supplies customers with electricity and also operates the municipal distribution network for about 18,400 customers (approx. 19,500 metering points). The company started a smart metering pilot project in 2006. In 2007, it decided to implement a smart metering system for all customers. Until now, about half if Feldkirch’s customers are already equipped with a smart meter and, according to the company’s schedule, the implementation for all customers should be completed by 2016. The company also provides an online platform with comprehensive energy consumption data and makes information available via email to interested customers. About 500 customers are using the consumption information actively. The customers can choose the level of detail of the data metered and provided. Quarter-hourly consumption data can also now be processed upon request by a customer.

### Actors

Actor	Role
Ministry of Economy	Institutional office responsible for the introduction of smart metering legislation, as well as the necessary cost-benefit analysis needed for the justification of a smart metering system. This office also oversees the implementation of the system.
The Energy Regulatory Authority	Entity responsible for the actual wording and publishing of the relevant decree, defining responsibilities and requirements for the smart metering system, including data formats, requirements, etc.
Network operators	The Austrian legal framework determines that metering is a monopolistic task of the network operator. The network operator has the obligation for metering, billing of the network charges and forwarding the necessary data to suppliers and other involved market participants. There are no intentions in Austria to liberalise the metering business.
Electricity distributors	Actors responsible for sending customers information about their actual consumption and related costs on a monthly basis either electronically or on paper.

## Barriers

- **Operators.** At the beginning of the launch of the regulation, network operators, who were responsible for implementing the actual metering services, felt uncomfortable with it. They raised serious concerns regarding the costs of smart metering and the feasibility of smart metering systems in general. They argued that all costs of smart metering implementation should be included in the regulated network charges. Suppliers did not play an active role in the public discussion regarding smart metering and there were no suppliers with a declared intention to offer new tariff models.
- **Benefits.** There was and still remains much uncertainty about the quantification of benefits related to smart metering, especially in relation to its associated energy savings. This is mainly due to the limited practical experience in this field, as well as to a lack of historical data.
- **Costs of installation.** Rolling out smart metering systems on a large scale is a very long and costly process, requiring considerable capital expenditures from the responsible market actors.
- **Customers.** The deployment of smart meters is a key enabler for the increase of demand-side responses. Yet, gaining consumers trust and participation remains the main challenge in this field as it is contingent on education and raising awareness efforts that go beyond the physical implementation of meters.
- **Cost-benefit tool.** A cost-benefit tool that was devised to assist in program implementation was of minor interest for certain stakeholders, in particular, Austrian utilities. Compared to the cost-benefit analysis undertaken by the Austrian regulatory body in early 2010, utilities felt that they would be obliged to install smart meters regardless of any analysis outcome they would arrive at on their own. The Austrian Energy Agency received hardly any feedback from decision makers, which may have been perceived as a confirmation of the above conclusion.
- **Stakeholder buy-in.** Several stakeholders and interest groups in Austria criticise the implementation of a smart meter program due to a perceived lack of privacy and data protection. Discussions regarding appropriate metering periods (daily, hourly, quarter-hourly) and the need of data aggregation are also on-going. Some IT security-experts have raised concerns regarding potential cyber-attacks against electricity networks. The Energy Regulatory Authority is currently preparing a new decree, which will determine the level of detail regarding the metered data and the provision of data to suppliers and customers by the network operator. Moreover, it is expected that the Ministry of Economy will develop an amendment to the Electricity Act this year, which will clarify open issues regarding data protection and privacy.

## Enablers for implementation

- The Austrian Regulatory Authority played a key role in programme implementation, by publishing the required cost-benefit-analysis for the introduction of smart metering for electricity and gas early 2010, which showed that the implementation of smart metering in Austria would bring about significant economic benefits. Even though the study was very controversial and was challenged by network operators as well as independent institutions, it was ultimately used to gain initial feedback from stakeholders and was the impetus for pushing for the eventual legislation required
- Small scale projects were successfully used to gauge the acceptance and feasibility of a larger, nationwide program. As a part of the SmartRegions Project<sup>45</sup>, Energieversorgung Niederösterreich, a local utility, and the Austrian Energy Agency jointly developed a year-long pilot project to measure the effectiveness, customer satisfaction and the willingness to pay for feedback mechanism in the use of smart metering systems. On basis of the consumption data measured with smart meters, the customers have been able to provide feedback on the usefulness of the system. The energy consumption within this period has been compared with

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<sup>45</sup> <http://www.smartregions.net/>

that of a control group, with participants selected randomly from the customer database . About 1 500 customers had to be invited for participation at the pilot project to recruit the 287 participants. This indicates that certain scepticism existed amongst the customers, thus highlighting even further the need for such 'pilot' experiences.

- Regional experience sharing and best practice determination was also an important enabler for a program of this nature. The European Smart Metering Landscape report provides an example of experience sharing. This report is created by monitoring and analysing the development of smart metering roll-out programs and services for energy end-users across various European countries. The report consists of in-depth country profiles of all European Union member states and Norway, and case studies of related services for energy consumption feedback and demand response. The Landscape Report has been published twice, in February 2011 and in October 2012 (with an update issued in 2013). The reports have been the single most successful deliverable in the SmartRegions project, receiving wide interest and positive feedback from market actors and policy makers, as well as from the research community. Based on the knowledge gathered from the Landscape Report and other project outcomes, 'recommendations for best regulatory framework for smart metering services' have been defined and published. The recommendations outline good practices with regards to appropriate regulatory frameworks for smart metering systems. Austria's programme benefited from this work.
- Even though it can also be seen as one of the barriers to policy implementation, the cost-benefit sustainability tool made available by legislators did help various stakeholders to conduct their own analysis. It also made it possible to achieve the following objectives:
  - provide a list of the major benefits and costs associated with smart metering;
  - allow different implementation scenarios to be examined, so that the financial implication of different options could be examined (smart meters with and without real-time displays);
  - identify reasonable input values that could be used in smart metering cost benefit analyses;
  - provide a means to identify the interplay of costs and benefits between stakeholders, depending on which benefits are included and how the different energy markets are organised;
  - include environmental and social costs and benefits in the evaluation of smart metering systems;
  - evaluate the effects of different categories of smart metering energy services according to certain predefined parameters.

## Funding

Type of funds	Implementation aspect it supports
Domestic	The financing of smart metering is mostly secured through an adequate remuneration of the Regulatory Asset Base via network tariffs. Austria has provided for an explicit metering tariff or for a rental price for the smart meters.

## Costs

In the cost-benefit analysis carried out in Austria by the regulatory authority in 2010, the estimated costs for smart metering implementation amounted to between EUR 3.3 billion (USD 3.5 billion) and EUR 4.4 billion (USD 4.7 billion), with the estimated benefits ranging between EUR 3.6 billion (USD 3.8 billion) and EUR 4.9 billion (USD 5.2 billion), and an estimated net present value between EUR 291 million (USD 309 million) and EUR 556 million (USD 590 million). These figures would be representative for the expected rollout period up until 2019, described earlier in this case study. The major costs associated with smart metering are the purchasing, instalment and operating costs of the smart meters, and the investment costs for advanced data collection and data communication infrastructure.

## Energy savings and associated emission reductions

Some caution is needed in interpreting the figures that have been determined for this category as different methodologies are currently employed to estimate benefits and different items included in the evaluation of smart meter implementation. For example, despite a considerable rollout programme for smart meters in France, policy makers in France consider that the assumptions used for benefits calculation are too uncertain to give a reliable value at the moment, thus there are currently no benefit values available for that country.

According to a most recent publication by the European Commission on smart metering deployment<sup>46</sup>, some of the cost and benefit figures for Austria have been further refined since the original cost-benefit analysis mentioned earlier. At the time of publication, and based on the assumption that 570,0000 smart meters would be rolled out in Austria during the period of 2012-2019, with a penetration rate of 95 percent, the following figures were determined for electricity smart metering only:

- Total investment: EUR 3,195 million (USD 3,391 million)
- Total benefit: EUR 3,539 million (USD 3,757 million)
- Consumer's benefit: 78.5 percent
- Energy savings: 3.5 percent
- Discount rate used: 4.2

The following figures were determined for gas metering:

- Total investment: EUR 352 million (USD 374 million)
- Total benefit: EUR 1,400 million (USD 1,486 million)
- Energy savings: 7.0 percent of total consumption.

## Benefits

Benefit		Description
<b>Reductions in energy demand</b>		According to the European Commission, the smart metering programme resulted in energy savings of 3.5 percent for electricity and 7 percent for gas.
<b>Mitigation of greenhouse gases</b>		No Information available.
<b>Improvement in air quality</b>		Not applicable
<b>Macro-economic impacts</b>	<ul style="list-style-type: none"> <li>• Impacts on GDP</li> <li>• Trade balances</li> <li>• Energy prices</li> </ul>	The cost-benefit analysis carried out in 2010 by the regulatory authority put forward the following estimates: <ul style="list-style-type: none"> <li>- net present value: between EUR 291 million (USD 309 million) and EUR 556 million (USD 590 million)</li> <li>- benefits: between EUR 3.6 billion (USD 3.8 billion) and EUR 4.9 billion (USD 5.2 billion)</li> </ul>
<b>Impacts on public budgets</b>	<ul style="list-style-type: none"> <li>• Reductions in operational and capital expenditure for the public sector.</li> <li>• Effects attributed to</li> </ul>	No information Available.

<sup>46</sup> European Commission, Cost-benefit analyses and state of play of smart metering deployment in the EU-27. June 2014 : <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014SC0189&from=EN>

	structural changes to the economy and changed economic activity due to investment in energy efficiency	
<b>Creation of jobs</b>		This program supports more than 21,000 jobs <sup>47</sup>
<b>Improvements in human health and well being</b>	<ul style="list-style-type: none"> <li>• Reduce risk of respiratory and cardiovascular diseases, allergies, arthritis and rheumatism with warmer, drier, more comfortable indoor environments resulting from improved building insulation</li> </ul>	Not applicable
<b>Increased access to energy and reduced fuel poverty</b>		Not applicable
<b>Benefits to energy providers</b>	<ul style="list-style-type: none"> <li>• Reduced operating costs</li> <li>• System and network deferral</li> <li>• Increased reliability</li> <li>• Market price changes</li> <li>• Associated with marketing</li> </ul>	<ul style="list-style-type: none"> <li>• Potential for energy savings driven by changes in consumption behaviour</li> <li>• Improvements in the security of supply through faster fault location,</li> <li>• Easier power restoration, and improved monitoring of voltage quality,</li> <li>• Quick remote disconnection or reconnection of customers or power, when required.</li> </ul>

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<sup>47</sup> Still TBD

<b>Title:</b>		
9.2 Eskom’s Energy Efficiency and Demand-Side Management (EEDSM) Incentive Program		
<b>Country:</b>	South Africa	
<b>Sector:</b> Industry/Buildings	<b>Stage:</b> Ongoing	<b>Type of policy/practice/instrument:</b> Demand Side Management
<b>Sub-sector (if applicable):</b> Manufacturing industry	<b>Period:</b> 2004 – Present	

### General Description

Eskom is the largest state owned utility company of South Africa. It generates approximately 95 percent of the electricity used in South Africa and 45 percent of the electricity used in Africa. South Africa’s ‘National energy efficiency strategy’ mandates to reduce energy demand and contribute towards the alleviation of short-term shortages of electricity supply in the country. In 2004, in response to this requirement, Eskom launched a financial incentives programme. The programme promotes the implementation of more energy-efficient technologies, processes and behaviours among Eskom’s customers.

The current incentive schemes that offer opportunities for industrial companies include the following:

- **Standard product programme.** Eskom provides discounts on the investment costs for the implementation of specific technologies that prove to be energy efficient. The standard value per rebated item is capped at ZAR 750,000 (USD 60,000) and a full payment is awarded once the project has been commissioned and verified. The focus is on small- to medium-sized projects (below 250 kW) such as lighting, shower heads, and industrial heat pumps. Customers who implement the approved technologies are thus eligible for a rebate on the investment costs.
- **Standard offer programme.** Under this programme any Eskom customer or energy service company that can commit to delivering verifiable energy savings (from 50 kW to 5 MW) in future planned activities can propose such projects to Eskom. In turn, and if the project is successful and implemented as planned, Eskom pays the fixed amount per kWh to the participant over a period of three years. The rate per kWh for energy savings is fixed per technology group, as per the requirements of the National Energy Regulator of South Africa. It ranges between ZAR 42 and 120 cents per kWh (between USD 0.03 and 0.10 cents per kWh). This is a performance-based programme for energy savings within the commercial, agriculture and small industrial sectors’. It includes such technologies as energy efficient lighting systems, building management systems, hot water systems, industrial process optimisation, and industrial and commercial solar water systems.
- **Energy service company programme.** In this programme energy service companies can participate in an incentive scheme if they submit a project proposal that includes significant energy demand reductions (over 1 MW). Such load management projects currently qualify for up to 100 percent funding of the financial benchmark value Eskom sets for various project categories. Under current rules, it is also possible for an industrial electricity consumer to register with Eskom as an energy service company. These demand-based payments equate to between ZAR 50 and 70 cents per kWh (between USD 0.04 and 0.06 cents per kWh), and common project types include such technologies and techniques as process optimisation, lighting, heat pumps, among others.



- **Aggregated standard product programme.** Under this programme project developers can aggregate the individual energy efficiency projects under the Standard Product Programme through a single contract. Target sectors are similar to those in the 'standard product programme' and the contract size is usually between 1 and 5 MW. The programme considers funding for projects that achieve demand savings of less than 250 kW per individual project and aggregated demand savings of between 1 MW and 5MW per group of projects.
- **Performance contracting.** This type of scheme consists of bulk buying of energy savings from project developers for multiple projects, including fixed payments for verified savings. Such performance contracting allows Eskom to purchase verified energy savings across multiple sites and technologies by contracting with a single project developer. Eskom drafts such contracts mainly during daytime hours on weekdays, and the rate used is determined either through a fixed offer or through a competitive bidding process. The minimum project size needs to be above 30 GWh of savings over a three year period. Rates per kWh are fixed and based on the time of savings: ZAR 55 cents per kWh (peak) and ZAR 10 cents per kWh (other time), equivalent to USD 0.04 cents per kWh (peak) and USD 0.01 cents per kWh (other time). Common project types included under this scheme are compressed air, ventilation, lighting, shower heads, heat pumps, and large capital-intensive industrial projects.

With the exception of the 'standard product programme' all other programs require applicants to perform an energy audit (to identify eligible energy efficiency measures), draw up a monitoring and verification plan, and submit a report on achieved savings that is verified by an independent verifier.

#### Actors

Actor	Role
Ministry of Energy	Set the energy efficiency and demand-side management) targets for the utility
National Energy Regulator of South Africa	Add, attend and remove license conditions by law Approve verification protocols Develop rules for the 'standard offer programme' Implement financial reconciliation of energy efficiency and demand-side management funds in relation to target savings
Eskom	Allocate the budget for the schemes in accordance with instructions from the National Energy Regulator. Collect the energy efficiency and demand-side management funding through the use of a wholesale tariff
Department of Energy	Develop policy on the 'standard offer programme', with differentiated approaches for solar water heating and other energy efficiency and demand-side management initiatives Provide for the 'Energy efficiency resource standard', which is the extent of the long-term funding for energy efficiency and demand-side management to cover the electricity savings purchased under that programme Develop criteria for so-called request for offers relating to the available solar water heating subsidy in a multi-year price determination cycle
National Energy Efficiency Agency	Request and receive verification reports for each energy efficiency and demand-side management initiative under the standard offer programme Advise the Development Bank of South Africa and the National Energy Regulator of verified savings per initiative Collate reports and produce energy efficiency and demand-side management performance reporting for industry
Development Banks of South Africa	Offer concessionary funding for project developers wishing to benefit from the standard offer programme, and for individuals and entities wanting to claim electricity savings against an energy efficiency and demand-side management funding mechanism.

	<p>Perform functions identified for the National Energy Efficiency Agency in the standard offer programme</p> <p>Model until the National Energy Efficiency Agency is fully capacitated to take over the function</p> <p>Advise market participants when the Department of Energy makes the criteria available for a 'request for offers'</p> <p>Receive and manage the energy efficiency and demand-side management funds in accordance with the 'standard offer policy' and National Energy Regulator rules when Eskom releases the funds</p> <p>Pay verified claims</p>
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## Barriers

A number of major issues and concerns related to the implementation of the demand-side management fund by Eskom were identified in consultation with senior managers and executives of Eskom, the Department of Minerals and Energy, the National Energy Efficiency Agency, the South African Association of energy-service companies, individual energy-service companies, large industrial customers, and the National Business Initiative. The general consensus was that the implementation of demand-side management projects had been far short of what was expected and plausible, and that substantial modification and enhancements were needed to make the demand-side management process more efficient and effective (ESMAP, 2011).

Some of the key issues identified included the following:

- Eskom's demand-side management group was understaffed and overburdened.
- The process that had been used by Eskom to evaluate and process the incoming demand-side management proposals was very cumbersome, slow, and non-transparent. The proposal process —a sequence of technical, financial, and procurement reviews conducted by separate Eskom committees— led to substantial delays and costs to the project developers, and often represented a major disincentive to applying for demand-side management funds. Further, questions raised at any stage of review required the applicant to resubmit and restart the review process, contributing to further delays and costs.
- The criteria that had been used by Eskom for project approval appeared to be unclear and inconsistently applied.
- The process of proposal evaluation had suffered from misunderstanding, poor communication, and insufficient feedback, particularly regarding why proposals were rejected.
- Eskom's evaluation teams had been overly concerned about, and spent inordinate amounts of time on, the details of the energy savings calculations and costs of the demand-side management measures.
- Eskom's contract negotiation process was very complex, time-consuming and adversarial.

In the opinion of many energy-service companies, Eskom itself appeared to be a barrier to demand-side management implementation, rather than a facilitator of schemes under this program. Further, in their opinion, the uncertainty and delays in the Eskom evaluation process created large risks and made many projects very difficult to finance and implement. ESKOM maintained that it had to devote sufficient time and resources for proper due diligence of every project as they were essentially responsible to assure that the 'ratepayer' funds in Eskom demand-side management funds were spent fairly and judiciously. Both Eskom and the ESCOs agreed that the goals of the demand-side management fund were not being met (ESMAP, 2011).

The most recent barrier that Eskom's scheme now faces is in relation to South Africa's most recent energy crisis, which is partly due to two coal-fired power stations (Medupi and Kusile) being years behind schedule and billions over-budget. These circumstances have placed the state owned utility in a precarious financial position as of late, and because of this, it has recently been forced to cut back on its energy efficiency incentives, according to a comment recently made by a senior general manager for the integrated demand management program<sup>48</sup>. In March of 2015, the National Energy Regulator of South Africa allowed Eskom to claw back actual costs with a 12.69

<sup>48</sup> <http://www.bdlive.co.za/business/energy/2014/10/07/eskom-curtails-energy-efficiency-schemes>

percent increase in tariffs in its next financial year. This was welcome news to the utility, as the doubling of the rate of inflation increase would potentially help to incentivise further energy savings. However, despite added interest on the part of members of the manufacturing industry when Eskom first asked the energy regulator for a 16 percent annual tariff increase for five years up to 2018, their interest dropped dramatically as soon as the regulator granted an 8 percent increase, which would seem to indicate that there is clearly also a high degree of price sensitivity among industrial customers for participating in energy efficiency schemes.

### **Enablers for implementation**

As the policy is based on regulation, incentives, and market based mechanisms at the same time, the central government role has been a crucial one for the initial execution, as well as for the subsequent implementation of the programme. The Electricity Regulation Act of 2006 (the Act) laid the ground rules for the incentive scheme and introduced a new regulatory framework for the electricity industry, with additional demand-side management obligations to existing licensees. This new legal framework required every licensee to comply with energy efficiency standards and demand-side management by law. In this sense, government mandates both empower and oblige the National Energy Regulator to amend, add or remove any licence condition, and at the same time, to help implement national government's new electricity policies. Implementers of the program now even provide their customers with a website platform in which they can find the necessary documents and procedures to allure them to the schemes. Information now includes introduction letters, templates for monitoring and verification reports, application forms, and lists of eligible technologies, accredited energy-service companies, and possible project developers.

Another important enabler for the continued implementation of the incentive schemes has been the programme's adaptive management approach, which has allowed it to recognise and quickly act in response to stakeholder feedback, including strong criticism. A clear example of this is when Eskom, in view of an apparent lack of progress with demand-side management programmes implemented by energy-service companies in recent years, changed its focus to rather emphasise specific technologies that could be more easily implemented, and rapidly launched a large-scale rollout of compact fluorescent lamps in the residential sector, as one of its response measures. In 2008 Eskom also announced an 'accelerated demand-side management plan' to further refine the scheme with the objective of achieving and sustaining 3,000 MW of additional electricity savings by March 2011, and a further 5,000 MW by March of 2026. These refinement measures naturally also called for further coordination and collaboration amongst all major stakeholders, including the National Energy Efficiency Agency, the Department of Minerals and Energy, the National Energy Regulator, and Eskom (ESMAP, 2011).

Furthermore, in light of the criticism and problems faced during the initial years of the program, all stakeholders, including Eskom, agreed that the business model of the demand-side management fund should be revamped to reduce bureaucracy, accelerate the approval of projects and disbursement of subsidy funds, provide a transparent and long-term pricing regime, differentiate between the contractual complexity required for demand-side management and energy-efficiency projects, and adjust the subsidy scheme to provide equal treatment to energy-efficiency and demand-side management investments. One example of such actions was the 'standard offer model', which was proposed as an alternative mechanism for acquiring demand-side resources at a series of briefings for Eskom management, the Department of Minerals and Energy, the National Energy Regulator, and the other stakeholders in 2011 (ESMAP, 2011). The programme's continued adaptive management approach has thus resulted in greater transparency, shorter processing times, and reduced transaction risks of the 'standard offer' approach, which has also facilitated the mobilization of commercial financing, essential to achieving a substantial scaling up of demand-side management investment (ESMAP, 2011).

### **Estimated cost for government**

The estimated cost for the government to implement the programme from 1 April 2011 was ZAR 5.4 million (USD 436,000), over 3 years, for energy efficiency and demand-side management.

## Funding

Eskom releases programme funds in accordance with instructions from the National Energy Regulator. This information is not publicly available.

## Costs/ Benefits for the industry

No numbers are available on the actual costs for the industry. In 2011 Eskom total funding of demand-side management projects amounted to ZAR 545 million (USD 44 million). Total budget allocated for a three year period is ZAR 5.44 billion (USD 0.44 billion).

## Energy savings and associated emission reductions

The tables below show a synthesis of available information related to the energy savings in each scheme of the programme.

Scheme	2011	
EEDSM funded by	Average verified (MW)	Energy savings percentage (%)
National Energy Regulator	344.4	
Department of Energy	0.5	
Customer	9	
Eskom internal Energy Efficiency	3.1	
	Residential	56
	Industrial optimization	21

Year	2012			
Scheme	ESCO Program	Standard Offer	Performance contracting	Standard Product
Energy-service companies registered <sup>49</sup>	80			
Projects registered	406 <sup>1</sup>	61	16	572
Demand savings (MW)	793 <sup>1</sup>	31.4		19.7
Energy savings (GWh)	2347 <sup>1</sup>	148.1	2076	86.9
Projects contracted			131	

## Benefits

Benefit	Description
<b>Reductions in energy demand</b>	Programme results in 2011: Average verified MWs: National Energy Regulator funded: 344.4 MW; Department of Energy funded: 0.5 MW; Customer funded: 9 MW; Eskom internal Energy Efficiency projects: 3.1 MW. Over 2011 about 56 percent of the savings were achieved through more efficient residential savings and 21 percent from saving through industrial optimisation. Energy service companies programme: according to the Department of Minerals and Energy (2005), by 2004 there were 80 companies registered. By March 2012, 406 projects were registered, demand savings equalled 793 MW and energy savings 2347 GWh. Standard Offer: by March 2012 a total of 61

<sup>49</sup> By 2004.

		<p>projects registered, demand savings equalled 31.4 MW and energy savings 148.1 GWh.          Performance contracting: by March 2012 a total of 16 projects registered, contracted 131 MW and energy savings 2076 GWh.          Standard Product: by March 2012 a total of 572 projects registered, demand savings equalled 19.7 MW and energy savings 86.9 GWh.          Cumulative total verified Demand Side Savings (MW) (*2): 2005: 100 2006: 150 2007: 450 2008: 1,000 2009: 2,000 2010: 2,400 2011: 2,770</p>
<b>Mitigation of greenhouse gases</b>		In 2012 the programme achieved a reduction of approximately 232 million tonnes of CO <sub>2</sub> .
<b>Improvement in air quality</b>		Information not available.
<b>Macro-economic impacts</b>	<ul style="list-style-type: none"> <li>• Impacts on GDP</li> <li>• Trade balances</li> <li>• Energy prices</li> </ul>	<p>Economic costs are lower, compared to supply side options.          Projects registered under the schemes have had savings in terms of demand and energy consumption, which derive in economic benefits for final consumers. The activities under the programme and its schemes are an accelerator for economic growth through process efficiencies and job creation, though no exact figures in relation to this were available at time of writing because they could not be directly attributable to the programme.</p>
<b>Impacts on public budgets</b>	<ul style="list-style-type: none"> <li>• Reductions in operational and capital expenditure for the public sector.</li> <li>• Effects attributed to structural changes to the economy and changed economic activity due to investment in energy efficiency</li> </ul>	No information available.
<b>Creation of jobs</b>		No information available.
<b>Improvements in human health and well being</b>	Reduce risk of respiratory and cardiovascular diseases, allergies, arthritis and rheumatism with warmer, drier, more comfortable indoor environments resulting from improved building insulation	Information not available.
<b>Increased access to energy and reduced fuel poverty</b>		Information not available.
<b>Benefits to energy</b>	<ul style="list-style-type: none"> <li>• Reduced</li> </ul>	No direct information directly attributable to

<b>providers</b>	operating costs <ul style="list-style-type: none"> <li>• System and network deferral</li> <li>• Increased reliability</li> <li>• Market price changes</li> <li>• Associated with marketing</li> </ul>	the EE/DSM is available.
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<b>Title:</b>		
<b>9.3 Vietnam Demand-Side Management (DSM) and Energy Efficiency—Phase 2</b>		
<b>Country:</b>	Vietnam	
<b>Sector: Utility-based</b>	<b>Stage:</b> Finalized	<b>Type of policy/practice/instrument:</b> Demand Side Management/Incentives
	<b>Period:</b> 2004-2010	

**Description**

Demand-side management refers to any initiative undertaken by a utility or its customers to influence the amount or timing of electricity use. In 2000, against a background of significant growth in the demand for electricity (from 26,600 GWh in 2000 to 70,400 GWh in 2010), Electricity of Vietnam, the largest power company in Vietnam, launched a demand-side management programme organised around two phases.

Phase 1 of the programme (2000-2003) consisted on (1) developing an energy efficiency building code and (2) introducing energy efficiency standards for appliances, including lighting and industrial motors. Phase 2 of the programme (2004-2010) aimed at reducing the demand peak load on the electricity network by implementing the following initiatives:

- Promotion of compact fluorescent lamps. It distributed 1 million units.
- Market transformation from traditional fluorescent tube lamps to the more efficient ‘thin-tube’ lamps. It conducted a promotional campaign and a demonstration design project (the latter resulted in the installation of T8 lamps in 405 classrooms at 135 schools in 127 provinces and cities nationwide).
- Reduction in peak capacity through time-of-use metering. A time-of-use tariff system was introduced to encourage eligible customers - mainly commercial and industrial customers - to shift some of their demand to off-peak and low-load hours. This allowed Electricity of Vietnam to reduce investments related to system expansion, reduce electricity losses at peak hours and improve the stability of the electricity network.
- Rationalise electricity use in urban building areas with high demand and peak congestion through a direct control load management programme. Direct control load management programme refers to a set up that allows the programme manager to control the electric supply to individual appliances or equipment on customer premises. The programme was cancelled for lack of customer interest.

Phase 2 of the programme also included two analytical activities and a series of training sessions. The analytical work sought to investigate options for improving the regulatory framework for demand-side management, as well as options for increasing the cost-effectiveness of demand-side management programmes. The training programmes touched upon different aspects of demand-side management, from baseline, to monitoring and evaluation, to cost-benefit analysis.

As a direct follow up of this programme, Electricity of Vietnam considered creating a funding mechanism for implementing demand-side management measures in the future. Such a mechanism would mobilise a share of electricity sale profits, to support energy efficiency activities.

**Actors**

Actor	Role
Electricity of Vietnam (EVN)	EVN is the largest power company in Vietnam. It has participation in all three segments of the electricity market (generation, transmission and distribution). EVN was the entity responsible for implementing the demand-side management programme.
Vietnam Ministry of Industry and Trade	MOIT is the government ministry in Vietnam responsible for the advancement, promotion, governance, regulation, management and

(MOIT)	growth of industry and trade. MOIT is now also the lead agency in managing and coordinating energy efficiency and conservation activities in Vietnam. Currently, all activities in the field of energy efficiency and conservation shall be supervised by MOIT, which was the case for this particular program.
Vietnam National Energy Efficiency Program (VNEEP)	Since 2006, The Vietnam National Energy Efficiency Program (VNEEP) has provided a national platform for implementing a variety of EE and conservation activities in all sectors and they are responsible for supporting the implementation of these programs.
International Institute for Energy Conservation	Entity responsible for the monitoring and evaluation elements in Phase 2 of the programme.
The World Bank Group and the Global Environmental Facility	Provided financial support for programme design, implementation and evaluation. Other lending institutions have also been involved, albeit with less significant input.
Electricity Regulatory Authority of Vietnam	Since 2006, ERAV leads load research and demand-side activities in the power sector in Vietnam. ERAV has also been assigned the responsibility to develop the overall smart grid program for Vietnam, to increase efficiency in the power sector, and implement efficient pricing in electricity tariffs and demand response programs.

#### Times, sponsors and agencies involved in the different components of the programme

Project name	Years	Sponsor	Implementing agency
Vietnam Demand-Side Management (DSM) and Energy Efficiency—Phases 1 and 2 <sup>a</sup>	2000–10	WB, SIDA and GEF	MOIT, EVN
The Pilot Commercial Energy-Efficiency Program (CEEP)	2004–10	WB and GEF	MOIT/ERAV
Compact Fluorescent Lamp (CFL) Promotion Program	2004–07	WB and GEF	EVN and PCs
Fluorescent Thin Tube Lamp (FTL) Promotion Campaign	2004–07	WB and GEF	EVN

#### Barriers

- **Lack of Information:** Vietnam is still a long way from providing consumers with good information, especially in commercial or industrial establishments, where users have little idea of the potential for energy savings in their businesses, and how much money could be saved through improved management or modest investment.
- **Insufficient Readily Available Expertise:** Key actors in Vietnam, including Electricity of Vietnam, do not have adequate staff capacity, which contributed to delays in the various programme components.
- **Energy Pricing:** In Vietnam, prices paid for energy are low, relative to those in most other countries, as are electricity tariffs. Despite increases in the last few years, the cost of electricity for final consumers was USD 0.06 per kWh in 2014. Domestic coal prices are well below levels in other countries.
- **Cost-Consciousness:** In Vietnam, where planned economy paradigms remain strong, reducing operating costs, such as energy or water utility costs, may not be a priority to managers, even if quite profitable.
- **Design of the 'compact fluorescent lamp programme':** The demand savings of the programme could have been higher if the right wattage of incandescent lamps was replaced with compact fluorescent lamps. The programme design was based on a 75W incandescent lamp being replaced by a 20W compact fluorescent lamp. However, the compact fluorescent lamps replaced lower wattage incandescent lamps and a significant number of fluorescent tube lights.



- **Design of the 'fluorescent thin tube lamp programme':** Even though the programme was broadly successful (it brought about peak load savings of approximately 14.4 MW and energy savings of 25.2 GWh per year), design problems prevented an even more significant impact. For example, potential customers were not aware of the option and suppliers did not promote it actively. Besides, fluorescent thin tube lamps do not work at low voltages (below 170 V), which limits their application in rural areas.

### Enablers for implementation

- **Dedication and training.** Electricity of Vietnam implemented these programmes, despite not having adequate staff capacity. Dedication on the part of its staff and targeted training helped overcome this problem.
- **Capacity building.** The International Development Association of the World Bank not only provided funding: it also helped improve the technical capacity of the local agencies that implemented the programmes.
- **Institutional framework.** The Vietnam National Energy Efficiency Program provides a national platform for implementing a variety of energy efficiency and conservation activities in all sectors.
- **Necessary infrastructure.** The Vietnam Ministry of Industry and Trade and its provincial affiliates provided specific guidance on energy-use and energy conservation planning requirements, constructed an effective data management system, defined compliance requirements for energy managers, launched a wide range of energy auditing efforts and, especially, planned and delivered large-scale training programmes.

### Funding

Type of funds	Implementation aspect it supports
<b>Multi-lateral Technical assistance grant provided by the Swedish International Development Agency (SIDA) administered by the International Development Association (IDA)</b>	USD 3.6 million for phase 1 of the project: <ol style="list-style-type: none"> <li>demand-side management planning and pilot projects</li> <li>initiation of load management and research functions</li> <li>development of initial equipment standards with the Vietnam Ministry of Science and Technology</li> <li>development of a commercial building code with the Vietnam Ministry of Construction</li> </ol>
<b>Multi-lateral Global Environment Facility and International Development Association through the World Bank</b>	USD 20 million for phase 2 of the project: <ol style="list-style-type: none"> <li>implementation of several larger demand-side management programmes within Electricity of Vietnam and its power companies:               <ol style="list-style-type: none"> <li>time-of-use metering</li> <li>promotion of compact fluorescent lamps</li> <li>promotion of fluorescent thin tube lamp</li> </ol> </li> <li>development and implementation of pilot commercial energy efficiency programmes, which included training of service providers and audit investment grants.</li> <li>development of pilot market transformation programmes with solar water heaters and air conditioners</li> </ol>

### Energy savings and associated emission reductions

#### Overall

- Electricity of Vietnam's programmes reported annual energy savings of 496 GWh by the year 2010, which were estimated to have a reduction of 0.95 million tons of CO<sub>2</sub> emissions.

#### Compact fluorescent lamp programme

- energy savings of 37,500 MWh per year
- lifetime energy savings of 198,900 MWh
- the indirect demand reduction through the compact fluorescent lamp market transformation is estimated to be around 220MW (based on sales information obtained from manufacturers).

### Estimated system benefits based on sales information provided local compact fluorescent lamp manufacturers

	Unit	Lamp types				Total
		In	In	In	In	
Type of lamp replaced	In / FI					
Wattage of lamp replaced	Watts	40	60	75	100	
Compact fluorescent lamp wattage	Watts	9	11	15	20	
Number of lamps replaced	#	882,220	2,016,956	1,722,003	1,504,030	<b>6,125,209</b>
Peak savings – system level	MW	16.2	63.9	64.6	75.2	<b>219.80</b>
Total energy savings	GWh/yr	34.8	125.6	131.4	153.0	<b>444.70</b>
Total lifetime savings	GWh	184.4	666.3	696.5	811.2	<b>2,358.40</b>

Note: In – incandescent ; FI – compact fluorescent lamp

### Benefits

	Benefit	Description
<b>Reductions in energy demand</b>	<ul style="list-style-type: none"> <li>• Overall peak load reduction levels in 2010 amounted to 120 MW</li> <li>• Direct demand savings arising from the compact fluorescent lamp programme are estimated at 12.3 MVA.</li> <li>• Indirect demand reduction through the compact fluorescent lamp market transformation programme is estimated at around 280 MW (based on sales information from manufacturers).</li> </ul>	
<b>Mitigation of greenhouse gases</b>	<ul style="list-style-type: none"> <li>• Estimated CO<sub>2</sub> emission reductions by the end of all programme components reached 0.95 million tonnes.</li> </ul>	
<b>Improvement in air quality</b>		Information not available.
<b>Macro-economic impacts</b>	<ul style="list-style-type: none"> <li>• Impacts on GDP</li> <li>• Trade balances</li> <li>• Energy prices</li> </ul>	<ul style="list-style-type: none"> <li>• The implementation of 100 commercial energy-efficiency projects resulted in an aggregate investment of USD 5.2 million and delivered training to more than 100 service providers.</li> </ul>
<b>Impacts on public budgets</b>	<ul style="list-style-type: none"> <li>• Reductions in operational and capital expenditure for the public sector.</li> <li>• Effects attributed to structural changes to the economy and changed economic activity due to investment in energy efficiency</li> </ul>	Information not available
<b>Creation of jobs</b>		Information not available
<b>Improvements in human health and well being</b>	Reduce risk of respiratory and cardiovascular diseases, allergies, arthritis and rheumatism with warmer, drier, more comfortable indoor environments resulting from improved building insulation	Information not available.
<b>Increased access to energy and reduced fuel poverty</b>		<ul style="list-style-type: none"> <li>• Average energy bill savings for consumers were</li> </ul>

		estimated at 15.2 percent • Consumer benefit/cost ratio from the compact fluorescent lamp programme was 6.34
<b>Benefits to energy providers</b>	<ul style="list-style-type: none"> <li>• Reduced operating costs</li> <li>• System and network deferral</li> <li>• Increased reliability</li> <li>• Market price changes</li> <li>• Associated with marketing</li> </ul>	<ul style="list-style-type: none"> <li>• Power company benefit/cost ratio from compact fluorescent lamp programme: 19.5</li> <li>• .</li> <li>• Estimated savings resulting from implementation of the time-of-use metering project amount to 45 MW.</li> </ul>

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## 10 FINANCIAL MECHANISMS

<b>Title:</b>		
<b>10.1 Turkey Private Sector Sustainable Energy Financing Facility (TurSEFF)</b>		
<b>Country:</b>	Turkey	
<b>Sector: Energy Production</b>	Stage: Implementation	<b>Type of policy/practice/instrument:</b> Incentive Based Strategies
<b>Sub-sector (if applicable):</b> SME sector	Period: June 2010-January 2013 (Phase I) Finalized  Extension I launched in 2014	

### Description

The **Turkey Private Sector Sustainable Energy Financing Facility** was launched in 2010 by the European Bank for Reconstruction and Development. The facility seeks to help Turkey establish a sustainable energy finance market, with a view to increasing private sector participation in both renewable energy and energy efficiency projects. In doing so, the facility contributes to strengthening energy security in Turkey; improving its environmental performance; and reducing the impact of energy imports on its current account deficit.<sup>50</sup>

Following a slow start, due to the limited experience in Turkey of financing dedicated to renewable energy and energy efficiency projects, the facility rapidly achieved full disbursement ahead of target. In the period from June 2010 to January 2013 the facility committed USD 450 million in cleaner energy projects.<sup>51</sup> What is more, the participating Turkish banks and the European Bank for Reconstruction and Development together created a powerful brand for cleaner energy finance.

The key objectives of the facility are as follows:

- improving energy efficiency in small- and medium-sized enterprises in key sectors of the economy;
- decreasing reliance on fossil fuels while meeting energy needs;
- increasing the involvement of the private sector in developing and financing cleaner energy projects.<sup>52</sup>

The facility provides up to USD 265 million in credit lines to partner banks, including four eligible commercial banks. In turn, banks provide loans to private sector borrowers for energy efficiency or small-scale renewable energy investments.<sup>53</sup> Borrowers who meet the banks' selection and credit appraisal are eligible for up to approximately USD 6.3 million for implementing projects which include a significant energy efficiency component. Other project components may be financed by the customer or the participating local bank.

The facility offers six types of loans:

- **Industrial energy efficiency.** Large scale projects by industrial clients that comply with the following requirements:
  - The energy-savings ratio (or a measured reduction of greenhouse gas emissions) must be equal to or greater than 20 percent and the minimum internal rate of return, calculated only from the financial value of the potential energy savings, must be greater than 7 percent.

<sup>50</sup> <http://www.ebrd.com/pages/news/press/2014/140120.shtml>

<sup>51</sup> [http://www.ebrd.com/downloads/sector/sei/TURSEFF\\_Case\\_Study\\_Jan\\_2014.pdf](http://www.ebrd.com/downloads/sector/sei/TURSEFF_Case_Study_Jan_2014.pdf)

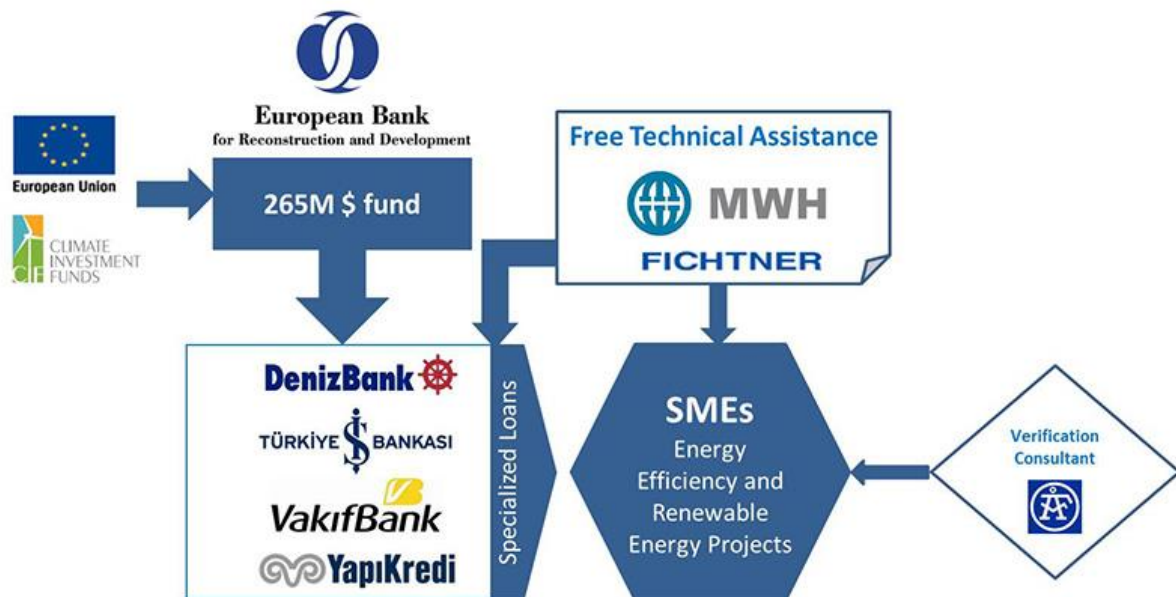
<sup>52</sup> <http://www.turseff.org/en/page/what-is-turseff>

<sup>53</sup> <http://www.turseff.org/en/page/what-is-turseff>

- Expansion of the capacity of existing production facilities is only eligible if the existing equipment is replaced with higher capacity equipment that is less than double the current capacity and its energy consumption per unit of output is reduced (as compared to the replacement that would have been undertaken in the absence of a facility loan).<sup>54</sup>
- **Energy efficiency projects for commercial buildings.** Large scale projects in commercial buildings must have an energy-savings ratio (or a measured reduction of greenhouse gas emissions) equal to or greater than 30 percent and the minimum internal rate of return, calculated only from the financial value of the potential energy savings, must be greater than 7 percent.
- **Stand-alone renewable energy projects.** For large scale renewable energy projects, the maximum installed capacity is set at 10 MW (eligible hydro and wind power projects must meet further specific environmental criteria). These projects must have a simple payback period of below 15 years at the time of approval and a positive net present value. There is a minimum requirement of 1.3 kWh per year of generated electricity (equivalent) per 1 Euro (approximately USD 1.26 USD) of investment.
- **Small scale energy efficiency and renewable energy projects.** The nature of small-scale projects in energy efficiency and renewable energy is restricted to a set of pre-approved technologies. The loan amount cannot exceed EUR 250,000 (approximately USD 315,660).
- **Supplier loan.** Only energy efficiency suppliers that manufacture, supply or install certain pre-selected technologies have access to these loans. The goal of the loan is to help these businesses expand their operations.
- **Vendor Loan.** Only small- and medium-sized enterprises that adopt certain pre-selected technologies have access to these loans. The loan amount cannot exceed EUR 250,000 (approximately USD 315,660). A special awareness raising effort is made to reach this kind of companies.

In addition to financing, the facility includes a technical assistance package: a team of experts helps prospective borrowers in identifying and developing energy efficiency (and renewable energy) projects and preparing successful loan applications. This technical assistance is provided free of charge. Experts also train local loan officers at participating banks in assessing large- and small-scale cleaner energy investments.<sup>55</sup>

Figure 1: Illustration of Loan Flow Scheme



<sup>54</sup> In exceptional situations the borrower may finance capacity expansions beyond double the current capacity. In these situations the conditions of the sub-loan eligible for financing are more constrained.

<sup>55</sup> <http://www.turseff.org/en/page/what-is-turseff>

### Additional Multilateral Financing Activities occurring in Parallel

#### Actors

Actor	Role
<b>European Bank for Reconstruction and Development</b>	Providing credit to support private sector investment.
<b>European Union and the Climate Investment Funds</b>	Financing the technical assistance programme.
<b>Project consultant (a consortium made up of Montgomery Watson Harza, Muhendislik ve Musavirlik, Sirkety and Fichtner)</b>	Providing technical assistance to potential sub-borrowers with regards to existing investment plans, identifying best measures to pursue, and supporting the preparation of investment proposals for accessing facility funds. Providing energy management training through energy audits and regional workshops. Providing project coordination, capacity building and training to the participating banks (including training of trainers and advice on eligibility of sub-projects requesting finance under the Facility).
<b>Verification consultant: ÅF Markets</b>	Ensuring that the objectives of the financing facility are met by sample-checking and confirming that sub-projects have been completed in accordance with the relevant investment plans and are on track to achieve planned energy savings.
<b>Turkish participating banks: Denizbank, İş Bankası, Vakıfbank and Yapı Kredi.</b>	Borrowing from the facility to on-lend to their industrial customers.

#### Barriers

The Turkish government had recently instituted energy efficiency programs through legislative and regulatory reforms as a priority; however, the private sector had not adopted the strategy, and, like many other emerging economies, their exclusion greatly hindered the adoption and acceptance of energy efficiency measures into key areas of the energy market. Key barriers for the private sector have been due to limited experience in energy efficiency projects and a lack of access to sustainable finance. Banks in Turkey also seem to have had limited experience in lending for the energy sector in general. Energy efficiency projects were limited mostly to selected large industries and energy-efficient bulbs in households. In the World Bank and EBRD experiences, financially viable projects may still remain unimplemented because of a combination of 5 main barriers:

1. Inadequate awareness of the benefits of energy efficiency and a perceived high technical and financial risk, particularly associated by medium and large industries.
2. A severe lack of capacity to evaluate energy efficiency projects by local banks and their perception of high financial risks of projects, resulting in inadequate debt financing.
3. A lack of capacity for managing a regulatory framework for energy efficiency.
4. High transaction costs in developing renewable energy and energy efficiency investments (other than large hydro and wind).
5. Lack of financial resources and proper lending facilities for small-scale projects and SMEs.

Until recently, electricity distribution companies were fully government controlled entities, yet full privatization of 21 companies was anticipated by 2010, thus making the experiences this facility could provide invaluable. The Electricity Market Law, which impulse this rapid privatization, aims to shift towards a more competitive wholesale power market, but private developers of power generation projects have found it more difficult to obtain financing as a result as support from the Treasury is no longer available.

Furthermore, private developers tend to be smaller and predominantly Turkish, and are less able to access international capital markets and export credit agencies. In addition to the 5 barriers above, private energy efficiency project developers also face:

- High pre-investment costs compared to conventional power generation projects. This is because of a lack of technically reliable information on energy efficiency resources and the costs of conducting pre-feasibility, detailed feasibility engineering designs, etc.
- Lack of medium to long-term debt financing needed for financial viability for what are typically small, but capital intensive infrastructure projects that have longer payback periods and need debt with longer maturity.
- Uncertainty about whether privatized distribution companies will enter into bilateral contracts to purchase electricity savings from smaller power generators.

### Enablers for implementation

- Targeted awareness-raising campaigns increased the understanding of local private sector actors about the benefits of energy efficiency improvements. Such awareness was rather low at project inception.
- To build capacity and experience among local banks in evaluating renewable energy and energy efficiency projects, the project implementation team trained bank staff in cleaner energy lending (including identification, evaluation and processing of cleaner energy project loans). Experts were hired to support partner banks in developing lending policies and procedures and to monitor their loan portfolios.
- On-the-job training for energy audits and feasibility studies was provided to local businesses.
- Monitoring and reporting was carried out by independent experts, to avoid any conflict of interest during the assessment and evaluation of completed energy efficiency projects. The experts hired for this task were required to ensure that facility objectives had been met and to confirm that projects had been completed in accordance with their investment plans.

### Funding

Type of funds	Implementation aspect it supports
<b>Multi-lateral (European Bank for Reconstruction and Development)</b>	USD 285 million financing for sustainable energy investments up to USD 5 million (market terms)
<b>Multi-lateral (Clean Technology Fund)</b>	- USD 50 million of concessional co-financing - about USD 2 million for technical assistance (grant funding)
<b>Multilateral (European Union)</b>	USD 7.5 million for technical assistance
<b>Bilateral (Japan Bank for International Cooperation)</b>	USD 20 million for disbursement (market terms)

Clean Technology Fund concessional funding was combined with European Bank for Reconstruction and Development commercial funding, to create more attractive pricing and longer maturity periods for partner banks. European Bank for Reconstruction and Development loans had a maturity of five years, including a two-year grace period, while Clean Technology Fund funds were offered with a maturity of fifteen years and a grace period of seven years. These terms were compatible with the typical payback timescale of energy efficiency (and renewable energy) projects.<sup>56</sup>

### Costs

<sup>56</sup> [http://www.ebrd.com/downloads/sector/sei/TURSEFF\\_Case\\_Study\\_Jan\\_2014.pdf](http://www.ebrd.com/downloads/sector/sei/TURSEFF_Case_Study_Jan_2014.pdf)

The funds were disbursed through 370 cleaner energy projects with a total project value of USD 460 million (as of December 31, 2012). The average value of these loans was USD 700,000 with amounts varying between the different investment categories.

- About 65 percent of the funds financed energy efficiency projects. Process machinery (18 percent), heating, ventilation and air conditioning (16 percent), co-generation (14 percent) and pumps and motors (12 percent) accounted for the majority of those investments.
- The remaining 35 percent of the funds financed renewable energy projects. Hydropower represented 92 percent of those loans, followed by wind projects (5 percent).

Table 1: TurSEFF loans by recipient category

Loan category	Total number of loans	Average loan size in US\$ million (rounded)
Commercial buildings	14	0.92
Large-scale industrial	88	1.72
Residential	1	0.05
Supplier	40	0.56
Small-scale	195	0.13
Vendor finance	32	1.50
<b>TOTAL</b>	<b>370</b>	<b>0.70</b>

Source: [http://www.ebrd.com/downloads/sector/sei/TURSEFF\\_Case\\_Study\\_Jan\\_2014.pdf](http://www.ebrd.com/downloads/sector/sei/TURSEFF_Case_Study_Jan_2014.pdf)

### Energy savings and associated emission reductions

Between June 2010 and January 2013 investments in sustainable energy projects through the facility avoided almost 650,000 tonnes of carbon dioxide per year. Those investments saved 1.5 TWh per year through energy efficiency projects and 1.15TWh per year through renewable energy projects.

### Benefits

Benefit	Description
<b>Reductions in energy demand</b>	1.5 TWh per year attributable to energy efficiency projects
<b>Mitigation of greenhouse gases</b>	Some 650,000 tonnes of carbon dioxide (including both renewable energy and energy efficiency projects)
<b>Improvement in air quality</b>	Information not available
<b>Macro-economic impacts</b>	<ul style="list-style-type: none"> <li>• Impacts on GDP</li> <li>• Trade balances</li> <li>• Energy prices</li> </ul> Information not available.
<b>Impacts on public budgets</b>	<ul style="list-style-type: none"> <li>• Reductions in operational and capital expenditure for the public sector.</li> <li>• Effects attributed to structural changes to the economy and changed economic activity due to investment in energy</li> </ul> TurSEFF partner banks have disbursed US\$ 264 million, which has considerably added to the public funding available for EE initiatives. Akbank is currently disbursing the remaining US\$ 24 million that the bank received in October 2012. The amount disbursed was channelled to 370



	efficiency	sustainable energy projects with a total project value of US\$ 460 million <sup>6</sup> . The CTF funding has thus supported a sustainable energy investment volume of 1:9. While the average value of these loans was US\$ 700,000, amounts varied between different investment categories, ranging from US\$ 1.7 million for complex energy efficiency and renewable energy projects to US\$ 0.05 million for the residential sector sub-project. The table below presents a breakdown of investment categories according to the number of projects and the average investment volume.
<b>Creation of jobs</b>		Some 36 percent of facility investments are outside of the economic hubs. It is believed that facility investments have contributed positively to employment creation, particularly in non-central areas.
<b>Improvements in human health and well being</b>	<ul style="list-style-type: none"> <li>• Reduce risk of respiratory and cardiovascular diseases, allergies, arthritis and rheumatism with warmer, drier, more comfortable indoor environments resulting from improved building insulation</li> </ul>	Information not available
<b>Increased access to energy and reduced fuel poverty</b>		Information not available
<b>Benefits to energy providers</b>	<ul style="list-style-type: none"> <li>• Reduced operating costs</li> <li>• System and network deferral</li> <li>• Increased reliability</li> <li>• Market price changes</li> <li>• Associated with marketing</li> </ul>	Information not available

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<b>Title:</b>		
10.2 Thailand's ENCON Fund		
<b>Country:</b>	Thailand	
<b>Sector:</b> Industrial	<b>Stage:</b> Implementation (Ongoing through extension)	<b>Type of policy/practice/instrument:</b> Directive and Incentive Based Strategies
<b>Sub-sector (if applicable): Industry, transportation, commercial, and residential</b>	<b>Period:</b> 1992-2012	

### Description

During the 1990's, despite considerable economic growth, many South East Asian countries saw minimal investments in (renewable energy and) energy efficiency. This trend was made stronger following the Asian financial crisis of 1997, where local banks' enthusiasm and inclination for lending to large and unfamiliar projects was even further reduced, and where a lack of financial liquidity decreased investor confidence in energy efficiency.

Thailand was no exception to these regional circumstances, though its government did put in early measures to counter these unfavourable investment conditions, even well before the economic crisis of 1997. In 1992 the government of Thailand established the 'Energy conservation fund', to foster the expansion of energy efficiency and renewable projects by mobilising investments towards projects of this nature. The fund was initially available to large-scale industrial and commercial facilities and later opened up to energy-service companies and small-to-medium sized enterprises. The main objectives of the fund were to enable project developers to access and leverage capital, expand the energy-service company market, stimulate private sector investment, and increase financial confidence in the energy efficiency and renewable energy sectors.

The fund is now of considerable importance, as it has generally proven to be a successful mechanism for the promotion of energy efficiency and renewable energy projects. It was designed to be a government-run institution, to mitigate the perceived risks of projects of this nature. This type of structure resulted in a lower required rate of return for financing, thus making it more attractive for other entities to participate.

Furthermore, the 'Energy-service companies fund', a separate fund under the umbrella of the 'Energy conservation fund', experienced a very low default rate, as its projects were, and continue to be, held to extremely stringent eligibility criteria and must undergo a thorough approval process. Most of the projects proposed under the fund have thus been well structured, have employed proven technologies from top-tier vendors (regardless of price), have attracted strong operation and financial co-equity investors, as well as a financially strong project host with consistent operational records, and have a clear exit strategy for the fund managers.<sup>57</sup>

The 'Energy conservation fund' was initially established with the passing of Thailand's 'Energy conservation promotion act'. The act outlined three major programme areas: a compulsory requirement on designated large commercial and industrial facilities to increase their energy efficiency; a voluntary programme targeting small- and medium-sized enterprises; and a complementary programme promoting research and development, and publicity initiatives. The fund was sourced from a tax placed on all petroleum sold within Thailand, which has raised approximately USD 50 million per year since 1991. To date the fund has been disbursed through a number of different economic and financial mechanisms, including grants, subsidies, tax

<sup>57</sup> "TH-5: Energy Conservation Promotion Fund (ENCON Fund)," Industrial Efficiency Policy Database, accessed October 2, 2014, <http://iepd.iipnetwork.org/policy/energy-conservation-promotion-fund-encon-fund>.

incentives, a feed-in premium for renewable energy, as well as the 'Energy efficiency revolving fund' and the 'Energy-service companies fund'.

According to a recent study conducted by the Center for Clean Air Policy, under the first phase of the 'Energy conservation fund', various impediments deterred the deployment of funds to projects. As a result, the programme progressed slowly, with inflows to the fund far exceeding the subsidies allocated to energy-efficiency projects, and a total unspent accumulation of USD 350 million by 2002. To overcome the bureaucratic and excessive reporting procedures that disturbed the fund early on, and to distribute funds more effectively, the Thai government established pilot and sub-fund programmes to stimulate further investments in large industrial energy-efficiency projects, one of which was the 'Energy efficiency revolving fund'.

Officially launched in 2003, the **Energy Efficiency Revolving Fund** seeks to stimulate energy efficiency investments in large-scale industrial projects by increasing the availability of debt financing for such projects, while minimising the borrowing costs to project developers. The fund initially provided credit lines for participating local banks at zero percent interest rates for energy efficiency projects of up to USD 10 million.

As the volume of finance grew, the banks themselves began to co-finance projects, and interest rates were subsequently reset to begin covering administrative costs. Local banks were then obliged to repay the principal and interest back to the fund within a 10-year period. With regards to project developers, local banks provided low interest loans of up to USD 1.4 million for individual projects, where the full cost of the project could be covered under those loans. In addition, loans were provided to developers and energy-service companies at a fixed rate of between 0 percent and 4 percent (compared to the market rate of 9 percent), with up to a seven-year loan period. The repaid loans were then used to finance new similar projects, hence the 'revolving' design of the fund.

The process for evaluating loan eligibility under this sub-fund was carried out by the local banks themselves, via applications and by assessing the strength of the balance sheet and the quality of securable assets versus future cash flows and savings. Most often funding for these projects was used to cover equipment installation, upgrade consultation, piping, transportation and other costs. Costs associated with land purchases, land improvement, and building construction permits did not qualify.

In general terms, the revolving fund is perceived to have been a success, as it achieved its goal of stimulating local bank financing of projects in a sector previously avoided by them, and it familiarised banks with energy efficiency technology financing.

The revolving fund was phased out in 2011, since Thailand's Department of Alternative Energy Development and Efficiency, which was responsible for the fund, felt that banks were adequately familiar with energy efficiency lending practices and could continue without government support. Even though the revolving fund was discontinued, the Department still provides technical support, particularly for projects involving new technologies.

The 'Energy conservation fund' spurred the creation of a second sub-fund, the **Energy Service Company fund**. This fund began operation in 2008 and was targeted at small- and medium-sized enterprises and energy-service companies, through a sponsorship by Thailand's Department of Alternative Energy Development and Efficiency, and managed by two government-appointed not-for-profits organisation, the Energy Conservation Foundation of Thailand and the Energy for Environment Foundation. With a fixed government budget, both fund managers would have the ability to co-invest in energy efficiency projects and/or energy-service companies, and could also provide assistance in securing funding from other co-investors. The different types of financial mechanisms that were offered under this particular sub-fund were the following:

- **Equity investment:** This type of mechanism provides co-investment in energy efficiency projects by allowing project developers to sell a specified amount of a project to investors, in return for a certain stake in the project's (future) profits. The mechanism increases opportunities for capital-intensive projects to expand operations, and since the energy-service companies fund is run by the government, the main impetus of the mechanism is thus to

support and promote efficiency investments, rather than to obtain a maximum return on projects.

- **Venture capital for energy-service companies:** Energy service companies in Thailand have historically experienced substantial constraints when trying to access large volumes of finance, since they tend to be small-sized enterprises that are technology-focused (as opposed to capital-focused), and therefore have lower values of registered capital. This mechanism serves as a form of co-investment for existing energy-service companies, to increase the registered capital of the company for new investments.
- **Equipment leasing:** This mechanism allows fund managers to carry out an equipment purchase agreement with energy-service companies and eliminates the need for project developers to invest directly in new technology upgrades.
- **Credit guarantee facility:** This facility is modelled after Thailand's state-owned 'Small business credit guarantee corporation', which is supervised and run by the Ministry of Finance. The corporation provides partial credit guarantees to commercial banks for loans to small enterprises eligible for debt financing. This facility provides similar services.

Just as the revolving fund above, the 'Energy-service companies fund' has also proved to be a successful mechanism for the promotion of energy efficiency projects in Thailand. By the end of its second phase of implementation in 2012, it had generated energy savings of 23.97 ktoe per year and financial savings of USD 29 million per year.

#### Actors

Actor	Role
<b>Ministry of Finance</b>	Fosters public awareness of the fund, and is the entity responsible for collecting and making available the tax proceeds that are used to replenish the fund.
<b>Thailand's Department of Alternative Energy Development and Efficiency</b>	In addition to establishing energy efficiency standards and labelling programmes, it provides technical assistance to project developers, and is the entity ultimately responsible for the implementation of projects under the fund.
<b>Energy-service companies</b>	The target group receiving funding from both the 'Energy-service companies fund'.
<b>Small Business Credit Guarantee Corporation</b>	Run and supervised by the ministry of finance, it provides partial credit guarantees to commercial banks for loans to small enterprises eligible for debt financing.
<b>Energy Conservation Foundation of Thailand</b>	One of two government-appointed not-for-profit organisations responsible for managing the 'Energy-service companies fund'.
<b>Energy for Environment Foundation</b>	One of two government-appointed not-for-profit organisations responsible for managing the 'Energy-service companies fund'.
<b>Multilateral lending institutions (mainly the Global Environment Facility)</b>	Provide financing and capacity building for government staff and banks, and support the development of appropriate standards.

#### Barriers

In addition to the negative impacts in financial attributable the Asian financial crisis of 1997, the fund faced the following barriers during the first years of implementation:

- Lack of financial liquidity due to weak balance sheets and risk-averse banks, uncertain investor confidence in the market and limited banker experience with cleaner energy projects.
- High fixed investment and operation, and maintenance costs.
- Burdensome bureaucratic procedures and paperwork.

After the first phase for implementation, disbursement of funds was slow, mainly due to political and administrative issues, including the following:

- Poor quality of many of the audits performed by energy consultants.
- Delay in government approval for energy audits.
- Lack of penalty for non-compliance.
- Lack of authority of energy managers.

It was in response to these bureaucratic and excessive reporting procedures and distribution hold-ups that the Thai government established additional pilot programmes, to stimulate investments in large commercial industrial energy-efficiency projects. These included the revolving fund and the energy-service companies fund mentioned above.

As the fund continues to expand and evolve through the years, its administrators are proactively changing and fine tuning their approach, so that the fund can have as much impact as possible. However, the fund does seem to continue to face barriers impeding its greater implementation, including the following:

- The requirement of high cost technologies from top-tier vendors for particular EE interventions has negatively affected the feasibility of projects.
- The financing cap to invest in capital-intensive projects such as wind farms and municipal solid waste biogas plants has deterred investment in this kind of projects.
- The slow turnaround for project approval has prevented some projects from getting off the ground.

#### **Enablers for implementation**

- For the most part of the life of the 'Energy conservation fund', and in addition to the fund's core resources, a complementary programme covering research, development and publicity initiatives was set up. This programme proved critical in promoting the use of the fund.
- After the political and administrative problems the fund faced during its initial years the Thai government established series pilot programmes to further stimulate investments in large commercial industrial energy-efficiency projects. These included subsidy schemes that provided 30 percent subsidies for buildings and factories to implement energy efficiency improvements. The schemes were modelled after the 'Standard measures and individual projects' programme implemented in Denmark during the mid-1990s.
- Another important enabler was the fund's ability to react to stakeholder feedback, and adapt itself accordingly. Such reforms involved the reduction in the number of government agencies involved in overseeing energy activities at one point, which streamlined administrative processes.
- The use of the revolving fund resulted in an increase in the number of projects overall, since loan repayments created new investments in more projects. Although it took between three and four years for the fund to achieve a good application rate, this period was crucial as it helped boost confidence in cleaner energy projects among commercial lending institutions.
- Besides the actual project funding, funds were also used to provide commercial banks with a better and deeper understanding of project risks, costs, return rates, and technology performance.
- The energy-service companies fund was designed to be a government-run institution for mitigating the credit and project risks associated with cleaner-energy projects. The benefit of this structure resulted in a lower required rate of return for financing, which was seen as critical for the fund's success.
- The fund also created a space for the energy-service companies industry to emerge, under both shared savings and guaranteed savings models. These service companies have been instrumental in reducing credit and performance risk for energy efficiency projects by providing turnkey energy services with performance based and/or lending based contracting to energy users. Ultimately this boosted lending confidence to the entire sector, and local banks were eventually able to lend independent of the government's involvement.

- Pilot projects were instrumental in determining the underlying economic feasibility, assessment of energy savings, and greenhouse gas emission reductions for specific types of projects, which also proved critical.

### Funding

The 'Energy conservation fund' collects revenue from a tax of USD 0.002 per litre on all petroleum products, receiving about USD 50 million annually. The Ministry of Energy administers these tax proceeds and other fund assets, and is responsible for the procedures related to the fund disbursement. A Fund Committee made up of representatives from various ministries and departments manages the fund. The Committee appoints sub-committees to assist with tasks such as screening and evaluating projects and proposals, prior to being submitted to the full committee. Each sub-committee can approve projects with budgets below USD 300,000. The sub-committee also evaluates the performance of the funded projects.<sup>58</sup>

Type of funds	Implementation aspect it supports
<b>Domestic (Ministry of Energy)</b>	Providing financial subsidies to speed up energy efficiency improvement and support measures for energy conservation in small- and medium-sized enterprises.

### Costs

It is estimated that, up till 2015, energy efficiency projects will receive funding from the fund at an average of USD 180.7 million per year (approximately USD 903.7 million over five years).<sup>59</sup> The industry sector will have benefitted from about 37 percent of the overall budget.

Spending is divided into five areas as follows:

- Direct funding for achieved energy savings: USD 613 million, 68 percent of the total funding.
- Management and public relations: USD 92 million, 10 percent of the total funding.
- Development of mandatory energy efficiency measures, standards and labels: USD 46 million, 5 percent of the total funding.
- Research: USD 107 million, 12 percent of the total funding.
- Human resources and institutional development: USD 46 million, 5 percent of the total funding.<sup>60</sup>

By the time it ended its operations, 13 public and local banks had participated in the revolving fund programme, which had resulted in 294 projects. The total investment was THB 15,959 million (USD 521.5 million), which consisted of THB 7,232 million (USD 236.34) from the revolving fund and THB 8,727.10 million (285.2 USD) in debt financing from local banks.

With regards to the energy-service companies fund, by close of its first phase (in 2010), a total of THB 330 million (USD 10.8 million) had been deployed, and resulted in a total investment of THB 3,334 million (USD 109 million). During that first phase equity investments represented 76 percent of all investment volume, equipment leasing projects represented 24 percent, and venture capital represented 2 percent.

### Energy savings and associated emission reductions

Consolidated figures concerning the overall benefits of the 'Energy conservation fund' are not available. Nonetheless, estimates exist about energy savings and emissions reductions attributable to the fund:

- energy savings worth 38,200 ktoe in 2030 (with respect to a baseline scenario);
- carbon dioxide emission reductions worth between 130 and 140 million tonnes per year;
- reductions in energy intensity of 25 percent in 2030, compared to 2010 levels.

<sup>58</sup> <http://iepd.iipnetwork.org/policy/energy-conservation-promotion-fund-encon-fund>

<sup>59</sup> For comparison, historical five-year disbursement levels were: USD 600 million in the period 1995-1999 and USD 900 million in the period 2000-2004.

<sup>60</sup> <http://iepd.iipnetwork.org/policy/thailand-20-year-energy-efficiency-development-plan-2011-2030-eedp>

By the close of the revolving fund, greenhouse gas emission reductions attributable to project having benefited from the fund totaled 98 million tonnes of carbon dioxide-equivalents. Overall financial savings were estimated at THB 5,394 million (USD 169 million) per year.

With regards to the energy-service company fund, by the end of its second phase (in 2012), energy efficiency projects were deemed to have created energy savings worth 23.97 ktoe per year and financial savings of THB 932.3 million (USD 29 million) per year.

### Benefits

Benefit		Description
<b>Reductions in energy demand</b>		A reduction of 38,200 ktoe in 2030, compared to a reference scenario
<b>Mitigation of greenhouse gases</b>		Between 130 and 140 million tonnes of carbon dioxide per year
<b>Improvement in air quality</b>		Information not available
<b>Macro-economic impacts</b>	<ul style="list-style-type: none"> <li>• Impacts on GDP</li> <li>• Trade balances</li> <li>• Energy prices</li> </ul>	Expenditure savings up to 2030 expected to reach USD 33.7 billion
<b>Impacts on public budgets</b>	<ul style="list-style-type: none"> <li>• Reductions in operational and capital expenditure for the public sector.</li> <li>• Effects attributed to structural changes to the economy and changed economic activity due to investment in energy efficiency</li> </ul>	Information not available.
<b>Creation of jobs</b>		Information not available
<b>Improvements in human health and well being</b>	<ul style="list-style-type: none"> <li>• Reduce risk of respiratory and cardiovascular diseases, allergies, arthritis and rheumatism with warmer, drier, more comfortable indoor environments resulting from improved building insulation</li> </ul>	Information not available
<b>Increased access to energy and reduced fuel poverty</b>		Information not available
<b>Benefits to energy providers</b>	<ul style="list-style-type: none"> <li>• Reduced operating costs</li> <li>• System and network deferral</li> <li>• Increased reliability</li> <li>• Market price changes</li> <li>• Associated with marketing</li> </ul>	Information not available

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<b>Title:</b>		
<b>10.3 City of Austin’s Residential Power Saver Program</b>		
<b>Country:</b>	United States	
<b>Sector:</b> Financial Schemes	<b>Stage:</b> Ongoing	<b>Type of policy/practice/instrument:</b> Government-run financial incentive program
<b>Sub-sector (if applicable):</b> Rebates And low--- interest unsecured loans for whole-- house energy retrofits	<b>Period:</b> 2004 - present	

### General description

Austin Energy is a city-owned utility that provides electricity for the 692,000 people living in Austin, the capital of Texas. It is the ninth largest community-owned public utility in the United States. Since 1982, to offset the need for additional electricity generation capacity, Austin’s local government has attempted to implement energy efficiency improvements and demand-side management measures. As from 1997 this duty has been passed on to Austin Energy.

The city of Austin’s 2007 ‘Climate protection plan’ envisages a 700 MW reduction in total electricity use by 2020. Austin Energy contributes to this goal by setting up, among other tools, financial schemes to promote energy efficiency. The so-called Home Performance is one of the most successful such schemes. It works alongside the ENERGY STAR international standard for energy-efficient consumer products.

Through Velocity Credit Union, Austin Energy’s financing partner, property owners can seek pre-approval for accessing financing from the programme. Access is contingent on the successful implementation of a range of improvements, as recommended by one of several certified contractors. These contractors also provide information on the estimated cost of the improvements as well as the financing options available through the programme.

Property owners are free to consult with as many (certified) contractors as they wish. Once a property owner has selected a set of improvements as proposed by one contractor, Austin Energy reviews them, to determine whether they are eligible for funding from the programme. Once the improvements have been implemented, a final inspection by Austin Energy is required to sign off on the application. If all eligibility requirements are met Austin Energy requests the Velocity Credit Union to make financing available to the property owner (or, at the request of this, to the contractor).

To achieve these ambitions goals, Austin Energy provides its municipality with a package of available technologies, financing assistance, advice, and pricing schemes to institute and encourage energy efficiency. One of the most successful and influential of these programs is the Home Performance with Energy Star<sup>61</sup> rebates and financing options offered as a component to the utility’s larger suite of residential efficiency and DSM initiatives, called the Austin Energy Residential Power Saver Program. The Power Saver program was already able to reach more than 44,000 customers in 2008, and today the utility’s commercial rebate and small business programs combined to offset 11.4 MW by providing rebates and incentives to more than 1,080 businesses, non-profit organizations and churches; and more than 2,000 residential customers made whole house energy improvements through the Home Performance program as well.

Property owners have to choose between a rebate and a finance loan (programme rules do not allow using both for one single project). In the case of the rebate, Austin Energy buys down interest rates (from 0 percent annually for 3 years and up to 6 percent annually for 10 years). Loan amounts must be above USD 1,500 and follow within one of two categories:  
Loan Option1: energy Improvement and/or replacement of air conditioning equipment

<sup>61</sup> <http://www.energystar.gov/>

- Up to USD 11,000 for single-family homes or duplexes.
- Annual interest rates range from 0 percent for three years, 3.5 percent for five years, 4.5 percent for seven years and 6 percent for 10 years.
- Closing costs are subsidized for up to USD 400.
- The loan must be used to make all recommended weatherisation improvements, improve duct systems, install up to two new high-efficiency air conditioning systems or heat pump systems, convert window units to high-efficiency central air conditioning or heat pump system, or perform required duct system testing.

#### Loan Option 2: optional residential measures

- Up to USD 8,500 for single family homes and up to USD 11,000 for duplexes and two high-velocity air conditioning system replacement or window-unit to central air conditioning system conversion.
- Annual interest rates range from 1.9 percent for three years, 3.5 percent for five years, 5 percent for seven years and 6 percent for 10 years.
- No closing costs up to USD 400
- The loan can be used to install a new high-efficiency central air conditioning system or heat pump system and perform the required duct system testing, improve duct systems, install attic insulation, install solar screens or window films, or install radiant barrier to underside of roof decking.

#### Actors

Actor	Role
<b>Austin City Council</b>	Adopted strategic energy policy for the city and established the utility (Austin Energy).
<b>Austin Energy</b>	Operates the programme on behalf of the municipal government (that is, it implements the programme and evaluates progress towards achieving its goals).
<b>Commercial lenders</b>	Offer a range of low-interest loan products for large-scale, energy improvements in residential properties. Velocity Credit Union is the main commercial lending partner to Austin Energy, though it is not the only one.
<b>Partners of the strategy (engineers, designers, professionals)</b>	They help implement the programme by providing technical advice, for example: <ul style="list-style-type: none"> <li>- to design structures with low maintenance, durable and effective in cutting energy cost for residents;</li> <li>- to support education, consulting and audits in the area of energy efficiency in residential properties.</li> </ul>
<b>Contracting companies</b>	Utility pre-approved contractors that perform the actual improvements financed through the programme.

#### Barriers

- There has been a shortage of energy efficiency experts in the Austin area. During the first years of the programme, there were a total of four participating contractors in the greater Austin area. This severe lack of companies to help conduct the actual retrofits and energy efficiency work spurred the utility to begin an additional training programme through a community college that focused on primordially on energy efficiency.
- During the initial programme implementation stages contractors faced one-off costs related to the purchase of the required specialised testing equipment needed.
- In the fall of 2009, feedback received from contractors and internal auditors for the utility indicated that the majority of inspections and audit work related to the energy efficiency home measures were happening after the negotiation period of sale, rather than before it. Because of this, an ordinance was passed that same year, which now requires all sellers of

homes over 10 years old that are located within the city to obtain an energy conservation and disclosure audit, unless the home meets specific exemption criteria.

### Enablers for implementation

- The programme is part of Austin’s commitment to significantly curtail its carbon dioxide emissions by 2020. The political will required to pass such commitment into law represents a key underlying enabler for programme implementation.
- The ENERGY STAR brand is familiar to many consumers in the United States and most residents in the area were already customers of Austin Energy. These conditions re-enforced the programme’s credibility and opened direct lines of communication to potential participants via utility bill inserts and other existing marketing channels.
- Contractor experience with the physical work and design of the kind of retrofits targeted by the programme allowed Austin Energy to design financial offerings that were suited to those retrofits, and in tune with the needs and concerns of participating homeowners.
- By requiring inspection and approval of all work done under the programme, Austin Energy was able to ensure a certain level of quality with each retrofit. Not least, this guarantee helped entice further participants.

### Funding

Austin Energy’s budget for demand-side management activities is calculated into the base rate paid by its customers. In 2008, for example, Austin Energy used USD 329,000 to administer a programme worth USD 2 million in rebates and financing.

### Costs

Table 1 shows Austin Energy’s most recent energy efficiency expenditure data.

Table 1: energy efficiency programme expenditures in the period 2008-2013

	2008	2009	2010	2011	2012	2013
	<b>(USD)</b>					
<b>Electric rebates and incentives</b>	15,963,318	18,586,842	17,646,312	16,986,869	17,735,225	22,050,490
<b>Change over prior year</b>	8%	16%	-5%	-4%	4%	24%

Source: own table based on Austin Energy’s ‘Annual performance report’ from 2012 and 2013

### Energy savings and associated emission reductions

According to an evaluation carried out in 2009, the energy savings associated with this programme amounted to 116,991 MWh in the period from 1982 to 2008 (this figure refers exclusively to the rebates and loan programme). This amounts to an average savings rate of approximately 1700 kWh per year. An estimated 2,824 tonnes of carbon dioxide were abated by the program through the same period.

According to Austin Energy’s ‘Annual performance report’ for the fiscal year ending in September 2013, peak demand was avoided through energy efficiency programmes, with energy savings reaching some 117 million kilowatt-hour. Also, more than 70,000 metric tonnes of carbon dioxide were avoided. Exact numbers for the residential program are highlighted in the tables below.

Table 2: emissions avoided in 2013

Area	Emissions avoided (tonnes of CO <sub>2</sub> )
------	--

<b>Residential</b>	14,317
Commercial	56,061
Demand Response	117
<b>Total</b>	<b>70,495</b>

Source: own table based on Austin Energy's 'Annual performance report' 2013

Table 3: energy efficiency-related energy savings (in MWh) over the period 2009-2013

Programme	2009	2010	2011	2012	2013
<b>Residential</b>	32,820	21,084	22,953	24,003	23,798
Commercial	69,151	67,966	94,322	84,588	93,183
Demand Response	152	71	22	15	194

Source: own table based on Austin Energy's 'Annual performance report' 2013

## Benefits

Benefit		Description
<b>Reductions in energy demand</b>		Energy savings attributable to energy efficiency measures amounted to just below 23,800 MWh in 2013, down from a peak of 32,800 in 2009.
<b>Mitigation of greenhouse gases</b>		In 2013 the programme resulted in savings of 14,317 tonnes of carbon dioxide.
<b>Improvement in air quality</b>		No information available.
<b>Macro-economic impacts</b>	<ul style="list-style-type: none"> <li>• Impacts on GDP</li> <li>• Trade balances</li> <li>• Energy prices</li> </ul>	Until 2007, the total economic impact of the fund in terms of available finance for EE initiatives was that of USD 108 million.
<b>Impacts on public budgets</b>	<ul style="list-style-type: none"> <li>• Reductions in operational and capital expenditure for the public sector.</li> <li>• Effects attributed to structural changes to the economy and changed economic activity due to investment in energy efficiency</li> </ul>	Information not available
<b>Creation of jobs</b>		Austin Energy has more than 80 employees managing its demand-side management programmes and had a USD 6.4 million operating budget for residential efficiency programmes in 2008. While current exact figures for contractors are not available, the residential energy efficiency programme had four participating contractors when it started in 1982. By 2008, the programme had grown to include 90 contractors.
<b>Improvements in human health and well being</b>	Reduce risk of respiratory and cardiovascular diseases, allergies, arthritis and rheumatism with warmer, drier, more comfortable indoor	Until 2009, the programme has assisted 90 families with low incomes in purchasing a home both centrally located in the city and equipped to minimise energy bills.

	environments resulting from improved building insulation	
<b>Increased access to energy and reduced fuel poverty</b>		Not applicable.
<b>Benefits to energy providers</b>	<ul style="list-style-type: none"> <li>• Reduced operating costs</li> <li>• System and network deferral</li> <li>• Increased reliability</li> <li>• Market price changes</li> <li>• Associated with marketing</li> </ul>	Energy efficiency reduces load on the entire grid, enhancing reliability.
<b>Others</b>		<p>Utility strategic plans that integrate energy efficiency and renewable energy efforts gain more support and outreach than investment in one type of programme or the other alone. (As a part of its efforts to implement demand-side management measures, Austin Energy runs a dual energy efficiency-renewable energy programme.)</p> <p>Aside from beneficial environmental and economic impacts, Austin’s efforts have further been associated with new opportunities for local democratic participation. Specifically, local leaders and larger grassroots groups have utilised or even created new institutions and bodies to achieve policy reform, linking energy development to new social agendas.</p>

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## 11 BROAD POLICY FRAMEWORKS AND INSTITUTIONAL ARRANGEMENTS

<b>Title:</b>		
<b>11.1 Institutional and Regulatory Framework Development in Mexico</b>		
<b>Country:</b>	Mexico	
<b>Sector: Energy efficiency general policies and development strategies</b>	<b>Stage:</b> Ongoing	<b>Type of policy/practice/instrument:</b> Institutional capacities, incentives, monitoring, and program implementation
<b>Sub-sector (if applicable): NA</b>	<b>Period:</b> Permanent	

### General Description

Energy efficiency has been an important issue all over the world, and in particular in Latin America, ever since the first oil shock of 1972. Following the wave of high energy prices, driven by the thirst for oil and by a growing concern about the environment, many countries in the region have made repeated attempts over time to improve their energy security and general outlook, yet not on a permanent basis, but rather on cyclical-style approaches, often spurred by progressions of available multilateral funding. This tendency was in sharp contrast to the more constant, long-term vision and systematic strategies of developed countries. Therefore, results in many countries of the region have been poor and unsustainable<sup>62</sup>.

A customer's awareness of the advantages and benefits of energy efficiency is also a matter of having a strong regulatory framework and the proper institutional arrangements needed to help create the conditions for developing a self-sustaining energy efficiency market. This market will thus have three major components to it: energy efficiency services demand (customers); energy efficiency services supply (Energy Services Companies, ESCOs), that could access customers and provide services; and, financial entities that could and would be willing to finance energy efficiency projects. According to the Latin American Energy Organization (OLADE), changing the energy sector models of some Latin American countries is deeply needed, including those dealing directly with renewable energy and above all, energy efficiency, which may allow reducing fossil fuels demand growth rates more than any other endeavor. Only long-term sustained efforts will ensure that energy efficiency becomes part of the energy planning processes in these countries and begins to be considered as a prime energy resource.

Mexico is one of the countries in the region which has taken the topics of building and fortifying an institutional capacity and a legal framework required for energy efficiency seriously. Advances in the penetration of efficient energy use within the major planning instruments of the public sector are now present everywhere, such as in National Development Plans, sectorial programs, and in various official guiding documents outlining the future outlook of the electricity sector. The concept of establishing an effective institutional governance structure for energy efficiency has also transcended political circles and factions and is now also reflected in development plans, specific regulations on energy, and on specialized programs run by newly created institutions, such as CONUEE, FIDE and the CRE (explained below). All these actions point towards an ever increasing ability of Mexican officials to be able to show advances in the promotion of energy efficiency initiatives, quantifying the savings obtained from them, with the establishment of specific and

<sup>62</sup>Roberto Gomelsky. Eficiencia energética. Las empresas de servicios energéticos: una actividad rentable. September 2007

realistic goals for EE interventions , and with the transformation of proposals geared towards energy saving projects.

### **SENER (Secretaria de Energia, Energy Secretariat)**

SENER is now the entity in charge of designing and conducting the national energy policy, within the national constitutional and legal framework, to guarantee a competitive, efficient, high quality, economically feasible and environmentally sustainable energy supply required by Mexican society<sup>63</sup>. This means:

- Full access to energy by Mexican population at competitive prices.
- World-class private and state owned companies.
- Appropriate legal and regulatory framework.
- Strong impulse for energy efficiency and technology research and development.
- Wide promotion of renewable energy sources.
- Energy supply security

In particular, SENER is responsible for the implementation of the Energy Reform (Reforma Energética) meant to achieve a rational, sustainable energy resources exploitation under the principles of sovereignty, economic efficiency and social benefit. This efficient use of natural resources will launch the country's energy potential to improve living conditions, reaching that goal through the increase of clean low cost energy production, the increase in oil profits, well paid job creation, and environmental protection.

Mexico is now also better equipped to impulse energy policies, programs, actions and projects to increase the use of: 1) renewable energy and clean technologies, 2) energy efficiency and sustainability, and to 3) reduce the dependency on fossil fuels, through the passing of the National Energy Transition Strategy and Sustainable Energy (ENTEASE, by its initials in Spanish) law which was passed in 2008. Within this new institutional environment, one of its most important aspects is the Fund for the Energy Transition and Sustainable Energy (FOTEASE, by its initials in Spanish), which is one of the main instruments to address some of the biggest obstacles to promote EE and RE in Mexico. The Fund's objective is to finance public, private, academic and NGO's programs and projects to promote, disseminate and develop EE and RE in helping to achieve the aforementioned strategy's goals. The FOTEASE fund now finances programs targeted towards the application of clean and renewable energy, promotion of EE in households, industries, commerce, agriculture, etc. SENER acts as the Fund Administrator as well as the Secretariat of an inter-institutional technical committee. A main fiduciary agent is BANOBRAS (Banco Nacional de Obras y Servicios Públicos), with the federal government now providing resources to the Fund in significant value, over US\$ 600 million from 2009 to 2014.

Yet another EE and RE fund managed by SENER is the Energy Sustainability Fund (FSE, by its initials in Spanish), which finances research, development and innovation projects undertaken by universities and research centres in the country. The fund now serves as an instrument to impulse applied technology and research into energy efficiency endeavours and to primary energy sources diversification. Government funding towards this fund is now important, with an approximate contribution of US\$ 87 million in 2013.

SENER has also created a specific program to support EE within the private sector, through the Entrepreneurial Energy Savings and Efficiency Program, (Eco-Crédito Empresarial). The Trustee for Electric Energy Savings (FIDE, by its initials in Spanish) operates the program and Nafinsa operates the guarantee fund. The main objective of this program is the replacement for or acquisition of efficient electric equipment: commercial refrigeration, electric motors, air conditioning, efficient lighting and power substations.

### **CONUEE**

Another important step towards the building of a strong institutional capacity and framework for EE was the creation of CONUEE. The National Commission for the Efficient Use of Energy (CONUEE)

<sup>63</sup> SENER [www.sener.gob.mx](http://www.sener.gob.mx)



is now an agency within the Secretariat of Energy. It was created by the Law for the Sustainable Use of Energy published in the Official Gazette on 28 November 2008, and has as its main objective to promote energy efficiency and to serve as a technical body on the sustainable use of energy.

CONUEE arose from the institutional structure of the National Commission for Energy Saving (CONAE), which was first created on September 28, 1989, as a consultative technical body of the departments and agencies of the Federal Government, the governments of states and municipalities, and the private sector, with regards to energy efficiency planning and saving. Beginning in 1999, CONAE underwent a restructuring process to stop being an Inter-ministerial Commission; on September 20, 1999, the National Commission for the Efficient Use of Energy, as an administrative body within the Secretariat of Energy was officially announced. Its institutional objectives now read as follows:

- Promote the sustainable use of energy through the adoption of measures and best practices for the efficient use of energy in the different sectors of the economy and the population.
- CONUEE aims to position itself as the technical body articulator of public policies on sustainable use of energy, in order to achieve technological and behavioural change of energy end-users, with the participation of public, social and private sectors.

The legal framework that CONUEE now operates under was created through the following:

- Constitution of the United Mexican States
- Law for the Sustainable Use of Energy. On November 28, 2008, the Law for Sustainable Energy Use entered into force in Mexico. This law, which has the objective of achieving a sustainable energy use through optimal energy use in all processes and activities, also proposes the elaboration of a national program for sustainable energy use.
- Regulatory Framework of the Law for the Sustainable Use of Energy. This program establishes strategies, objectives, actions and goals to achieve optimal energy use in all processes and activities related to its production, transformation, distribution and end-use.
- Federal Law on Metrology and Standardization. Includes the mandate to implement mandatory technical standards (Mexican Official Standards or NOM) which define "the characteristics and/or specifications that products or processes must meet in case they may constitute a risk for the human safety or could endanger human, animal or vegetable health, overall or working environment, or for natural resources preservation". Through this law, the Mexican Ministry of Energy has the mandate for energy efficiency NOMs, which is transferred to the National Commission for Efficient Energy Use (CONUEE).

CONUEE 's Work Programme now holds the following general objectives:

- Mitigate climate change
- Strengthen economic competition in the energy efficiency market
- Gather and coordinate the efforts coming from different sectors

Its priority areas are:

- Standardization on energy efficiency
- Linking energy users with consultants, financial institutions, manufacturers and other institutions
- Promotion of the energy saving culture among users
- Support to local governments
- Sharing information regarding sustainable use of energy
- Cooperation with universities and research institutions
- Strengthening Mexico 's participation in the international context

The sectors it works in:

- Federal government
- Local governments
- Government corporations
- Large corporations
- Small and medium Enterprises (SMEs)

- Residential sector

It's cross cutting programs:

- Standardization
- Capacity building and certification of activities
- Transport
- Buildings
- Distributed generation

### **Nacional Financiera, S.N.C. (Nafinsa)**

Nafinsa is also an important institution to note here. It was first created in 1934 and is a Development Banking Institution that operates in accordance with the rules of its own Organic Law, in accordance with the Law of Credit Institutions, and with the rules issued by the National Banking Securities (NBSC). The objectives of Nafinsa are to promote the overall development and modernization of the industrial sector with a regional approach, to stimulate the development of financial markets, and to act as financial agent of the Federal Government in the negotiation, contracting and management of credits from abroad.

Nafinsa carries out its operations in accordance with financing criteria applicable to development banks, channeling its funds mainly through commercial banks and non-banking financial intermediaries. The principal sources of Nafinsa's resources are loans from international development institutions such as the International Bank for Reconstruction and Development (IBRD) and the Inter-American Development Bank (IDB), lines of credit from foreign banks and the placement of securities in the international and domestic markets.

As of December 31, 2001, the operating structure of Nafinsa abroad includes two branches: one in London, England and another in Grand Cayman; two representative offices in Washington and Tokyo and a subsidiary established in New York. This is a short, medium and long-term credit line to finance companies and local or international financial intermediaries to promote projects oriented to an environmentally, economic and socially sound development, based on a better use of natural resources, aggregate economic value and climate change mitigation, in accordance with the objectives of the national development Plana 2013-2018. Customers will get the design and implementation of financial arrangements appropriate to the specific characteristics of each project, longer repayment periods, and increased benefit. Various energy efficiency initiatives in Mexico have now begun thanks in part to the existence of this mode of available finance.

### **Energy efficiency programs**

A great example of how the establishment of these new institutions and an accompanying legal framework has facilitated the penetration of energy efficiency into the market is the Energy Efficiency Program headed by SENER, Nafinsa and KfW, a German development bank, who all signed a loan agreement for US\$ 65 million to leverage the substitution of household electric appliances and commercial electric equipment in the country. KfW funding will be channeled through Nafinsa to co-finance the credit portion of the Mexican electric appliances substitution program, up US\$ 39 million, and the electric equipment substitution program to the commercial and services sector (mostly the hotel sector), up to an additional amount of US\$ 26 million. The KfW funding is a 12 years loan with a grace period from signature up to the limit disbursement date (December 2015).

Another example of what kind of national EE initiatives are now available for Mexico is that of the Hong Kong Shanghai Bank Corporation (HSBC) and Nafinsa credit line to finance energy impulse program. On May 19, 2014, HSBC and Nafinsa signed an agreement to allocate \$26 billion Mexican pesos (near US\$ 2 Billion) to finance projects to companies that already are operating in the Mexican energy sector or that are looking to invest in this area. The new program is called Energy Impulse HSBC, lending form \$500 thousand Mexican pesos to \$500 million, at an interest rate of 6% in Mexican pesos and 4.5% in US\$ dollars, with repayment periods of up to 60 months. This financial support will help beneficiaries to identify the right technologies to select in order to take advantage of energy efficiency opportunities, offering loans to support any need from of equipment, inventories, works, advance payments and working capital, investments, infrastructure

development, modernization, environmental improvement and technology development as well. Nafinsa will provide guarantees for the loans from 50% to 80%.

### Actors

The most relevant actors are:

Actor	Role
SENER	<ul style="list-style-type: none"> <li>• In charge of designing and conducting the national energy policy, within the constitutional and legal framework,               <ul style="list-style-type: none"> <li>◦ Strong impulse to energy efficiency and technology research and development.</li> <li>◦ Wide promotion of renewable energy sources.</li> <li>◦ Energy supply security</li> </ul> </li> <li>• Funds creation and funding, operation through financial institutions               <ul style="list-style-type: none"> <li>◦ FOTEASE</li> <li>◦ FSE</li> </ul> </li> <li>• Specific EE and RE programs, as "Eco-Credito Empresarial)</li> </ul>
CONUEE	<ul style="list-style-type: none"> <li>• Implement a national registry of end-users certified as energy responsible.</li> <li>• Issue mandatory opinions to public agencies and federal government bodies on best practices for sustainable energy use.</li> <li>• Issue recommendations on best practices for sustainable energy use for state and municipal authorities, as well as the private sector.</li> <li>• Develop a program directed towards private sector end-users, seeking to promote the certification of processes, products and services, as well as to providing follow-up on the implementation of energy efficiency improvements.</li> <li>• Conduct and order visits to those end –users who carry out sustainable energy use measures, in order to verify compliance of existing laws and regulations.</li> <li>• Elaborate and issue greenhouse gas emissions quantifying methodologies in energy production, transformation, distribution and end-use, as well as those to quantify the implementation of sustainable energy use measures.</li> <li>• Elaborate and issue methodologies and procedures to quantify energy use and to determine economic value of end use and the avoided processes resulting from sustainable energy use.</li> <li>• Provide technical assistance on sustainable energy use to the entities and agencies of the federal government, as well as state and municipal authorities.</li> <li>• To implement a National Information subsystem of sustainable energy use.</li> <li>• Implement and update the information on resources and trust funds, which are directed towards financing sustainable energy use and are operated partially or completely by the federal government.</li> </ul>
Private and state-owned production companies (customers): industrial, commerce and services companies; energy production and transformation companies.	<ul style="list-style-type: none"> <li>• Designing energy efficiency projects, having technical support from private ESCOs</li> <li>• Implementing projects, some of them without significant investment requirements, other involving technology innovation through new equipment may require investments that may have financing</li> </ul>

Actor	Role
Financial Institutions  Nacional Financiera, S.N.C.       BANOBRAS  Private Banks	<ul style="list-style-type: none"> <li>• Development Banking Institution</li> <li>• Promotes the overall development and modernization of the industrial sector with a regional approach; stimulate the development of financial markets and act as financial agent of the Federal Government in the negotiation, contracting and management of credits from abroad</li> <li>• Structure national and internationally funded credit lines to promote energy efficiency and renewable energy</li> </ul> <p>Fiduciary of the FSE</p> <p>Lending to private customers for EE and RE projects, funding Nafinsa programs (for instance Hong Kong Shanghai Bank Corporation, HSBC) or direct to customers (i.e. Santander Serfin)</p>

### Barriers/risks

Below are some of the most notable barriers identified in trying to impulse energy efficiency as a permanent energy resource in the Mexican context:

- The erroneous yet still traditionally applied supply side strategy approach to EE. Energy planning and investment decisions at the national, local and entrepreneurial levels were strongly supply side oriented, using very detailed methodologies to analyze technologies and costs to supply electricity and fuels, optimize investments at the lowest possible cost to address a given demand. Energy demand itself was never part of the equation but in fact, it is possible to manage that demand to have an efficient use of energy and utilize clean energy sources, reduce environmental impacts and reduce cost in the energy system, as Mexico has begun to realize.
- Energy prices vs energy efficiency. This was a very common approach based on the concept of a customer’s rational behavior: a right relative pricing structure and prices level will produce by itself, with no other requirement, this rational behavior steering business naturally towards energy efficiency. Experience has shown that this is not true. Even though a correct pricing structure is necessary, this is not enough to produce energy efficiency on its own, because, among other factors:
  - Normally, except for energy intensive productions, the cost of energy has a low influence in total production costs.
  - There is a lack of knowledge and understanding of energy efficiency and clean energy economic incentives opportunities by customers. However, customers are the ones that have to identify and implement these types of projects. In some cases, they do not even know how to read an electricity bill or how much they are paying for fuels in some jurisdictions.
  - In some cases, demand is also inelastic to energy prices.
- Lack of an appropriate regulatory and institutional framework, that was finally overcome through the legal and institutional arrangements described above.
- The different situations and circumstances of different companies in terms of size, markets and real problems to solve. As not all countries have the same problem facing energy efficiency, and in some cases, this may not be an urgent issue to solve, the same tendency occurs with

energy customers. It not the same for big companies paying high-energy bills that for many SMEs that are coming in and going out of the market with high frequency and in some cases have other urgencies, as paying salaries at the end of the month.

- Financing. In the past, banks did not understand at all the complexities of the energy efficiency business, a situation that has changed in several countries, including Mexico. Financing was and is the main concern regarding promotion of EE and RE in Mexico as was described in the general description section.

### **Enablers for implementation**

- Finally establishing a new and effective regulatory and institutional framework, which today plays an invaluable role for the energy efficiency sector in the country.
  - The entire legal framework is in place and has strong political support, as was demonstrated over time.
  - The specific institutional arrangements established by the country are now working reasonably well
- Increasing acceptance by customers of the competitive advantages of EE
  - Cost reductions
  - Access to markets
  - Access to financing
- Financing
  - In this particular case the SENER, NAFINSA, BANOBRAS and private banks have the key role to overcome this barrier, promoting EE and RE project financing with local and international funding.
  - There is a number of initiatives to impulse EE and RE through credit lines operated by NAFINSA, with international (KfW) and private banking funding (HSBC) and specific funds managed by SENER and direct loans available form banks as well.

### **Costs and Financing**

Since this is not a specific project case but rather a general policy and institutional arrangement analysis of a successful process in a Latin-American country, there are no exact costs and funding figures for the processes described earlier. The dispersion amounts for individual projects undertaken by customers, ESCOs and banks are mostly labeled as private and/or confidential information. In any case, a prime example of the type of funding arrangements that are now available for EE initiatives in Mexico could be that of the HSBC credit line described earlier in this case study.

As a result of a clear and efficient legal and institutional framework devised for EE interventions in Mexico, the Hong Kong Shanghai Bank Corporation (HSBC) and Nafinsa credit line to finance energy impulse program was able to be created. On May 19, 2014, HSBC and Nafinsa signed an agreement to allocate \$26 billion Mexican pesos (near US\$ 2 Billion) to finance projects to companies that already are operating in the Mexican energy sector or that are looking to invest in this area. The new program is called Energy Impulse HSBC, lending form \$500 thousand Mexican pesos to \$500 million, at an interest rate of 6% in Mexican pesos and 4.5% in US\$ dollars, with repayment periods of up to 60 months. This financial support will help beneficiaries to identify the right technologies to select in order to take advantage of energy efficiency opportunities, offering loans to support any need from of equipment, inventories, works, advance payments and working capital, investments, infrastructure development, modernization, environmental improvement and technology development as well. Nafinsa will provide guarantees for the loans from 50% to 80%.

### **Energy Efficiency Results and Emission Reductions**

Although it is not possible to have a direct link or correlation between energy efficiency policies and institutional arrangement adopted by Mexico and its effect on energy efficiency of consuming sectors, some indicators may help to show improvements in the energy intensity of production sectors and the potential for benefits of energy efficiency in general, looking towards the future.

The table below shows the mitigation potential of energy efficiency by sector, given a 90% penetration rate of energy efficiency in its operations<sup>64</sup>

Sector	Mitigation Potential (TCO2/yr)	Percentage (%)
Residential	5,752,827	31.99
Municipal	861,716	4.79
Agricultural	1,582,569	8.80
Comercial	3,533,225	19.65
Industrial	6,253,966	34.77
<b>Total</b>	<b>17,984,303</b>	<b>100.00</b>

### Benefits

Benefit	Description
<b>Reductions in energy demand</b>	Improvement of energy efficiency leads to lower energy demand in successful sectors. Please refer to table above for general numbers.
<b>Mitigation of greenhouse gases</b>	Please refer to table above.
<b>Improvement in air quality</b>	NA
<b>Macro-economic impacts</b>	<ul style="list-style-type: none"> <li>• Trade balances</li> <li>• Energy prices</li> </ul>
<b>Impacts on public budgets</b>	<ul style="list-style-type: none"> <li>• Reductions in operational and capital expenditure for the public sector</li> <li>• Effects attributed to structural changes to the economy and changed economic activity due to investment in energy efficiency, renewable energy</li> </ul>
<b>Creation of jobs</b>	The Energy Efficiency Business may have a job creation effect, providing energy services to customers and developing renewable energy projects
<b>Improvements in human health and well being</b>	<ul style="list-style-type: none"> <li>• Reduce risk of respiratory diseases, with more comfortable indoor environments resulting from the absence of combustion gases</li> </ul>
<b>Increased access to energy and reduced fuel poverty</b>	N.A.

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<sup>64</sup> [http://www.inecc.gob.mx/descargas/cclimatico/2012\\_estudio\\_cc\\_mitgef13.pdf](http://www.inecc.gob.mx/descargas/cclimatico/2012_estudio_cc_mitgef13.pdf)

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<b>Title:</b>		
<b>11.2 Institutional Energy Efficiency Development and Long Term Planning in Spain</b>		
<b>Country:</b>	Spain	
<b>Sector: Energy efficiency general policies and development strategies</b>	<b>Stage:</b> Ongoing	<b>Type of policy/practice/instrument:</b> Institutional Framework Capacity for Energy Efficiency
<b>Sub-sector (if applicable): NA</b>	<b>Period:</b> 2011-2020	

### General Description

Improved energy efficiency (EE) has become a critical response option for many policy makers to be able to react to the pressing issues of climate change, economic development and energy security challenges that face many countries today. Yet achieving EE improvements can be difficult, especially if this is a relatively new topic of interest for certain economies and energy markets. It requires a combination of technology development, market mechanisms and government policies that can influence the actions of millions of energy consumers, from large factories to individual households. Governments, stakeholders and the private sector must work together in order to achieve the required scale and timing of energy efficiency improvements needed for sustainable economic development. While much has been researched and written upon the involvement of market forces and market-based instruments in playing a central role in national energy efficiency policies, much less is known about the legal, institutional, and coordination arrangements needed to scale-up energy efficiency.

Experience has shown that successful EE policy outcomes are more likely if an effective system of EE governance is established. From the legal frameworks and institutions that develop and implement policies, to the stakeholders who participate in their implementation in the market place, EE governance is a complex, and yet critical, part of the energy efficiency delivery system. Time and again, actions to improve energy efficiency have failed to deliver their full potential, in part, because of limited attention to EE governance arrangements.

This particular need was first identified and addressed by Spain as early as 1974, just a couple of years after the first global oil crisis. Since then, these efforts have continued to mold and added upon in order to give support and continuity to new energy efficiency and renewable energy policies and strategies over time. Institutional arrangements were strengthened considerably yet again in 1984 and 1986, just after the second oil shock, and such steps and early work on institutional capacity building have been seen as key enablers for implementing such recent policy interventions as the Spanish Energy Saving and Efficiency Action Plan of 2011-2020.

### **Institute for Energy Diversification and Savings (Instituto para la Diversificación y Ahorro de Energía, IDAE)**

The core institutional body of Spain's energy efficiency and renewable energy strategy has been the Institute for Energy Diversification and Savings (IDAE). It was first created in 1974, a short time after the first oil shock of 1972, as an Energy Study Center, managed directly by the body of the State's General Administration, without any financial or jurisdictional autonomy. In 1984, its name was then changed to the Institute for Energy Diversification and Saving, IDAE, and it officially became a separate and autonomous institutional body with its own technical authority. It was later in 1986 that the institution took yet another important step, when it officially became a State Company with the capacity to provide the following technical and financial services to certain sectors:



- Energy efficiency improvement actions.
- Planning and establishment of renewable energies.
- Actions in the market to promote energy savings and diversification.

In 1999 the IDAE finally obtained its financial autonomy as a Public Business Body, and in 2004 was ascribed to the Ministry of Industry, Tourism and Commerce by the Secretariat of State for Energy through a Royal Decree.

### **Ministry of Industry, Energy and Tourism (MIET)**

This ministry is now in charge of all the functions related to the State's General Administration as it relates to the energy sector. Inside the MIET, the entity in charge of the energy sector is called the State Secretary of Energy (SE), which now holds the following main functions:

- Preparation of standards related to the energy and mining sectors, according to all applicable legislation
- Preparation of proposals on tariff structure regulations, energy prices and toll tariffs
- Formulation of proposals for energy savings and conservation, promotion of renewable energies and energy planning
- Formulation and implementation of actions oriented to secure energy supply.

As part of the SE, there is the General Direction of Energy and Mining Policies center, which holds several sub-directions within its auspices in order to coordinate interventions across different sectors, including electric power, hydrocarbons, nuclear, mining and energy planning.

### **Energy Saving and Efficiency Action Plans**

One important and distinctive characteristic of Spain's strong and early commitment towards building an institutional framework for energy efficiency development and implementation has been the country's robust planning system. The country is now able to set specific objectives and goals for energy efficiency and conservation, even under the larger framework of the European Union, and it can also involve and stimulate the country's productive sectors and population more easily when trying to promote a new initiative. Spain's prior work and dedication to building an energy efficiency governance system now also facilitates investing on the achievement of EE objectives, as well monitoring the progress made towards those goals, and supports the continuity of such planning efforts into the long term future.

### **Energy Saving and Efficiency Action Plan 2011-2020 and Long Term Strategies and Goals**

Spain's Action Plan (2011-2020) is the second National Energy Efficiency Action Plan, which the country submitted to the European Commission in 2011. The Plan was approved by a Cabinet Meeting Agreement of the Spanish Government as of 29th July 2011, and complies with the European Parliament procedures, as well as with the Council on energy end use efficiency and energy services, established during Spain's early action on devising an EE institutional framework, noted earlier. The final and primary energy savings estimated within the Plan are consistent with the scenarios of final and primary consumption included in the indicative energy planning sessions that were carried out with stakeholders and relevant institutions in April of 2009, where the decision was made based on current trends and available information, leading to the objective of improving the final energy intensity in Spain by 2%, year-on-year, for the period of 2010-2020.

The savings stated in the 2011-2020 Plan are also consistent with the objectives on greenhouse effect gas reduction established for Spain within the framework of the European Union's 20-20-20 Strategy<sup>65</sup>, even if there are differences in the approach and the calculation methods with the emission projections over the 2020 horizon, as reported to the European Commission. The plan is also consistent with other strategies in the field of the R+D+I, industrial policy or infrastructures (specifically the Strategic Infrastructures and Transport Plan 2005-2020 —PEIT—), as necessary conditions to achieve the saving objectives of final and primary energy to the year 2020. The Plan also assumes the objectives of the Strategy to Promote Electric Vehicles in Spain and the objectives to meet the renewable fuel incorporation scenarios for transportation, as set forth in

<sup>65</sup> [http://ec.europa.eu/clima/policies/package/index\\_en.htm](http://ec.europa.eu/clima/policies/package/index_en.htm)

Directive 2009/28/EC on the promotion of the use of renewable energy (2.5 million electric vehicles in 2020).

The scenario considered as the objective of the 2011-2020 Plan, that is the efficiency scenario, is stated in terms of primary and final energy consumption as well as energy consumption by sectors, which is summarized in Tables 1 to 3. In terms of primary energy, it calls for an improvement in primary energy intensity of 1.5% a year between both years –considering a GDP increase of 2.3% a year, between 2010 and 2020, and a high growth rate of renewable energy, almost three times the one of natural gas, and a declining oil primary consumption growth rate.

**Table 1 Primary energy consumptions by sources (ktoe)**

	2004	2007	2008	2009	2010	2016	2020	Annual Growth Rate 2010-2020
<b>Coal</b>	20,921	20,354	13,983	10,509	8,271	10,448	10,058	1.98%
<b>Oil</b>	71,054	70,848	68,182	63,684	62,358	55,746	51,980	-1.80%
<b>Natural gas</b>	24,671	31,601	34,782	31,096	31,003	37,147	38,839	2.28%
<b>Nuclear</b>	16,576	14,360	15,368	13,750	16,102	14,490	14,490	-1.05%
<b>Renewable</b>	8,854	9,976	10,942	12,165	14,910	21,802	27,878	6.46%
<b>Electricity balance (*)</b>	-260	-494	-949	-697	-717	-1,020	-1,032	3.71%
<b>Total</b>	<b>141,816</b>	<b>146,645</b>	<b>142,308</b>	<b>130,507</b>	<b>131,927</b>	<b>138,613</b>	<b>142,213</b>	<b>0.75%</b>

(\*) Imports-exports

Source: IDAE. Energy Savings and action Plan 2011-2020. Madrid, 2011

Savings in 2016 amounts to more than 13,000 ktoe, which equals 12.2% of final energy in that year in a non-energy savings scenario (consumption of final energy without these measures would have reached 107,896 ktoe in 2016). The Action Plan 2011-2020 therefore meets the saving objectives demanded by Directive 2006/32/EC, and is coherent with the global objectives agreed on by the European Council of 17th June 2010, and with the capacity and potential to implement EE systems within Spain under the country's well established policy framework for energy efficiency and conservation.

**Table 2 Final energy consumptions by sources (ktoe) – non-energy uses excluded**

	2004	2007	2008	2009	2010	2016	2020	Annual Growth Rate 2010-2020
<b>Coal</b>	2,405	2,317	2,080	1,427	1,693	2,168	2,146	2.40%
<b>Oil products</b>	54,244	55,277	52,867	49,032	48,371	43,026	39,253	-2.07%
<b>Natural gas</b>	16,283	17,277	16,866	14,639	16,573	18,211	18,800	1.27%
<b>Electric power</b>	19,914	22,159	22,253	20,980	21,410	24,343	27,085	2.38%
<b>Renewable</b>	3,774	4,101	4,374	4,828	5,375	6,971	8,070	4.15%
<b>Total</b>	<b>96,620</b>	<b>101,131</b>	<b>98,440</b>	<b>90,906</b>	<b>93,422</b>	<b>94,719</b>	<b>95,354</b>	<b>0.20%</b>

Source: IDAE. Energy Savings and action Plan 2011-2020. Madrid, 2011

Final & primary energy savings in the Action Plan 2011-2020 focus on the Transport Sector, which accounts for 51% of the entire savings in 2020. It is followed in importance by the Industry Sector, with savings equivalent to 25% of the total. These savings yield a decrease in the final energy consumption of 13% in the Industry Sector, between years 2007 & 2020, and of 5% in the Transport Sector.

**Table 3 Final energy consumption by sectors (ktoe) (non-energy uses excluded)**

	2004	2007	2008	2009	2010	2016	2020	Annual Growth Rate 2010-2020
<b>Industry</b>	29,855	29,878	30,241	26,468	28,209	26,034	25,777	-0.90%
<b>Transport</b>	37,736	40,804	39,313	37,464	36,744	38,670	38,752	0.53%

<b>Residential, services and others</b>	29,030	30,448	28,886	26,975	28,470	30,016	30,807	0.79%
<b>Total</b>	<b>96,621</b>	<b>101,130</b>	<b>98,440</b>	<b>90,907</b>	<b>93,423</b>	<b>94,720</b>	<b>95,336</b>	<b>0.20%</b>

Source: IDAE. Energy Savings and action Plan 2011-2020. Madrid, 2011

Energy efficiency targets by final demand sectors and uses (Table 4) show the strong effort proposed by the Plan in transportation, mostly in railroad (both freight and passengers) and cars, as major results were already achieved by trucks; industry, compensating the low performance caused by the economic crisis up to 2010; and households electrical appliances, public lighting, service sector energy and electricity uses and agriculture.

**Table 4 Efficiency improvements objectives by sectors**

Sector	Energy Indicator	Unit	Variation rate (year-to-year %)	
			2007-2010	2010-2020
<b>Industry</b>	Energy intensity (Final consumption/Gross Value Added, GVA)	ktoe/M.Euros	2.74	-2.52
<b>Transport</b>	Road	Cars energy consumption/pass-km	-2.57	-0.87
		Energy consumptions of trucks and light vehicles per vehicle	-8.05	0.30
	Railway	Energy consumption passenger rail transport/pass-km	-3.85	-3.03
		Energy consumption freight rail transport/tonne-km	10.44	-9.22
<b>Building, equipment and services</b>		Space heating households energy consumption per floor area	-1.43	0.11
		Space cooling households energy consumption per floor area	-3.10	6.64
		Lighting electricity consumption per dwelling	-2.43	0.11
		Energy consumption of electrical appliances per unit	-7.87	-2.92
		Service sector non-electric energy consumption per employee	-9.47	-0.87
		Service sector electric energy consumption per employee	-3.90	-0.68
		Public lighting electricity consumption per dwelling	-1.13	-1.39
	<b>Agriculture and fisheries</b>	Energy intensity (Final consumption/Gross Value Added, GVA)	ktoe/M.Euros	-4.30

Source: IDAE. Energy Savings and action Plan 2011-2020. Madrid, 2011

### Energy Efficiency Indicators

The saving results, in terms of final energy by sectors, by type of programs and by institutional actions are shown in Tables 5 to 7. The total primary savings amount to 4,720 ktoe/year, on a year 2007 basis, and to 8,342 ktoe/year, on a year 2004 basis.

In general, sector savings were calculated as the difference between the value of the energy efficiency indicators that were chosen for each sector, transportation mode or energy use, between the base year and 2010. This difference determines the plus or minus sign of the savings. If the indicator (usually unit consumptions) decreases until 2010, there are savings and alternatively, if the indicator increases, "unsavings" take place, which are shown as "negative savings" on the result tables. Industry shows negative values for saving, both for the 2004 & 2007 bases, as a result of the energy intensity increase in the sector, due to the reduction of use factors for production capacities installed and the fall of production values resulting from Spain's latest economic crisis. The industrial sector failed to achieve final energy savings targets, due mainly to the decline in output ratios in various sub-sectors. The economic crisis also distorts any analysis of the results corresponding to the energy efficiency measures aimed at this sector. On the one hand, per unit energy consumption rose in the last few years, largely as the result of productive capacity being under-utilized while fixed costs still had to be met, which resulted in negative savings. On the other hand, the contraction of the building industry in comparison with others produced

positive results in terms of achieving energy savings by means of structural change. Nevertheless, it was an effort made to offset these consequences by measures designed to improve the efficiency of industrial equipment. The administrations initiated and funded the actions proposed in the Plans 2005-2007 and 2008-2012, articulated through cooperation agreements between the IDAE and regional administrations, together with IDAE aid program for strategic projects.

The saving achieved in 2010, calculated as the percentage of final energy consumption in the last five years just prior to the application of directive 2006/32/EC amounts to 9.2%. This means that Spain is well ahead of meeting the savings objectives of the directive stated for 2016 (9%), six years in advance (2010), and partly in thanks due to a solid energy efficiency governance framework being in place.

**Table 5 Final and primary energy savings by sectors, year 2010 (ktoe)**

	2004 Base		2007 Base	
	Final energy savings	Primary energy savings	Final energy savings	Primary energy savings
Industry	-799	-2,696	-2,866	-5,717
Transport	6,451	6,874	4,561	4,909
Building and equipment	2,232	3,165	2,529	4,189
Public services	32	80	29	67
Agriculture and fisheries	426	535	467	580
Final sectors total	8,342	7,958	4,720	4,028
Energy transformation		9,767		7,019
<b>Total</b>		<b>17,725</b>		<b>11,047</b>

Source: IDAE. Energy Savings and action Plan 2011-2020. Madrid, 2011

**Table 6 Energy savings summary through direct actions programs through IDAE, year 2010 (ktoe), base 2004**

	Final energy savings	Primary energy savings
Programme for strategic projects on energy efficiency	199.9	337.0
Other IDAE's direct executing programs	140.5	301.9
<i>Eco-driving for cars and vans</i>	1.1	1.2
<i>Eco-driving for trucks and buses</i>	30.7	34.4
<i>MOVELE project</i>	2.1	0.9
<i>Low energy bulb distribution programme</i>	84.9	212.5
<i>2x1 low energy bulb programme</i>	13.0	32.5
<i>Traffic light replacement programme</i>	8.7	20.4
<b>Total</b>	<b>340.4</b>	<b>638.9</b>

Source: IDAE. Energy Savings and action Plan 2011-2020. Madrid, 2011

**Table 7 Energy savings summary achieved in 2010 (ktoe), base 2004**

	Final energy savings	Primary energy savings
IDAE-Autonomous communities programme	2,305	3,221
Strategic project programme	200	337
Other IDAE's direct implementation programmes	140	302

Others/car fleet renewal	730	813
<b>Total</b>	<b>3,375</b>	<b>4,673</b>

Source: IDAE. Energy Savings and action Plan 2011-2020. Madrid, 2011

### Actors

The most relevant actors are:

Actor	Role
Ministry of Industry, Energy and Tourism (MIET)	<ul style="list-style-type: none"> <li>• Preparation of standards related to the energy and mining sectors, according with the applicable legislation</li> <li>• Preparation of proposals on tariff structure regulations, energy prices and toll tariffs</li> <li>• Formulation of proposals for energy savings and conservation, promotion of renewable energies and energy planning</li> <li>• Formulation and implementation of actions oriented to secure energy supply.</li> </ul>
Institute for Energy Diversification and Savings (IDAE)	<ul style="list-style-type: none"> <li>• Implementation of sectorial studies in industry.</li> <li>• Definition of technical measures on energy conservation.</li> <li>• Promotion of renewable energies.</li> <li>• Regulatory actions</li> <li>• Energy audits and diagnoses</li> <li>• Rural electrification plans</li> <li>• Pre-diagnosis and counselling in energy diversification and saving</li> <li>• Administration of funds for the allowances to incentivized actions</li> <li>• Energy efficiency improvement actions</li> <li>• Planning and establishment of renewable energies</li> <li>• Actions in the market to promote energy savings and diversification.</li> </ul>
Regions (Autonomous communities)	Implementation of energy efficiency programs and projects jointly with the MIET and IDAE
Private companies and residential customers	Implementation of energy efficiency programs and projects, main beneficiaries of the program structure and support offered by MIET and IDEA.
European Commission	Establishment of rules, regulations and energy efficiency objectives and monitoring.

## Barriers/Risks

The current state of energy efficiency initiatives in Spain after four decades of continuous efforts to help define and set an efficient and adaptable policy and institutional framework does not show any significant barriers for its current and future operations, other than those of larger economic crisis, which are due to factors outside the immediate influence of EE policy makers. If anything, and in particular the developments of this last decade, have contributed to the effective and systematic planning and implementation of actions promoted and partially financed by government institutions and programs, such as the country's Energy Saving and Efficiency Action Plan, mentioned earlier.

Barriers that the country faced, and which were then overcome by this strong national push for institutional development and effective planning strategies, were related to:

- The traditional energy development's faulty concept of always looking at EE issues almost exclusively from the "supply side approach", be it with energy planning and investment decisions at the national, local and entrepreneurial levels always being strongly supply side oriented;
- An inadequate pricing system and structure to promote energy efficiency;
- A lack of knowledge and understanding of energy efficiency and clean energy economic incentives opportunities by customers and financing institutions;
- Inadequate financing and lack of economic incentives;
- And, probably the most important, the lack of an appropriate regulatory and institutional framework, that was overcome through the legal and institutional arrangements described above.

## Enablers for implementation

The most important enablers for the now strong institutional and policy framework for the implementation of energy efficiency initiatives were:

- The strong national commitment on energy efficiency, both at governmental and private levels, and where all of society is conscious and engaged as to what energy efficiency entails.
- The early configuration of a strong institutional arrangement and its strengthening over time, having all the required legal support required to move ahead.
- The independence, both operational and financial, of the entity in charge of the energy efficiency planning and implementation in the country (IDAE).
- The meticulous, permanent and stable energy efficiency planning process, involving plans formulation, implementation, results monitoring and measurements, including social and macroeconomic and environmental impacts.
- The European Commission rules and regulations that bring an umbrella to the energy efficiency development and at the same time impose obligations to member countries who are obliged to react.

## Costs and Financing

The final & primary energy savings of the 2011-2020 Plan will be feasible as a result of the investments made available for such an initiative and through the finance channels spurred on by a strong accompanying policy framework. These amounted to almost 46 billion euros during the entire enforcement and implementation period of the Plan –from 2011 until 2020 (Table 8). This represents an annual average volume of investment worth 4.6 billion euros. These investments will correspond to autonomous investments carried out by private agents to get adapted to the new regulatory framework that may be derived from the Plan, and to the investments to be made as a result of the incentive of the aids managed by the public sector of around 500 million Euros on an annual average.

**Table 8 Financial resources managed by the public sector and investments (Million Euros)**

	Aid managed by public sector		Investments (*)	
	2011-2020	Annual average	2011-2020	Annual average
Industry	750	75	8,060	806
Transport	996	100	3,104	310
Building and equipment	2,883	288	27,322	2,732
Public services	143	14	809	81
Agriculture and fisheries	77	8	596	60
Energy transformation	22	2	5,970	597
Communication	124	12	124	12
<b>Total</b>	<b>4,995</b>	<b>499</b>	<b>45,985</b>	<b>4,598</b>

Source: IDAE. Energy Savings and action Plan 2011-2020. Madrid, 2011

The Building & Equipment Sector absorbs 59.4% of the total investments, whereas the Transport Sector accounts for 6.7% of the total. The Action Plan 2011-2020 has not assessed the investments in infrastructures linked to the modal shift or whatsoever others, bound to the development of railway transport networks, which may be necessary to enable the increase of the passenger and goods traffic by railway. It is deemed that these investments are accounted for in the Strategic Infrastructures and Transport Plan 2020 (PEIT). This way, the investments stated in the Transport Sector in the Plan show the total cost (both public and private) of the measures directly promoted by it, and therefore, subject to receiving the aids. These measures focus, to a great extent, on the design of the Sustainable Urban Mobility Plans and the Mobility Plans for Companies and Activity Centers, the development of pilot projects, the drafting of surveys to improve road transport fleet management, courses on Eco-driving, both for cars and for industrial vehicles.

On the same pattern, investments and aids associated with the Strategy to Promote the Electric Vehicle, necessary to materialize the goal of 2.5 million plug-in vehicles in 2020, have not been included in it. The investments corresponding to the Industry Sector and to the Energy Transformation Sector account for 17.5% and 13.0%, respectively, of the total investments planned.

### Emission reductions

Results of the continuing efforts on planning and implementations of energy efficiency actions have given important results in terms of avoided emissions, despite the above mentioned situation regarding the industry performance caused by the economic crisis (Tables 9 to 11).

**Table 9 CO<sub>2</sub> avoided emissions by sectors**

	2004 Base	2007 Base
Industry	-5,282	-12,417
Transport	21,471	13,330
Building and equipment	6,983	9,269
Public services	161	144
Agriculture and fisheries	1,526	1,673
Final sectors total	24,859	11,999
Energy transformation	51,797	53,253
<b>Total</b>	<b>76,656</b>	<b>65,252</b>

Source: IDAE. Energy Savings and action Plan 2011-2020. Madrid, 2011

**Table 10 CO<sub>2</sub> avoided emissions by programs (base 2004)**

	ktCO <sub>2</sub>
Programme for strategic projects on energy efficiency	722.5
Other IDAE's direct execution programmes	652.3
<i>Eco-driving for cars and vans</i>	3.7
<i>Eco-driving for trucks and buses</i>	105.0
<i>MOVELE project</i>	4.6
<i>Low energy bulb distribution programme</i>	429.5
<i>2x1 low energy bulb programme</i>	65.8
<i>Traffic light replacement programme</i>	43.7
<b>Total</b>	<b>1,374.8</b>

Source: IDAE. Energy Savings and action Plan 2011-2020. Madrid, 2011

**Table 11 CO<sub>2</sub> avoided emissions summary (base 2004)**

	ktCO <sub>2</sub>
IDAE-Autonomous communities programme	7,844
Strategic project programmes	723
Other IDAE's direct implementation programmes	652
Others/car fleet renewal	2,328
<b>Total</b>	<b>11,547</b>

Source: IDAE. Energy Savings and action Plan 2011-2020. Madrid, 2011

## Benefits

Benefit	Description
<b>Reductions in energy demand</b>	Improvement of energy efficiency leads to lower energy demand in successful sectors (see tables above for exact figures).
<b>Mitigation of greenhouse gases</b>	Yes (see description and tables above for exact figures. )
<b>Improvement in air quality</b>	Information not available in public sources
<b>Macro-economic impacts</b>	<ul style="list-style-type: none"> <li>• Production</li> <li>• Value Added</li> </ul> The energy efficiency plans have an important effect on productive sectors in terms of production and value added (see Tables below)
<b>Impacts on public budgets</b>	<ul style="list-style-type: none"> <li>• Reductions in operational and capital expenditure for the public sector</li> <li>• Effects attributed to structural changes to the economy and changed economic activity due to investment in energy efficiency,</li> </ul> Improvement in energy efficiency may reduce companies costs and eventually indirect changes in economic structure and public budgets (public aids, see cost and financing section above)



Benefit	Description
renewable energy	
<b>Creation of jobs</b>	The energy efficiency plans have an important effect on employment (see Tables below)
<b>Improvements in human health and well being</b>	<ul style="list-style-type: none"> <li>Reduce risk of respiratory diseases, with more comfortable indoor environments resulting from the absence of combustion gases</li> </ul> N.A.
<b>Increased access to energy and reduced fuel poverty</b>	N.A.

**Table 12 Socio-economic impact of the energy efficiency sector on production, GVA and employment, % on Spain, 2009**

PRODUCTION	Million Euros	% on Spain
Size of EE sector	21,462	1.05%
Intersectoral impact	28,786	1.40%
<i>Indirect</i>	17,292	0.84%
<i>Induced</i>	11,494	0.56%
<b>Total impact on production</b>	<b>50,248</b>	<b>2.45%</b>
GROSS VALUE ADDED	Million Euros	% on Spain
Size of EE sector	7,431	0.76%
Intersectoral impact	10,341	1.05%
<i>Indirect</i>	6,574	0.67%
<i>Induced</i>	3,767	0.38%
<b>Total impact on GVA</b>	<b>17,772</b>	<b>1.81%</b>
EMPLOYMENT	Number employments	% on Spain
Size of EE sector	106,393	0.53%
Intersectoral impact	175,080	0.87%
<i>Indirect</i>	96,233	0.48%
<i>Induced</i>	78,847	0.39%
<b>Total impact on employment</b>	<b>281,473</b>	<b>1.40%</b>

Source: IDAE. Plan de Ahorro y Eficiencia Energética 2011-2020. Impacto Socioeconómico del Mercado e la Eficiencia Energética en el Horizonte 2020. Resumen Ejecutivo. Madrid, Noviembre 2011

**Table 13 Previsions of magnitude and impact of energy efficiency sector in 2016 and 2020**

	2009		2016		2020	
	Million Euros	% on Spain	Million Euros	% on Spain	Million Euros	% on Spain
<b>PRODUCTION</b>						
Size of sector	21,642	1.00%	40,472	1.70%	58,154	2.30%
Productive impact	50,247	2.60%	94,756	4.00%	136,153	5.30%
<b>GROSS VALUE ADDED</b>						
Size of sector	7,431	0.80%	14,013	1.30%	20,136	1.60%
Productive impact	1,771	1.80%	33,513	3.00%	48,155	3.90%

EMPLOYMENT	Number employments	% on Spain	Number employments	% on Spain	Number employments	% on Spain
Size of sector	106,393	0.50%	200,634	0.90%	288,290	1.10%
Productive impact	281,473	1.40%	530,798	2.30%	762,698	3.00%

Source: IDAE. Plan de Ahorro y Eficiencia Energética 2011-2020. Impacto Socioeconómico del Mercado e la Eficiencia Energética en el Horizonte 2020. Resumen ejecutivo. Madrid, Noviembre 2011

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10. Royal Decree 20/2012, regarding budget stability and promotion of competitiveness
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<b>Title:</b>		
<b>11.3 Peru Reference Plan for the Efficient Use of Energy</b>		
<b>Country:</b>	Peru	
<b>Sectors:</b> Commercial, Public, Residential, Industrial and Services	<b>Stage:</b> ongoing	<b>Type of policy/practice/instrument:</b>
<b>Sub-sector (if applicable):</b>	<b>Period:</b> 2009 -2018	

### General Description

Energy efficiency has been an important issue all over the world, and in particular in Latin America, ever since the first oil shock of 1972. Following the wave of high energy prices, driven by the thirst for oil and by a growing concern about the environment, many countries in the region have made repeated attempts over time to improve their energy security and general outlook, yet not on a permanent basis, but rather on cyclical-style approaches, often spurred by progressions of available multilateral funding. This tendency was in sharp contrast to the more constant, long-term vision and systematic strategies of developed countries. Therefore, results in many countries of the region have been poor and unsustainable.

A customer's awareness of the advantages and benefits of energy efficiency is also a matter of having a strong regulatory framework and the proper institutional arrangements needed to help create the conditions for developing a self-sustaining energy efficiency market. This market will thus have three major components to it: energy efficiency services demand (customers); energy efficiency services supply (Energy Services Companies, ESCOs), that could access customers and provide services; and, financial entities that could and would be willing to finance energy efficiency projects. According to the Latin American Energy Organization (OLADE), changing the energy sector models of some Latin American countries is deeply needed, including those dealing directly with renewable energy and above all, energy efficiency, which may allow reducing fossil fuels demand growth rates more than any other endeavor. Only long-term sustained efforts will ensure that energy efficiency becomes part of the energy planning processes in these countries and begins to be considered as a prime energy resource. Peru is one of the nations in Latin-America who has moved considerably towards making the necessary institutional arrangements needed for the long term operation of energy efficiency in the country.

Within Peru, the Reference Plan for the Efficient Use of Energy or *Plan Referencial de Uso Eficiente de la Energía* (PREE) was created to coordinate all the energy efficiency (EE) policies and programs in Peru and it is under the administration of the Ministry of Energy and Mining (MINEM) from 2009 until 2018. The primary goal of the plan is to achieve a 15% annual energy savings by the year 2018 by undertaking 125 energy efficiency actions within the industrial; commercial, public and residential; and services sectors. Reaching the 15% reduction in energy consumption is estimated to save the country US\$ 529 million per year with an estimated investment of US\$ 67 million per year.

Out of these 125 EE actions, 106 are aimed at reducing energy consumption and 19 are referred to the establishment of the baseline, determination of indicators and a periodic measuring of the outcomes. Within the first two years of the implementation of the PREE, the quantification of the energy savings and greenhouse gas (GHG) emissions reductions for the 10 most important energy consumption reducing activities of the plan have been achieved.

### Previous work on EE

In the early-nineties, Peru started a rapid economic growth, which led to an increase in energy consumption. At the same time, a severe drought threatened the power generation sector, which more than 80 percent of the electricity production was hydroelectric. These circumstances created

a projected shortage of the electricity capacity of 100 MW by the year 1995. This way, the government of Peru, through the MINEM, created the Energy Savings Project or Proyecto para Ahorro de Energía (PAE) in 1994. Also, the MINEM put this project in charge, along the Center of Conservation of Energy (CENERGIA), of the specific task of reducing electricity demand by 100 MW in North Central Interconnected System (SINC). The PAE project was a model program, since it achieved the reduction goal and created along a know-how that was praised by other countries in the region.

### **Legislative support**

A number of pieces of legislation to support the establishment of EE were issued since the early 2000s. Along with the 2007 ministerial resolution that created the PREE, an important regulation was the Law 27,345 to Promote Energy Efficiency from 2000, which assigned several roles to the Ministry of Mines and Energy, through the General Direction of Energy Efficiency (DGEE). Finally, the National Energy Policy 2010 – 2040 gave PREE the legal support to work on policy and carry out EE projects in all sectors.

### **PREE Projects 2009 - 2018**

This is a list of the most important projects in the consumption sectors that had been identified by the year 2012.

*Residential sector:* Out of 34 actions, four had been quantified: replacement of 1 million traditional stoves for modern ones; replacing all incandescent lightbulbs with energy-saving CFLs; improvement of consumption habits; and the replacement of 100,000 electric water heaters with solar.

*Production and services sector:* As in the residential sector, four out of 37 identified actions were quantified: replacement program 30,000 electric motors; improving the operation of 60% of the boilers of the country; use of cogeneration; and use of efficient lighting.

*Public sector:* Only one of 26 identified actions has been identified: the updating of lighting in government buildings.

*Transportation sector:* Out of 28 identified actions, only one had been quantified: efficient driving. It is estimated that the savings to be gained in 10 years from these 10 quantified actions in the 4 sectors above mentioned, amount to 372,640 TJ, which equals to US\$ 5,291 million. These savings could be obtained with an estimated investment of US\$ 673 million (a ratio of approximately 8 to 1). The resulting avoidable GHG emissions are close to 35 million tons of CO<sub>2</sub>.

### **Specific projects<sup>66</sup>**

A more recent presentation by the MINEM showed a more detailed assessment of few specific projects:

#### **Lighting markets transformation**

The transformation program for lighting market is a program financed by the GEF and PNUMA for the 2013 - 2017 period and its indirect goals are:

- to reduce the maximum demand of electricity for up to 484 MW;
- achieve savings of US\$ 600 million;
- increase the sales of CFL by 3.5 million units and 1.2 million of fluorescent tubes; and
- replace 100 thousand HPS lamps<sup>67</sup> with LED or induction technology.

#### **Energy efficiency standards and labeling program**

The most important goals of this program are to build capacity within the public and private sectors, and to transform the market so consumers include EE as one of their purchasing priorities. This program runs from 2013 to 2016 and it has a budget of US\$ 6.8 million, which US\$ 2 million are financed by the GEF and the rest is paid by the government.

#### **LED Street Light**

<sup>66</sup> Quintanilla, Edwin, Vice Minister of Energy of Peru. Energy Efficiency in Peru. Presentation at the 5th Policy Dialogue on Energy Efficiency in Latin America and the Caribbean: Energy Efficiency Markets. Lima, October 27<sup>th</sup>, 2014.

<sup>67</sup> High pressure sodium

This program aims at replacing 1.2 million street lamps, which will have estimated savings of 60 percent in energy consumption.

### Actors

The most relevant actors are:

Actor	Role
<p><b>Ministry of Mines and Energy, General Direction of Energy Efficiency (DGEE).</b></p> <p><b>CENERGIA (Center for Conservation of Energy and the Environment)</b></p> <p><b>Private and state-owned production companies (customers): industrial, commerce and services companies; energy production and transformation companies.</b></p>	<ul style="list-style-type: none"> <li>• Energy efficiency education and culture</li> <li>• Sectorial energy efficiency programs               <ul style="list-style-type: none"> <li>○ Residential</li> <li>○ Productive and services</li> <li>○ Public</li> <li>○ Transportation</li> </ul> </li> <li>• Planning and diffusion of Energy Efficiency               <ul style="list-style-type: none"> <li>○ Energy Efficiency Reference Plan</li> <li>○ Diffusion of energy efficiency</li> </ul> </li> <li>• Capacity building               <ul style="list-style-type: none"> <li>○ Certification of consultants and ESCOs</li> <li>○ Financial support, coordinating efforts with financial entities</li> </ul> </li> <li>• Promote rational and efficient use of sources of energy in the country, the substitution of energies with other more efficient ones, the development of renewable energies and conservation of the environment.</li> <li>• Promote training, research and development of technologies for the efficient use of energy.</li> <li>• Provide technical assistance related to energy efficiency, the use of renewable energies and the reduction of pollutant emissions.</li> <li>• Organize and promote forums, conferences, seminars and other activities geared towards disseminating and fostering knowledge about sustainable development.</li> <li>• Development of energy audits and designing energy efficiency projects, having technical support from CENERGIA and private ESCOs</li> <li>• Implementing project, some of them without significant investment requirements, other involving technology innovation through new equipment may require investments that may have financing</li> </ul>
<p><b>Financial institutions</b></p> <p><b>Corporación Financiera de Desarrollo S.A. (COFIDE)</b></p> <p><b>Private Banks.</b></p>	<p>Its mission is "to actively participate in the sustainable and inclusive development of the country by providing financing for investments and the financial system, as well as support for entrepreneurial ventures, with innovative products and services, while being socially responsible"<sup>68</sup>.</p> <p>It is very important to point out that Peru is one of the few LAC countries in which private banks are financing ESCOs and energy efficiency projects. This was after a long, slow and sustained effort</p>

<sup>68</sup> COFIDE 2013 Annual Report

Actor	Role
	to support an energy efficiency services market development. At the beginning it was a case-by-case approach, with financing based on own customers and services companies resources. Finally, private banks started to understand the energy efficiency business. For example, BBVA marketed at least two rounds of resources to its clients for energy efficiency and environmental projects, having funding from the World Bank's IFC. Scotia Bank is also working on these type of projects.

### Barriers/risks

Below are some of the most notable barriers identified in trying to impulse energy efficiency as a permanent energy resource for this case:

#### Relying too much on regulation

A 2012 study financed by the Inter-American Development Bank<sup>69</sup> warns of the overestimation of what regulation can achieve by itself in Peru. For example, even though the Law for Promotion of Effective Use of Energy Act was enacted in 2000 states that EE labeling should be mandatory, it has not happened despite the existence of a national regulation for the largest energy consuming equipment.

#### Lack of political support at the time of implementation

Lack of political will to carry out the actions oriented to the implementation of the Plan decision making. This policy decision should be taken to allocate the economic-financial and human resources necessary for the successful accomplishment of the goals and objectives outlined in the Plan. Like any plan, the PREE 2009-2018 risked having a very satisfactory conception but ultimately not meet expectations at the time of its implementation. The good intentions and initiatives, from the point of view of the development of energy efficiency in the country, have not had a concrete and acceptable correlation with reality, at least until the time of this analysis (December 2011).

#### Lack of institutional coordination

The actions related to the efficient use of energy in the official area in Peru were always included in the area of responsibility of the MINEM. There are however, other energy efficiency projects developed by other government agencies, private firms and other types of organizations.

Other ministries of the Peruvian government work on issues indirectly related to energy efficiency (case of the Ministries of Transportation and Communications, Environment and Housing) but there is still no proper coordination between agencies in order to optimize efforts to save energy. Another example is the "Energy Efficiency in Small and Medium Industry" is implemented by the National Environmental Fund (FONAM), with support from the IDB through its Multilateral Investment Fund (FOMIN).

The EE programs conducted in Peru to date have mainly targeted consumers of electricity, leaving out a large untapped potential for EE of different forms of energy consumption.

The participation of electricity distribution utilities in EE programs is very limited, although they are the ones that best know the final users and their electricity consumption behavior. The authorities are missing a large EE potential by not transferring part of the projects or incorporating the utilities in programs like revenue decoupling.<sup>70</sup>

#### Shortage of know how

The number of companies that have potential to implement EE measures far exceed the working capacity of the 30 energy consultants (firms and independent consultants) currently on the market.

Lack of participation in international EE activities like the adoption of the ISO 50001 and the EE programs hosted by multilateral organizations. This is a barrier to learn from the international experience and the use of international protocols that could help organize and increase the levels of EE in the country.

<sup>69</sup> Banco Interamericano de Desarrollo. "Elaboración de la Nueva Matriz Energética Sostenible y Evaluación Ambiental Estratégica, como Instrumentos de Planificación". Plan Estratégico de Energía Sostenible y Bioenergía para Perú (PEESB) Cooperación Técnica No Reembolsable N° ATN/OC-10984 –PE. Apoyo a la Estrategia Energética del Perú Cooperación Técnica No Reembolsable N° ATN/OC-11010 –PE. January 2012

<sup>70</sup> Alliance to Save Energy. Utility Rate Decoupling. <https://www.ase.org/resources/utility-rate-decoupling-0>

## Enablers for implementation

### Ministry of Energy and Mines

The ministry has showed its leadership since the early implementation of EE programs in Peru in the 1990s. Recent lack of coordination and prioritization (described in the previous section) was identified by the MINEM and it addressed it in the new Energy Efficiency Plan 2012-2040, which subsumes the Reference Plan 2009-2018.

### COFIDE-JICA-KfW and private banks

These institutions, through direct investment and credit lines, are financing energy efficiency and renewable energy projects in Peru

### Costs and financing

A study by the Inter-American Development Bank estimates that the implementation of the programs in the National Energy Efficiency Plan will require an investment of US\$ 140 million in the year 2012 and that annual investment increases every year until it reaches a peak investment level of US\$ 2.5 billion the year 2034. The following table shows the detail of the required investment according to the IDB study.

Estimated required investment for EE programs in Peru (Million US\$)														
2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
140	149	181	251	214	154	227	357	499	759	926	1,102	1,292	1,501	2,043
2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total
1,864	2,110	2,373	1,331	1,677	1,939	2,216	2,507	33	7	7	7	7	7	25,882

### Public Budget

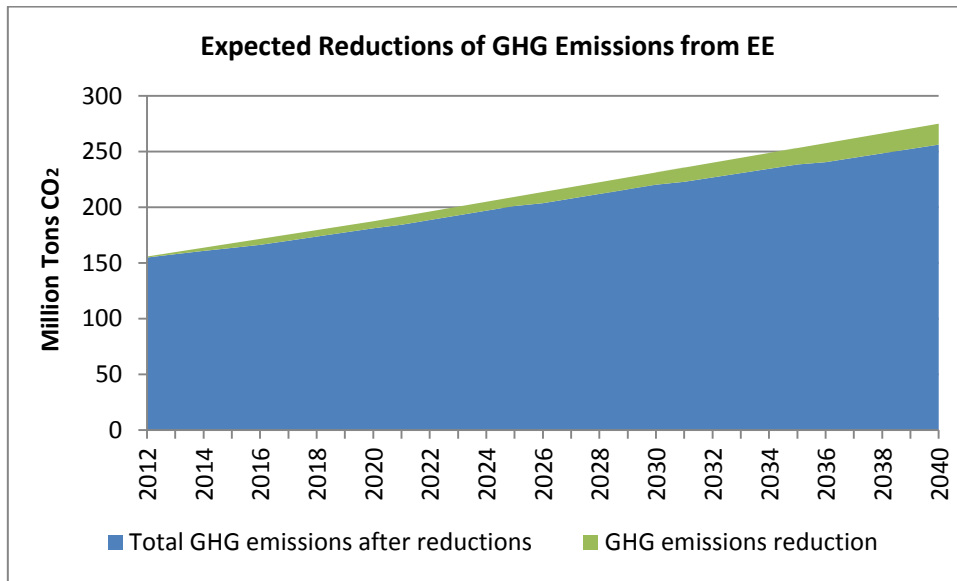
The annual budgets for the DGEE are approximate the following.

- 2010: US\$ 0.5 million
- 2011: US\$ 1.12 million
- 2012: US\$ 1.5 million

### Emission reductions

On the other hand, a study by the Inter-American Development Bank estimates that the programs created by the national energy efficiency plan in Peru have reduced 896 thousand tons of CO<sub>2</sub> in the year 2012, which represents 0.6 percent of the total GHG emissions of the country (155,883 tons of CO<sub>2</sub>). That percentage would increase by the year 2040 to 6.8, bringing the GHG emissions down from 275,156 to 256,336. The following graph shows this tendency.<sup>71</sup>

<sup>71</sup> Banco Interamericano de Desarrollo. "Elaboración de la Nueva Matriz Energética Sostenible y Evaluación Ambiental Estratégica, como Instrumentos de Planificación". Plan Estratégico de Energía Sostenible y Bioenergía para Perú (PEESB) Cooperación Técnica No Reembolsable N° ATN/OC-10984 –PE. Apoyo a la Estrategia Energética del Perú Cooperación Técnica No Reembolsable N° ATN/OC-11010 –PE. January 2012



**Benefits**

Benefit	Description
<b>Reductions in energy demand</b>	<p>The total expected reduction in total energy demand as a direct product of the programs of the National Energy Efficiency Plan in Peru is 3,401 petajoules. This total reduction on energy demand is estimated to be divided in the following way (petajoules):</p> <ul style="list-style-type: none"> <li>Residential sector: 621</li> <li>Production and services sectors: 518</li> <li>Commercial and public sectors: 7.7</li> <li>Transportation sector: 1,051</li> <li>Other sectors: 1,203</li> </ul>
<b>Mitigation of greenhouse gases</b>	<p>The expected total GHG emissions reduction from the year 2012 to 2040, as a direct consequence of the National Energy Efficiency Plan in Peru, is 289 billion tons of CO<sub>2</sub>.</p>
<b>Improvement in air quality</b>	N/A
<p><b>Macro-economic impacts</b></p> <ul style="list-style-type: none"> <li>• Trade balances</li> <li>• Energy prices</li> </ul>	<p>The total expected annual savings as a product of the National Energy Efficiency Plan in the period 2012 - 2040 is US\$ 94.8 billion. In addition, the EE programs could add economic benefits of US\$ 1.95 billion in the same period, totalling US\$ 96.7 billion by the year 2040.</p>
<b>Impacts on public budgets</b>	<ul style="list-style-type: none"> <li>• Reductions in operational and capital expenditure for</li> </ul> <p>The most tangible and direct benefit for the public sector as a consequence of the national EE programs is the expected reduction of electricity</p>



Benefit	Description
<p>the public sector</p> <ul style="list-style-type: none"> <li>• Effects attributed to structural changes to the economy and changed economic activity due to investment in energy efficiency, renewable energy</li> </ul>	<p>demand from improved efficiency of public lighting. Starting in the year 2012 at 8 MW of demand reduction, the efficiency is expected to increase to reach 31 MW of demand reduction by the year 2016 and stay at that level until the year 2040.</p>
<p><b>Creation of jobs</b></p>	<p>The Energy Efficiency Business may have a job creation effect, providing energy services to customers and developing renewable energy projects</p>
<p><b>Improvements in human health and well being</b></p> <ul style="list-style-type: none"> <li>• Reduce risk of respiratory diseases, with more comfortable indoor environments resulting from the absence of combustion gases</li> </ul>	<p>In 2009, the MEM implements the program to replace kerosene stoves for cooking Liquefied Petroleum Gas - LPG. In July 2011, 36,000 stoves were replaced with an efficiency of 55% and improved energy efficiency by 15% compared to using kerosene stoves.</p> <p>Until October 2011 month, 219.537 units installed improved stoves to replace traditional wood stoves through social program "TOGETHER". Additionally, the MEM 59.147 units installed, pointing to meet the goal of replacing traditional stoves 1 million for improvement.</p>
<p><b>Increased access to energy and reduced fuel poverty</b></p>	<p>UNDP, UNIDO and IEA proposed in 2010, the goals to be achieved by the rural and urban population of the world in 2030. Of these goals, the MINEM implemented the rural electrification program "Light for All", which to May 2011 had already benefited 3 million people. This program includes the provision of electricity from renewable energy sources (hydro, solar photovoltaic, wind, hybrid, etc.).</p> <p>The "Benchmark Plan for Efficient Use of Energy" is planned as a goal the replacement of 100,000 solar electric heaters, which are installed more than 30,000 solar heaters for domestic and commercial use.</p> <p>Implementation of the "Collection System Passive Solar Energy Indirect Method" called "Trombe Wall". The development of this project was entrusted to the National Training for the Construction Industry (SENCICO), an organization that has installed 17,754 Trombe walls in 615 locations in 12 regions, a task for which the Ministry of Housing's transfer 15.4 million soles.</p>

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Programa de eficiencia energética en el Perú busca ahorro de US\$800M para el 2018

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<http://www.apefiperu.org/>

## 12 BENCHMARKING IN INDUSTRY

Title:

### 12.1 Benchmarking in Industry: India's Perform Achieve and Trade (PAT) Scheme

<b>Country:</b>	India	
<b>Sector:</b> Industrial	<b>Stage:</b> In progress	<b>Type of policy/practice/instrument:</b>  Benchmarking industry performance with incentive strategies and marketable permits
<b>Sub-sector (if applicable):</b> NA	<b>Period:</b> 2012-2015	

#### Description

India has been seeking to prioritize and implement more energy efficiency measures within its industry sector for some time now. One of the greatest steps taken in this direction by policy makers was made in 2001 with the passing of the country's Energy Conservation Act, which called for energy efficiency improvements to several key sectors within industry by allowing the government to label certain energy-intensive industrial plants as "designated consumers", which would in turn require them to implement energy-efficiency measures and to also report their energy consumption to government authorities from henceforth. These so called "designated consumers" are big players and energy consumers in the industrial sector in India, accounting for about 25% of the country's GDP and 45% of its entire energy consumption in 2012<sup>72</sup>.

Under the general auspices of the country's energy conservation law, policy makers devised even more significant developments to the expansion of energy efficiency programs in India by approving the National Mission on Enhanced Energy Efficiency in 2008, which included the mission's cornerstone project, the Perform, Achieve, and Trade (PAT) scheme. The scheme is a market-based mechanism designed to facilitate industrial investment in energy efficiency through the trading of energy savings certificates. The aforementioned designation of "designated consumer" was mandated down to eight particular industrial sectors in 2008 (power, cement, iron and steel, chlor-alkali, aluminum, textile, pulp and paper, and fertilizer) and these are now required to participate in the first cycle of implementation of the PAT scheme until 2015.

The target for the scheme's first commitment period (2012-2015) was set to achieve an overall reduction of 10 million tons of oil equivalent energy use across the eight industry sectors selected, with each sector being responsible for a proportional share of its total reduction target based on their respective energy consumption amounts. Energy consumption for each sector is primarily determined by a designated consumer's total energy input in relation to its total product output, and a baseline specific energy consumption value is determined for each by analyzing consumption data for the previous three years. Once this baseline figure is determined, scheme officials will then conduct a comprehensive analysis to determine a particular plant's existing efficiency measures, as well as its potential for further improvements, and also look at a number of other factors, such as production capacity, raw material quality, product mix and the age of the particular facility, to help determine a plant or sector's appropriate reduction target, which most commonly will take on the form of percentage reductions from the previously determined baseline specific energy consumption value.

By employing the method just described, it is perceived that the less efficient energy consumers will thus be called upon to reduce emissions and energy consumption, more than the ones that do

<sup>72</sup> Bureau of Energy Efficiency, India. January 10, 2011. "PAT Consultation Document: 2010-2011." Web. October 2012. [http://220.156.189.23/NMEEE/PAT%20Consultation%20Document\\_10Jan2011.pdf](http://220.156.189.23/NMEEE/PAT%20Consultation%20Document_10Jan2011.pdf)

so already, relative to their baselines. During the compliance period under the scheme, those consumers that can show and verify that they have exceeded their targets in their annual reports (which are required under the program) will then be eligible to receive energy savings certificates.

Each of these certificates represents one metric ton of oil equivalent, and the number to be issued will depend on the degree of overachievement of a particular plant or sector. All the way through the compliance period then, consumers can then trade these energy savings certificates bilaterally or through power or commodity exchanges. In addition, they can also trade “obligations,” which are similar to energy savings certificates, but are based on future energy savings rather than realized efficiency improvements. By the end of the compliance period, those consumers that fall short of their targets can either purchase energy savings certificates from other designated consumers or pay a penalty for noncompliance, which is currently priced at is INR 1 million (approximately USD 18,000), plus an additional amount depending on the spread between the established target and actual performance.

Compliance is determined by a transparent measurement and verification system that was created particularly for the scheme, where designated energy auditors conduct audits to verify the data provided by the consumers, and where assessments are performed for the specific energy consumption baseline year and at the end of the pre-established three-year cycles. It is expected that under this system all audits conducted would be consistent and impartial by following the rules set out by the Bureau of Energy Efficiency in India.

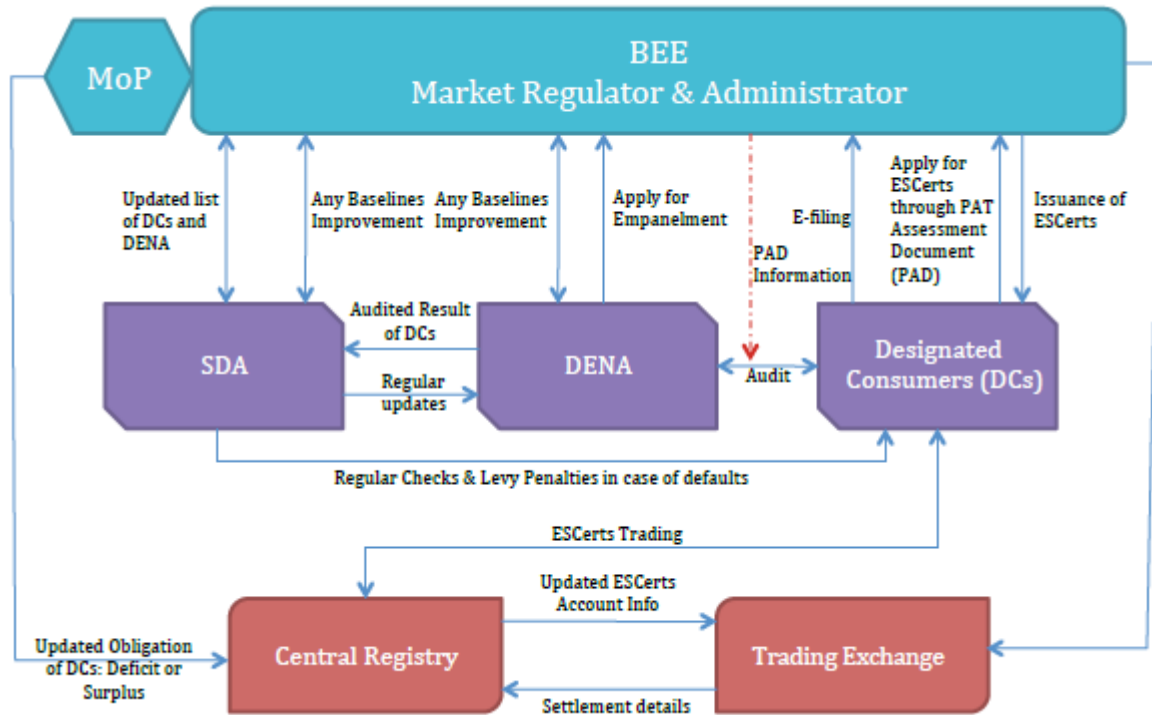
The implementation plan for the PAT was designed in 4 phases as the following table describes:

Phase	Description	Implementation Date
<b>1. Target Setting Phase</b>	Establish a Specific Mandated Energy Consumption (SEC) for each company (Plant) according to their energy intensity level, the target is a percentage that the plant needs to improve on their energy intensity	March 2011 until all participating designated consumers is reached.
<b>2. Target Achieve Phase</b>	The companies have three years to reach their SEC targets.	April 2011 to March 2014
<b>3. Measure and Verification (M&amp;V) Phase</b>	The verification of the energy savings is done by audits from the accredited agencies that provided certificates for the market	April 2012 and beyond
<b>4. Trading Phase</b>	The companies that exceed their targets can access to a creditable trade permit that allows them to commercialize the permits to the industries that did not reach the target.	To be implemented after the M&V Phase

The mechanism for the actual trading of certificates under the PAT scheme is defined in the Energy Conservation Act and contemplates the following:

- The methodology for setting SEC at sector level and the target for each DC
- The process to verify the SEC of each DC
- The process to issue energy savings certificates (ESCerts)
- Trading ESCerts
- Compliance and reconciliation of ESCerts
- Cross-sectorial use of ESCerts and synergy with renewable energy certificates

The process for the trading market is schematised in the following figure:



Source: Perform Achieve and Trade mechanism (PAT) Neeraj Dhingra<sup>73</sup>

**Actors**

Actor	Role
Bureau Energy Efficiency (BEE)	Entity ultimately responsible for the transparent, flexible, efficient and robust system design and implementation of the PAT scheme, as well as the regulating authority responsible for compliance and organizing reconciliation of the energy savings certificates emitted.
Designated Energy Auditor (DENA)	Certified 3 <sup>rd</sup> party experts for various activities under PAT, mainly: <ul style="list-style-type: none"> <li>o Baseline data collection</li> <li>o Baseline Energy Audit</li> <li>o Monitoring &amp; Verification</li> <li>o And other PAT related activities</li> </ul>
Designated Costumers (DCs)	Companies (Plants) that need to improve their energy consumption to reach the SEC targets. Also can sell and buy energy savings certificates. These are the main participants of the PAT scheme.
Central Registry (CR)	Entity responsible for maintaining and making publicly available in electronic form all the transactions of the scheme on an online registry or depository.
State Designated Agencies (SDA)	In case of non-compliance the State Designated Agencies (SDA) as constituted in accordance with the Energy Conservation Act, 2001 will act as the body responsible for adjudicating matters related to penalizing the Designated Consumers for noncompliance.
Ministry of Power (MOP)	Ministry of Power & Bureau of Energy Efficiency (BEE) have been entrusted to develop the implementation framework of National Mission for Enhanced Energy efficiency (NMEEE), which includes the PAT scheme.

<sup>73</sup> [http://proceedings.eceee.org/papers/proceedings2011/3-494\\_Dhingra.pdf?returnurl=http%3A%2F%2Fproceedings.eceee.org%2Fvisabstrakt.php%3Fevent%3D1%26doc%3D3-494-11](http://proceedings.eceee.org/papers/proceedings2011/3-494_Dhingra.pdf?returnurl=http%3A%2F%2Fproceedings.eceee.org%2Fvisabstrakt.php%3Fevent%3D1%26doc%3D3-494-11)

## Barriers

The DC sectors have had some trouble with making progress towards their intended targets to reach in 2015, partly due to the unfamiliarity of energy efficiency measures and technologies within certain sectors, as well as with many of the up-front costs associated with the scheme, which instituted additional upfront costs and obligations for industries and individual plants, such as reporting on their energy consumption and energy efficiency activities, and the necessity of having an energy manager as part of their full time personnel.

A number of other barriers, fairly common with energy efficiency initiatives in developing economies are also mentioned throughout literature related to the scheme. These include:

- High cost of efficient technologies
- Lack of experience of local banks for financing
- Uncertainties in regulatory policies
- Lack of capacity of relevant stakeholders to develop projects

A specific barrier for the cement sector, for example, was the lack of awareness of energy savings at the top management level, and the high costs of enlisting energy managers within their personnel.

In response to these circumstances, the federal government implemented two fiscal instruments to facilitate the implementation of energy efficiency projects in the industry:

- Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE): that addresses credit risk and transaction barriers for energy efficiency to finance the industrial sector, act as the guarantor and enter into agreements with commercial banks. Grantee to financial institutions for Energy Service Companies (ESCO) investments up to USD\$ 0.55 million or 50% of loan for the project (the lesser)
- Venture Capital Fund for Energy Efficiency (VCFEE): works by an institutional framework agreements with financial intermediaries for equity investments in emerging technology and key investments themes .Equity investments with ESCO projects up to USD\$ 0.36 million or 15% of equity (the lesser)

Despite the obvious benefits and optimism spurred on by the PAT scheme, some other pitfalls and barriers to wider implementation have surfaced, having slowed the process down, and caused some controversy in some examples. One of the most controversial issues has been the setting of the appropriate reduction targets for all designated consumers. Plant boundaries, materials used and outputs vary across the different industries and sectors, and the affected parties have criticized the arrival at of some targets by program implementers.

Other critiques have been in relation to the supposed bureaucratic and complex system and methodology that have been put in place for the scheme, as it still needs to account for large differences in the level of energy efficiency possibilities across different sectors, and because India has still yet to have any experience with benchmarking or market-based systems of this kind on a national level. By that same token, other barriers have been identified with the issue of the system being so new to most participating companies, where personnel in various sectors have minimal to no experience with efficiency standards or targets.

Despite what seems like a robust stakeholder consultation process at the beginning of the program, it would seem that some DCs still lack knowledge about the scheme and are not fully engaged. While DCs in some sectors (e.g. cement) show a high level of awareness and confidence, others (e.g. fertilizers and textiles) lack understanding and capacity to implement the scheme as 2012. In addition, the consultation process saw fairly limited civil society and local state government involvement, with PAT being a largely federal government schemes, these issues underline the importance of continued stakeholder engagement throughout the life of the program.

## Enablers for implementation

According to a recent evaluation performed by the Climate and Development Knowledge Network<sup>74</sup>, there are three main implementing conditions that have facilitated the better design and implementation of the program thus far. These are the following:

- Seek early buy-in from industry and other key stakeholders to ease compliance:** Stakeholder engagement is often neglected in a mandatory policy; however, it can increase compliance rates by raising awareness and improving preparedness, demonstrating flexibility in policy design, securing participant engagement and buy-in early on, and identifying innovative solutions to address country and industry specific realities. Sustained stakeholder engagement over the course of implementation can further increase the likelihood of success of implementation can further increase the likelihood of success.
- Obtain accurate data to define coverage, establish baselines, set goals and monitor performance.** Comprehensive, verifiable data are essential to design a mechanism that enjoys credibility both domestically and internationally. Sector associations and state-level agencies can assist in developing expertise and establishing systems to facilitate data collection, auditing and verification. Data collection is often resource-intensive but, depending on the nature of the policy, international support may be available. A strong monitoring, reporting, and verification system built upon accurate data can help create linkages with international carbon markets, translate policies into Nationally Appropriate Mitigation Actions and attract finance from climate funds.
- Invest in strengthening institutional and human capacity.** Technical and institutional capacity is a prerequisite for developing an energy efficiency trading scheme. As India's example shows, existing capacity – a result of efforts over the last 25 years – provided a pool of experts to tap during planning and implementation. Often such capacity can be used to realize multiple initiatives, thus sharing the cost burden across a suite of policies. Capacity building efforts promoting self-reliance in the long run are also relatively easier to fund using international support.

## Costs

The Indian government has already allocated nearly \$13 million USD for the operation of PAT from 2011-2014, which is a significant budgetary outlay for a single energy savings scheme, and is committed to resolving any technical or regulatory issues that are likely to come up during this time. It remains to be seen whether PAT's overall impact in terms of cost-effectiveness is positive, both for the environment and for Indian industry.

## Funding

Because the PAT scheme is still under implementation, exact figures on its funding sources and the corresponding costs for industry are still not determined. However, the government of India is estimating that total investment costs for industry over the period of 2011-2014 will total about INR 300 billion (USD 5.37 billion), and that the majority of this money would be spent on such matters as data collection, capacity building, and energy saving measures across the 8 sectors.<sup>75</sup>

## Energy savings and associated emission reductions

The government estimates that by the end of the first implementation period in 2015, the PAT scheme will have reduced carbon emissions by nearly 100 million metric tons over a business-as-usual scenario, and the energy savings certificate market will be worth about USD 16 billion.

## Benefits

Benefit	Description
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<sup>74</sup> [http://r4d.dfid.gov.uk/PDF/Outputs/CDKN/India-PAT\\_InsideStory.pdf](http://r4d.dfid.gov.uk/PDF/Outputs/CDKN/India-PAT_InsideStory.pdf)

<sup>75</sup> Industrial Efficiency Policy database. "N-2: Perform Achieve Trade Scheme (PAT Scheme)." Web. October 2012.

<b>Reductions in energy demand</b>		The government estimates that by the end of the first implementation period in 2015, the PAT scheme will have produced an energy savings certificate market that will be worth about USD 16 billion. <sup>76</sup>
<b>Mitigation of greenhouse gases</b>		The government estimates that by the end of the first implementation period in 2015, the PAT scheme will have reduced carbon emissions by nearly 100 million metric tons over a business-as-usual scenario. <sup>77</sup>
<b>Improvement in air quality</b>		Information not available.
<b>Macro-economic impacts</b>	<ul style="list-style-type: none"> <li>• Impacts on GDP</li> <li>• Trade balances</li> <li>• Energy prices</li> </ul>	According to Climate Connect estimates, the industrial units covered by the PAT scheme could save more than USD 1 billion by fiscal year 2014-2015 by meeting their specific energy consumption targets. <sup>78</sup>
<b>Impacts on public budgets</b>	<ul style="list-style-type: none"> <li>• Reductions in operational and capital expenditure for the public sector.</li> <li>• Effects attributed to structural changes to the economy and changed economic activity due to investment in energy efficiency</li> </ul>	Apart from the benefits described in the box above (macro-economic impacts), the exact impacts of the PAT scheme on public budgets is yet to be determined.
<b>Creation of jobs</b>		No information available.
<b>Improvements in human health and well being</b>	<ul style="list-style-type: none"> <li>• Reduce risk of respiratory and cardiovascular diseases, allergies, arthritis and rheumatism with warmer, drier, more comfortable indoor environments</li> </ul>	NA

<sup>76</sup> <http://www.reuters.com/article/2011/05/29/us-indiaemissions-idUSTRE74S2PV20110529>

<sup>77</sup> <http://www.reuters.com/article/2011/05/29/us-indiaemissions-idUSTRE74S2PV20110529>

<sup>78</sup> <http://www.climate-connect.co.uk/Home/?q=node/2489>



	ts resulting from improved building insulation	
<b>Increased access to energy and reduced fuel poverty</b>		NA
<b>Benefits to energy providers</b>	<ul style="list-style-type: none"> <li>• Reduced operating costs</li> <li>• System and network deferral</li> <li>• Increased reliability</li> <li>• Market price changes</li> <li>• Associated with marketing</li> </ul>	Reduced energy demand from energy-intensive industry sectors.

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**Title:**

## 12.2 Malaysia: The Industrial Energy Efficiency Improvement Project

<b>Country:</b>	Malaysia	
<b>Sector:</b> Industry Wide	<b>Stage:</b> Finished (2007)	<b>Type of policy/practice/instrument:</b>  Benchmarking in Industry
<b>Sub-sector (if applicable):</b> NA	<b>Period:</b> 1999-2007	

### Description

Since the mid-1990's, energy efficiency has been an issue that has continuously gained more momentum and traction in the country of Malaysia. This impetus was even more evident with the approval of the Seventh (1996-2000), Eighth (2000-2005), and Ninth (2006-2010) Malaysian Plans, where one of the main initiatives re-concurringly touched upon throughout them was the establishment and continued operation of the Malaysian Energy Centre (PTM), whose major task as a government-owned company is to promote and implement energy efficiency programs at the national level. By the time the Ninth Malaysian Plan came to fruition, energy efficiency was once again explicitly addressed, now with a specific focus on the need of energy savings to be featured from within the industrial and commercial sectors, as these sectors (in particular the industrial one) were notorious for their inefficient and sometimes wasteful use of energy in their facilities, implying also high energy consumption, demand, and increased greenhouse gas emissions.

To deal specifically with these issues, along with many of the typical barriers developing economies face when trying to promote and implement energy efficiency measures within their industrial sectors, is how the Malaysian Industrial Energy Efficiency Improvement Project (MIEEIP) came to be. The project was formulated and approved in 1998, with the main objective of "improving energy efficiency in Malaysia's industrial sector, through removing barriers to efficient industrial energy use, and through creating a sustainable institutional capacity to provide energy efficiency sources by creating a conducive policy, planning, and research framework". As of today, the project has primordially been considered a great success, as it was able to make important and real contributions to removing barriers to energy efficiency in industry, in particular awareness creation and capacity building in important areas such as benchmarking, best practices, audits and demonstration of energy efficiency processes and technology. The project has also been deemed transformative in nature for energy efficiency promotion in Malaysia as a whole, as it took the first steps in creating the basic skills required to understand the factors affecting decision-making concerning energy efficiency by industrial energy users, as well as consultancy companies. According to a project evaluation carried out by a third party consultant in 2009<sup>79</sup>, the project has also been deemed successful as it has generated powerful insights into the technical and economic potential for energy efficiency initiatives and the means available to the Malaysian government to realize that potential.

The original master Project Document further details that the particular milestones that were to be achieved through eight project components, along with immediate objectives, which are listed as follows:

- Component 1: Energy Use Benchmarking Program
  - To establish and develop energy-use benchmarks for various industrial sub-sectors (based on industrial processes, operations and energy systems) that can be used by industries as guides in their EE&EC efforts.
- Component 2: Energy Auditing Program

<sup>79</sup> <http://erc.undp.org/evaluationadmin/manageevaluation/viewevaluationdetail.html?evalid=3266>

- To promote energy auditing as an effective tool for industrial energy management;
- To establish Sectorial Energy Audit Teams; and,
- To conduct a continuing Energy Audit Program for industries
- Component 3: Energy Rating Program
  - To provide information on energy-efficient equipment and energy rating programs to increase awareness and encourage the use of energy efficient equipment in industry and set up an industrial equipment testing facility to label equipment.
- Component 4: Energy Efficiency Promotion Program
  - To disseminate information on energy efficient practices in industries, EE&EC technology applications and establish an association of accredited energy specialists, consultants and technology developers and providers.
- Component 5: ESCO Support Program
  - To develop a suitable institutional and legal framework for ESCO activities in the country;
  - To develop institutional arrangements that will promote ESCOs to the industrial sector;
  - To assist the local ESCOs in making bankable project proposals, business plans, and in securing financing arrangements for their clients;
  - To advise ESCOs in defining the feasible products and services that they can offer and evaluating the risks associated with performance contracting.
- Component 6: Energy Technology Demonstration Program
  - To demonstrate the applicability and the feasibility (technical and economic) of proven energy efficiency technologies;
  - To document and disseminate information on the application and benefits of energy efficiency technologies in local industrial settings;
  - To provide technical and financial assistance to industrial energy users.
- Component 7: Local Energy Efficient Equipment Manufacturing Support Program
  - To initiate design and manufacturing improvement projects of local industrial equipment manufacturers as a means of promoting and accelerating the production and utilization of energy efficient equipment in industries.

While the MIEEIP initially focused on eight energy-intensive industries (wood, rubber, food, ceramics, glass, pulp & paper, iron & steel and cement), during its implementation, three other sub-sectors were also then included: plastics, textile and oleo-chemical. The project was primordially executed by the Pusat Tenaga Malaysia (PTM), on behalf of the Ministry of Water, Energy and Communications (MEWC), and in co-operation with private sector partners interested in implementing energy efficiency improvement measures. For general coordination, monitoring and strategy support purposes, a National Steering Committee was also established (NSC) consisting of representatives from a number of Malaysian and International donor and expert organizations. A Project Implementation Unit (PIU) was set up at the beginning of the project, and was initially led by a full time Chief Technical Advisor, who was responsible for the day-to-day management of the project, ensuring that the expected outputs were completed in a timely manner and that all project proponents were complying with specific UNDP/GEF (donor) criteria and requirements. The project managers were also required to regularly report on the progress of the project to the executing agency and the UNDP. The Head of PTM functioned as the National Project Director, representing the Government as the person responsible for the project's implementation from that side.

Additional short-term international consultants were also recruited to provide specific services and to support the implementation of the project through critical stages. Finally, each component was led by a Component Project Manager as well as a part-time local Technical Advisor who was appointed to provide advisory services on an as-needed basis. Initially the project team consisted of about 18-20 staff, but at the time of the project's end, it consisted of a staff of only 6-8.

By the time of the project's final evaluation (2008), the following outcomes were identified as having been achieved:

1. **Establishment and publication of sub-sectoral energy benchmarks:** the e-benchmarking activities had successfully compiled a database of more than 1,500 industries built up from data sourced from the Department of Statistics (DOS), although the use of the tools has some limitations.

2. **Promotion of energy audits as an effective tool for energy management:** A total had audited in the following sub-sector, cement (3), ceramic (6), iron & steel (4), food (10), glass (3), pulp & paper (6), rubber (9), wood (7), oleo-chemical (2), plastics (2) and textile (2). Also, MIEEIP produced a document called "Industrial Energy Audit Guidelines-A Handbook for Energy Auditors".
3. **Energy rating programs for energy-efficient equipment:** An energy efficient motor rating and labelling program has been proposed to the Energy Commission. Only, was implemented on a voluntary bass and "Boiler Best Practice" guidebook has been developed.
4. **Documented and widely disseminated information on energy-efficient processes, technologies and practices:** Several promotional materials had been developed and disseminated to stakeholders and beneficiaries: articles, newspaper, workshops and seminars. MIEEIP had helped to establish the MEPA (Malaysian Energy Professionals Association). A booklet was published by UNDP "Achieving Industrial Energy Efficiency in Malaysia" to highlight efforts of the MIEEIP and energy conservation efforts in Malaysia in general.
5. **Trained and supported local energy services companies (ESCOs):** A Master Energy Services Agreement (MESA) was drawn up by the MIEEIP Team at PTM (Pusat Tenaga Malaysia-Malaysia Energy Centre) as a sample document to assist ESCOs (Energy Services Company) and industries in the implementation of energy efficiency activities.
6. **Implementation of significant energy efficient technology and processes demonstrations in collaboration with relevant agencies, private sector and financial institutions:** Ten EE technology demonstration projects in energy-intensive industries (pulp and paper, glass, food, steel, palm oil) had been supported as well as three local equipment manufacturers (motor rewinding, fans) by means of technical assistance (feasibility analysis) and investment support (through the Energy Efficiency Projects Lending Scheme, EEPLS).

## Actors

Actor	Responsibilities
The Ministry of Energy, Water and Communications (MEWC)	<ul style="list-style-type: none"> <li>• Entity responsible for facilitating and regulating the electricity sectors in the country, and to ensure affordable energy is available to consumers throughout Malaysia. As time has gone by, its responsibility has shifted from being a service provider to policy formulation, in coordination with the Economic Planning Unit (of the Prime Minister's Office) to provide the general direction, strategies and determine levels of implementation. They provided general supervision and support for the MIEEIP.</li> </ul>
The Energy Commission (Suruhanjaya Tenaga, ST)	<ul style="list-style-type: none"> <li>• This Commission's main tasks were to provide technical and performance regulation for the electricity and piped gas supply industries, as the safety regulator for electricity and piped gas and to advise the Minister on all matters relating to electricity and piped gas supply including energy efficiency and renewable energy issues. During MIEEIP, the commission was charged with attempting to emulate the experiences of efficiency standards and labelling programmes worldwide to possibly inform mandatory measures to be implemented in the future.</li> </ul>
The Malaysia Energy Centre (Pusat Tenaga Malaysia, PTM)	<ul style="list-style-type: none"> <li>• This entity was established by the Malaysian Government in 1997 as an independent not-for-profit company for the development and coordination of energy research. PTM's aim is to be the focal point on energy implementation and catalyst for linkages with universities, research institutions, industry, and national and international energy organizations. The PTM has four major functions.               <ul style="list-style-type: none"> <li>○ Energy policy research;</li> <li>○ Guardian and repository of the national energy</li> </ul> </li> </ul>

	<p>database;</p> <ul style="list-style-type: none"> <li>○ Promoter of national energy efficiency and renewable energy programmes</li> <li>○ Coordinator and lead manager in energy research and development and demonstration projects (including MIEEIP).</li> </ul>
<p>Multilateral Lending Institutions: Mainly the UN Development Programme (UNDP) and the Global Environment Facility (GEF).</p>	<ul style="list-style-type: none"> <li>• Entities that put forth considerable portions of the funding needed for project implementation, as well as with it periodic assistance with its design, as well as monitoring and evaluation.</li> </ul>

### Barriers

- One of the most prominent barriers that the project faced during its implementation was that of a severe lack of a conducive policy and planning framework in Malaysia for the promotion and implementation of energy efficiency. In retrospect, project evaluators felt that a separate component on energy efficiency planning and regulations would have benefited the project, but was not included in its original design back in 1998, despite the master document providing some initial mention and inputs with regards to regulatory framework formulation.
- Another general barrier the project faced was that of helping ESCOs overcome their specific barriers in order to enter and stand as considerable players and stakeholders within the energy efficiency market in Malaysia. In retrospect, it is perceived that additional care should have been taken so as to not exaggerate the potential of certain energy efficiency promotion instruments, such as ESCOs or certain financial incentives, while other larger and institutional barriers remain in place, such as the practice in Malaysia of substantially subsidizing energy cost.
- In relation to the previous barrier presented, the project also had to contend with the important barrier of having highly subsidised energy prices in Malaysia. There was little that the MIEEIP project could do to contend directly to remove this barrier except for providing relevant policy recommendations. Yet despite the low cost of energy, the MIEEIP project managed to still demonstrate the feasibility and achievability of energy saving measures and has managed to entice managers in industrial companies as well as some financial institutions to get involved in energy efficiency and conservation.
- One of the most critical barriers the project faced during and after implementation was that of its long term sustainability. In other words, it was feared that all of the results achieved during this project's implementation would suffer in terms of their long-term sustainability without continuous government support, as well as important legislative and financial interventions. Since the project's closing, this duty now falls on the Ministry of Energy, Green Technology and Water (MEGTW), which was established in April of 2009 following the reshuffling of the Malaysian cabinet, and replaced the duties of the former Ministry of Energy, Water and Communications to spearhead all national matters related to renewable energy as well as efficiency.<sup>80</sup>

### Enablers for implementation

- Capacity Strengthening and Awareness: Until the MIEEIP project, energy efficiency promotion efforts in Malaysia focused on individual energy audits, while MIEEIP provided a more holistic framework to create awareness and promote energy efficiency in industries. Project evaluators concluded that MIEEIP had largely been successful in lowering one main barrier in implementing energy efficiency in industries, i.e. the lack of awareness or ignorance among the higher management circles of the industry. Through the accumulation of participation in seminars, workshops, training sessions, and other capacity-building exercises, it has been estimated that over the six-year period, the MIEEIP had reached out approximately 5,000 industries, in particular within the 11 industrial subsectors: (cement, ceramics, food, glass, iron and steel, pulp and paper, rubber, wood, textiles, plastics and oleo-chemicals.

<sup>80</sup> [http://aperc.ieej.or.jp/file/2014/1/27/CEEP2009\\_Malaysia.pdf](http://aperc.ieej.or.jp/file/2014/1/27/CEEP2009_Malaysia.pdf)

- Institutional and Organizational Coordination: MIEEIP proved to be a good and successful collaboration among different Government agencies, professional bodies, and industry associations. MIEEIP successfully established the E-Benchmarking program in a smart partnership with National Productivity Corporation (NPC) and the Department of Statistics (DOS), as well as with nine working groups that were established. Other important stakeholders included the state power company Tenaga Nasional Berhad (TNB), Institute of Malaysian Engineers (IEM), Association of Consulting Engineers (ACEM), Persatuan Akitek Malaysia (PAM), PORIM, Electrical and Electronics Association of Malaysia (TEEAM) and the CETREE (Centre for Education and Training in Renewable Energy and Energy Efficiency).
- Financing and Demonstration Projects: This particular enabler seems to have had a huge impact on the amount of personnel from various industries that was enticed to promote energy efficiency in their own operations as a result of the project. One clear example of this was the MIEEIP Energy Efficiency Project Lending Schemes (EEPLS) fund, which actually served as a mini-version of an 'energy efficiency revolving fund (EERF) during project implementation. In the absence of such an upscale fund and/or other 'green funding' schemes, more ambitious energy efficiency improvements in energy-efficient processes and technologies could not have easily been pursued, nor would also other stakeholders be interested in providing similar services if it not were for the experiences made available through these such ventures.

## Funding

The support and funding that were provided by multilateral lending institutions, the private sector, and the Government of Malaysia are broken down as follows:

Type of funds	Implementation aspect it supports	Amount
<b>Domestic funds</b>		
Government contribution	In cash	6,302,000
	In kind	1,627,600
<b>Private sector contribution (Energy Supply Industry Trust Fund)</b>	In cash	5,260,000
<b>UNDP/GEF</b>		7,300,600

## Costs

Actual expenditures on the project from 1999 until October 2007 totalled USD\$ 13,282,795, which was actually only 64% of the total that was originally disbursed for the project (USD\$ 20,790,200). These costs covered the expenditures required to implement each of the different components of the project and other corresponding activities, mainly:

- Energy-use Benchmarking
- Energy Audits
- Energy Ratings
- Energy Promotion
- ESCOs Support
- Technology Demonstration
- Equipment Manufacturing
- Financial Participation
- Admin & Other Costs

## Energy savings and associated emission reductions

A feedback received by the MIEEIP team from factories covered in the MIEEIP database indicated that over 250 companies had started implementing energy efficiency activities at their sites as a result of the project. Assuming an average energy savings of 12,814 GJ per company (based on the estimate of 615.1 GJ per year of energy savings in the 48 audits companies), this would imply indirect CO<sub>2</sub> savings of 3,778 tCO<sub>2</sub> per company. Thus, total energy savings of 250 companies

implementing energy saving measures would be around 3.2 million GJ, giving a CO<sub>2</sub> reduction of approximately 944.7 kilotons of CO<sub>2</sub> annually.

## Benefits

Benefit		Description
<b>Reductions in energy demand and mitigation of greenhouse gases</b>		<ul style="list-style-type: none"> <li>• Energy savings: 3.2 million GJ per year</li> <li>• Direct CO<sub>2</sub> emission reduction (in 48 audited industries, including demonstration projects)               <ul style="list-style-type: none"> <li>◦ Annual: 181,000 tCO<sub>2</sub>+</li> <li>◦ Cumulative: 1.81 million tCO<sub>2</sub> (10-yr period)</li> </ul> </li> <li>• Indirect CO<sub>2</sub> emission reduction (250 industries)               <ul style="list-style-type: none"> <li>◦ Annual: 944.7 ktCO<sub>2</sub></li> <li>◦ Cumulative: 9.45 million tCO<sub>2</sub></li> </ul> </li> <li>• Potential: if all no cost, low-cost and high-cost energy savings measures would be implemented in 250 industries, CO<sub>2</sub> reduction could be 4 times higher.</li> </ul>
<b>Improvement in air quality</b>		No information available.
<b>Macro-economic impacts</b>	<ul style="list-style-type: none"> <li>• Impacts on GDP</li> <li>• Trade balances</li> <li>• Energy prices</li> </ul>	<ul style="list-style-type: none"> <li>• Project provided the expansion of business and supporting services for energy efficiency investments               <ul style="list-style-type: none"> <li>◦ Establishment of MEPA (association of energy professionals)</li> <li>◦ Establishment of an optimal structure for ESCOs and of options for performance contracting</li> </ul> </li> </ul>
<b>Impacts on public budgets</b>	<ul style="list-style-type: none"> <li>• Reductions in operational and capital expenditure for the public sector.</li> <li>• Effects attributed to structural changes to the economy and changed economic activity due to investment in energy efficiency</li> </ul>	<ul style="list-style-type: none"> <li>• Increase of financing availability and financing mechanisms:</li> <li>• As an evaluation study reports:               <ul style="list-style-type: none"> <li>◦ Volume of investments:                   <ul style="list-style-type: none"> <li>▪ US\$ 4.4 million (MIEEIP)</li> <li>▪ US\$ 10 million (private)</li> </ul> </li> <li>◦ Two banks (Bank Pembangunan and RHB Bank) have established funds for sustainable energy (RM 2 billion).</li> <li>◦ Investments in EE in 2006/7 were reportedly were RM 40 million.</li> </ul> </li> </ul>
<b>Creation of jobs</b>		No information available.
<b>Improvements in human health and well being</b>	<ul style="list-style-type: none"> <li>• Reduce risk of respiratory and cardiovascular diseases, allergies, arthritis and rheumatism with warmer, drier, more comfortable indoor environments resulting from improved building insulation</li> </ul>	No information available.
<b>Increased access to energy and reduced fuel poverty</b>		No information available.
<b>Benefits to energy</b>	<ul style="list-style-type: none"> <li>• Reduced</li> </ul>	<ul style="list-style-type: none"> <li>• The program provided Malaysian industries</li> </ul>

<p><b>providers</b></p>	<p>operating costs</p> <ul style="list-style-type: none"> <li>• System and network deferral</li> <li>• Increased reliability</li> <li>• Market price changes</li> <li>• Associated with marketing</li> </ul>	<p>with best practices in operation, monitoring, inspection and maintenance for energy efficiency endeavors, as well as ways how to conduct energy-savings measures to achieve cost savings and improved productivity.</p> <ul style="list-style-type: none"> <li>• The program helped to increase the number of energy experts and trained energy professionals in the country.</li> <li>• The industries where energy audit activities were carried out were benefited by on-the-job training of their staff and increased awareness of energy efficiency. Industries would be able to gauge their performance with other industries in the same sector using similar processes.</li> <li>• Encouraged manufacturers to produce more energy efficient equipment at competitive costs.</li> <li>• Encouraged much needed development of sectorial policies, laws, and regulations for energy efficiency.</li> </ul>
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<b>Title:</b>		
<b>12.3 The Northwest Energy Efficiency Alliance</b>		
<b>Country:</b>	USA, North-western states (Idaho, Montana, Oregon, and Washington)	
<b>Sector:</b> Industry: Food Processing	<b>Stage:</b> Ongoing yearly implementation since 2006	<b>Type of policy/practice/instrument:</b> Management and finance consulting, training, goal and benchmark setting and energy information services.
<b>Sub-sector (if applicable):</b> NA	<b>Period:</b> (2006-present)	

### General Description

The Northwest Energy Efficiency Alliance (NEEA) has developed strategic initiatives for the industrial sector to increase energy efficiency. As an alliance of more than 100 utilities and organizations engaged in energy efficiency in the Northwest of the United States (Idaho, Montana, Oregon and Washington), NEEA seeks to transform the market toward sustainable energy. NEEA launched its Industrial Initiative in 2005, building on experience gained through an earlier program known as the Industrial Energy Alliance. The Initiative now focuses on the food processing sector.

In 2005, NEEA developed and implemented an initiative designed to integrate continuous energy improvement with NW industrial firms' management culture. The initiative seeks to produce energy savings by causing industrial facilities to include energy management in their operational practices and capital investment decisions. The initiative aims to transform these practices and decisions by supporting a core group of participating companies and facilities to successfully implement and sustain Continuous Energy Improvement (CEI) systems with the intent that these facilities will provide a model of success for the rest of the market. NEEA pays for the services of expert consultants and advisors to work with participating companies in implementing strategic energy management activities in their plants. Additionally, NEEA is collaborating with the Northwest Food Processors Association (NWFPA) in support of its program to enroll member companies and have them commit to energy reduction goals.

Since 2005, NEEA's Industrial Initiative has relied on a framework for strategic energy management known as Continuous Energy Improvement (CEI). The CEI program supports facilities to integrate energy management into their business. The purpose of the program is to obtain long-term, sustainable energy savings in the industrial sector through continuous improvement in energy management. Using the strategies and techniques honed in the continuous quality improvement movement, CEI equips firms with the tools to continually improve their energy performance.

CEI approaches comprise of molding the following six key elements into a company or operation's management and operational practices:

- Having dedicated staff, including an energy champion;
- Tracking energy use;
- Setting energy reduction goals;
- Developing and routinely updating an energy management plan;
- The ability to quantify energy savings from energy-efficient equipment upgrades; and
- The ability to quantify energy savings from O&M improvements.

CEI also aims at permanently integrating energy management into business systems —from corporate office to shop floor. As a program/product, it addresses organizational structures, people, manufacturing systems, and measurements as equally essential aspects of industrial energy management. While CEI leads to specific actions and energy-efficiency measures, the program's emphasis is to position energy as an input into the manufacturing process, so it can be managed for maximum value. The Initiative categorizes facilities based on the following five CEI engagement stages:

- Stage 1: Aware/Receptive/Interested. The facility, having heard about the program, has expressed interest.
- Stage 2: Engaged. The facility has begun a business practice assessment process to identify specific opportunities.
- Stage 3: Committed. The facility has dedicated resources to work with the Initiative and to develop an action plan for energy management.
- Stage 4: Practicing. The facility is implementing the action plan and actively practicing energy efficiency.
- Stage 5: Sustained Practicing. The facility has implemented and continues to practice all CEI elements. The facility can continue practicing CEI without the Initiative’s assistance.

Unlike other early market transformation efforts typical in the US, which have primarily focused on technology upgrades, this initiative was designed with a more holistic approach, where targeting end users, trade allies, and utilities was done to promote a whole-system strategy for improving energy efficiency. As such, the Initiative complements local utility incentive programs providing financial incentives for capital projects.

Research conducted into the achievements of the initiative as of 2011 show that it has succeeded in integrating energy management into the Northwest region’s food processors’ business and manufacturing operations, with energy as a manageable cost for food processors, as evidenced by the following:

- Participating facilities that joined were generally pleased with the program, and the Initiative was then able to eventually disengage with these facilities, confident the facilities could continue practicing CEI on their own.
- Nonparticipant and participant surveys revealed that 36 percent of the target market was practicing CEI at that point, an increase of 13 percent from 2004.
- Trade ally and market partner interviews showed that awareness had increased regarding energy as a controllable cost and as an important factor in maintaining a competitive advantage. The availability and quality of software tools and training opportunities had also increased during the initiative.
- Outside of the Northwest, the California Public Utilities Commission (CPUC) and Investor Owned Utilities (IOUs) have implemented energy management programs for industrial facilities, based on this Initiative’s design.

Since this last evaluation, NEEA has continued to make progress in getting the food processing industry to adopt CEI practices. As of 2013, about one-third of large food processors in the region exhibited some evidence of CEI practices, and more corporate level decision makers are aware of the benefits and credit NEEA with influencing their energy saving actions.

### Actors

Actor	Role
<b>Northwest Energy Efficiency Alliance (NEEA)</b>	Main Implementing entity of the program, responsible for the day to day operations and services offered to its members.
<b>US Department of Energy (DOE)</b>	Provider of federal financial assistance to the program, in specific, they provide support for training on energy management for selected industrial systems, and is actively involved in encouraging facilities to move toward energy management. They also offer technical assistance for organizations with the long term goal of achieving ISO 50001 compliance as well as improvements in energy performance.
<b>US Environmental Protection Agency (EPA)</b>	Provider of federal financial assistance to the program, in specific, they have and continue to offer Energy Star recognition for industrial plants with higher energy performance relative to peer facilities involved in the program.
<b>Energy Trust of Oregon and the Bonneville Power Administration</b>	Regional programs offering funding and resource support for facilities and corporations implementing energy management in their territories, supporting such SEM elements as energy champion salaries, facility energy assessments, and system training.

<b>Northwest Industrial Firms</b>	Main beneficiaries and implementing recipients of program services and offerings.
<b>Northwest Food Processors Association</b>	Provides program support and the recruitment of member companies/facilities to join in on the program, responsible for energy management systems operations specifically within firms and plants in the food industry.
<b>Northwest Utilities</b>	Implementing partners of the program. Provide the technical and capacity building program support for the initiative, and also serve as beneficiaries as this initiative can also be construed as a form of demand side management.

### Barriers

According to an evaluation strategy conducted on the program, administrators believe the following factors may have limited the Initiative’s contributions to market development:

- Possible market confusion caused by the initiative copyrighting the phrase “CEI” and preventing other program administrators from implementing marketing with this term. Such a move may have alienated and prevented further participants and/or companies from joining the program or adopting similar energy management practices.
- A lack of coordination between the cluster partner’s outreach activities and the work of utility account executives, as this decreased beneficiaries confidence when they received mixed and different message from these actors regarding the same program.
- A lack of monitoring and evaluating capacity among CEI contractors, which would be helpful in demonstrating savings and reducing uncertainties around cost-effectiveness and program planning
- Smaller companies with single facilities or facilities in multiple utility territories face greater challenges in identifying and consolidating multiple funding sources to support their energy management efforts.
- End-users have a low level of awareness of both SEM and ISO 50001. Familiarity with SEM is a pivotal component of the logic model and is assumed to contribute to increased uptake of energy efficiency measures and necessarily precedes the medium-term outcome of end-users implementing SEM systems. While the initiative also promoted ISO 50001, which is an international standard for implementing energy management systems, no companies reported adopting ISO 50001.

Other potential barriers that the program faced and/or is facing identified as the following:

- CEI contractors’ supply channel limited to public utility and other similar programs, thus limiting the possible reach and benefits of energy management systems to other types of firms/business and industries.
- Funders believe more inclusive and pronounced outreach strategies would improve by integrating cluster partners’ and Funders’ industrial account executives’ activities
- Market seems to be implementing energy management elements non- systematically as planning (goals) are the least common implemented energy management indicator to date.

### Enablers for implementation

Some of the most effective enabling conditions for the implementation of this program have been determined to be the following:

- The CEI cohort companies all operate multiple facilities in the region. This enables them to achieve some economies of scale in that they can use uniform processes and share resources across facilities. Furthermore, all of the firms in the CEI cohort relied on multiple sources of funding which included funding from the DOE to support salaries for their corporate energy champions, and support from the Initiative for CEI contractors.
- Industrial facilities engage in equipment-based approaches to energy management, and this demonstrates energy focus potentially favorable to progressing toward implementation of SEM systems.

- Participation in the program may be increasing market interest in SEM. NWFPA members who have taken part in the roadmap program generally report that it was effective in supporting the adoption of energy management practices.
- The CEI contractor market in the region was deemed to be sufficient enough to meet market’s demand for SEM implementation services
- The initiative itself helped develop the CEI contractor market; and its successes as a test case opened supply channels, in the form of Funders’ SEM programs, for these contractors.

**Funding and Costs**

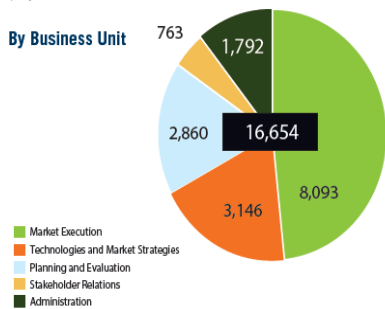
Federal resources provided support for facility energy assessments between 2008 and 2011. As of 2011, the Department of Energy provides support for some training on energy management for selected industrial systems. Participants reported that they had relied on federal support for funding their corporate energy champions and that the DOE reduced or restricted this program as early as 2012. DOE has modified its industrial offerings, encouraging facilities to move toward energy management. DOE now offers technical assistance for organizations with the long term goal of achieving ISO 50001 compliance as well as improvements in energy performance.

In 2009, regional programs, funded by the Energy Trust of Oregon (ETO) and Bonneville Power Administration (BPA), began to offer funding and resource support for facilities and corporations implementing SEM in their territories, support such SEM elements as energy champion salaries, facility energy assessments, and system training. Programs offered outside of these administrators’ territories include support for some training in energy management, but do not include SEM systems or support for an energy champion.

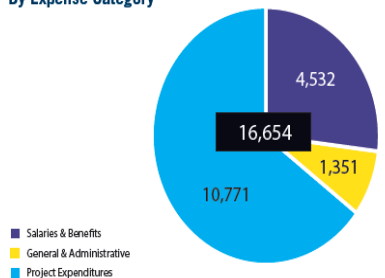
Funding figures from these two previously mentioned sources have not been made readily available. However, according to a recently published NEEA quarterly report, the following financial figures were obtained for Q2 of 2014:

**Q2 2014 Actual Expenses (YTD)**  
(in \$1000s)  
\$16,654

**By Business Unit**



**By Expense Category**



**Financial Summary**

Q2 2014 actual expenses are 79% percent of budget primarily due to shifting of Heat Pump Water Heater promotions and incentives to later in the year, RPP Pilot incentive delays and seasonality of Efficient Homes.



2014 Expenses (in \$1,000s)	ANNUAL BUDGET	BUDGET \$70	ACTUAL* \$70	ACTUAL AS % OF BUDGET	Reason for Budget Variance
<b>BY BUSINESS UNIT</b>					
Market Execution	20,897	10,732	8,093	75%	HPWH promotions and incentives shifted to later in the year; RPP pilot identified data reporting anomalies, resulting in incentive delays - corrective action in place; Efficient Homes seasonality.
Technologies and Market Strategies	6,451	3,260	3,146	97%	
Planning and Evaluation	6,475	3,942	2,860	73%	Codes and Commercial Lighting evaluations delayed; Stakeholder survey cancelled.
Stakeholder Relations	1,845	945	763	81%	CRM system upgrade deferred due to reprioritized organizational improvement projects; insourcing professional services
Administration	4,162	2,152	1,792	83%	Data Knowledge Management project delay according to reprioritized organizational improvement projects.
<b>Total Organization</b>	<b>39,830</b>	<b>21,031</b>	<b>16,654</b>	<b>79%</b>	
<b>BY EXPENSE CATEGORY</b>					
Salaries and Benefits	9,849	4,830	4,532	94%	Hiring deferrals for open positions and additional turnover.
General and Administrative	3,716	1,979	1,351	68%	Professional services deferrals due to reprioritized organizational improvement projects.
Project Expenditures	26,265	14,222	10,771	76%	Residential programs and planning and evaluation project delays as referenced above.
<b>Total Organization</b>	<b>39,830</b>	<b>21,031</b>	<b>16,654</b>	<b>79%</b>	

\*Excludes Special Funds of \$249K

Other quarterly reports and additional financial data can be found at: <http://neea.org/home>

### Energy savings and associated emission reductions

An independent assessment of the energy impact of participation in the elements of the initiative on energy consumption in 9 plants owned and operated by the CEI cohort, and on 23 additional plants that participated in the NWFP Roadmap program was, carried out in April of 2014. According to this assessment, the overall realization rate for these measures was high for electric (117%) but much lower for gas savings (43%) due to over-stated claims on process heating measures. Overall, 0.4 annual megawatts (aMW) and nearly 300,000 therms were saved annually. The total electric savings from the CEI cohort participants was that of 0.62 aMW, and the net savings from CEI alone were 0.23 aMW. These net savings accounted for approximately 1% of annual electric consumption for these facilities.

### Benefits

Benefit		Description
<b>Reductions in energy demand</b>		The total electric savings from the CEI cohort participants was that of 0.62 aMW, and the net savings from CEI alone were 0.23 aMW.
<b>Mitigation of greenhouse gases</b>		Estimated CO2 reductions or their equivalent have not been calculated for this initiative as it spans various states and jurisdictions, and thus data needed to arrive at credible estimations is not available.
<b>Improvement in air quality</b>		Information not available.
<b>Macro-economic impacts</b>	<ul style="list-style-type: none"> <li>• Impacts on GDP</li> <li>• Trade balances</li> <li>• Energy prices</li> </ul>	The program has paid upward of \$73.5 million in incentives to more than 4,000 unique customers for implementing energy efficiency projects that represent more than \$926 million in lifetime savings.
<b>Impacts on public budgets</b>		Impacts on public budgets have not been estimated for this program.
<b>Creation of jobs</b>		Hiring of local contractors and consultants for implementation, as well as new energy management position within participating companies. Exact numbers still TBD.
<b>Improvements in human health and well being</b>		Analysis on direct benefits of this nature stemming from the program have not been analysed yet.
<b>Increased access to energy and reduced fuel poverty</b>		N/A.
<b>Benefits to energy providers</b>		<ul style="list-style-type: none"> <li>• Participating facilities that joined were generally pleased with the program, and the Initiative was then able to eventually disengage with these facilities, confident the facilities could continue practicing CEI on their own, thus continuing with demand side management operations on their own.</li> <li>• Trade ally and market partner interviews showed that awareness had increased</li> </ul>

regarding energy as a controllable cost and as an important factor in maintaining a competitive advantage. The availability and quality of software tools and training opportunities had also increased during the initiative.

- Outside of the Northwest, the California Public Utilities Commission (CPUC) and Investor Owned Utilities (IOUs) have implemented energy management programs for industrial facilities, based on this Initiative's design.

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**Title:**

## 12.4 Program for Energy Efficiency in Energy Intensive Industry (PFE)

<b>Country:</b>	Sweden	
<b>Sector:</b> Industry	<b>Stage:</b> Ongoing	<b>Type of policy/practice/instrument:</b> Incentives for Industry
<b>Sub-sector (if applicable):</b> Manufacturing Industry	<b>Period:</b> 2005- present	

### General Description

The Program for Energy Efficiency (PFE) in Sweden was first introduced on the 1<sup>st</sup> of January 2005, under the Energy Efficiency Act (2004:1996). The PFE is a voluntary program directed towards the energy intensive<sup>81</sup> manufacturing industry in the country, with the hopes of improving upon that sector's efficient use of energy during their production processes. The main objective of the program is to contribute to an economically and environmentally sustainable energy system in Sweden, in which industry has a central role. Through the program, companies lower their energy cost, employees gain knowledge about energy efficiency, and the industry's environmental impacts are reduced.

The incentive offered through the program was generated by the introduction of a new energy tax, which came into effect on the 1<sup>st</sup> of July 2004. This new tax on electricity for the processing industry raised the price of energy from 0 to 0.5 öre/kWh (0.50 Euro/Mwh). However, Swedish companies belonging to energy intensive industries could then apply to the PFE program, voluntarily participate in the implementation of energy efficiency measures, and thus be exempt from the tax. Sweden targeted this rebate program specifically to the industrial sector because it accounted for about one-third of the energy used in the entire country. Three energy-intensive sectors—paper and pulp, iron and steel, and the chemical industry—dominated industrial energy consumption and represented 75 percent of total industrial energy use at the time. Similarly, one-third of total Swedish carbon emissions came directly from industry; with the largest emitters being the iron and steel, and the mineral sectors, with almost half of those emissions.<sup>82</sup> The tax rebate program imposed many requirements on industry participants based on qualitative targets rather than quantitative measurements for electricity savings. The initiative has proven to be a big success as almost 100 percent of participating firms complied with its demands, resulting in nearly a 4 percent reduction in total electricity used by participating companies according to some sources<sup>83</sup>.

The program worked and functioned in the following manner: The Swedish Energy Agency first decided if a company that applied to the program could participate or not. One out of two criteria must have been met:

1. The cost of bought and produced energy for the company must amount to at least 3 percent of its production value.

<sup>81</sup> A firm is defined as energy intensive either if energy costs make up at least 3 % of the production value, or the energy, carbon dioxide and sulphur tax compiled make up at least 0,5 % of the company's added value.

<sup>82</sup> Johansson, B., Modig, G., & Nilsson, L. J. 2007. "Policy instruments and industrial responses—experiences from Sweden." Presented at the ECEEE 2007 Summer Study. Saving energy - just do it! Web. June 2012.: <http://euclimatepolicybibliography.net/2012/07/17/policyinstruments-and-industrial-responses-experiencesfrom-sweden/>

<sup>83</sup> Stenqvist, C., & Nilsson, L. J. 2011. "Energy efficiency in energy-intensive industries: an evaluation of the Swedish voluntary agreement Program for Energy Efficiency. Energy Efficiency [doi:10.1007/s12053-011-9131-9]."

2. The company's taxes on energy, CO<sub>2</sub>, and sulphur must amount to at least 0.5 percent of the company's added value.

A company could participate in the PFE program, either with the whole company operation, or with just one part of the company that was energy intensive, and was run independently with its own means. It was also possible to participate with several facilities under the same corporate identity number, separately and collaterally, during the same program period. Once a company had joined the program, it then committed to a process of five years to receive the full tax exemption.

During the first two years of joining the program, companies were required to:

- Get certified according to a standardized energy management system. Since 2003 there has been a Swedish standard for energy management. There is also a Danish standard in use now, and from 2009, also a European standard (EM 16001).
- Perform an inventory analysis, in fact, deeper than the one described in the standard for energy management. The inventory and analysis were required so as to help the company become aware of its efficiency potential and needs, and to find suggestions on measures and investments that could make their electricity consumption more effective. The company would then make a list of the measures to be implemented over the following years, with these requiring a shorter payback time than three years. The list was then submitted to the Energy Agency for approval.
- Establish a routine for the purchase of power intensive equipment. When new equipment was to be purchased, the company was obliged to choose energy-efficient products to the highest degree possible.
- Establish a routine for planning of development projects and restoration. As early as possible, the company was also required to analyse and evaluate the impact of alternative choices for its energy use.

During the last three years of a company's participation in the program, they were required to:

- Implement the actions in the list submitted to and approved by the Energy Agency;
- Continue to apply the introduced energy management system and procedures for purchasing and planning;
- Demonstrate the impacts of the purchasing routines in the company,
- Assess the impacts of the routine for planning.

The measures implemented during the program period had to correspond to the same level of electricity efficiency that the participating company would have achieved had it instead paid the tax on electricity that was imposed on those not associated with the program. Measures with a payback period longer than that of three years did not have to be implemented unless they were required for the company in order to reach the energy efficiency goals the company would have implemented had it been subjected to the tax.

Notwithstanding its success, the tax exemption under the voluntary agreement is scheduled to end at the end of 2012 due to a new EU directive on energy taxation.

#### Actors

Actor	Role
<b>Swedish Energy Agency</b>	Entity ultimately responsible for the implementation of the program,. It provided the following: Supervisory authority, Program Funding Source, Implementing Guidance. In addition, it also provided information and guidance in the form of manuals on energy mapping and analysis, life-cycle costing, and procurement. It also integrated all participants in a network with the aim of sharing best practices.
<b>Swedish Standards Institute</b>	Entity responsible for emitting standards and indices in Sweden. In the case of this particular program they were the entity involved in the specification of SS675520, which spelled out the specifications of the Energy Management Systems that were to be implemented by companies under the program.



<b>Industries/Main Target Group</b>	<p>The program targeted the energy intensive industry which, during the planning and design phase, in lack of a clear definition, was considered to consist mainly of the industrial sectors of: mining and quarrying, pulp and paper, basic chemicals, non-ferrous mineral products and basic metals. These sectors were known to be energy intensive and consisted of companies for which the cost of electricity could be a considerable share of the company's added value. It was not until the minimum tax directive was introduced that a threshold for energy intensity was defined, which resulted in companies from other sectors could now also be classified as energy intensive.</p>
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### Barriers

Some of the most notorious barriers that the program has faced since its implementation have been the following:

- The program has been criticized for its strong government involvement in regulating the energy system and market for efficiency, and for the information asymmetries not captured when determining the baseline of the scheme (Mansikkasalo & Michanek 2011).
- A recent report by the Swedish National Audit Office evaluating the impacts of Swedish energy efficiency initiatives within industry, pointed out PFE deficiencies when defining goals and accounting for the energy savings (Swedish National Audit Office 2013).
- The program's success has actually been called into question as of late. Since no clear targets had ever been formulated for PFE it is not possible to judge success based on target achievement.
- Double-counting factors: Depending on the mix of policy instruments operating in a country there is a possibility that industrial companies are affected by overlapping instruments which then involves the risk for double-counting the effects of one or several of them. The range of the double-counting factor. There are no other policy programs in Sweden that like PFE specifically target electricity savings within the energy intensive industry. However, there are still other instruments in place that could interfere with the policy effect from PFE.
- Much like other EE initiatives in other countries, participants had to further develop a network and a dissemination of good practices, helping to build expertise and to lower the perceived investment risk associated in such ventures, even in an industrialized country such as Sweden.

### Enablers for implementation

For the PFE program to lift off the ground and to be able to reach as many participating companies as possible, its implementers, mainly the SEA, provided industry stakeholders with the following in order to make the program more enticing and effective:

- Additional resources: Including manuals on EMS, energy audits, energy analysis and mapping guidelines; templates for life cycle costing; a guide to procedures on purchasing energy-intensive equipment and project planning.
- Technical assistance and training: the Swedish Energy Agency, in cooperation with other partners, initiated a training course for practitioners in "LEAN production/energy management", on lifecycle costing calculations, and on routines for EE procurement in addition to the program.
- Networking and workshops: Seminars for program participants and best practice dissemination were held on a regular basis <sup>[3]</sup>.
- The actual monetary incentive was perhaps the main driver towards enlisting participation: Exemption from carbon tax on electricity of 0,55 € per MWh.

- Participants developed a network and disseminated good practices, helping to build expertise and lower investment risk, which had previously been a key barrier.
- By involving tax money, the rebate program made energy issues a management task, which gave it higher priority in companies. Moreover, several firms educated all employees in energy issues due to the energy management system.
- The program imposed specific requirements and clear deadlines, which proved essential in preventing energy efficiency issues from being put aside for other strategic or more acute ones.

### **Funding and Costs**

Governmental expenditures on the program related mainly to administrative issues related to the planning, formulation, implementation and evaluation of the policy. In addition, the program also translated into reduced government revenue due to lower tax levels, which added to governmental expenditures:

- For the SEA, being the ultimate responsible agency for the program, expenditures involved about 35 MSEK between 2004 and 2008 (SEA 2008). Assuming that the average annual of 7 MSEK was also valid in 2009, the rough estimate of the total expenditures for administrating PFE over the program period 2004-2009 was 42 MSEK.
- The annual tax exemption was proportional to the electricity use of the participating companies. The annual electricity use was assumed to be more or less equal to 30 TWh which implied an annual tax exemption of 150 MSEK. During the five year participation the foregone tax revenue amounts to 750 MSEK.

Hence, the total government expenditure from 2004 to 2009 would have been approximately 792 MSEK. Assuming a 4 percent interest rate and an 8 year depreciation period for all reported actions, an annualised government expenditure of 118 MSEK was estimated.

For end-users, or to otherwise say the companies involved, the expenditures involved in PFE were the investments that had been made for the reported actions, as well as the administrative expenditures for implementing the EMS, applying the routines, and coping with the required documentation and reporting procedures. Companies that participated stated that the 860 actions involved investments of almost 1,120 MSEK. In an evaluation of the administrative expenditures due to the PFE obligations, it is estimated that PFE involved expenditures of about 130 MSEK (Nutek 2008). Hence, the total expenditures for the companies would have been 1,250 MSEK over the program period. Assuming a 10 percent interest rate and an 8 year depreciation period, the annualised expenditure came out to be approximately 234 MSEK. This figure is adjusted with the benefit of the annual tax exemption of 150 MSEK, resulting in an annualised end-user expenditure of 84 MSEK.

### **Energy savings and associated emission reductions**

During the first five-year phase of the Program for Energy Efficiency, electricity savings surpassed expectations. Instead of the expected annual electricity savings of 0.5 TWh, participating companies reported estimated savings from the investments in energy efficiency between 0.689 and 1.015 TWh (1 TWh per year represents three to 4 percent of the total electricity used by the companies). They also made investments totalling USD 102 million in more than 1,200 electricity efficiency measures, and carried out over 350 other measures to increase energy performance (for example by replacing fossil fuels with renewable energy sources). The tax exemptions have led to USD 19 million per year in savings for the enterprises. In addition, savings from using at least 1 TWh per year less electricity translate into annual cost savings of about USD 71 million. By improving their efficiency in electricity use, the companies participating in the tax-rebate efficiency program also helped mitigate the environmental and climate effects of their activities. The companies reported average electricity savings of just under 1 TWh per year, which would result in reducing 0.5-1 million metric tons CO<sub>2</sub> emissions per year (considering 1 MWh of electricity from a coal fired power station to be equivalent to a CO<sub>2</sub> emission of 0.5-1 ton).

## Benefits

Benefit		Description
<b>Reductions in energy demand</b>		During the first five-year phase of the Program for Energy Efficiency, electricity savings surpassed expectations. Instead of the expected annual electricity savings of 0.5 TWh, participating companies reported estimated savings from the investments in energy efficiency between 0.689 and 1.015 TWh (1 TWh per year represents three to 4 percent of the total electricity used by the companies).
<b>Mitigation of greenhouse gases</b>		By improving their efficiency in electricity use, the companies participating in the tax-rebate efficiency program also helped mitigate the environmental and climate effects of their activities. The companies reported average electricity savings of just under 1 TWh per year, which would result in reducing 0.5-1 million metric tons CO <sub>2</sub> emissions per year (considering 1 MWh of electricity from a coal fired power station to be equivalent to a CO <sub>2</sub> emission of 0.5-1 ton).
<b>Improvement in air quality</b>		No Information Available.
<b>Macro-economic impacts</b>	<ul style="list-style-type: none"> <li>• Impacts on GDP</li> <li>• Trade balances</li> <li>• Energy prices</li> </ul>	No Information Available.
<b>Impacts on public budgets</b>	<ul style="list-style-type: none"> <li>• Reductions in operational and capital expenditure for the public sector.</li> <li>• Effects attributed to structural changes to the economy and changed economic activity due to investment in energy efficiency</li> </ul>	Participating companies in the program made investments totalling USD 102 million in more than 1,200 electricity efficiency measures, and carried out over 350 other measures to increase energy performance (for example by replacing fossil fuels with renewable energy sources). The tax exemptions have led to USD 19 million per year in savings for the enterprises. In addition, savings from using at least 1 TWh per year less electricity translate into annual cost savings of about USD 71 million.
<b>Creation of jobs</b>		No available information.
<b>Improvements in human health and well being</b>	Reduce risk of respiratory and cardiovascular diseases, allergies, arthritis and rheumatism with warmer, drier, more comfortable	No available information.

	indoor environments resulting from improved building insulation	
<b>Increased access to energy and reduced fuel poverty</b>		NA
<b>Benefits to energy providers</b>	<ul style="list-style-type: none"> <li>• Reduced operating costs</li> <li>• System and network deferral</li> <li>• Increased reliability</li> <li>• Market price changes</li> <li>• Associated with marketing</li> </ul>	<p>Through the program companies lower their energy cost, the employees gain knowledge about energy efficiency and the environmental impacts are reduced.</p> <p>Better knowledge in energy efficiency opportunities in the manufacturing industry. Two years in to the program, the companies provide lists of measures to be implemented in the three coming years of the program. In an evaluation from 2007, 100 of the 110 companies taking part in the program had submitted their lists of actions, giving a total of 912 different actions to be implemented in the coming three years.</p>

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