Finland's Second National Energy Efficiency Action Plan (NEEAP-2)

27 June 2011

Report for the European Commission

under Article 14 of the Energy Services Directive (32/2006/EC).

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FOREWORD

One of the key objectives of the Energy Services Directive (2006/32/EC), which entered into force in May 2006, is to prepare national energy efficiency action plans. Finland sent the first action plan (NEEAP-1) to the Commission in June 2007. The next plans are to be sent to the Commission in June 2011 and June 2014. It was a requirement of the first action plan to set an indicative energy conservation target for 2016, accounting, in energy terms, for 9% of Finnish energy end-use under the ESD. Industrial sites under the Emissions Trading Act, air traffic and maritime traffic fall outside the scope of the ESD. The mean energy end-use for 2001-05 had to be used to calculate the savings target. Finland's indicative energy conservation target thus calculated is 17.8 TWh by 2016, and the interim target for 2010 is 5.9 TWh. The second action plan is to set out the energy savings achieved in 2010, and an estimate of savings by 2016.

For this second Finnish national energy efficiency action plan (NEEAP-2), endeavours have been made to compile comprehensively the energy efficiency activities for which energy saving effects are to be calculated. In order to obtain a better picture of the entire scope of energy efficiency activity in Finland, NEEAP-2 also includes key "non-assessable" energy efficiency activities.

The preparation of NEEAP-2 was the responsibility of the ESD Implementation Group[1], the chairman and work coordinator of which is Heikki Väisänen of the Ministry of Employment and the Economy. The following experts participated in the preparation of NEEAP-2: Saara Jääskeläinen of the Ministry of Transport and Communications, Veli-Pekka Reskola, Raija Seppänen and Kjell Brännäs of the Ministry of Agriculture and Forestry, Riina Vuorento of the Ministry of Education and Culture, Heikki Väisänen and Outi Kumpuvaara of the Ministry of Employment and the Economy, Seija Kivinen, Leo Parkkonen, Ilkka Koponen and Hannu Koivurinta of the Ministry of Finance, Merja Laitinen, Juha-Pekka Maijala, Maarit Haakana and Riitta Kimari of the Ministry of the Environment, Kalle Konttinen of the National Land Survey of Finland, Teija Lahti-Nuuttila of TEKES, Juha Muttilainen of Senate Properties, and Ulla Suomi, Lea Gynther and Päivi Laitila of Motiva Oy. Erja Reinikainen of Insinööritoimisto Olof Granlund Oy acts as the Expert Secretary for the ESD Implementation Group.

Ulla Suomi was responsible for coordinating the impact assessment for energy efficiency activities. Ulla Suomi, Saara Elväs and Lea Gynther of Motiva Oy, Erja Reinikainen of Insinööritoimisto Olof Granlund Oy, Heikki Väisänen of the Ministry of Employment and the Economy, Juhani Heljo and Jaakko Vihola of Tampere University of Technology, and Riikka Holopainen, Ari Laitinen, Juhani Laurikko and Kari Mäkelä of VTT Technical Research Centre of Finland participated in calculating the energy savings. In addition to this, many other players participated in compiling the source data.

Finland's NEEAP-2 has calculated the energy conservation effects for a total of 36 energy efficiency activities. In addition, the plan also includes approximately 50 other activities to promote energy efficiency. The energy saving calculated for 2010 is 12.1 TWh in the energy end-use area covered by the ESD, equivalent to an energy saving of 6.1% using the calculation method in the Directive. The estimated energy saving achieved through these activities will have risen to 12.5% by 2016, and nearly 18% by 2020. In estimating the energy conservation, it must be borne in mind that, despite the comprehensiveness of the preparation work, some energy saving activities implemented in Finland must necessarily be excluded from NEEAP-2.

National calculation and monitoring methods have been used to calculate the energy savings, and some of these have been in use since the mid-1990s. The starting point for the calculation has been to obtain results reflecting reality as far as possible, since Finland's NEEAP-2 should primarily serve national needs and act as a reliable information base, both for assessing ongoing activities and programmes and for preparing future national climate and energy strategies.

[1] The ESD Implementation Group was established by the Climate and Energy Policy Ministerial Working Group Network on 17 February 2006 to prepare Finland's first national energy efficiency action plan.

ABBREVIATIONS

ESD[2]	Energy Services Directive (Directive 32/2006/EC on energy end-use efficiency and energy services)
Non-ESD	energy use and energy savings outside the scope of the Energy Services Directive (industrial sites and energy production falling within the scope of the Emissions Trading Act)
ELY centre	Centres for Economic Development, Transport and the Environment
EPBD	Energy Performance of Buildings Directive (Directive 2010/31/EU on the energy performance of buildings, recast)
BU	bottom-up (calculation)
TD	top-down (calculation)
NEEAP-1	ESD first national energy efficiency action plan (26 June 2007)
NEEAP-2	ESD second national energy efficiency action plan (27 June 2011)
SRMK	National Building Code of Finland
LVM	Ministry of Transport and Communications
MMM	Ministry of Agriculture and Forestry
OKM	Ministry of Education and Culture
KTM	Ministry of Trade and Industry (TEM since the start of 2008)
TEM	Ministry of Employment and the Economy (KTM until the end of 2007)
VM	Ministry of Finance
YM	Ministry of the Environment
ARA	Housing Finance and Development Centre of Finland[3]
Mavi	Finnish Agency for Rural Affairs
Sitra	Sitra, Finnish Innovation Fund
SYKE	Finnish Environment Institute
TEKES	Finnish Funding Agency for Technology and Innovation
TIN	Research and Innovation Council
Trafi	Transport Safety Agency
VTT	Technical Research Centre of Finland

[2] The Commission also uses the abbreviation ESD in the Effort Sharing Decision (406/2009/EC) related to the EU energy and climate package.

[3] The former Housing Fund of Finland was split into an agency and fund on 1 January 2008. The agency's name became the Housing Finance and Development Centre of Finland, and the fund continued under the name of the Housing Fund of Finland.

1 SUMMARY

Finland's long-term climate and energy strategy sets an energy savings target of 37 TWh for energy end-use by 2020. If no action is taken, energy end-use is estimated to rise to 347 TWh by 2020, but the level of end-use will be 310 TWh under the strategy, which starts from the 2006 energy end-use of 313 TWh.

The report (9 June 2009) by the Energy Efficiency Committee operating under the leadership of the Ministry of Employment and the Economy described 125 new or extended energy saving and energy efficiency measures. The benchmark for the Committee's work was the energy savings target of 37 TWh set in the climate and energy strategy. In February 2001, Government passed a resolution on the implementation of these measures, and the aim is to start most of them by the end of 2011.

For Finland's second national energy efficiency action plan (NEEAP-2), the aim has been to compile as comprehensively as possible all the ongoing and completed energy efficiency activities which promote energy savings and energy efficiency in Finland. Energy conservation effects have been calculated for a total of 36 activities, 34 of which are aimed at the ESD area. This impact has been calculated for 2010, while estimates of the energy savings to be achieved by these activities are presented for 2016 and 2020. NEEAP-2 also presents activities the energy-saving impact of which aims at the energy end-use and energy production of industry outside the scope of the ESD. The action plan also sets out approximately 50 individual activities the impact of which cannot be presented in terms of energy units.

Annex 2 to the action plan presents more detailed descriptions and the basis for the energy saving calculations for energy efficiency activities the impact of which is considered by the energy saving set out in Table 1. Annex 3 contains descriptions of other key activities to promote energy efficiency, the energy saving impact of which is not assessed in NEEAP-2.

The energy saving calculated for 2010 is 12.1 TWh in the energy end-use area covered by the ESD, equivalent to an energy saving of 6.1% using the calculation method in the Directive. The estimated energy saving achieved through these activities will have risen to 13% by 2016 (24.7 TWh), and over 17% by 2020 (33.7 TWh). Including the energy efficiency activities aimed at energy end-use outside the scope of the ESD, the energy saving is 21.2 TWh in 2010 and the estimated energy savings for 2016 and 2020 are 34.9 TWh and 43.8 TWh respectively.

Table 1. Overview of objectives and implementation of energy savings and efficiency

YEAR	PRIMARY ENERGY	ENERGY END-USE		
		ESD		EPBD
	Target TWh/a	Energy saving target TWh/a	Energy saving 2010 and estimated saving 2016 and 2020[3] TWh/a	Target for near zero-energy new buildings %
2010	not set	5.9	12.1	
2015				not set[4]
2016	not set	17.8	24.7	
2020	–[1]	–[2]	33.7[3]	not set[4]

[1] The difference between the base and target scenarios calculated in the national climate and energy strategy (2008) is 49 TWh.
[2] The overall national savings target for energy end-use by means of new and existing energy efficiency activities in 2010–2020 is 37 TWh. N.B.: The target does not include the impact of "early" action.
[3] Energy saving in the ESD area. Accordingly, the overall energy saving for energy end-use is 43.8 TWh.
[4] To be defined in conjunction with the national plan for near zero-energy construction (see section 5.1.2).

2 STARTING POINTS AND GOALS

2.1 Energy use

2.1.1 Energy use in Finland

TOTAL ENERGY CONSUMPTION AND END-USE

According to preliminary data, total energy consumption in Finland in 2010 was 401 TWh and end-use was 310 TWh. Total energy consumption and end-use fell slightly during the slump in the early 1990s, but then increased steadily until 2003. The data for 2005 reflect the lengthy industrial dispute in the forestry industry. In 2006–09, total energy consumption and end-use clearly fell. Energy consumption in 2008 and 2009 shows the impact of the international financial crisis, which affected production in energy-intensive sectors in particular. In 2008, consumption also fell owing to an exceptionally mild winter. According to preliminary data for 2010, total energy consumption rose by 9% compared to the previous year. The main reasons for this growth were the growth in industrial production that accompanied the economic recovery, and a cold winter. Although there are clear reasons for the lower than normal level of total energy consumption in 2003–10, it may be noted when examining the whole 1990–2010 period that the growth that has continued for a long time is at the very least being curtailed.

In 2010, total energy consumption per capita was 74.6 MWh, meaning 18% growth since 1990. Energy end-use per capita was 57.7 MWh, equivalent to 20% growth over the same period.

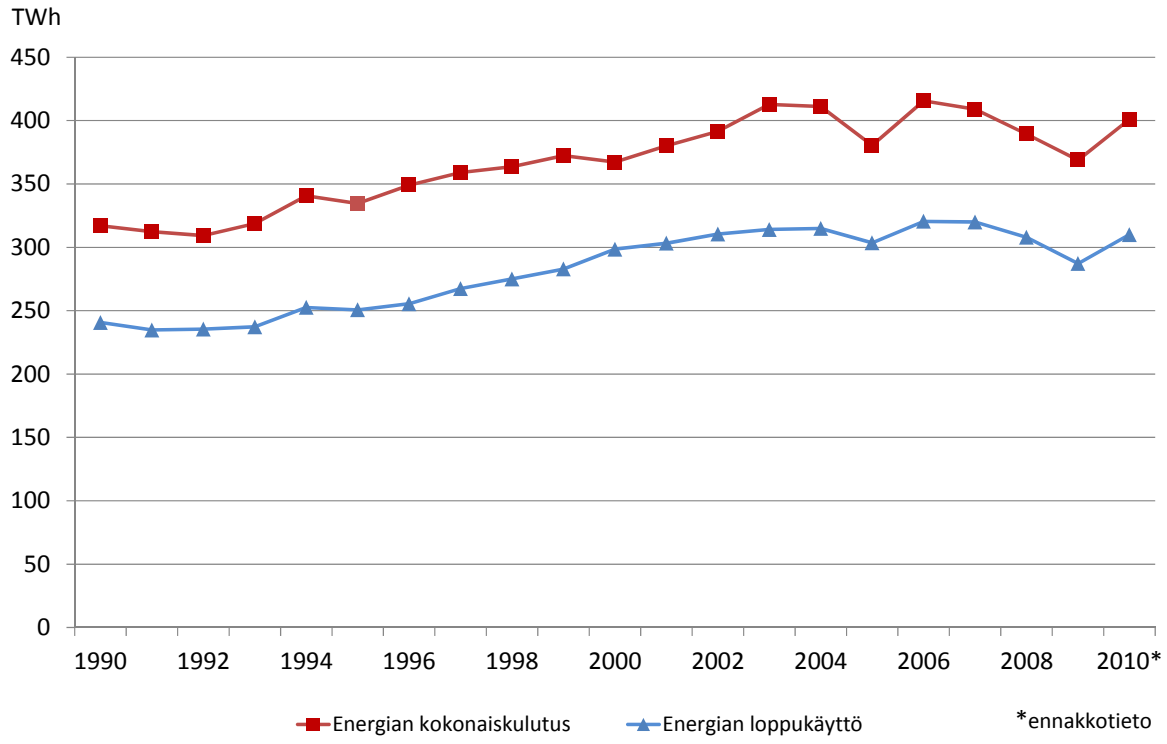

Figure 1 Total energy consumption and end-use in Finland in 1990–2010

Following the slump of the early 1990s, the intensity of total energy consumption and end-use (kWh/€$_{2000}$) started to fall in Finland in 1995. Although energy consumption rose, gross domestic product grew even more robustly. The downward trend continued until 2008, after which intensity increased as a result of the recession. The intensity of total consumption fell by approximately 25% in 1994–2010 and the intensity of end-use by 22%. The intensity of energy end-use may also be calculated with allowances for temperature. The intensity of end use allowing for temperature corrections reflects the reduction in

heating needs, as a result of which for a good ten years the trend curve has been well above the curve showing the intensity of end-use, which has remained uncorrected. The peak in 2000 was caused by an exceptionally warm year, during which the figures for heating needs "over-compensated" for intensity.

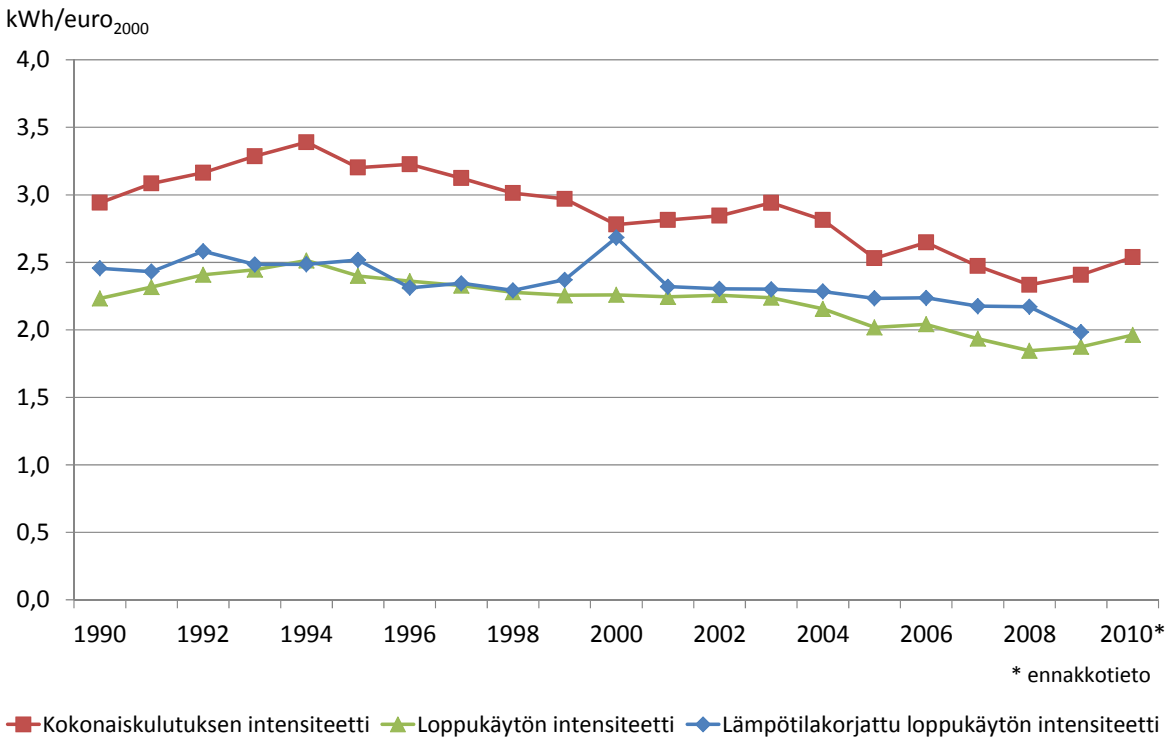

Figure 2 Total energy consumption and intensity of end-use in Finland, 1990–2010

Table 2 shows the proportions of energy end-use per sector and the relative change in end-use since 2000. The most significant change in energy end-use is the reduction in the relative proportion of industry as a result of structural change. As for 2010, the proportion of heating for buildings increased owing to a cold winter.

Table 2. Proportions of energy end-use per sector and energy end-use, 2000–2010

SECTOR	2000	2002	2004	2006	2008	2010*
Industry	52.3	50.7	50.5	50.5	48.8	45.2
Transport	15.6	15.4	15.8	15.8	16.5	16.6
Heating of buildings	19.7	21.3	21.1	20.9	21.0	24.6
Other	12.4	12.6	12.6	12.7	13.7	13.5
Total end-use (2000 = 100)	100	104	105	107	103	104

*preliminary data

ENERGY PROCUREMENT

The most significant source of energy in Finland in 2010 was oil (24%), with wood fuels accounting for 21%, nuclear energy 17%, coal 13%, natural gas 10% and other energy sources and net imports of electricity a total of 15%.

The energy efficiency of electricity production in Finland is improved by the significant proportion of combined heat and power (CHP) in electricity production. Electricity production at CHP plants grew by 54% in 1990–2009, reaching a level of 24.8 TWh. The proportion of total electricity production accounted for by electricity produced at CHP plants has also increased slightly, from 31% in 1990 to 36% in 2009.

Electricity lost in distribution and transmission fell from 4.5% in 1990 to 3.4% in 2009.

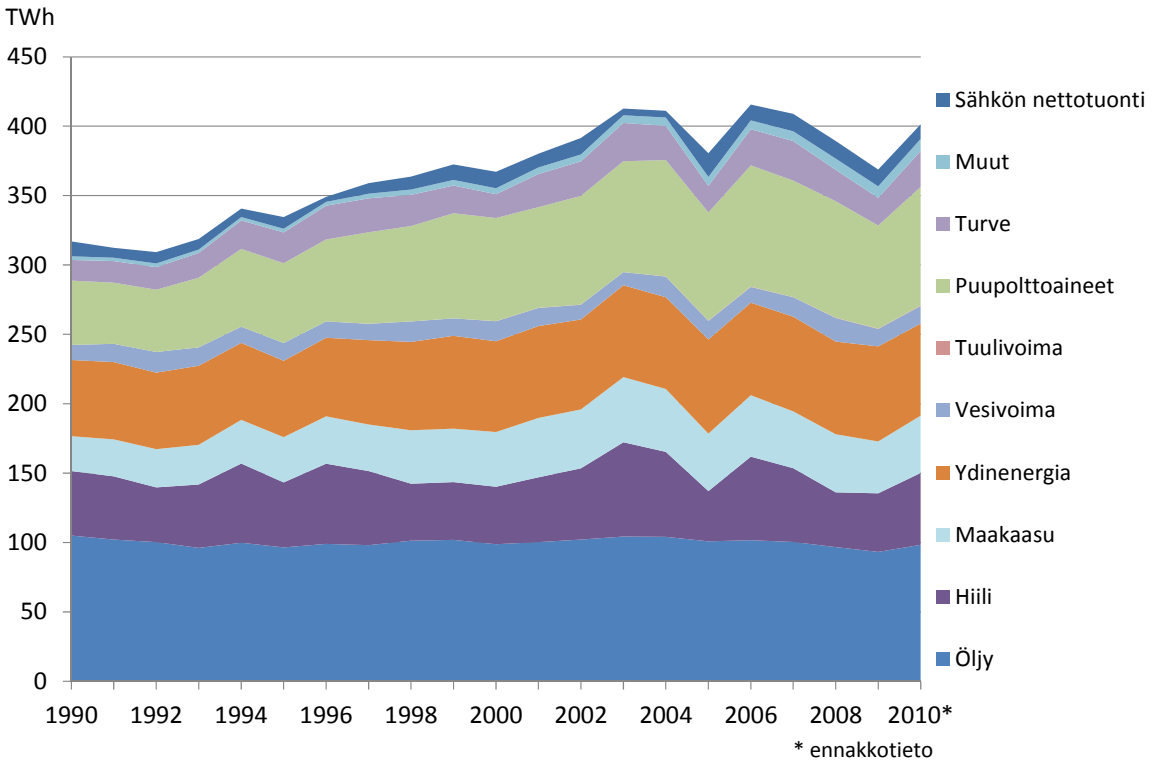

Figure 3 Energy procurement (primary energy) in Finland, 1990–2010

2.1.2 Energy use of buildings

The built environment has a key role in energy use and the generation of greenhouse gas emissions. The heating of buildings and electricity for lodgings and property in buildings (a total of approximately 120 TWh) account for approximately 38% and the manufacture and construction of building materials approximately 4% of Finland's total energy end-use.[4]

The energy end-use of buildings is distributed between electricity for heating (12%), district heating (29%), oil and natural gas (14%), wood and pellets (12%), and electricity for lodgings and property (approximately 33%).

[4] ERA17 – For an energy-smart built environment 2017. Ministry of the Environment, Sitra and Tekes, 2010, http://era17.fi.

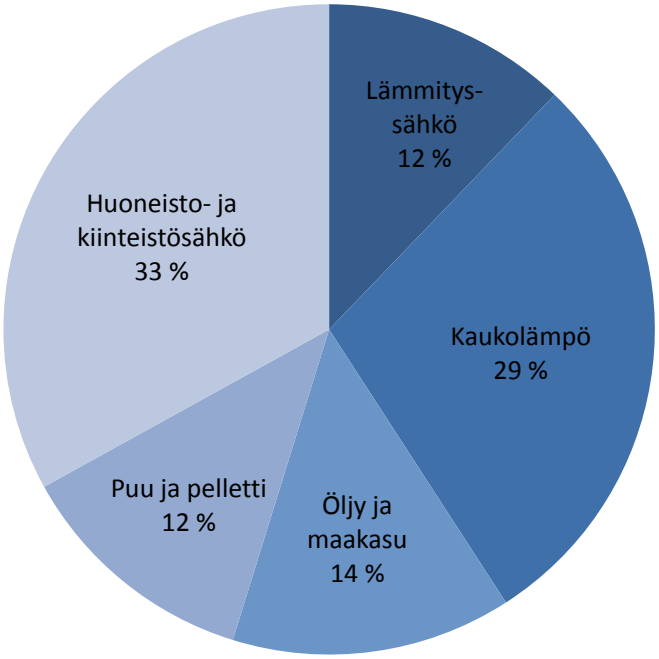

Figure 4 Distribution of the end-use of energy in buildings

There are 1.4 million buildings in Finland, 85% of which are residential buildings. There are a good three million homes. The building stock has a total capacity of approximately 1 800 million m^3, and a total floor area of 429 million m^2. Residential and service buildings account for approximately 60% of capacity and floor area.

The number of new buildings produced per year constitutes a good 1% of all building stock, and loss is 0.3–2%, depending on the house type. It is estimated that approximately 75% of current building stock will still be standing in 2050.

It is estimated that renovations will continue to be significant during the 2010s and 2020s, among other things owing to the need to repair façades and pipe-work. Financial investment in renovations and new building for residential buildings is nearly as great.

2.1.3 Public-sector energy use

The energy use of buildings used by central government and of street lighting amounts to approximately 2.3 TWh. Senate Properties, a state-owned company subordinate to the Ministry of Finance, is responsible for the majority (70%) of the management and leasing of state-owned property assets. In 2010, it managed 11 700 buildings and 6.6 million m^2. Approximately 10% of the building stock is managed by other state property agencies[5] and 20% is privately leased premises. At the start of 2010, universities that had previously operated under the state were privatised, and the ownership of 1.7 million m^2 of building stock was transferred from Senate Properties to private companies.

In 2010, the heating consumption of buildings maintained by Senate Properties was 928 GWh, and their electricity consumption was 628 GWh. During the 2006–10 period, specific heating consumption fell by 8% and specific electricity consumption by 3%. As for other organisations managing state property assets, there is not currently any comprehensive monitoring information. In order to make monitoring more effective, the Ministry of Finance started a project in 2010 concerning all central government prem-

[5] The Finnish Transport Agency, the Finnish Border Guard, the National Board of Antiquities, the Governing Body of Suomenlinna, the Finnish Parliament, the Office of the President of the Republic of Finland, and the Ministry for Foreign Affairs.

ises, which is gathering data into a joint database from all premises owned by the state and leased by it from third parties.

Energy use by municipalities and municipal federations is 11–12 TWh, approximately 88% of which is by buildings and approximately 12% of which is other consumption. For energy use other than buildings, street and outdoor lighting account for nearly half, and water supplies a good one-third. Approximately two-thirds of municipal energy use falls under the energy efficiency agreements system.

2.1.4 Energy use in the service sector

In 2009, total energy consumption in the private and public service sector[6] was approximately 34 TWh. The service sector accounted for approximately 12% of Finland's total energy end-use, and end-use by the service sector increased by 33% over the 1995–2009 period. Energy consumption increased greatly (9%) in 2009 owing to the fact that the year was very cold and the previous year, 2008, had been exceptionally warm. Total consumption by the service sector may only be calculated from 1995 onwards, since there is no information about heating consumption in that sector in the years prior to that.

Electricity consumption in the service sector was 18 TWh in 2009, and has grown by nearly 3% per annum since 1990. It grew by 66% during the 1990–2009 period, and by 30% in 2000–09.

The energy intensity of services, corrected for temperature (kWh/€$_{2000}$), fell by nearly one-third during the 1995–2009 period. Although energy consumption did grow over that period, the added value of the services sector[7] nearly doubled at the same time, which resulted in a falling trend. Similarly, the contrary trend in the early 1990s was the result of the economic slump.

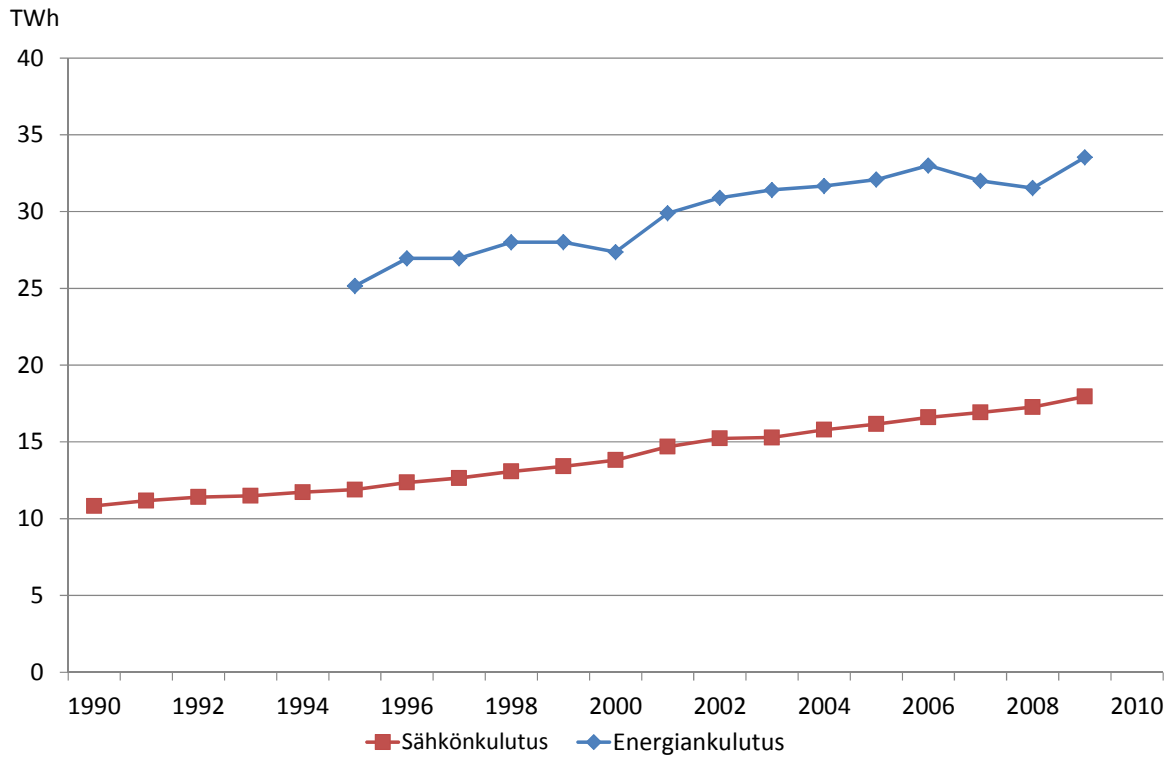

Figure 5 **Energy and electricity consumption by the service sector in Finland, 1990–2009**

[6] This includes the public-sector energy use presented in section 2.1.4.

[7] Added value is the difference between the sale price of a manufactured good and the purchase price of the unfinished products used in its manufacture. Added value mainly includes employee salaries, ancillary staff costs, and depreciation. Totalling the added value of the goods produced during one year gives the gross domestic product.

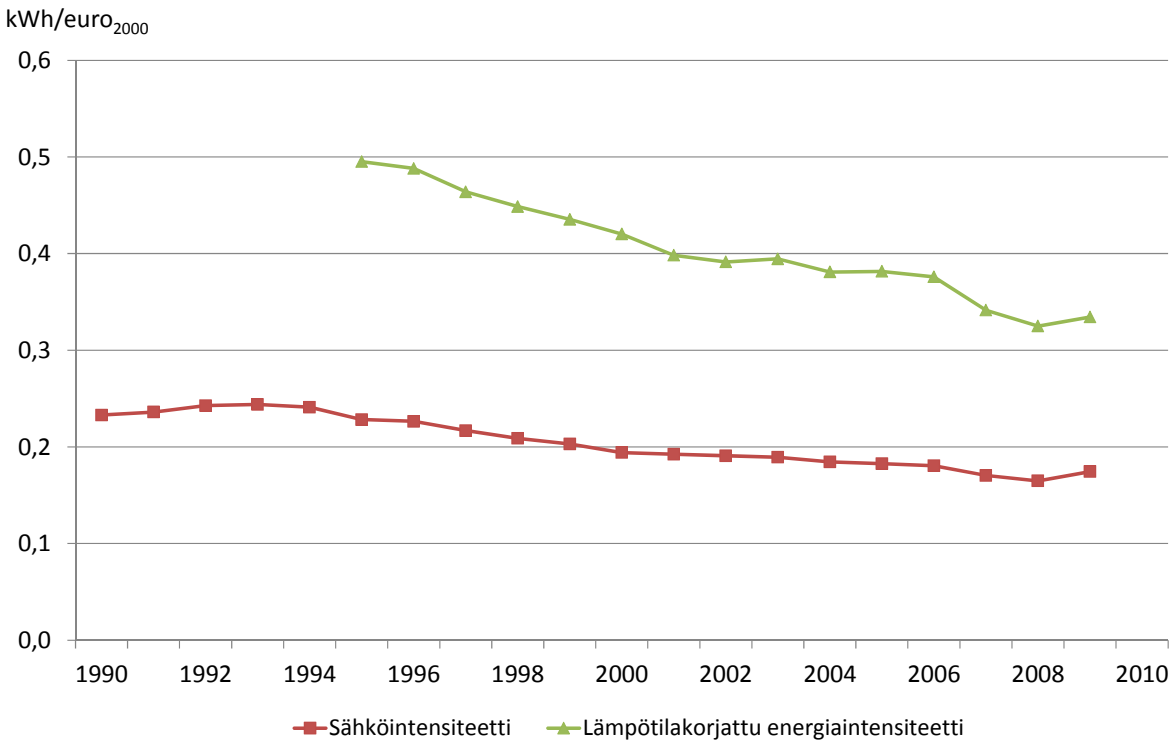

Figure 6 **Intensity of energy and electricity consumption by the service sector in Finland, 1990–2009**

2.1.5 Industrial energy use

The energy end-use of Finnish industry was 125 TWh in 2009, and its growth stopped in the early 2000s. The trend in energy end-use shows the dramatic impact of the financial crisis on the quantities produced by energy-intensive industry at the end of the last decade. In 2009, end-use was 23% lower than in the years preceding the financial crisis. Although, according to preliminary data, end-use increased by 12% in 2010 from the previous year to a level of 140 TWh, thanks to the economic recovery in 2010, end-use that year was still 13.5% lower than before the financial crisis.

When examined per sector, the largest industrial energy users in 2009 were the pulp and paper industry (48%), metal processing (13.4%), oil refining (10.4%) and the chemicals industry (8.5%).

Industrial energy consumption was 37 TWh in 2009, and has fluctuated significantly less than energy end-use over the last two decades.

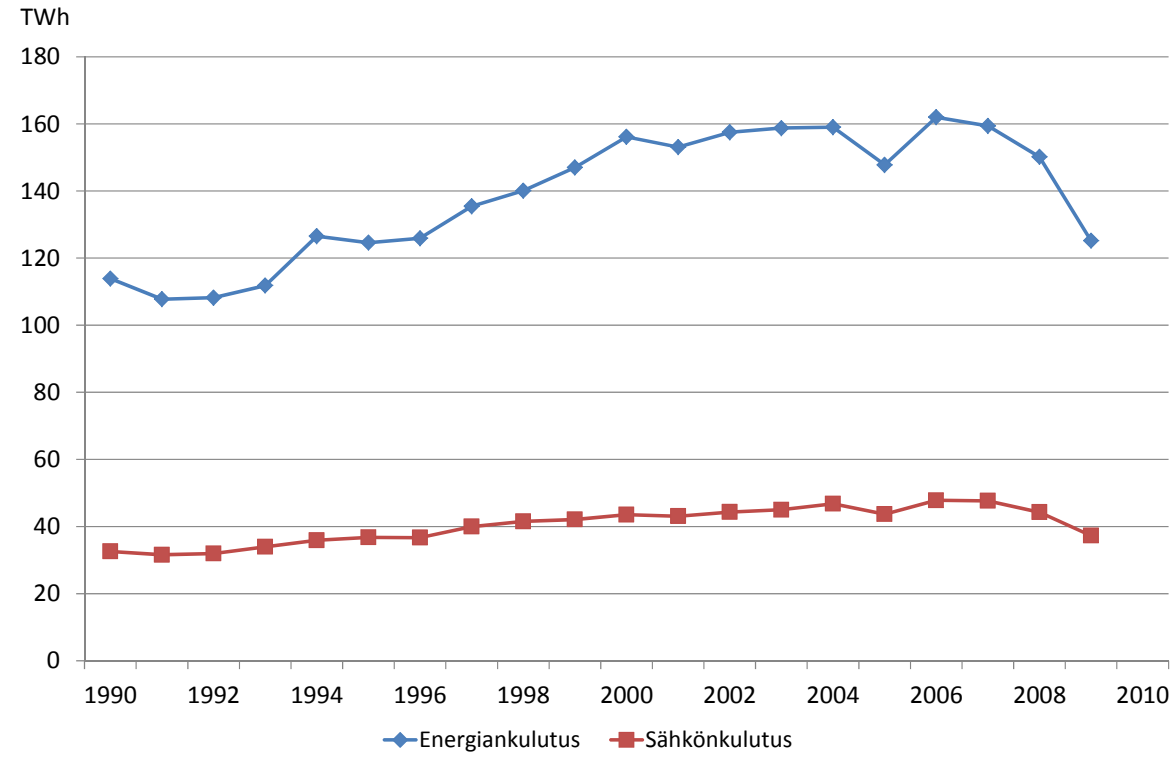

Figure 7 Energy and electricity consumption by Finnish industry, 1990–2009

Industrial energy intensity (kWh/€$_{2000}$) in Finland started to fall significantly in 1995, and fell by 44% over the 1994–2009 period. Industrial added value grew significantly more quickly than energy end-use in the sector. As a result of structural change, more than half of the added value is generated in sectors that are not energy-intensive.

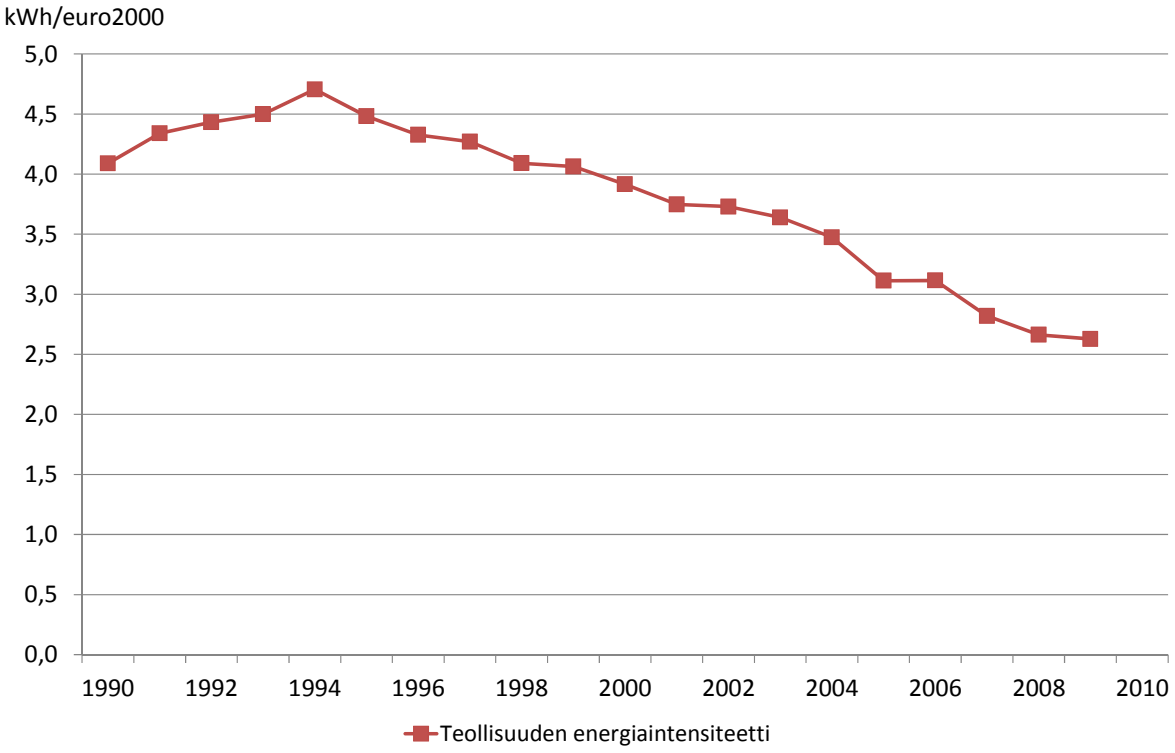

Figure 8 Energy intensity of Finnish industry, 1990–2009

2.1.6 Transport energy use

According to the national emission calculation system (LIPASTO), energy consumption for transport in 2009 was approximately 60.6 TWh (218 PJ). Of this, road traffic accounted for approximately 44.7 TWh (161 PJ, 74%), waterborne traffic approximately 10.8 TWh (39 PJ, 18%), air traffic 3.3 TWh (12 PJ, 5.5%) and rail traffic 1.6 TWh (5.8 PJ, 2.5%). In comparison with emission reports for international purposes, the proportion of total energy consumption for transport accounted for by road traffic remains quite moderate in the LIPASTO system, which also includes shipping traffic and the energy production required for electric rail traffic in Finland's exclusive economic zone as part of the traffic emissions in Finland. This particularly increases the proportion of consumption accounted for by waterborne traffic, but reduces that of road traffic.

According to the national emission calculation system, the proportion of total energy consumption for transport accounted for by cars and vans is approximately 53% and that of heavy goods vehicles is approximately 17%. Journeys made by buses and coaches take less than 3% of all transport energy use, and the proportion of other forms of road transport, including motorcycles, is approximately 1%.

After the slump years of the 1990s, energy consumption for transport increased steadily right up until 2007. In 2007–09, energy consumption fell by approximately 2.2 TWh (8 PJ, VTT 2009). Preliminary data indicate that energy consumption also fell in 2010.

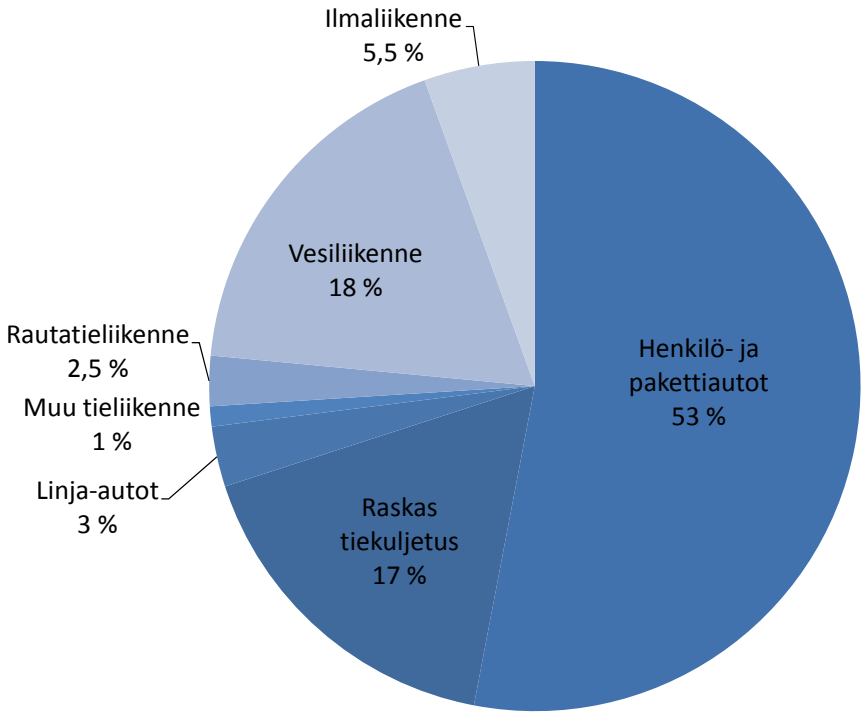

Figure 9 **Distribution of energy consumption per mode of transport in 2009. Includes energy consumption in the Finnish exclusive economic zone by outbound waterborne and air traffic. (VTT 2009)**

2.1.7 Agricultural energy use

The annual energy consumption of farms is approximately 12 TWh[8], which is divided up into machinery fuel (33%), heating fuel (28%), grain dryer fuel (17%) and electricity (22%).

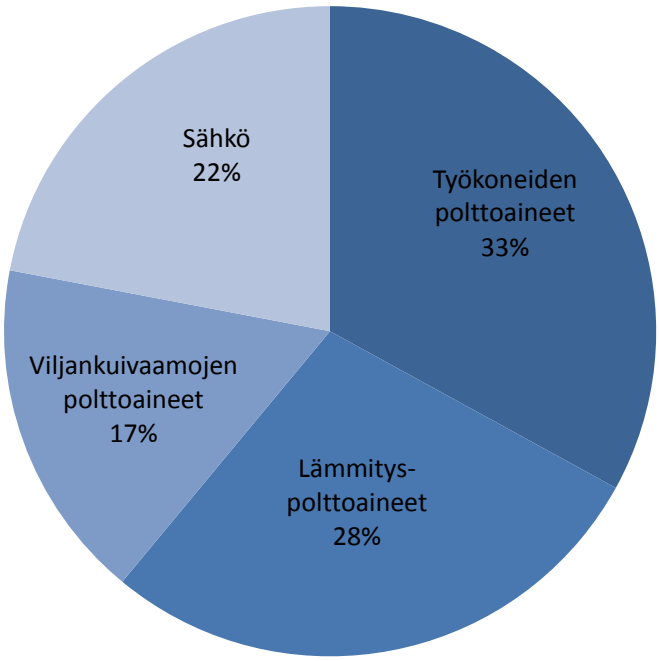

Figure 10 Distribution of agricultural energy use

The most significant consumers of energy are machinery (33%) and production premises (29%). Residential buildings and grain dryers (including electricity) both consume the same amount (19%).

The proportion of electricity on cattle farms is typically 20–30% of total consumption. The majority of electricity is in farrowing houses, owing to the use of thermal lighting to warm the piglets. The proportion of electricity on chicken farms is 12%, and approximately 8% on cereal farms.

The proportion of fuels for heat production on farms is 44–56%, excluding beef farms (27%) and chicken farms (79%). There is no heating on beef farms, and the need for heating on chicken farms is great, owing to the high temperature required for raising the chicks. The proportion of machinery fuel varies between 9% and 25%, excluding cattle farms, depending at times on the arable area in particular, the plants cultivated and the consumption of heat and electricity. [8]

In addition to agricultural and outdoor horticultural farms, other significant energy consumers in the agriculture and horticulture sector are greenhouses in year-round cultivation. The annual energy consumption of greenhouses (heated, and with an area of more than 1 000 m^2) is approximately 1.8 TWh, which is divided up into heating fuel (64%), district heating (8%) and electricity (28%)[9]. This energy consumption is not included in the annual energy consumption of 12 TWh.

2.1.8 Household energy use

Energy consumption in the household sector was approximately 64 TWh in 2009, an increase of 25% compared to energy consumption in 1995. Approximately half of the energy use is for heating, a quarter for service water heating, and a quarter for electricity for appliances and lighting. Total consumption in this sector can only be calculated from 1995, because there is no information concerning the consump-

[8] Bionova Oy, 2007.

[9] http://www.maataloustilastot.fi/sites/default/files/puutarhayritysrekisteri_2008_0.pdf [Finnish only].

tion of heating in the years prior to that. The household sector accounted for 22% of Finland's total energy end-use in 2009.

Electricity consumption in the household sector was approximately 22 TWh in 2009, including household electricity, electricity for heating, electricity consumption of holiday homes, and electricity to properties.

Net energy for household heating per home and in proportion to heating needs (kWh/home*degrees) has remained almost unchanged since 1995. However, electricity consumption per permanent home has risen.

There are two ongoing development projects to develop statistics on household heating energy and to update the distribution of household electricity. The distribution was last updated on the basis of the 2006 data.

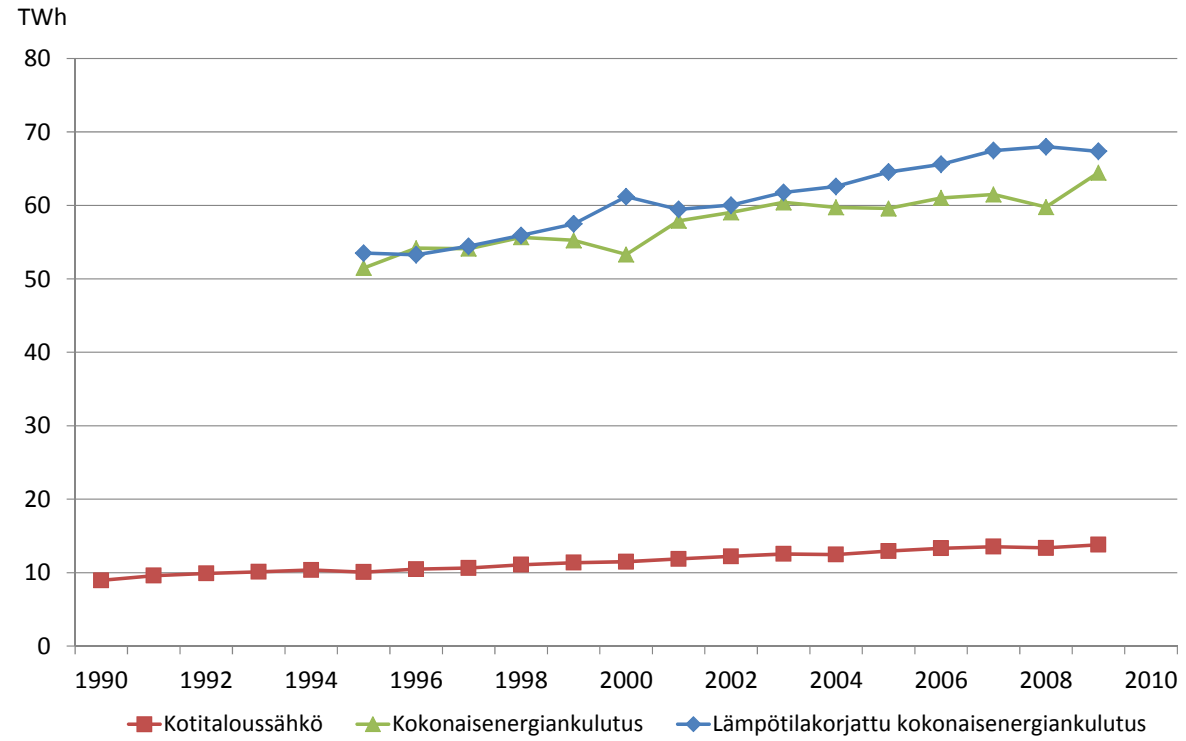

Figure 11 **Total household energy consumption including consumption of household electricity, total energy consumption with temperature adjustments, and consumption of household electricity in Finland, 1990–2009**

2.2 Energy savings and energy efficiency in Finland's energy policy

2.2.1 National strategies and programmes

Long-term climate and energy strategy (2008)

A new long-term climate and energy strategy was prepared for Finland in 2008. The strategy was prepared under the guidance of the Government's Climate and Energy Policy Ministerial Working Group, and it was drawn up by the Climate and Energy Policy Network, comprising representatives of various ministries. On 6 November 2008, the Council of State reported the strategy to the Parliament, which made a statement on it in June 2009.

The long-term climate and energy strategy sets out the guidelines approved by the European Council in spring 2007 and the measures required by the climate and energy package presented by the Commission on the basis thereof in January 2008 with regard to, among other things, targets for reducing greenhouse gases, energy procurement, renewable energy and energy efficiency in Finland. The main

emphasis of the strategy is on the guidelines up to 2020 and on the measures that they require. In addition to this, it sets out a vision right up until 2050.

The long-term climate and energy strategy states that if no further energy-policy measures are taken, primary energy consumption will rise over the 2006–20 period from 421 TWh to 479 TWh, energy end-use from 313 TWh to 347 TWh, and electricity consumption from 90 TWh to 103 TWh. The Council of State set the strategic objective of stopping the growth in energy end-use and instigating a reduction. The objective is for energy end-use in 2020 to be 310 TWh and for total electricity consumption to be 98 TWh. Primary energy consumption for the target scenario is 430 TWh. In comparison with the base scenario, the savings target for energy end-use is 37 TWh by 2020, according to the strategy, and 5 TWh for total electricity consumption. The reduction would be a total of 49 TWh, calculated in terms of primary energy. The longer-term target is that energy end-use would fall by another third of the 2020 level by 2050, and that electricity consumption would start to fall.

The target set for energy end-use is particularly important for Finland to achieve its renewable energy target of 38%. In order to ensure that this target is met, new targets were set in April 2010 for increasing the amount of renewable energy, using a benchmark of 327 TWh of energy end-use in 2020.

Government foresight report on climate and energy policy: towards a low-carbon Finland

In addition to the long-term climate and energy strategy, a foresight report on climate and energy policy[10] has also been produced in Finland in accordance with the Government programme. In particular, this foresight report, produced in 2009, examined climate and energy policy, global development and preparation for the impact of climate change throughout the timeline for the strategy and extending up to the middle of the century and beyond, where necessary. In addition to energy production, the report also discusses energy use, transport, forests and other key sectors for climate protection. Four different model scenarios were drawn up for the report, describing potential routes towards a low-carbon Finland. In the report, the Council of State outlines the targets and measures that show the way towards a thriving, low-carbon Finland.

Energy Efficiency Committee

On 22 April 2008, the Ministry of Employment and the Economy founded a broad-based energy efficiency committee to prepare new activities relating to energy savings and energy efficiency. According to the long-term climate and energy strategy, the benchmark for the Committee's work was an energy saving of 37 TWh, including an electricity saving of 5 TWh. The Committee's report, submitted to the Ministry of Employment and the Economy on 9 June 2009[11], describes 125 new or extended energy saving and energy efficiency measures. An impact assessment was also performed on the measures set out in the report in connection with the Committee's work, in which 130 experts from 40 organisations participated. It is estimated that, in total, more than 10 000 work hours were spent on the work as a whole over the year. On the basis of the report by the Energy Efficiency Committee, Government passed a resolution concerning the energy efficiency measures on 4 February 2010.

Previous national strategies and programmes relating to energy efficiency

In 1992, 1995, 2000 and 2002, Finland prepared separate energy saving programmes on the promotion of energy savings and energy efficiency. In 2005, no separate energy savings programme was prepared, but energy saving and energy efficiency activities were incorporated into the Council of State report on climate and energy policy that was submitted to Parliament.

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[10] http://www.vnk.fi/julkaisukansio/2009/j28-ilmasto-selonteko-j29-klimat-framtidsredogoerelse-j30-climate_/pdf/fi.pdf [Finnish only; English version available at http://www.vnk.fi/julkaisukansio/2009/j28-ilmasto-selonteko-j29-klimat-framtidsredogoerelse-j30-climate_/pdf/en.pdf].

[11] http://www.tem.fi/index.phtml?s=2403 [Finnish only].

SECTOR-SPECIFIC PROGRAMMES

Climate Policy Programme for the Ministry of Transport and Communications' administrative sector

The Climate Policy Programme (CPP) for the Ministry of Transport and Communications' administrative sector 2009-2020[12] was completed in March 2009. According to the CPP, transport emissions will be reduced by 2.8 million tonnes (15%), in addition to the use of biofuels, in comparison with the estimated emissions levels in 2020. The CPP consists of five different measures: 1) renewing the vehicle stock; 2) improving energy efficiency in transport; 3) directing the growth in passenger traffic volumes in urban areas to more environmentally-friendly modes of transport; 4) supporting the attainment of Finland's climate targets by means of information society and communications policy; and 5) making a decision in 2012 on any new financial steering methods. The implementation of the CPP will be monitored annually[13].

Programmes for the agriculture sector

The main programme for promoting energy efficiency in the agriculture sector is the Farm Energy programme. It is also the most important individual measure that implements the energy efficiency targets of the national climate and energy strategy in the agriculture sector. In other respects, the promotion of energy efficiency activities is integrated into the development programmes and aid schemes to be implemented in the administrative sector. Measures aiming at energy efficiency are promoted, among other things, through the rural development programme for mainland Finland and the agricultural investment aid scheme.

ERA 17 action programme

In 2010, the ERA17 action programme (For an energy-smart built environment 2017) was prepared by a working group comprising decision-makers from business, research and public administration, led by Jan Vapaavuori, Minister of Housing. The action programme comprised more than 30 recommended measures aimed at land use, decentralised energy production, construction guidance, property use and ownership, and the development of expertise.

2.2.2 Government resolutions

Government resolution of 8 April 2009 on promoting sustainable choices in public procurement

In the resolution that it approved on 8 April 2009[14], Government required the central government to consider environmental perspectives in at least 70% of its own procurement in 2010, and in all its procurement in 2015. Government departments are committed to the targets of the resolution, and the targets are recommended for state-owned companies and local government. The obligations connected with energy efficiency relate to the procurement of public transport services, cars and equipment that uses energy, energy inspections of buildings, and new building and leased properties.

Government resolution of 4 February 2010 on energy efficiency activities

The Government resolution of 4 February 2010 on energy efficiency activities[15] was prepared in autumn 2009 at the Ministry of Employment and the Economy as a programme of measures implementing the energy saving and energy efficiency activities set out in the Energy Efficiency Committee's report for 2010–20. The aim is to start most of the measures by the end of 2011.

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[12] http://www.lvm.fi/web/fi/julkaisu/view/908048 [Finnish only].

[13] http://www.lvm.fi/web/fi/julkaisu/view/1198918 [Finnish only].

[14] http://www.valtioneuvosto.fi/toiminta/periaatepaatokset/periaatepaatos/fi.jsp?oid=258914 [Finnish only].

[15] http://www.valtioneuvosto.fi/toiminta/periaatepaatokset/periaatepaatos/fi.jsp?oid=287171 [Finnish only].

The resolution presents a total of 19 measures over four areas (namely 1) establishing activities; 2) developing research and innovation; 3) communication, consultancy and training; and 4) the public sector), and a total of 28 measures for five sector-specific areas of measures (namely 1) community structure; 2) buildings; 3) transport; 4) households and agriculture; and 5) industry and the service sector). The Ministry of Employment and the Economy will regularly coordinate and monitor the implementation of the measures set out in the resolution.

Government resolution of 18 September 2008 on renovation building

On 18 September 2008, Government passed a resolution on renovations. It also emphasises measures for improving the energy efficiency of building stock, reducing energy consumption and emissions by building stock, social integration through complementary construction, and improving information and expertise relating to renovations. The resolution is based on the Renovation Strategy 2007–2017, and a programme of measures has been based on it.

2.2.3 Regulations and provisions

This section presents the regulations and provisions used to impose obligations directly on energy end-users or the efficiency of energy end-use. The regulations relating to aid and assistance to promote energy savings and energy efficiency are presented in section 2.2.4.

In addition to the regulations and provisions, the ministries have issued various guidelines on measures relating to energy savings and energy efficiency. The key guidelines are presented with the description of the measures for the sector in question.

NATIONAL

Laws on energy certificates and inspection of air-conditioning systems

The Act on Energy Certificates for Buildings and the Act on Energy Efficiency Inspections on Cooling Equipment for Air-Conditioning Systems in Buildings as well as certain amendments to land-use and construction legislation served to bring into effect Directive 2002/91/EC of the European Parliament and of the Council on the energy performance of buildings.

The Act on Energy Certificates for Buildings (487/2007) entered into force on 1 January 2008, upon which energy certificates for new buildings became a requirement for applying for planning permission. According to this Act, energy certificates also became mandatory for existing buildings at the start of 2009 when they are sold or leased. The amendment to the Act on 1 March 2011 made it compulsory to display the energy certificate in public buildings of more than 1 000 m^2. The Ministry of the Environment Decree on Energy Certificates for Buildings (765/2007) regulates, *inter alia*, the calculation method.

The Decree on Methods for Measuring the Surface Area of Owner-Occupied Flats and on Landlord Certificates (365/2010) regulates the inclusion of information from energy certificates in landlord certificates which are provided by housing associations. The Government decree on Information to be Provided Concerning the Marketing of Homes (30/2001) has been amended so that, as of 1 January 2009, property specifications must, as a general rule, show the building's energy certificate.

The Act on Energy Efficiency Inspections on Cooling Equipment for Air-Conditioning Systems in Buildings (489/2007) entered into force on 1 January 2008. The amendment to the Act that entered into force on 1 March 2011 made inspections of cooling equipment more frequent, changing the frequency from ten years to five.

Energy efficiency in building regulations

For new construction, the energy consumption of buildings is guided by the provisions and guidelines in the National Building Code of Finland (SRMK), which in turn implement the Energy Performance of Buildings Directive. The energy efficiency of buildings has been guided by national legislation since 1976. The building regulations have mainly regulated the properties of buildings relating to the consumption of thermal energy (U-values of the envelope, ventilation heat recovery).

In 2003, the energy requirements were made 25–30% more stringent than the level of the 1976 provisions. In 2008, the energy efficiency calculation was revised, so that the air impermeability of the building envelope was considered as a new factor. The energy efficiency provisions were tightened up again in 2010, when they were made 30% more stringent than the 2003 level.

In March 2011, the energy efficiency regulations for buildings due to enter into force in 2012 were issued; these will improve the energy efficiency of new buildings by approximately 20% and also instigate a shift towards overall energy reviews. Under the new regulations, an upper limit is set for the building's total energy consumption (heating, cooling and electrical energy), depending on the type of building, and it is expressed using an "E ratio". The method employed to produce the energy used by the building is considered when calculating the E ratio.

The provisions of the National Building Code of Finland concern the construction of new buildings. Unless expressly stipulated otherwise in the regulations, the provisions apply to renovations and modifications to buildings, only in so far as is required by the nature and scope of the work or by a possible change in the use of the building or part thereof. The Ministry of the Environment is in the process of drafting energy efficiency requirements relating to renovation building, as well.

The building regulations concerning water and drainage systems make it mandatory to install water meters in new homes as from the beginning of 2011.

Energy efficiency in transport

The national rules affecting the energy efficiency of transport include Decree 938/2000 on the Reporting of Fuel Consumption and Carbon Dioxide Emissions From Cars (in the marketing of cars), the decision on the monitoring of mean carbon dioxide emissions from cars registered in Finland (Ministry of Transport and Communications letter to the Finnish Vehicle Administration, 2000), and the Bill currently in process on Consideration for the Energy and Environmental Impact of Vehicles in Public Procurement, due for completion in autumn 2011.

Energy efficiency requirements in environmental permits

In certain cases, energy efficiency is taken into account in the environmental permit process. The requirement originated from the IPPC Directive of the EU Council (96/61/EC, amended by 2008/1/EC) concerning the harmonisation of pollution prevention and control, which requires that the energy efficiency of activities be considered as part of the assessment for the permit.

Energy efficiency is regulated in Finland by section 43(3) of the Environmental Protection Act (86/2000), according to which, when permit regulations are issued, energy efficiency must be taken into account as needed. Taking into account energy efficiency when issuing environmental permits is based on this legal provision. Section 19(3) of the Environmental Protection Decree regulates the consideration of energy saving agreements in permit decisions. This provision endeavours to ensure rational activities and avoid unnecessary work. If the operator already employs methods that may be used for the implementation and monitoring of environmental permits, efforts must be made to make use of them when setting the terms for the permit. A company's accession to the energy savings agreement between professional organisations and the Ministry of Trade and Industry (1997–2007) or the current energy efficiency agreement between professional organisations and the Ministry of Employment and the Economy (2008–2016) has been one way of showing that the efficient use of energy is considered in its activities.

The Ecodesign Act and the Ecodesign Decree

The Ecodesign Directive (2009/125/EC) and the Energy Labelling Directive (2010/30/EU), which concern the energy efficiency of products, have been brought into effect in Finland by the Ecodesign Act (1005/2008) and the Ecodesign Decree supplementing it (1043/2010). Both instruments were updated in late 2010 to reflect amendments to the Ecodesign and Energy Labelling Directives. Their scope was extended from products that use energy to also include energy-related products. The requirements for each

product group are currently issued as Commission Regulations. The monitoring authority is Tukes, the Finnish Safety and Chemicals Agency.

National regulations on energy labelling requirements specific to each product group

The national regulations for each product group, implementing the EU Directives, apply with regard to the product energy labelling requirements. The aim is to guide consumers and end-users towards choosing better products. The Ministry of Trade and Industry has issued decrees or decisions on the following product groups: household cooling equipment, washing machines, washer-dryers, tumble-dryers, dishwashers, electric ovens and household lamps. A decree has been issued by the Ministry of the Environment on energy labelling for air-conditioning equipment. The Directive on efficiency requirements for hot-water boilers (92/42/EEC) was implemented by the Ecodesign Act and Section D7 of the National Building Code of Finland.

EU REGULATIONS DIRECTLY APPLICABLE AT NATIONAL LEVEL

The European Commission's "delegated" Regulations are directly in force in all Member States. Although there are no national implementing regulations associated with these EU Regulations, some national information and advisory projects have been started in Finland to ensure compliance.

Regulation (EC) No 106/2008 of the European Parliament and of the Council ("Energy Star")

According to Regulation (EC) No 106/2008 of the European Parliament and of the Council, for the duration of the agreement, the central government authorities of Member States shall specify energy-efficiency requirements not less stringent than the Common Specifications (Energy Star 2007) for public supply contracts relating to office equipment having a value equal to or greater than the "thresholds". Office equipment in the sense of the Regulation includes computers, visual display units and imaging devices.

Regulations laid down under the Ecodesign Directive and the Energy Labelling Directive

The Ecodesign Directive (2009/125/EC) is a Framework Directive under which ecological design requirements are imposed on products to be sold in the EU. The requirements for each product group are laid down as Commission Regulations, which apply in Finland as they stand. Ecological design requirements have been laid down (on 1 June 2011) for the following product groups: stand-by consumption of electrical and electronic devices, simple set-top boxes, household lighting products, lighting products for the service sector, external power supplies, electric motors, circulators, televisions, household refrigeration equipment, washing machines, dishwashers and fans.

Labelling requirements are laid down for various product groups under the Energy Labelling Directive (2010/30/EU). The requirements were previously laid down in the form of Directives that were transposed into national law. In future, they will be laid down in the form of Commission Regulations. The Commission has issued (on 1 June 2011) new "delegated" Regulations for the following product groups: household cooling equipment, dishwashers, washing machines and televisions. The first requirements for these groups will enter into force in late 2011.

EU Regulations affecting the energy efficiency of transport

The main EU rules affecting the energy efficiency of transport are Regulation (EC) No 2009/443 of the European Parliament and of the Council setting emission performance standards for new passenger cars (binding limit on CO_2 from cars), Regulation (EU) No 510/2011 of the European Parliament and of the Council setting emission performance standards for new light commercial vehicles (binding limit on CO_2 from vans, approved in March 2011), and Commission Regulation 1222/2009 on the energy labelling of car tyres.

2.2.4 Economic instruments

TAXATION POLICY

Energy tax

In addition to fiscal targets, energy tax also aims to meet energy and climate policy objectives. Energy taxes on transport, heating and electricity were increased on average by 9.8% at the start of 2008, whilst keeping the tax structure unchanged. The tax rise increased energy tax revenue by approximately EUR 300 million. A structural change in the taxation of energy products entered into force at the beginning of 2011, whereby tax on heating and transport fuels changed to become based on the energy content of the fuels and on the specific emissions of carbon dioxide originating from combustion (energy content tax and carbon dioxide tax). In conjunction with this structural change, excise duty on fuel oils, coal, natural gas and electricity increased by approximately EUR 730 million. The main objectives of the structural reforms of energy tax and the increase in tax on fossil fuels and electricity were to stimulate energy savings, improve energy efficiency and promote renewable energy.

Transport tax

Transport tax comprises the car tax to be paid when a vehicle is first registered, the vehicle tax to be paid annually, and fuel tax on transport fuels. Transport tax is therefore directed at the procurement and availability of the vehicle, as well as its actual use. Car and vehicle tax are defined according to the vehicle's emissions, in addition to which fuel tax was also amended in 2011 so that it is now based on energy and carbon content.

Household discounts in taxation

An individual may deduct from his tax the costs caused by work that he has had done in a private household, in the form of a "household discount" of up to EUR 3 000 per spouse. There is also a discount for repair work that improves the energy efficiency of residential buildings.

AID PAYABLE FROM THE STATE BUDGET AND EXTERNAL FUNDS

This section presents aid granted from the State Budget and external funds for energy savings and energy efficiency. Financing from the State Budget is discussed and decided upon during the framework decision on the State Budget and the budget procedures.

Energy aid from the Ministry of Employment and the Economy

The Ministry of Employment and the Economy grants energy aid to undertakings and corporations for investments and energy audits that promote energy savings and the use and production of renewable energy. The budgetary sub-item is the same for energy savings and renewable energy, but authority to grant energy aid is reserved annually for specific targets. The granting of aid is regulated by the Council of State Decree on General Conditions for Energy Aid (1313/2007).

In 2002–08, approximately EUR 30 million of energy aid was granted each year. In 2009, EUR 95 million of energy aid was granted. In 2010 the amount of energy aid granted fell to EUR 53 million, because energy production plants which from 2011 are included in the feed-in tariff for electricity produced at wind and biogas power plants no longer applied for aid. In 2011, a total of EUR 173 million of energy aid is available, of which EUR 91 million is reserved for "basic" activities and EUR 82 million for biofuels for use in transport and to replace coal.

On average, EUR 4–6 million of energy aid per annum was spent on energy audits and energy saving investments in 2002–08. In 2009, EUR 7.6 million of energy aid was granted for energy saving projects and EUR 14.2 million in 2010. The number of energy saving projects is expected to continue growing in 2011.

Energy subsidies for residential buildings

Resources from the Ministry of the Environment's administrative sector have been granted as energy assistance for residential buildings. These relate to, *inter alia*, the Act on Assistance for Repairs, Energy and Health Problems in Homes (1184/2005) and the Council of State Decree on Assistance for Repairs, Energy and Health Problems in Homes (128/2006).

Assistance has been granted for energy repairs to residential buildings for various purposes every year since 2003. Appropriations amounting to EUR 30 million have been set aside in the 2011 State Budget for the introduction of heating methods that use renewable energy in residential buildings. EUR 14 million has been reserved for other forms of energy assistance in residential buildings, EUR 2 million of which is allocated for needs-assessed energy assistance for single-family dwellings. In particular, energy assistance is granted for energy audits of residential buildings, repairs to the external building envelope and improvements in energy efficiency, the construction of ventilation heat recovery, and for connecting residential buildings to district or regional heating systems.

Improving energy efficiency is also given substantial consideration when repair assistance is granted for residential buildings.

Public transport aid for major urban areas

In 2009, the Ministry of Transport and Communications gave financial aid for the first time to three major urban areas (Helsinki, Tampere and Turku) to develop public transport. Oulu region subsequently became involved too. The amount of public transport aid for major urban areas came to a total of EUR 5 million in 2009, EUR 7.7 million in 2010, and EUR 10 million in 2011. The city central regions also increased their own aid by similar amounts.

Energy planning aid for farms

Energy planning by farms falling under the Farm Energy programme is promoted by State aid, amounting to 85% of total approved costs. The upper limit for eligible costs is EUR 1 100 per plan. Aid is applied for by the energy planner, and the application is submitted to the regional ELY centre. The aid is regulated by Government decree (1000/2009). In 2011, it is planned to extend the aid scheme so that it also covers energy audits on farms.

Investment aid for farms

Through the farm investment aid scheme, aid may be granted for certain investments that promote energy efficiency on farms. These include boiler houses that use the farm's own renewable energy sources, and energy-saving solutions for production buildings, such as unheated cattle sheds, for example. Energy-efficient solutions are promoted, for instance, by applying different percentages of aid.

The aid scheme is regulated by the Act on Agricultural Investment Aid (1476/2007) and the Government decree on Agricultural Investment Aid and Start-Up Aid for Young Farmers (299/2008). The acceptable unit costs for various construction targets under the aided investments are regulated by a decree of the Ministry of Agriculture and Forestry (354/2011). Additionally, a Government decree is issued annually on the Targeting of Investment Aid for Farms (977/2010), which regulates the targets of investment, as well as the aid percentages and conditions.

Aid for reparcelling of farm land

The consolidation of arable plots increases the parcel size of the farms participating in the procedure by bringing together a farmer's dispersed field parcels to make them more continuous and closer to the farm's economic centre. This arrangement is used to reduce farming traffic on roads and to make agricultural work in the fields more efficient. The National Land Survey of Finland organises the practical aspects of reparcelling projects. The State provides aid for both the costs of reparcelling and any adjustment measures necessary as a result of the procedure, which include arterial and subsoil drainage as well as the construction of farm roads. The aid is specific to each instance of land reparcelling.

2.2.5 Energy audits

In Finland, the Ministry of Trade and Industry started to provide aid for the energy audit of service buildings and of industrial and energy production facilities in 1992, with the actual energy audit programme starting in 1994. In 1992–2009, a total of more than 7 300 energy audits were carried out as part of the audit programme. Since 2008, the Ministry of Employment and the Economy has been responsible for administration of the programme. Since 1993, Motiva has been responsible for the practical organisation of the audit programme, and its duties include the promotion of audit activities, development and monitoring, the training of energy auditors, and the quality assurance of audits. The results of energy audit activities have been monitored through a separate monitoring programme since 1994. The energy audit programme (HO-14-TEM) is described in more detail in Annex 3, while the impact on energy savings per sector is presented in section 3 below.

In 2003 the Ministry of the Environment initiated aid for energy audits of residential buildings in Finland. An energy audit model was created for conducting energy audits, in order to map out the opportunities for saving energy in blocks of flats and terraced houses.

An aid scheme for energy audits on farms is scheduled to start in 2011. Experts in the energy sector and the agricultural energy sector are involved in the audits, in collaboration with the farmer. The audit reviews thoroughly the farm's energy use and production, and produces a summary based on measurements and calculations to make the farm's energy use more efficient. Since the start of 2010, it has been possible for farms to have a State-aided farm energy plan drawn up, which is more constricted in scope than the audit.

2.2.6 Energy efficiency agreements

The energy efficiency agreement scheme that started in 2008 is a continuation of the energy savings agreements that Finland started to enter into with undertakings and local councils in 1997. With the exception of one agreement area, these energy savings agreements ended in 2007.

The energy efficiency agreements are a key instrument in Finland for the fulfilment of the obligations under the Energy Services Directive that entered into force in 2006. The agreements will be in force until the end of 2016, and one of their key targets is the 9% energy saving under the Energy Services Directive.

Three of the first energy efficiency agreements, relating to the business sector, the local government sector and the oil sector (2008–16) were signed on 4 December 2007. Of the sectors covered by the agreements, the Ministry of Employment and the Economy is responsible for the energy efficiency agreement and energy programme in the local government sector, as well as the energy efficiency agreement for the business sector, which includes industry, the energy sector and the private services sector. The Höylä [Plane] III energy efficiency agreement for the oil sector, which covers the distribution of heating and transport fuel, as well as oil heating, was concluded by the Ministry of Employment and the Economy, the Ministry of the Environment, organisations from the oil sector as well as all six companies representing nearly 100% of the distribution of liquid fuels.

The energy efficiency agreement for the property sector (2010–16) was signed by the Ministry of the Environment, the Ministry of Employment and the Economy, and the Finnish Association of Building Owners and Construction Clients (RAKLI ry). The agreement includes two operational programmes, of which the programme for residential lettings companies started in 2010 and that for business premises in 2011.

The energy efficiency agreement for public transport and that for goods transport and logistics started in 2008. The Ministry of Transport and Communications bears the main responsibility for both agreements. The energy efficiency agreement scheme also includes the Farm Energy programme, which started in 2010 under the responsibility of the Ministry of Agriculture and Forestry.

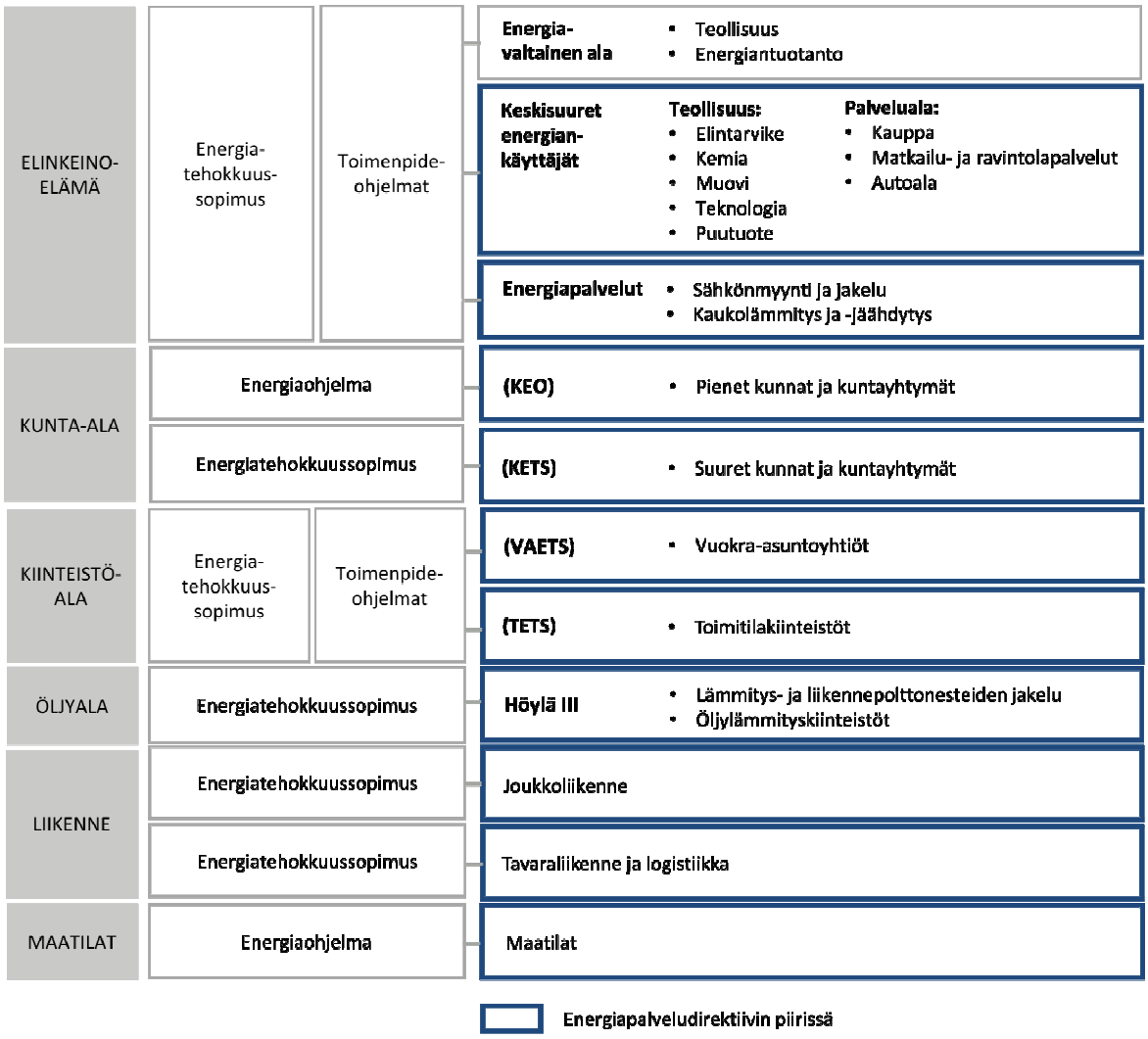

Figure 12 Operational areas covered by Finland's energy efficiency agreement scheme

As a whole, the energy efficiency agreement scheme, which includes several sectors, is very broad and covers approximately 70% of Finland's total energy use. By 1 June 2011, more than 450 undertakings in industry, the service sector, the property sector and the energy sector had signed up to the agreement, involving a total of more than 2 500 reporting premises or clusters of premises. In total, the energy use and energy saving activities of nearly 4 400 buildings or premises are reported under the agreements. There are also over a hundred towns, municipalities or federations of municipalities that have signed up to the agreement for the whole municipality's energy use, including several thousands of buildings. There are also 23 residential lettings companies that have signed up to the agreements, with a total of 113 reporting premises or clusters of premises involving more than 6 200 different properties.

2.2.7 Training and education

Energy efficiency in the Finnish education system

Energy efficiency is dealt with in varying ways depending on the level of education. The increased significance of energy and climate affairs also shows in the volume and content of the education.

Particularly in general education (secondary school and sixth form) and vocational training, energy efficiency is examined from the perspective of sustainable development. The skills required of students are defined in the national curriculum or the criteria for basic vocational degrees. Sustainable development has been a subject in the curricula of both secondary education and sixth form since 2004, with the objectives and themes of sustainable development appearing in various subjects. The criteria for basic vocational degrees were reviewed in 2010. In the new criteria for the degrees, sustainable development

is included in the basic degree studies as a key skill for life-long learning. Sustainable development is included as part of the criteria for all studies (including vocational and specialised vocational studies) according to the priorities included in the sector in question.

Higher education establishments (universities and polytechnics) are independent players and make their own decisions on course content. The promotion of sustainable development in universities is one of the common objectives for all universities in the agreement on targets and results in force (2010–12) that every university enters into with the Ministry of Education and Culture.

Further education provided by universities under apprenticeship agreements is a new form of supplementary education implemented since 2009 and funded by the Ministry of Education and Culture. Education programmes of this kind include energy efficiency expert training (Aalto University and Tampere University of Technology), as well as training in the energy efficiency management of buildings (Metropolia University of Applied Sciences).

In addition to this, many private training providers offer blocks of studies and courses related to energy efficiency.

Energy efficiency is also promoted in educational institutions' own activities at all levels of education. Sustainable development programmes, for example, serve as tools for this. The tools developed for educational institutions include sustainable development certification of educational institutions, and the Green Flag.

Energy auditor training

The training of auditors organised by Motiva for the energy audit programme organised by the Ministry of Employment and the Economy has an established position in Finland as the basic course for energy efficiency and energy savings. The auditor training is a two-day supplementary training course designed for experts who have completed basic technical training, and it qualifies them to act as the person responsible for energy audits aided by the Ministry of Employment and the Economy. In 1994–2010, nearly 1 600 experts have obtained the qualification as a person responsible for such audits. Annually, 80–90 such qualifications are awarded in Finland.

Qualification for those drawing up energy certificates

A total of 528 qualifications providing entitlement to draw up energy certificates were awarded in 2008–10. The stipulated requirement for the qualification is a vocational degree or equivalent, acceptable work experience and, in addition to this, passing a test on the preparation of energy certificates and on the regulations, organised by the party establishing the qualification. Training on energy certificates is not mandatory. In 2008–2010, a total of 2 120 people participated in energy training arranged by organisations that award qualifications.

Training for farm energy planners

Initial training for farm energy planners is part of the Farm Energy programme administered by the Ministry of Agriculture and Forestry. The training lasts for two days, and participation in it is a requirement for obtaining approval as a farm energy planner, which is awarded by the Agency for Rural Affairs (Mavi). In addition to initial training, farm energy planners must also have adequate basic technical or agricultural training and expertise in farm energy matters. There are 64 approved planners on Mavi's list (as of 1 June 2011).

2.2.8 Communication and advice

The implementation of energy efficiency in Finland has traditionally been supported by long-term communication and advice activities with a specific purpose. Communication, information and advice are used to support both regulatory and financial guidance and voluntary activities. Information and advice are aimed at businesses and local government as well as consumers. Communication and advice activities associated with promoting energy savings and energy efficiency are funded by the state to the tune of

approximately EUR 1.5 million per annum. Some projects are also funded by businesses and organisations in addition to the state.

The key player in energy efficiency communication and advice is Motiva, which was founded by the Ministry of Trade and Industry (now the Ministry of Employment and the Economy) in 1993 as a three-year Energy Savings Service Centre project. Motiva is now a limited company owned by the state, which also promotes the sustainable use of renewable energy and materials. Motiva supports the state administration in the implementation of the national climate and energy strategy and EU Directives, such as the Energy Services Directive. Communication and advice activities are one of Motiva's areas of focus. At the start of 2011, Motiva employed 25 experts in the field of energy efficiency, whereas there were five experts when it commenced its activities in 1993. In December 2010, the Ministry of Employment and the Economy designated Motiva as a national coordination centre for energy advice for consumers.

Communication and advice activities linked to energy efficiency are carried out by many consumer and civil organisations, unions and associations in Finland, as well as by regional and local energy agencies. There are ten energy agencies started partly with EU aid, and many of them carry out active work in their own areas. The energy agencies are networked under Motiva's leadership. The Association of Finnish Local and Regional Authorities encourages local government to act, for instance as part of its Climate Campaign work. Local government officers are also offered information and training in municipal energy efficiency agreement activities. The businesses involved in such agreements are offered advice (ENE advice). Many energy companies have also shared information with their customers for decades concerning appropriate energy use.

Consumers' need for energy advice is recognised by the national strategies and programmes. Energy advice is given to consumers under three far-ranging projects with the following names: consumer energy advice, travel guidance, and renovation advice.

In 2010–2011, an exceptionally extensive consumer advice project is implemented in Finland. Of the nearly EUR 4 million in funding that it has received, half came from the implementers of the advice projects, EUR 1.4 million from the Ministry of Employment and the Economy, and EUR 0.5 million from Sitra. The experience from the pilot projects will be used to develop a permanent programme of energy advice for consumers. Energy advice is also being developed in conjunction with the development of advice given by the Ministry of the Environment relating to repair work, the travel guidance by the Ministry of Transport and Communications, and the energy advice aimed at farms by the Ministry of Agriculture and Forestry. In 2010–2011, Motiva coordinates 13 pilot projects relating to travel guidance[16], which are funded by the Ministry of Transport and Communications and the Finnish Transport Agency.

The Ministry of the Environment is improving the Renovation Advice Network[17]. The aim of the renovation building advice is to offer commercially independent, impartial and timely advice, if necessary at the renovation site. Energy efficiency and systematic maintenance of properties are the key areas for communication on the subject of renovation building. The comprehensive advice network includes approximately 40 operators at regional level in Finland (public corporations, local government, provincial museums, renovation centres and operators in property and construction) and approximately 500 people, 300 of whom provide advice on energy at the local government level.[17]

The information and advice work linked to energy efficiency makes use of both established communication activities and campaigns and, to an ever-greater extent, web-based services. Four hundred and fifty-eight operators participated in the annual national Energy Savings Week in 2010, and 19 participated in Mobility Week. Nearly 300 leaflets can be ordered through Motiva's electronic online shop. The key web-based services include the www.motiva.fi website[18], the service showing the best energy-efficient equipment, funded by the Ministry of Employment and the Economy and the EU, at www.topten-

[16] http://www.motiva.fi/liikenne/liikennejarjestelma_ja_liikkumisen_ohjaus/liikkumisen_ohjaus [Finnish only].
[17] http://www.korjaustieto.fi [Finnish only].
[18] http://www.motiva.fi [English version: http://www.motiva.fi/en/].

suomi.fi[19], the service for energy certificates for buildings, developed under commission from the Ministry of the Environment, at www.motiva.fi/energiatodistus[20], the www.energiatehokaskoti.fi website[21], produced in collaboration with players in the sector and designed to promote low-energy construction, and the www.korjaustieto.fi service[17], which was produced by the Ministry of the Environment, introduced in 2011 and focuses on renovation building. There were approximately 1.4 million visitors (with over 1.8 million visits) to the various web-based services maintained by Motiva in 2010. Many energy companies, energy agencies, local councils and other operators have also put together various web-based services and electronic tools to promote appropriate energy use.

2.2.9 Research, development and innovation

FINLAND'S RESEARCH, DEVELOPMENT AND INNOVATION POLICY

The Council of State and, as part of it, the ministries are responsible for the planning and implementation of scientific policy. The Research and Innovation Council (TIN) is an expert body of the Council of State and its ministries, under the leadership of the Prime Minister, which deals with key questions relating to the direction of scientific, technological and innovation policy, as well as monitoring, evaluation and co-ordination, and prepares plans and proposals relating to them. In December 2010, TIN approved a new training, research and innovation policy report[22] for 2011–15. This core document defines Finland's strategic priorities, which also include energy and the environment. There are three key public sources of funding for research, development and innovation activity in Finland, namely Tekes, the Academy of Finland, and Sitra.

PUBLIC-SECTOR FUNDING FOR RESEARCH, DEVELOPMENT AND INNOVATION

Tekes

Tekes is the main source of public funding for applied research and product development in Finland. Approximately EUR 600 million is spent on funding every year, and its target groups are both businesses and public-sector research organisations. Tekes operates under the guidance of the Ministry of Employment and the Economy, and receives funding for its activities from the state budget. In its strategy, Tekes has defined energy efficiency, raw-material efficiency, and intelligent energy systems as its particular focal points.

Funding for projects aimed at making energy use more efficient amounted to EUR 116 million in 2010. This funding has undergone strong growth in recent years, since energy efficiency is regarded as a key factor in future competitiveness. Approximately half of the funding is aimed at industrial energy use. Other key sectors include the energy efficiency of buildings as well as transport. Some Tekes funding is channelled into thematic areas that are important for industry and society, through structured programmes.

Energy efficiency has also been key content of many programmes implemented in the 2000s. The Tesla programme (1998–2002) created basic expertise for the energy efficiency services of energy companies and the automatic measurement of consumption. The Cube programme (2002–2006) developed technology for making buildings energy-efficient. The Process Integration programme (2000–2004) developed methods for managing energy and material flows in the process industry. The ClimBus programme (2004–2008) continued the work done by the previous projects in the field of energy efficiency with the aim of developing generic energy-efficiency technologies.

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[19] http://www.topten-suomi.fi [Finnish only].

[20] http://energiatodistus.motiva.fi [Finnish only].

[21] http://www.energiatehokaskoti.fi [Finnish only].

[22] http://www.tem.fi/files/29559/Tutkimus_ja_innovaatiopoliittinen_linjaus2011_2015.pdf [Finnish only].

In addition to its own programmes, Tekes also funds research programmes by a cluster of six strategic cutting-edge centres of excellence (SHOK), which also include projects related to energy efficiency.

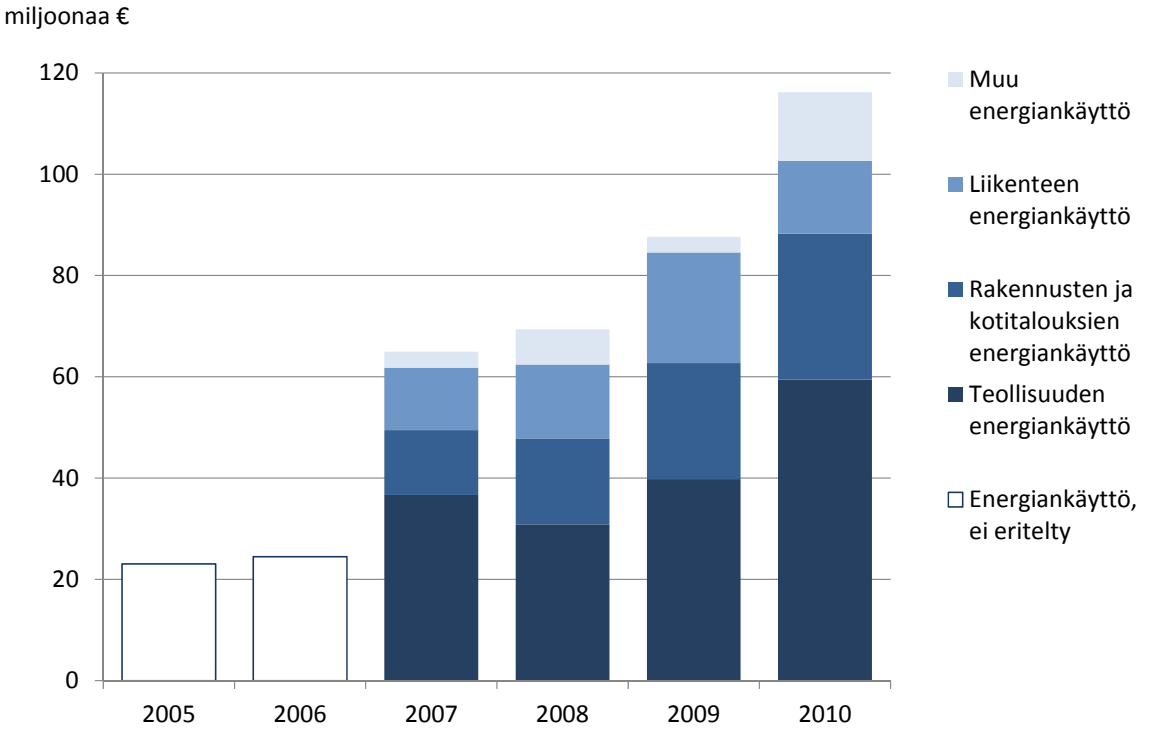


Figure 13 Tekes funding in the field of energy use, 2005–10 (EUR million)

Academy of Finland

The Academy of Finland, which falls under the jurisdiction of the Ministry of Education and Culture, is a key source of funding for scientific research. The Academy funds, *inter alia*, research projects, research programmes, centres of excellence in research, research posts, researcher training and international collaboration. The majority of the Academy's funding from the state budget is channelled into research conducted at universities. In 2011, the Academy is funding research amounting to EUR 340 million. The Academy's key programmes relating to energy efficiency are the Sustainable Energy programme (2008–2011) and the FICCA programme (2011–2014).

The Finnish Innovation Fund (Sitra)

Sitra, the Finnish Innovation Fund, was founded in 1967 and is a fund under the jurisdiction of the Finnish Parliament. Its mission is to promote Finland's stable, balanced development, economic growth and international competitiveness and collaboration. Sitra acts as both an investor and a coordinator for time-limited programmes. Sitra funds programme-related projects to the tune of approximately EUR 50 million per annum. The main programme related to energy efficiency is Sitra's Energy programme (2008–2012).

Research programmes and projects

The most significant research, development and innovation programmes in use in Finland are set out in section 3.3.9. In addition to these programmes, several individual development projects are implemented every year, funded jointly by the ministries and by the businesses, local councils and organisations participating in the projects. Additionally, in 2007, the sustainable development division of the Finnish Advisory Board for Sectoral Research, which was established to coordinate overall guidance for state sector research, started some projects relating to energy efficiency.

2.2.10 Community planning and zoning

The management of community planning at national and local level creates requirements for the organisation and coordination of energy-efficient land use, housing and business. Safeguarding the integrity of the regions and communities, and ensuring the appropriate location of operations are considered activities with long-term impact. The main policy instruments are the Land Use and Building Act (132/1999) and guidance at various planning levels. There are several development projects underway relating to this field.

2.3 National energy saving and energy efficiency targets

2.3.1 Energy end-use savings targets

The starting point of Finland's climate and energy strategy (2008) is the energy end-use level of 313 TWh in 2006. The strategy estimates that, if no further action is taken, energy end-use will rise to 347 TWh by 2020. A target of 310 TWh has been set for 2020, i.e. an energy saving of 37 TWh compared to the basic scenario. According to the basic scenario, energy end-use was estimated to be 381 TWh by 2050. A target level of 220 TWh has been set as a vision for energy end-use by 2050.

For electricity, energy end-use was 90 TWh in 2006. In the basic scenario, electricity use is estimated to rise to 103 TWh by 2020. The target level has been set at 98 TWh, i.e. an energy saving of 5 TWh compared to the basic scenario. According to the basic scenario, electricity consumption would be 116 TWh in 2050. A target level of 80 TWh has been set as the vision by 2050.

Table 3. Overview of energy end-use savings targets

	ENERGY END-USE SAVINGS TARGETS	
Year	TWh/a	Percent (%)
2010[23]	5.9	3%
2016	17.8	9%
2020[24]	37.0	11%

2.3.2 Primary energy savings targets

No actual targets have been specified for primary energy consumption in Finland, but the trends in total primary energy consumption in the basic scenario up to 2020 and 2050 and the target scenario up to 2020 as well as the vision for 2050 were also assessed when the long-term climate and energy strategy (2008) was prepared. If no further action is taken, total primary energy consumption is estimated to rise from 421 TWh (2006) to 479 TWh by 2020. In the target scenario, total primary energy consumption in 2020 will be 430 TWh. The strategy estimates that total primary energy consumption will rise to 523 TWh by 2050 in the basic scenario. The vision for total primary energy consumption by 2050 is estimated to be 450 TWh.

[23] Interim target set out in NEEAP-1, which is in linear proportion to the 9% savings target by 2016.

[24] Target from the 2008 climate and energy strategy, which relates to total energy end-use, including the emissions trading sector.

3 ENERGY-SAVING MEASURES AND THEIR IMPACT IN TERMS OF SAVINGS

3.1 Overview of the impact in terms of energy savings

Finland's second energy efficiency action plan calculates the impact on energy savings of 36 measures, 31 of which have an impact on savings that targets energy use within the scope of the ESD and three of which have an impact that targets both the scope of the ESD and the emissions trading sector. Two of the measures have an impact on energy savings that is calculated entirely outside the scope of the ESD.

The biggest energy savings are achieved in buildings where the most important individual measures are the building regulations, heat pumps for single-family dwellings and measures aimed at oil-heated single-family dwellings. There are also great energy savings in industry, but the majority are aimed at energy use outside the scope of the ESD. In the field of the ESD, the second-biggest saving comes from the transport sector, where the most significant individual measure is an improvement in the energy efficiency of new cars achievable as the combined effect of several measures. Industry (ESD), agriculture and horizontal activities produce energy savings of the same order of magnitude. One of the horizontal measures in the action plan is a review of the Ecodesign Directive and the energy efficiency requirements for each group of equipment.

The energy savings in 2010 (12 097 GWh) are approximately double those of the interim target set (5 931 GWh). By 2016, the estimated energy savings (24 688 GWh) will correspond to an energy saving of approximately 12.5%, using the calculation method of the ESD. Finland's energy end-use under the ESD was calculated by NEEAP-1 as being 197 700 GWh. By using the measures set out in this action plan, it is estimated that the energy saving will increase to approximately 17% (33 730 GWh) by 2020.

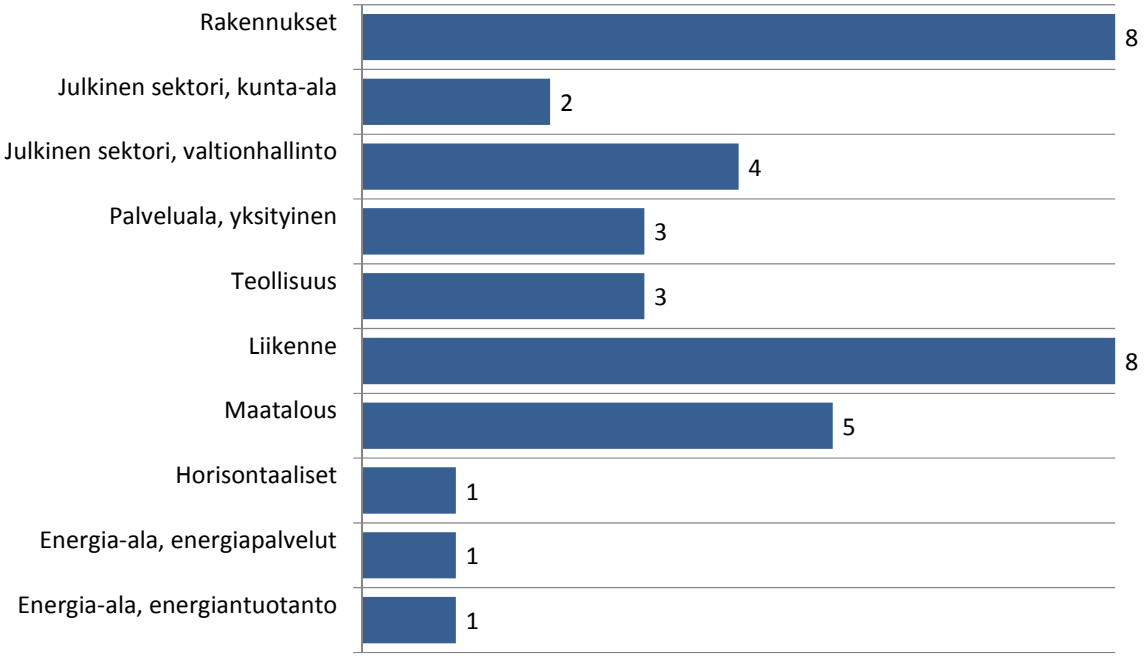
Table 4. Overview of energy savings

	ENERGY SAVING		
SECTOR	2010 GWh/a	ESTIMATE 2016 GWh/a	ESTIMATE 2020 GWh/a
ESD:			
Buildings	6 580	14 381	18 566
Public sector – municipal level	289	563	422
Public sector – central government	107	261	365
Service sector – private	144	417	363
Industry	2 755	2 605	2 641
Transport	998	3 311	5 925
Agriculture	1 224	1 812	2 318
Horizontal measures	0	1 338	3 130
NON-ESD:			
Industry	8 351	8 207	7 952
Energy sector – energy services	85	303	321
Energy sector – energy production	634	1 746	1 829
TOTAL ENERGY SAVING – ESD AREA	**12 097**	**24 688**	**33 730**
TOTAL ENERGY SAVING – NON-ESD AREA	9 070	10 256	10 102
TOTAL ENERGY SAVING – ALL	21 167	34 944	43 832

3.2 Calculating the energy savings

According to the Energy Services Directive, Member States may choose whether to use bottom-up (BU) or top-down (TD) calculation methods, as well as whether to use the calculation methods recommended by the Commission or their own national methods. The Directive does, however, require that at least 20–30% of energy end-use falling under the ESD is covered using BU methods.

All the energy savings set out in this national energy efficiency action plan have been assessed using national BU methods. In total, there are 36 measures/sets of measures that have been assessed to have an impact on energy savings. In Finland's first energy efficiency action plan (26 June 2007) savings were calculated for 14 measures/sets of measures.



Rakennukset = construction

Julkinen sektori, kunta-ala= public sector, local government

Julkinen sektori, valtionhallinto = public sector, national government

Palveluala, yksityinen = service sector, private

Teollisuus = industry

Liikenne = transport

Maatalous = agriculture

Horisontaaliset = horisontal

Energia-ala, energiapalvelut = Energy sector, energy services

Energia-ala, energiantuotanto = Energy sector, energy production

Figure 14 Number of measures assessed in each field

Several of the national methods used for the calculation have been used for a long time, and there is no BU method for them, as recommended by the Commission. Some of the methods were used in the first national energy efficiency action plan in 2007. For those measures that are aimed at both end-use under the ESD and energy use under emissions trading, the impact assessment is divided into these two groups (ESD and non-ESD). Primary energy savings have only been calculated for one measure relating to energy production.

Table 4 gives an overview of the impact of measures in various areas of activity. Section 3.3 sets out the impact on savings of each measure in each area, as well as a brief description of the measures. The descriptions of the most important measures and a report on the savings impact assessment, as well as the assumptions and initial data used in the calculations, are presented for each measure in Annex 2.

Section 3.3 also sets out measures for each area of activity, the impact of which in terms of savings has not been evaluated at all at this stage, but the aim of which is to make energy use more efficient for the items falling under the Directive. A more detailed description of fourteen of these measures/sets of measures is given in Annex 3. These measures are mainly horizontal measures relating to education and training, communication, advice, taxation and community planning.

3.3 Energy-saving measures

3.3.1 Buildings

For buildings, the most significant energy-saving measures are making the energy efficiency regulations for new construction more stringent, promoting the use of renewable sources of energy by means of advisory services (heat pumps for single-family dwellings), energy subsidies for residential buildings and energy efficiency agreement work relating to oil-heated single-family dwellings.

The impact on energy savings in buildings, calculated as 6 580 GWh for 2010, corresponds to an energy saving of more than 5%, calculated from the total energy consumption of buildings. Using the measures presented below, the energy saving is estimated to increase to 12% by 2016, and to more than 15% by 2020.

Table 5. Buildings (RA) – overview of savings

		ENERGY SAVING		
MEASURE CODE	MEASURE*	2010 GWh/a	ESTIMATE 2016 GWh/a	ESTIMATE 2020 GWh/a
RA-01-YM	Energy efficiency regulations for new construction, 2003, 2008, 2010 and 2012	1 560	4 550	6 710
RA-02-YM	Energy subsidies for residential buildings	282	1 005	1 005
RA-03-TEM	Heat pumps for single-family dwellings	2 326	5 310	6 960
RA-04-TEM	Heat pumps for terraced houses and blocks of flats	228	446	471
RA-05-YM	Mandatory water meters for homes	0	74	128
RA-06-TEM	Energy labelling of windows	59	80	129
RA-07-TEM/YM	Höylä III energy efficiency agreement – oil-heated single-family dwellings	2 099	2 722	3 085

RA-08-YM	Energy efficiency agreement for the property sector – residential lettings associations	26	194	78
TOTAL ENERGY SAVING – ESD AREA		**6 580**	**14 381**	**18 566**

*Descriptions of the measures and the principles for calculating the savings are set out in Annex 2.

Measures – impact on energy savings evaluated

Energy efficiency regulations for new construction, 2003, 2008, 2010 and 2012 (RA–01–YM)

For new construction, the energy efficiency of buildings is guided by regulations dating from 1976. Parts D3 and D5 of the National Building Code of Finland concern the energy efficiency of buildings and the calculation of energy consumption, parts C3 and C4 concern heating insulation for buildings, and part D2 concerns the indoor climate and ventilation of buildings.

The regulations were made more stringent in 2003, such that the energy consumption of buildings had to be reduced by 25–30% compared to the regulated level in 1976. In 2008, the energy efficiency calculation was reviewed, such that the air impermeability of the building envelope was taken into consideration as a new factor. The energy efficiency regulations were again made more stringent in 2010, resulting in a 30% increase in requirements relating to the relative efficiency between U-values and ventilation heat recovery, compared to the 2003 level.

The next tightening up relating to the energy efficiency of buildings, and amounting to approximately 20%, will enter into force in 2012. The new regulations were issued in March 2011, and they will implement the Energy Performance of Buildings Directive. At the same time, there will be a shift towards overall energy assessment, which will also consider the way in which energy is produced. The E ratio of the building should be lower than the maximum value for the type of building according to the regulations. The E ratio is the net energy purchased for each net area heated (kWh/m²,a), weighted using an energy form factor. The impact on savings for 2012 will be examined separately, since the overall structure of the regulations will be changing, in addition to the changed requirement level.

The description of measure RA–01–YM and the energy saving impact assessment are set out in Annex 2.

Energy subsidies for residential buildings (RA–02–YM)

Subsidies are granted every year for energy repairs in residential buildings for various purposes. In the 2000s, energy subsidies were used in particular to support repairs aimed at energy savings, changes to heating methods, and the introduction of renewable forms of energy. Energy subsidies for residential buildings are subject to, *inter alia*, the Act on Assistance for Repairs, Energy and Health Problems in Homes (1184/2005), and the Council of State Decree on Assistance for Repairs, Energy and Health Problems in Homes (128/2006).

The description of measure RA–02–YM and the energy saving impact assessment are set out in Annex 2.

Heat pumps for single-family dwellings (RA–03–TEM)

335 000 heat pumps had been installed in single-family dwellings in Finland by the end of 2010. Heat pumps are installed as an energy-saving measure in existing single-family dwellings, and as energy-efficient basic heating systems in new buildings. The number of heat pumps sold started to increase significantly in 2000, when their use started to be promoted in Finland by the Finnish Heat Pumps Association and by Motiva. Approximately 60 000 heat pumps were sold in 2010, whereas fewer than 1 000 were sold in 1999. Heat pumps are a significant energy-saving measure for single-family dwellings in Finland.

The description of measure RA–03–TEM and the energy saving impact assessment are set out in Annex 2.

Heat pumps for terraced houses and blocks of flats (RA–04–TEM)

Air heat pumps are acquired in Finland as an energy-saving measure for existing terraced houses that are mainly heated by electricity, and to some extent for blocks of flats. These devices, which are installed in each flat or house, are the same heat pumps that are acquired for single-family dwellings. More than 50 000 air heat pumps had been installed in terraced houses and blocks of flats by the end of 2010.

The description of measure RA–04–TEM and the energy saving impact assessment are set out in Annex 2.

Mandatory water meters for homes (RA–05–YM)

The Decree on Water and Drainage Systems for Properties (National Building Code of Finland, part D1) was amended by Decree of the Ministry of the Environment so that during new construction meters are installed in each premises in properties containing more than one home, in addition to the main water meter, in order to measure the hot and cold household water coming to the home. It should be easy to monitor water consumption and to use the reading as the basis for billing. The amendments to the Decree entered into force on 3 January 2011.

The description of measure RA–05–YM and the energy saving impact assessment are set out in Annex 2.

Energy labelling of windows (RA–06–TEM)

In October 2006, as a consequence of a development project funded by the Ministry of Trade and Industry (now the Ministry of Employment and the Economy), the Ministry of the Environment and by businesses, the voluntary energy labelling of windows was introduced with the aim of facilitating comparison between various window solutions by a range of builders and decorators. As part of this labelling, windows are divided into energy classes A–G, using the familiar scale for household appliances.

The description of measure RA–06–TEM and the energy saving impact assessment are set out in Annex 2.

Höylä III energy efficiency agreement – oil-heated single-family dwellings (RA–07–TEM)

The Höylä III energy efficiency agreement (2008–2016) is a continuation of the Höylä I and Höylä II programmes, which promoted energy efficiency in oil-heated single-family dwellings between 1997–2007. The main areas for action in the Höylä III energy efficiency agreement are the improvement of the energy efficiency of oil-heated houses and oil-heating systems, the promotion of the use of renewable energy (biofuel oils and solar-powered heating), and the provision of advice and information to energy end-users as required under the Energy Services Directive.

The description of measure RA–07–TEM and the energy saving impact assessment are set out in Annex 2.

Energy efficiency agreement for the property sector – residential lettings associations (RA–08–YM)

The energy efficiency agreement for the property sector includes two programmes of measures. Associations which own rental properties, right-of-residence properties or part-ownership properties are entitled to participate in the programme for residential lettings associations. Twenty-three companies have joined the operational programme (as at 1 June 2011), covering approximately 80% of the housing stock falling under the operational programme.

The description of measure RA–08–YM and the energy saving impact assessment are set out in Annex 2.

Measures – no assessment of impact on energy savings

Energy certificates for buildings

Since the start of 2008, new buildings have been required to have an energy certificate as part of the application for planning permission. In cases where existing buildings, or parts thereof, are sold or leased, an energy certificate has been required since the start of 2009. The building control departments of local councils should archive the energy certificates of new buildings. According to local government statistics, more than half of all new detached houses were of class A or B in 2009. The average class under the building regulations was C or D. In 2010, construction was even more energy efficient than before, since half of all new detached houses were of class A. The presence of energy certificates when homes are sold was charted in 2009 and 2010. In 2010, the energy certificate was available for perusal in 79% of cases, whereas in 2009 it had only been available in 61% of sales. Only in 10% of sales was there no energy certificate at all.

In March 2011, it became a requirement for energy certificates to be displayed in public buildings of more than 1 000 m^2. The certificates should be on display by no later than 1 March 2012. Up to now, the display of energy certificates in public buildings has been promoted in conjunction with the implementation of the voluntary municipal energy efficiency agreements.

Environmental and energy classification of buildings

The use of environmental classification systems for buildings (LEED, BREEAM and Promise) has become more common in Finland. The national Promise environmental classification was introduced in Finland as early as 2004. The international LEED and BREEAM classifications are more common among operators involved in international property business. Of the items to be assessed for the classification, energy use is represented by the largest number of points, and the classifications at the very least arouse interest in the introduction of energy-efficient solutions.

There is also increased attention paid to the classifications used in energy certificates when targets are set for construction projects. Many professional developers have set requirements for new and basic repair projects that are better than the class 1–2 required by the regulations, and the next step is to set a target close to zero-energy buildings. The impact on energy savings of a widespread environmental and energy classification has not been evaluated separately.

Inspection of cooling equipment for air-conditioning systems

The Act on Energy Efficiency Inspections on Cooling Equipment for Air-Conditioning Systems in Buildings (489/2007) entered into force on 1 January 2008. As a general rule, cooling equipment of at least 12 kW and powered by the use of a compressor must be inspected at least once every five years. A certificate of the inspection should be issued, showing its condition, efficiency and, where possible, recommended measures to improve energy efficiency. The Act also regulates inspectors' qualifications.

Alternative procedure for inspecting boilers

In Finland, boilers are inspected using an alternative approach under Article 8(b) of the Energy Performance of Buildings Directive (2002/91/EC). Boilers are inspected in accordance with technical recommendation TS-4/2010 "Temporary maintenance work on oil-heating equipment, measurements of heating technology, and energy efficiency inspections" published by the Heating Energy Association in 2010. There are approximately 130 trained, certified boiler inspectors (as at 1 June 2011). A national programme monitoring boiler inspections was built into the monitoring programme for the Höylä III energy efficiency agreement in 2010, and the first annual report was prepared in 2011. The aim is to conduct approximately 50 000 boiler inspections every year.

3.3.2 Public sector

LOCAL GOVERNMENT

The two most significant energy-saving measures by local government that are monitored separately are the energy efficiency agreement scheme for local government and energy audits of local government service buildings. The energy saving of 289 GWh calculated for 2010 corresponds to an energy saving of approximately 2.5% of all energy use in local government. Using these measures, it is estimated that the energy saving will increase to approximately 5% by 2016. The energy-saving measures affecting energy use by local government are also included among the measures set out in section 3.3.1, "Buildings", and the horizontal measures set out in section 3.3.9. The impact of these measures on savings has not been evaluated separately for local government, but the total saving may be estimated to increase to at least the 9% required by the Energy Services Directive by 2016. Additionally, approximately one-third of local government energy use is currently outside the scope of the annual report.

Table 6. Local government (KU) – overview of savings

		ENERGY SAVING		
MEASURE CODE	MEASURE*	2010 GWh/a	ESTIMATE 2016 GWh/a	ESTIMATE 2020 GWh/a
KU–01–TEM	Local government energy efficiency agreement and energy programme 2008–16	216	475	343
KU–02–TEM	Energy audits – local government	72	88	80
TOTAL ENERGY SAVING – ESD AREA		**289**	**563**	**422**

*Descriptions of the measures and the principles for calculating the savings are set out in Annex 2.

Measures – impact on energy savings evaluated

Local government energy efficiency agreement and energy programme 2008–16 (KU–01–TEM)

In local government, there is a separate energy efficiency agreement designed for large and medium-sized councils, between the Ministry of Employment and the Economy and the council, and the energy programme administered by Motiva, which is intended for small councils. A total of 101 councils or municipal federations had joined the local government energy efficiency agreement or the energy programme by 1 June 2011. This covered 67% in terms of inhabitants.

The description of measure KU–01–TEM and the energy saving impact assessment are set out in Annex 2.

Energy audits – local government (KU–02–TEM)

Energy audits of local government service buildings have been subsidised since 1992. During the 1992–2010 period, 4 277 council and municipal federation service buildings were inspected. The audited building capacity amounts to a total of 72.7 million m^3, corresponding to approximately 59% of Finland's stock of local government service buildings.

The description of measure KU–02–TEM and the energy saving impact assessment are set out in Annex 2.

CENTRAL GOVERNMENT

For central government, the impact on energy savings has been evaluated for four different measures. The impact on savings of 107 GWh in 2010 corresponds to an energy saving of approximately 5% of all central government energy use. Using these measures, the energy saving is estimated to increase to 11% by 2016 and nearly 16% by 2020. Senate Properties, which manages the majority of state building stock, and one of its principal capital tenants, the Defence Administration, have joined the energy efficiency agreement for the property sector. According to the agreement, the savings target for 2010–2016 is 6%.

The energy-saving measures affecting central government energy use also include the horizontal measures set out in section 3.3.9, but the impact of these measures on savings has not been evaluated separately for central government.

Table 7. Central government (VA) – overview of savings

		ENERGY SAVING		
MEASURE CODE	MEASURE*	2010 GWh/a	ESTIMATE 2016 GWh/a	ESTIMATE 2020 GWh/a
VA–01–VM	Making the use of space more effective in central government	9	64	101
VA–02–VM	Renovation of state property stock	4	28	57
VA–03–VM	Improving energy efficiency in new construction for the state	1	11	19
VA–04–VM	Maintenance activity and user information for state property stock	93	158	188
TOTAL ENERGY SAVING – ESD AREA		**107**	**261**	**365**

*Descriptions of the measures and the principles for calculating the savings are set out in Annex 2.

Measures – impact on energy savings evaluated

Making the use of space more effective in central government (VA–01–VM)

The state premises strategy of 2005 sets the target of making the use of space on central government premises approximately 20–25% more efficient. The politically reinforced premises strategy provides guidance on the use of all central government space, and every agency and department should therefore take account of the target level under the strategy in connection with any basic repairs or new investment in their premises. The Ministry of Finance is responsible for monitoring the implementation of the strategy.

The description of measure VA–01–VM and the energy saving impact assessment are set out in Annex 2.

Renovation of state property stock (VA–02–VM)

The proportion of all state construction projects accounted for by repair projects is currently approximately 80%, so measures to improve energy efficiency that are implemented in connection with repairs will have a greater impact on energy end-use than new construction. The measures relating to energy savings in renovations are based on the energy efficiency progress plan for construction investment in 2011–2020 prepared by Senate Properties.

The description of measure VA–02–VM and the energy saving impact assessment are set out in Annex 2.

Improving energy efficiency in new construction for the state (VA–03–VM)

New construction for the state is not currently implemented, except as a special consideration. The impact of new construction in terms of improving the energy efficiency of state building stock is based on the fact that new construction replaces property stock that is sold and demolished, which has average or poorer than average energy properties.

The description of measure VA–03–VM and the energy saving impact assessment are set out in Annex 2.

Maintenance activity and user information in state property stock (VA–04–VM)

Experience shows that maintenance activity and property user information have a significant role in reducing the energy consumption of the property stock and in developing and maintaining energy effi-

ciency. Without ongoing action, introducing new items to the range of measures and making monitoring continuous, it will not be possible to manage the energy consumption of property stock, far less reduce it. The measures already implemented and those that are to be implemented and developed during the review period are the development of property management agreement models, maintenance and energy repairs, improving the coverage of consumption measurements, and developing lease agreements and tenant information.

The description of measure VA–04–VM and the energy saving impact assessment are set out in Annex 2.

Measures – no assessment of impact on energy savings

Government resolution of 8 April 2009 on the promotion of sustainable choices in public procurement

In the resolution that it approved on 8 April 2009, Government required the central government to consider environmental perspectives in at least 70% of its own procurement in 2010, and in all its procurement in 2015. In its resolution, Government requires the following:

Of the electricity purchased by central government, at least 30% in 2010 and at least 60% in 2015 is to be electricity produced using renewable energy sources, the origin of which is to be verified by means of a certificate from a third party.

For new construction and new properties leased for public use by central government, the target is for these to be of energy efficiency class A in 2010, and for basic repairs to existing buildings to be of at least energy efficiency class C. The target is for houses built, repaired and leased after 2015 to be passive.

In public procurement, central government and providers of public transport services falling within the scope of the Decree on Public Transport Services are to consider the fuel consumption of the vehicles being procured, and the impact of emissions of carbon dioxide and pollutants. In 2010, carbon dioxide emissions are to be below 120 g/km in at least 50% of all new cars that are acquired or leased for normal use, and below 110 g/km in at least 25%. Journeys and the need to travel by car are to be reduced by 10% by 2015, including by means of logistics solutions, travel tickets as employment perks, and by exploiting remote and video conference technology.

In the procurement and leasing of energy-consuming equipment, technical specifications or criteria corresponding to the level required for energy and environmental labelling are to be used as the basis for an overall comparison of savings. During the procurement of services, the impact on the environment in the early stages of the life cycle will be reduced *inter alia* by considering service criteria developed for the Nordic or EU environmental labelling.

Central government is committed to the targets set out in the decision in principle. These targets are recommended for state-owned companies and local government.

Energy efficiency plans for state organisations

In its resolution of 4 February 2010, Government requires the Ministry of Employment and the Economy to prepare its own energy efficiency plan in 2010, and other state organisations are required to do so by the end of 2012. The energy efficiency plan by the Ministry of Employment and the Economy sets a target of a 25% reduction in total energy consumption, and a reduction of 15% in energy consumption per employee, for the 2008–2016 period. The target for 2020 is a reduction of 30% in total energy consumption, and a reduction of 20% in energy consumption per employee. For administration subordinate to the Ministry of Employment and the Economy, the preparation of energy efficiency plans is included in the TEM group's performance management. The first training event on the preparation of energy efficiency plans was arranged for state organisations in May 2011.

Environmental programmes for state organisations and the Eco-Office

The Government decision on Sustainable Procurement of 8 April 2009 required central government organisations to introduce an environmental scheme by 2010. In 2008, the Ministry of the Environment

introduced its own environmental scheme, called Eco-Office. It makes environmental affairs part of the Ministry's management system. The system achieves environmental benefits and financial savings by reducing travel, making energy use in properties more efficient, introducing energy-saving techniques and improving space efficiency, and by raising environmental awareness. The Ministry of the Environment has set a target of reducing heat consumption per employee by 10%, and electricity consumption by 20%, in the 2006–2013 period.

3.3.3 Service sector – private

The most significant energy-saving measures that are monitored separately in the service sector are two energy efficiency agreements and energy audits for service buildings in the private sector. The energy savings of 114 GWh calculated for 2010 corresponds to an energy saving of approximately 0.6% of the total energy end-use of the private sector, calculated to be approximately 20 TWh. The impact of these measures on energy savings is estimated to increase to approximately 2% by 2016. The energy-saving measures affecting energy use in the service sector also include the measures directed at buildings as set out in section 3.3.1 and the horizontal measures set out in section 3.3.9. The impact on savings of these energy-saving measures has not been evaluated separately for the private service sector.

Table 8. Private service sector (PA) – overview of savings

		ENERGY SAVING		
MEASURE CODE	MEASURE*	2010 GWh/a	ESTIMATE 2016 GWh/a	ESTIMATE 2020 GWh/a
PA–01–TEM	Energy audits – service sector	100	133	118
PA–02–TEM	Energy efficiency agreement for business - service sector	44	136	122
PA–03–TEM	Energy efficiency agreement for the property sector - office premises	0	148	123
TOTAL ENERGY SAVING – ESD AREA		**144**	**417**	**363**

*Descriptions of the measures and the principles for calculating the savings are set out in Annex 2.

Measures – impact on energy savings evaluated

Energy audits – service sector (PA–01–TEM)

Energy audits for service buildings in the private sector have been subsidised since 1992. During the 1992–2010 period, 1 913 service buildings in the private service sector were audited. The capacity of audited buildings totalled 86.9 million m^3, corresponding to approximately 58% of building stock in the private service sector.

The description of measure PA–01–TEM and the energy saving impact assessment are set out in Annex 2.

Energy efficiency agreement for business – service sector (PA–02–TEM)

The energy efficiency agreement for business contains three sector-specific operational programmes for businesses in the service sector, and these programmes are managed by trade associations in each sector. Additionally, there is one general operational programme for those businesses in the service sector that have not had a specific operational programme prepared for their sector. Sixty-one businesses (as at 1 June 2011) have joined the programmes of measures for the service sector under the energy efficiency agreement for business, including nearly 3 000 premises.

The description of measure PA–02–TEM and the energy saving impact assessment are set out in Annex 2.

Energy efficiency agreement for the property sector – office premises (PA–03–TEM)

The energy efficiency agreement for the property sector contains two programmes of measures. Of these, the operational programme for office premises may be joined by companies that own or use premises, or which manage premises under authorisation from the owner. Fifteen businesses (as at 1 June 2011) have joined the operational programme since the start of 2011, covering more than half of the property stock falling within the scope of the programme.

The description of measure PA–03–TEM and the energy saving impact assessment are set out in Annex 2.

3.3.4 Industry

The most significant energy-saving measures that are monitored separately in industry are the broad energy efficiency agreement scheme for business, and energy audits and analyses of industrial facilities. The impact of these measures on energy savings is monitored separately for industrial premises falling within the scope of the Energy Services Directive and those falling within the Emissions Trading Act. Of the 11.1 TWh impact on savings calculated for 2010, 2.76 TWh (25%) is aimed at industrial energy use falling within the scope of the Energy Services Directive, and 8.35 TWh (75%) is aimed at the use of energy by premises falling within the scope of the Emissions Trading Act. In relation to the total energy end-use of Finnish industry, amounting to approximately 140 TWh, the impact of the measures implemented on energy savings was approximately 8% in 2010.

Table 9. Industry (TE) – overview of the impact on savings

		ENERGY SAVING		
MEASURE CODE	MEASURE*	2010 GWh/a	ESTIMATE 2016 GWh/a	ESTIMATE 2020 GWh/a
TE–01–TEM	Energy audits for industry, ESD	1 435	1 119	1 074
	Energy audits for industry, non- ESD	1 348	848	857
TE–02–TEM	Energy efficiency agreement for business – medium-sized industry, ESD	277	386	389
	Energy efficiency agreement for business – medium-sized industry, non-ESD	80	93	85
TE–03–TEM	Energy efficiency agreement for business – energy-intensive industry, ESD	1 043	1 100	1 179
	Energy efficiency agreement for business – energy-intensive industry, non-ESD	6 924	7 265	7 011
TOTAL ENERGY SAVING – ESD AREA		**2 755**	**2 605**	**2 641**
TOTAL ENERGY SAVING – NON-ESD AREA		8 351	8 207	7 952
TOTAL ENERGY SAVING – ALL		11 106	10 812	10 594

*Descriptions of the measures and the principles for calculating the savings are set out in Annex 2.

Measures – impact on energy savings evaluated

Energy audits for industry (TE–01–TEM)

Energy audits for medium-sized industry have been subsidised since 1992. During the 1992–2010 period, 1 246 medium-sized industrial production facilities have been audited. Energy audits and analyses for energy-intensive industry have been subsidised since 1998, when energy-intensive industry joined the Ministry of Trade and Industry's energy saving agreement scheme. During the 1992–97 period, energy-intensive industry mapped out its opportunities for energy savings, mainly on its own initiative and without any energy aid, which was only used for a few individual projects during the whole period. A significant factor involved in starting energy audit activities in energy-intensive industry was the development of a dedicated two-phase energy audit model, "Energy Analysis of Process Industry".

The description of measure TE–01–TEM and the energy saving impact assessment are set out in Annex 2.

Energy efficiency agreement for business – medium-sized industry (TE–02–TEM)

The energy efficiency agreement for business contains five sector-specific operational programmes for small and medium-sized industrial energy users, and these programmes are managed by trade associations in each sector. There is one general operational programme for those businesses that have not had a specific operational programme prepared for their sector. One hundred and ninety-seven businesses (as at 1 June 2011) have joined these six operational programmes. Energy use by those who have joined the operational programme for medium-sized industry varies depending on the sector, and is on average 50−70% of the energy use in the ESD area for the sectors in question.

The description of measure TE–02–TEM and the energy saving impact assessment are set out in Annex 2.

Energy efficiency agreement for business – energy-intensive industry (TE–03–TEM)

The energy efficiency agreement for business contains a dedicated operational programme for energy users in energy-intensive industry. This programme is joined by industrial businesses with at least one site with total energy consumption of more than 100 GWh/a. Thirty-eight businesses (as at 1 June 2011) have joined the operational programme, and this covers practically all energy use in energy-intensive industry.

The description of measure TE–03–TEM and the energy saving impact assessment are set out in Annex 2.

3.3.5 Energy sector

ENERGY SERVICES

Eighty-seven businesses with over 130 premises have joined the Energy Services operational programme under the energy efficiency agreement for business. Just under one-third of the premises are electricity sale premises, approximately one-third are district heating premises and the remainder are electricity distribution premises. The businesses that have joined the programme for energy services cover nearly 90% of all electricity distribution in Finland, approximately 94% of electricity sales, and 80% of district heating sales.

The businesses that have signed up to the agreement are committed to making their own energy use more efficient and to offering energy services to their customers. The table shows the impact on savings of the measures aimed at the businesses' own energy use. No energy savings have been calculated for the ESD area, owing to the uncertainty factors associated with dividing up the impact on savings.

Table 10. Energy services (EP) – overview of savings

		ENERGY SAVING		
MEASURE CODE	MEASURE*	2010 GWh/a	ESTIMATE 2016 GWh/a	ESTIMATE 2020 GWh/a
EP–01–TEM	Energy efficiency agreement for business – energy services/own activities, non-ESD**	85	303	321
TOTAL ENERGY SAVING –NON- ESD AREA		85	303	321

* Descriptions of the measures and the principles for calculating the savings are set out in Annex 2.

** The impact of the measures has not been divided up into ESD and non-ESD areas at this stage.

Measures – impact on energy savings evaluated

Energy efficiency agreement for business – energy services/businesses' own energy use (EP–01–TEM)

Under the energy efficiency agreement for business, businesses that have joined the Energy Services operational programme and pursue the transfer and distribution of electricity and the sale of district heating have an obligation to set an energy saving target of at least 5% on their own energy use by 2016.

The description of measure EP–01–TEM and the energy saving impact assessment are set out in Annex 2.

Measures – no assessment of impact on energy savings

Energy efficiency agreement for business – energy services/customers

Under the energy efficiency agreement for business, businesses that have joined the Energy Services operational programme and pursue the transfer and distribution of electricity and the sale of district heating have an obligation to implement energy-saving measures in collaboration with those of their customers who receive energy services, where such measures help substantially to meet the 9% energy saving target under the ESD for their customers' energy use in 2008–2016. The energy services offered to customers are mainly "soft" measures, for which there is currently no calculation method available.

The description of measure EP–02–TEM is set out in Annex 3.

ENERGY PRODUCTION

For energy production, the Energy Production operational programme under the energy efficiency agreement for business is being monitored. Thirty-three businesses with nearly 200 premises (as at 1 June 2011) have joined the programme. The electricity production of the businesses that have joined covers 93% of Finland's electricity production and 76% of its heating production. The impact on savings calculated for 2010 is not included in the ESD area.

Table 11. Energy production (ET) – overview of savings

		ENERGY SAVING		
MEASURE CODE	MEASURE*	2010 GWh/a	ESTIMATE 2016 GWh/a	ESTIMATE 2020 GWh/a
ET–01–TEM	Energy efficiency agreement for business – energy production, non-ESD			
	Primary energy saving **	647	1 605	1 679
	Increased efficiency in electricity production	375	1 104	1 157
TOTAL SAVING CALCULATED – NON-ESD**		634	1 746	1 829

*Descriptions of the measures and the principles for calculating the savings are set out in Annex 2.

**An average factor of 2.5 was used to convert the primary energy saving into a form that can be added up.

Measures – impact on energy savings evaluated

Energy efficiency agreement for business – energy production (ET–01–TEM)

The measures in the Energy Production operational programme under the energy efficiency agreement for business are aimed at improving the efficiency of primary energy use and the overall efficiency of energy production. The businesses that have signed up to the agreement are committed to a saving of 1 000 GWh in primary energy use and 1 000 GWh of increased efficiency in electricity production by 2016.

The description of measure ET–01–TEM and the energy saving impact assessment are set out in Annex 2.

3.3.6 Transport

For the transport sector, the impact on savings has been estimated for eight energy-saving measures, the most significant of which is improving the energy efficiency of new cars. The energy savings for the transport sector have been estimated through energy end-use. The impact on savings of nearly 1 TWh, calculated for 2010, corresponds to an energy saving of 1.6% of the 60.6 TWh of total energy consumption by transport. Using these measures, the energy saving has been estimated to rise to 5.5% by 2016 and to nearly 10% by 2020. Additionally, some measures have also been implemented in the transport sector, the energy-saving potential of which is either very difficult to assess or has been assessed as very small.

Table 12. Transport (LI) – overview of savings

		ENERGY SAVING		
MEASURE CODE	MEASURE*	2010 GWh/a	ESTIMATE 2016 GWh/a	ESTIMATE 2020 GWh/a
LI–01–LVM	Improving the energy efficiency of cars	360	2100	4100
LI–02–LVM	Training in economical ways of driving in car traffic	128	173	198
LI–03a–LVM	Training in economical ways of driving in bus and coach traffic	33	42	42
LI–03b–LVM	Training in economical ways of driving in lorry traffic	102	265	242
LI–04–LVM	Promoting public transport	38	230	570
LI–05–LVM	Promoting walking and cycling	38	190	460
LI–06–LVM	Winter speed limits	165	165	165
LI–07–LVM	Tyre pressure checks	134	146	148
TOTAL ENERGY SAVING – ESD AREA		**998**	**3 311**	**5 925**

*Descriptions of the measures and the principles for calculating the savings are set out in Annex 2.

Measures – impact on energy savings evaluated

Improving the energy efficiency of cars (LI–01–LVM)

The energy efficiency of cars is being improved through three different measures. These are: 1) the development of EU legislation; 2) the development of taxation; and 3) the development of guidance through information.

The description of measure LI–01–LVM and the energy saving impact assessment are set out in Annex 2.

Training in economical ways of driving in car traffic (LI–02–LVM)

Training in economical ways of driving in car traffic is promoted both as part of basic driving lessons and by means of courses in economical ways of driving (= further training).

The description of measure LI–02–LVM and the energy saving impact assessment are set out in Annex 2.

Training in economical ways of driving in professional traffic (LI–03a–LVM, LI–03b–LVM)

Training in economical ways of driving for bus and coach drivers and for lorry drivers is promoted, *inter alia*, through the Professional Qualifications Act, which entered into force in 2007.

The description of measures LI–03a–LVM for bus and coach driver training and LI–03b–LVM for lorry driver training and the energy saving impact assessment are set out in Annex 2.

Promoting public transport (LI–04–LVM)

The use of public transport is being promoted through various measures, the most important of which are: 1) coordinating land use and transport, particularly in growing urban areas; 2) targeting investment in routes at points that support public transport; 3) developing public transport legislation; 4) increasing financial support for public transport; 5) investing in development programmes for public transport; and 6) the permanent organisation of the traffic management measure at both national and major urban level.

The description of measure LI–04–LVM and the energy saving impact assessment are set out in Annex 2.

Promoting walking and cycling (LI–05–LVM)

People are being encouraged to walk and cycle more than they currently do through various measures, the most important of which are: 1) coordinating land use and transport, particularly in growing urban areas; 2) reforming planning practices and targeting investment in routes at light traffic routes more than previously; 3) improving the maintenance of light traffic routes; and 4) the permanent organisation of the traffic management measure at both national and major urban level.

The description of measure LI–05–LVM and the energy saving impact assessment are set out in Annex 2.

Winter speed limits (LI–06–LVM)

A general speed limit of 80 km/h is set for most of the Finnish major road network for the winter period (in total from October to the start of April) instead of the 100 km/h speed limit that applies in summer. On stretches of motorway where the speed limit is 120 km/h in summer, speed is restricted to 100 km/h. In addition to having an impact on road safety, the lower speeds in winter also have an impact on traffic energy consumption.

The description of measure LI–06–LVM and the energy saving impact assessment are set out in Annex 2.

Tyre pressure checks (LI–07–LVM)

The tyres on nearly all cars and vans used in Finland are changed twice a year (in spring and in autumn). The tyre pressure is usually checked when the tyres are changed. Tyre pressure has a significant impact on vehicle energy consumption. Approximately 0.5 bar of under-pressure increases fuel consumption by an estimated 3–6%, corresponding to additional consumption of 0.2–0.4 litres for a journey of 100 kilometres in a car that consumes 7 l/100 km.

The description of measure LI–07–LVM and the energy saving impact assessment are set out in Annex 2.

Measures – no assessment of impact on energy savings

Improving the energy efficiency of vans

The energy efficiency of vans is being improved mainly through EU legislation and car and vehicle tax. The Regulation of the European Parliament and of the Council setting emission performance standards for new light commercial vehicles (binding limit on CO_2 from vans) was approved in March 2011. The aim of the regulation is to bring the average level of carbon dioxide emissions from new vans down to 175 g CO_2/km by 2017 and to 147 g/km by 2020. The regulation will enter into force in Finland as it stands, on the third day following its publication.

Finnish car and vehicle tax was reformed in 2007. The car tax reform entered into force on 1 January 2008 and the vehicle tax reform on 1 March 2010. The reform and the tax levels are described in Annex 2 (LI–01–LVM), which describes the improvements to the energy efficiency of cars. Since the necessary statistical data on the trends in carbon dioxide emissions from vans are not currently available, it is not yet possible to perform a calculation.

Energy efficiency agreements for transport

There are two energy efficiency agreements in force in the transport sector: the energy efficiency agreement for public transport (2008–2016) and the energy efficiency agreement for goods transport and logistics (2008–2016). They are part of the wider body of energy efficiency agreements (see section 2.2.6).

The implementation of energy efficiency agreements for transport has had a rather faltering start. Fewer than 1 000 businesses have signed up to the goods transport agreement (the target is approximately 5 400 businesses), and four have signed up to the public transport agreement (the target is approximately 1 200 businesses). Agreement-related activities will be developed during 2011. Unless there is some progress in the trend towards the energy savings target that has been set, the Ministry of Transport and Communications will make a decision on alternative methods by no later than 2012.

For the businesses that have signed up to the agreement, once of the key means of improving energy efficiency in transport has been training drivers in economical ways of driving. Thanks to the Act on Professional Qualifications, training for lorry, bus and coach drivers has gradually become mandatory for all professional drivers since 2007. The energy efficiency impact of the Professional Qualifications Act is evaluated in Annex 2 (LI–03a–LVM and LI–03b–LVM). The other effects of the energy efficiency agreements are currently assessed to be very small, and have not been evaluated this time.

Energy labelling for tyres

Commission Regulation (EC) No 1222/2009 on the energy labelling of tyres entered into force in November 2009. The properties and air pressure of tyres affect rolling resistance, which is one of the key factors affecting vehicle fuel consumption. Rolling resistance causes approximately one-fifth of fuel consumption in cars, and approximately one-third in lorries. There may be differences in rolling resistance of as much as 50–70% between tyre models.

The aim of the regulation is to promote consumer awareness of the proportion of fuel consumption accounted for by the tyres. The labelling should be done by gluing a sticker or table onto the tyres in the same way as is currently done for the energy classification of household appliances. The labels are to be introduced in the Member States starting from 1 November 2012.

According to the Commission's estimates, the Tyre Labelling Regulation may reduce traffic energy consumption by as much as 10%, but in the absence of any experience the impact of labelling on Finnish traffic has not yet been evaluated in this context.

Procurement of clean and energy-efficient road transport vehicles

Directive 33/2009 on the procurement of clean and energy-efficient vehicles was issued in May 2009. The Directive's national implementation is underway in Finland.

The aim of the Directive is to consider in the procurement of motor vehicles their impact on energy and the environment during their life cycles. The Directive applies to the public sector and also, to a certain extent, to providers of public transport services. When procuring vehicles, they must at least consider the vehicle's energy consumption and carbon dioxide emissions, as well as emissions of nitrogen oxides, hydrocarbons and particles, and also other environmental effects if they so wish. These matters are to be considered either by imposing (minimal) technical requirements on the vehicle with regard to its energy and environmental efficiency or by including energy and environmental impact as part of the decision to purchase (points score + value in EUR of environmental matters).

The impact of the Directive on energy savings has not been evaluated in Finland at this stage, since there is not yet any experience of applying the Directive in Finland.

3.3.7 Agriculture

Five energy-saving measures are presented for the agriculture sector, one of which is a far-ranging energy savings programme. Of the 13.8 TWh of energy end-use on agricultural and horticultural farms, an energy

saving of 8.9% was achieved using these energy-saving measures in 2010. The impact on savings has been estimated as approximately 13% by 2016 and nearly 17% by 2020.

Table 13. Agriculture (MA) – overview of savings

		ENERGY SAVING		
MEASURE CODE	MEASURE*	2010 GWh/a	ESTIMATE 2016 GWh/a	ESTIMATE 2020 GWh/a
MA-01-MMM	Investments in boiler houses	1 210	1 568	1 757
MA-02-MMM	Fresh grain silos	4	17	31
MA-03-MMM	Unheated cattle buildings	2	9	17
MA-04-MMM	Agricultural reparcelling project	8	49	73
MA-05-MMM	Farm Energy programme	0	169	440
TOTAL ENERGY SAVING – ESD AREA		**1 224**	**1 812**	**2 318**

*Descriptions of the measures and the principles for calculating the savings are set out in Annex 2.

Measures – impact on energy savings evaluated

Investments in boiler houses (MA–01–MMM)

The Ministry of Agriculture and Forestry is promoting the use of wood, and of building materials and energy sources based on other renewable natural resources. Many farms are self-sufficient in the production of wood chips, and changing energy types is generally a worthwhile investment. Other biofuels generated by agricultural activity are also exploited. Since 1996, the Ministry has granted investment aid for building boiler houses when the switch is made from fossil fuels to biofuels.

The description of measure MA–01–MMM and the energy saving impact assessment are set out in Annex 2.

Fresh grain silos (MA–02–MMM)

The Ministry of Agriculture and Forestry grants investment aid for the construction of silos used to store fresh grain. Fresh-stored grain may be used to replace dried feed grain in cattle farming. Fresh feed storage involves significantly lower energy consumption than traditional grain-drying methods.

The description of measure MA–02–MMM and the energy saving impact assessment are set out in Annex 2.

Unheated cattle buildings (MA–03–MMM)

In agricultural construction guidelines, and with the help of agricultural investment aid, farmers are instructed to build unheated cattle sheds wherever possible from the perspective of animal welfare and the viability of production. The electrical and heat energy consumption of cold cattle sheds is lower than that of heated cattle sheds and other cattle buildings.

The description of measure MA–03–MMM and the energy saving impact assessment are set out in Annex 2.

Reparcelling project (MA–04–MMM)

Agricultural reparcelling means bringing together the fragmented fields, forests, roads or other agricultural property of various owners in order to turn them into bigger units that are more functional in terms of management and ownership. The reparcelling of fields has a particular impact on agricultural energy savings. Farm sizes in Finland have increased, but the extra land is often situated far away from the economic centre of the farm and is small in size. Reparcelling is a way of updating the structure of farms and of developing rural land use.

Reparcelling is done in collaboration with landowners, the National Land Survey of Finland and other land-use experts. The road and drainage networks are also repaired in conjunction with reparcelling

where necessary. During the 1995–2010 period, reparcelling was carried out on a field area of 141 555 hectares. There are currently 71 reparcelling projects and 38 needs assessments in progress.

The description of measure MA–04–MMM and the energy saving impact assessment are set out in Annex 2.

Farm Energy programme (MA–05–MMM)

The Farm Energy programme is an energy efficiency agreement programme that farms may join voluntarily. The background players are the Ministry of Agriculture and Forestry and national agricultural and horticultural producer organisations. The programme started in January 2010 and will continue until at least the end of 2016. The aim is for the programme to involve a number of farms representing 80% of total energy use in the agricultural sector. In addition to producing notifications and guidance materials, the measures in the programme include, *inter alia*, subsidised farm energy plans and audits. By the beginning of June 2011, 181 farms had joined the programme and subsidised energy plans had been prepared for 80 farms.

The description of measure MA–05–MMM and the energy saving impact assessment are set out in Annex 2.

3.3.8 Households

No impact on energy savings is calculated separately for households. If the heating, property electricity and household electricity are taken into consideration for household energy use, the energy saving from other energy efficiency measures set out in this action plan and aimed at household energy use is calculated as being of the order of 5–6 TWh in 2010, corresponding to 8–9% of households' 64 TWh of energy use (in 2009). When examined in this way, the amount saved may be estimated to increase to 18–20% by 2016 (12–13 TWh) and to 24–26% by 2020 (16–17 TWh).

Of the savings calculated for buildings, 70–80% is aimed at residential buildings, as is some of the impact of the Ecodesign Directive presented under the horizontal measures. Household consumers also comprise the main target group for far-ranging communication, advice and training activities, the impact on savings of which is not evaluated separately in this action plan. When viewed more broadly, some of the energy savings from transport may also be regarded as being aimed at the energy use of households and consumers.

3.3.9 Horizontal measures

There are a significant number of horizontal measures promoting energy savings and energy efficiency in Finland, concerning which at this stage there is no method available for calculating the impact on savings. These measures typically include "soft" measures, i.e. education and training, communication, and advice as well as development and research programmes and projects. It has also not been considered appropriate to prepare separate impact assessments for all economic policy instruments, such as taxation and aid. There is a large extent of overlap in terms of savings with measures for which the savings impact has been calculated. The only horizontal measure for which the impact on savings has been evaluated is the Ecodesign Directive, and the equipment-specific energy efficiency requirements that have been set pursuant to it.

Table 14. Horizontal measures (HO) – overview of savings

		ENERGY SAVING		
MEASURE CODE	MEASURE*	2010 GWh/a	ESTIMATE 2016 GWh/a	ESTIMATE 2020 GWh/a
HO–13–TEM	Ecodesign Directive and energy efficiency requirements for each equipment group	0	1 338	3 130
TOTAL ENERGY SAVING – ESD AREA		**0**	**1 338**	**3 130**

*Descriptions of the measures and the principles for calculating the savings are set out in Annex 2.

Measures – impact on energy savings evaluated

Ecodesign Directive and energy efficiency requirements for each equipment group (HO–13–TEM)

The energy efficiency requirements of products that use energy are regulated by Commission Regulations laid down pursuant to the Ecodesign Directive (2009/125/EC). Equipment and products with poorer energy efficiency will be eliminated from the market as a consequence of these requirements. In 2009, an impact on savings was calculated for 13 different product groups in Finland, as part of the impact assessment for proposed measures to improve energy efficiency.

The description of measure HO–13–TEM and the energy saving impact assessment are set out in Annex 2.

Measures – no assessment of impact on energy savings

TAXATION AND AID

Tax guidance (HO–01–VM)

Energy efficiency in Finland is guided by means of tax on energy products, car and vehicle tax, and household deductions. The impact of tax guidance has not been evaluated separately, since it affects nearly all of the measures set out in this national energy efficiency action plan. The impact of household deductions on energy savings also has some overlap with energy subsidies.

The description of measure HO–01–VM is set out in Annex 3.

Energy aid from the Ministry of Employment and the Economy (budget entry 32/60/40)

Energy aid from the Ministry of Employment and the Economy is granted to businesses and companies for investments that promote energy savings and the use of renewable energy, and for energy audits. A separate payment authorisation is set aside from the energy aid every year for energy audits and investments in energy saving. The aid is granted by the Energy Department of the Ministry of Employment and the Economy and by the 15 regional Centres for Economic Development, Transport and the Environment (ELY centres).

Aid for normal investments in energy saving is restricted to businesses and companies that have signed up to the energy efficiency agreements, and the level of aid is 25% as a general rule. Aid may be granted to all businesses and companies for investments in new technology, and the aid level is generally 30–35%. During the 1998–2008 period, EUR 2–4 million of energy aid was granted every year for investments in energy savings. The number of energy savings projects has increased significantly over the last two years. EUR 5.4 million of energy aid was granted in 2009, EUR 12 million in 2010, and the number of projects is expected to continue to grow in 2011. Energy audits have been subsidised since 1992. The amount of annual energy aid has been on average EUR 1.4 million, and the level of aid 40–60%, depending on the energy audit model and the aid applicant. Approximately EUR 2.2 million of energy aid was granted in 2009 and 2010, and the number of projects is expected to continue to rise in 2011. The key factor in the background to the rise in the amount of energy aid is the energy efficiency agreement scheme that started in 2008.

The impact of energy aid on energy savings has not been evaluated separately, since it largely overlaps with the energy audits and the energy savings investments reported within the framework of the energy efficiency agreement scheme, the impact of which on savings is set out in section 3.3 above.

EDUCATION AND TRAINING

Sustainable development and energy efficiency in general education (HO–02–OKM)

In secondary school and sixth form, energy efficiency is linked to the subject of sustainable development. Learning about energy efficiency is promoted, *inter alia*, by producing learning materials for use in schools.

The description of measure HO–02–OKM is set out in Annex 3.

Sustainable development and energy efficiency in vocational training (HO–03–OKM)

The reform of the basics of vocational training in each educational programme was completed in 2010. Sustainable development is a key skill in life-long learning. In the different parts of vocational degrees of the educational programmes energy efficiency is dealt with according to the sector-specific weighting. Vocational training establishments are encouraged to include sustainable development in their activities, management and teaching.

The description of measure HO–03–OKM is set out in Annex 3.

Sustainable development and energy efficiency in higher education (HO–04–OKM)

Institutions of higher education decide on the content of their education independently. The energy sector may be studied as an undergraduate and in postgraduate and supplementary education. In particular, training programmes focusing on energy efficiency are found in the vocational apprenticeship training component of continuing education. This is a new form of education that has been organised by means of funding from the Ministry of Education and Culture since 2009.

The more detailed description of measure HO–04–OKM is set out in Annex 3.

Sustainable development certificates for schools (HO–05–OKM)

The energy efficiency of schools is promoted by supporting their day-to-day practices. Models and tools for building sustainable development programmes and promoting sustainable development as a whole have been developed for educational establishments. These include sustainable development certification for educational establishments, and the Green Flag.

The description of measure HO–05–OKM is set out in Annex 3.

Measures linked to environmental education for young people (HO–06–OKM)

There are ten youth centres in Finland the development of which is funded by the Ministry of Education and Culture. The national youth centres have developed into specialists in environmental education, camps and nature schools, as well as implementers of social youth work in the natural environment. Local councils may obtain aid to prepare environmental education models for youth work.

The description of measure HO–06–OKM is set out in Annex 3.

COMMUNICATION AND ADVICE

Motiva (HO–07–TEM)

Motiva Oy is a company offering expertise and services, operating as an in-house unit fully owned by the state. It engages in diverse work to increase the sustainable use of energy and materials and the use of renewable sources of energy. Advice and communication as well as the networking of operators and the production of information materials are key parts of Motiva's activities. It has been in operation for almost 20 years.

The description of measure HO–07–TEM is set out in Annex 3.

Energy advice for consumers (HO–08–TEM/YM/LVM)

Consumers need reliable energy advice. In 2010–2011, there were 24 pilot projects on energy advice, funded by the Ministry of Employment and the Economy and by Sitra, and 13 on travel management,

funded by the Ministry of Transport and Communications and the Finnish Transport Agency. In December 2010, the Ministry of Employment and the Economy designated Motiva as the coordination centre for consumer energy advice. The Ministry of the Environment has set up the www.korjaustieto.fi portal to support advice on renovations.

The description of measure HO–08–TEM/YM/LVM is set out in Annex 3.

Energy advice for SMEs (HO–09–TEM)

In 2009, within the framework of the energy efficiency agreement for business, an energy efficiency advice project was started, aimed mainly at medium-sized businesses that had signed up to the agreement. The businesses were from four sectors of industry as well as the tourism and catering sector. Motiva is responsible for the implementation of the advice project, which is co-funded by the Ministry of Employment and the Economy and by trade associations, and it includes telephone advice, sector-specific seminars, business visits and the production of advice-related materials.

The description of measure HO–09–TEM is set out in Annex 3.

Established communication activities and campaigns (HO–10–TEM/YM/LVM)

The annual communication campaigns established at national level are Energy Savings Week and Mobility Week. Energy Savings Week, which is coordinated by Motiva, highlights topical themes in energy efficiency and offers energy-saving tips to businesses, communities and consumers. In 2010, Energy Savings Week was held for the fourteenth time and had 458 participants, while Mobility Week involved 19 players, mainly local councils. The Local Government Climate Campaign coordinated by the Association of Finnish Local and Regional Authorities has a strong communicative element.

The description of measure HO–10–TEM/YM/LVM is set out in Annex 3.

Tools and web-based services (HO–11–TEM/YM/LVM)

Information relating to energy efficiency is rapidly shifting towards web-based services aimed at various target groups. Information materials, leaflets and electronic tools for these web-based services are produced by several operators in Finland. Web-based services already cover a significant part of the information needed by energy end-users. There are dedicated websites for, *inter alia*, the procurement of equipment, lighting products, low-energy construction, renovation building, and travel and transport. A key web-based service, www.motiva.fi, which contains impartial information on energy efficiency, is a popular and reliable source of information, which had 242 000 visitors in 2010.

The description of measure HO–11–TEM/YM/LVM is set out in Annex 3.

Information and advice activities in the agricultural sector

The web-based Bioenergiatieto [Bioenergy Information] service of the Ministry of Agriculture and Forestry at www.bioenergiatieto.fi presents, *inter alia*, ways of promoting renewable energy and energy efficiency and associated services in rural areas. Energy efficiency advice for farms is also offered by various advisory agencies, such as Pro Agria and the Work Efficiency Institute.

Ecodesign communication for equipment manufacturers and importers

In connection with the implementation of the Ecodesign Directive, in collaboration with the Finnish Safety and Chemicals Agency (Tukes), the Ministry of Employment and the Economy and the Ministry of the Environment launched a communication project in 2009, aimed at equipment manufacturers and importers, and targeting SMEs in particular. A website was set up for the project[25], including exhaustive, up-to-date guidance on the requirements for each product group. The main operating mode of the project is visits to companies, during which importers are informed about the changes brought about by the Ecodesign Directive. Fifty visits were made in 2010, and the target for 2011 is 80 business visits. The visits

[25] http://www.ekosuunnittelu.info [Finnish only].

to companies have been found to be an effective means of communication, especially for micro-enterprises, which would not otherwise be reached. The communication project is being implemented on an annual budget of EUR 70 000.

Ecodesign and energy labelling communication for consumers

In Finland, communication concerning the Ecodesign and energy labelling requirements aimed at consumers is managed by Motiva. The communication activity is funded by the Ministry of Employment and the Economy and the Ministry of the Environment. Publications for consumers include the guide "Good Buy – A Guide to the Acquisition of Energy-Efficient Household Appliances 2011". The guide also has a website[26].

Communication relating to lighting products

Household lighting products have a dedicated website[27], which Motiva maintains together with operators in the lighting sector. The website contains information on, *inter alia*, selecting the right type of light bulb and places to which bulbs may be returned. In connection with this, an online course[28] on light bulbs has also been developed for sellers. The course material sets out the main issues affecting the selection of light bulbs in a clear, interactive format.

Standardisation of official guidance on renovation building

In order to standardise official guidance on renovations, the Ministry of the Environment has commissioned the reporting and analysis of approximately 150 cases, or "sore points". Approximately 10% of these are connected to the energy efficiency of buildings. The case evaluations and methodology guidelines are published on the www.korvo.fi website. The service is particularly aimed at professionals and officials in the construction sector.

RESEARCH, DEVELOPMENT AND INNOVATION

This section sets out the main programmes used in connection with energy savings and energy efficiency. The total budget for funding the projects is also given. Approximately half of the financing for Tekes programmes generally comes from public funds.

Green Growth – the way towards a sustainable economy (2011–15)

The aim of the Tekes Green Growth programme is to identify new potential areas of growth in sustainable economic activity, based on substantially lower use of energy and natural resources. The total funding for the programme is EUR 80 million.

Sustainable community (2007–12)

The Tekes Sustainable community programme[29] creates new, renewable business activities in the planning, construction and maintenance of sustainable, energy-efficient areas and buildings, and in their repairs. The total funding for the programme is EUR 100 million, and a total of 155 projects have been funded through it.

Clusters of strategic cutting-edge expertise (SHOK)

Strategic cutting-edge expertise clusters (SHOK) offer research units and businesses exploiting research results close, long-term collaboration. Tekes promotes the creation of the clusters, develops their operational prerequisites, and also funds the research programmes and projects undertaken by the clusters.

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[26] http://www.motiva.fi/ostajanopas [Finnish only].

[27] http://www.lampputieto.fi [Finnish only].

[28] http://www.lamppukoulu.fi [Finnish only].

[29] http://www.tekes.fi/ohjelmat/yhdyskunta [also available in English].

Not-for-profit limited-liability companies are in charge of the operation of individual SHOK clusters. The companies have as shareholders major businesses, universities and research institutions which operate in the field concerned.

CLEEN Oy, the cluster for energy and the environment, was founded in 2008. It is currently preparing a programme in the area of energy efficiency, which is an element of CLEEN Oy's Intelligent Energy Networks and Energy Markets programme (2010–14), which has already started, and the annual budget of which is more than EUR 7 million. RYM Oy, the cluster for strategic cutting-edge expertise on the built environment, runs the PRE (Built Environment Process Re-Engineering) programme and is in the process of preparing a programme entitled Internal Environments that Promote Health and Improve Productivity as well as another one entitled Energizing Society. The clusters responsible for forestry and the metal and machinery manufacturing industries also have programmes relating to resource and energy efficiency, either already up and running or currently being planned. Examples include the EFFIMA programme (2009–2013) managed by FIMECC Oy, the cluster for the metal and machinery manufacturing industry, which focuses on energy-efficient machinery and has a total budget of more than EUR 40 million.

Sustainable Energy programme (2008–2011)

The Sustainable Energy programme[30] (SusEn) of the Academy of Finland focuses on research and development concerning raw materials, technology and processes relating to energy production and use, and on analysing the socio-economic and political systems designed to manage them. The thematic areas of the programme are new energy production technologies, efficient energy systems and efficiency of energy use. Of the EUR 13 million of total funding for the programme, approximately EUR 1 million comes from businesses and foundations.

Energy programme (2008–2012)

Sitra's Energy programme focuses on making energy use more efficient and reducing greenhouse gas emissions in the built environment. The measures are the production and dissemination of impartial information to support social decision-making, the development of new operating models in collaboration with partners, and boosting business through capital investments. The total funding for the programme is EUR 30 million, and there is close collaboration with the Tekes Sustainable Community programme and with the ministries.

Centres of Excellence programme (2007–2013)

The Centres of Excellence programme[31] (OSKE) is a special programme coordinated by the Ministry of Employment and the Economy, which serves to direct local, regional and national resources towards exploiting expertise. Of the programme's thirteen expertise clusters, the Energy Technology, Environmental Technology and Residential cluster programmes include activities relating to energy efficiency. The energy efficiency of industry and of urban areas are examples of the areas of input. Project preparation, business engagement, reinforcement of collaboration and strengthening of expertise are at the core of the measure. The Centres of Excellence programmes have an important role in transferring research expertise generated through public funds to businesses and into practical application.

TransEco research programme (2009–2013)

In 2009, an extensive five-year research programme into energy savings and renewable energy in road traffic commenced. The main objectives of the TransEco programme[32] are to make energy use in road traffic more efficient and to introduce more renewable energy. The projects in the programme are devel-

[30] http://www.aka.fi/fi/A/Tutkimusohjelmat/kaynnissa/Kestava-energia-SusEn/ [English version available at http://www.aka.fi/en-GB/A/Research-programmes/Ongoing/Susen/].

[31] http://www.oske.net/osaamisklusterit [English version available at http://www.oske.net/en/].

[32] http://www.transeco.fi FI/EN [English version available at http://www.transeco.fi/en/].

oping technology to reduce energy use and emissions in road traffic as well as commercialising the results of the development work. The programme is important for the development of progressive biofuels and technology for electric and hybrid cars, and for their marketing. Various applications of information technology also have a significant role in the programme. The total funding for the programme is EUR 15 million.

Other programmes relating to energy efficiency

Tekes's EVE (electric vehicle systems) programme (2012–2015) and Fuel Cell programme (2007–2013) will create efficient technologies for future transport systems. Energy efficiency is also a focal point in Tekes's Water programme (2008–2012), from the perspective of making water use more efficient.

Tekes's Climbus programme (2004–08) has provided approximately EUR 1 million in funding for the far-reaching Energy Efficiency Indicators and Potential (EPO) project being implemented in 2008–2011, which is researching energy efficiency concepts and indicators and developing an approach for calculating the achievable energy efficiency potential. The five components of the EPO project are industry, transport, energy production, construction and communities.

The Academy of Finland Climate Change – Impact and Management FICCA programme (2011–2014) was started to meet the scientific challenges created by climate change in a far-ranging manner. The general goal of the Sustainable Production and Products KETJU research programme (2006–2013) is to meet the significant future basic research challenges of chemical technology and of process and production technology.

Various development and innovation projects relating to renewable energy and energy efficiency are funded through the rural development programme for mainland Finland (2007–2013), which is administered by the Ministry of Agriculture and Forestry.

Among other things, various research projects promoting both the competitiveness of agricultural and food production and social adjustment are funded every year through research funding from the Development Fund of Agriculture and Forestry (Makera). Much research into agricultural construction has been funded in recent years, and one of the elements that has been researched is improving energy efficiency.

The Sustainable Development Division of the Advisory Board for Sectoral Research, which is coordinated by the Ministry of Education and Culture, carried out a research project on energy efficiency in the public sector in 2008–11.

COMMUNITY PLANNING AND ZONING

Guidance to make community planning more energy efficient (HO–12–YM)

There are several projects relating to community planning and zoning in progress under the jurisdiction of the Ministry of the Environment, one of the aims of which is also to improve energy efficiency. These projects comprise the amendment of the Land Use and Building Act (132/1999) concerning the content of the plans that guide the location of commerce, development projects involving national and regional cooperation in order to integrate communities, model projects on energy-efficient town planning, pilot sites for regional development, and methods for evaluating the energy efficiency of the community structure.

The description of measure HO–12–YM is set out in Annex 3.

4 OTHER OBLIGATIONS UNDER THE ENERGY SERVICES DIRECTIVE (ESD)

4.1 Public sector

Article 5 of the Energy Services Directive requires Member States to ensure that the public sector fulfils an exemplary role in the context of the Directive. To this end, they shall communicate effectively the exemplary role and actions of the public sector to citizens and/or companies, as appropriate.

Member States shall ensure that one or more energy efficiency improvement measures are taken by the public sector. At least two of the measures, however, shall be selected from the list set out in Annex VI to the Energy Services Directive. Of the measures in the list, five relate to energy efficiency in public procurement and one concerns energy audits. Member States shall facilitate this process by publishing guidelines on energy efficiency and energy savings as a possible assessment criterion in competitive tendering for public contracts. Member States shall also facilitate and enable the exchange of best practices between public sector bodies.

In the context of the implementation of the Energy Services Directive in Finland, the public sector consists of central government and local government. The central government of the state comprises 12 ministries and approximately a hundred agencies and departments. Taking into account regional and local government, there are approximately 1 000 individual central government bodies in Finland. Approximately 600 of these bodies are small[33] and some of them do not have any "own" energy use at all. Local government consists of 336 local councils and 184 municipal federations (2011). Thanks to the consolidation of local government, the number of local councils has fallen by more than one hundred in the space of ten years, and is estimated to continue falling significantly until 2020.

4.2 Exemplary role of the public sector

In Finland, the exemplary role written into the Energy Services Directive is regarded as meaning that the public sector sets its own energy savings target for its own energy use, at least in line with the saving of 9% in the Energy Services Directive, by 2016, in addition to implementing and communicating energy-saving measures.

The Government resolution of 4 February 2010, concerning energy efficiency measures, imposes an obligation on state organisations to prepare energy efficiency plans by the end of 2012. In connection with the preparation of the energy efficiency plans government organisations will set comprehensive targets for energy efficiency and energy savings. In 2010, an environmental scheme was already in use at 30% of state agencies and departments. In future, the preparation of energy efficiency plans will serve to improve and complement the implementation of these schemes.

Senate Properties, which manages the majority of building stock used by the state, has signed up to the energy efficiency agreement for the property sector. The agreement includes a mandatory energy savings target of 6% over the 2011–2016 period as well as the obligation to prepare an efficiency plan, to disseminate information to tenants and to impose energy efficiency obligations on property management agreements. Annually, Senate Properties runs one or two of its own broader development projects, funded by Tekes, as well as participating in 10–15 research and development projects. It is openly committed to sharing the results of its development work and to participating actively in joint research and development activities in the sector. Senate Properties has published a social responsibility report on its activities since 2002. The management of central government property has traditionally been somewhat more advanced than in the private sector in Finland. In particular, Senate Properties is well-known as a pioneer in the Finnish property sector.

[33] Authorities with no more than 50 employees.

In local government, the exemplary role is a key contractual obligation of the energy efficiency agreement scheme (2008–2016). Councils that sign up to the agreement scheme also commit to an energy saving of at least 9% as well as including the promotion of energy efficiency as part of their management system and preparing an action plan on the implementation of energy-saving measures and other contractual obligations. The local government agreement scheme is described in Annex 2 (KU–01–TEM).

4.3 Communication to citizens and/or companies

One of the obligations written into the local government energy efficiency agreement (KU–01–TEM) is education and information activities and, in this context, the targets of the communication activity are listed as their own staff, fiduciaries, the media, citizens, and corporate bodies. Several large councils communicate with citizens and companies through energy agency-type organisations including, for example, Ekokumppanit Oy (Tampere/Pirkanmaa), Valonia (Turku/Finland Proper), the Central Finland Energy Agency (Jyväskylä/Central Finland), Popento (Oulu/Northern Ostrobothnia), Vintilä (Joensuu/North Karelia), Thermopolis Oy (Lapua/Southern Ostrobothnia), ESET (Mikkeli/South Savo), HKR Rakennuttaja (Helsinki), the Satakunta Energy Agency (Pori) and Climateinfo (Helsinki Metropolitan Area).

4.4 Guidance on considering energy efficiency in public procurement

In November 2008, the Ministry of Employment and the Economy published guidelines on the consideration of energy efficiency in public procurement. These guidelines replaced the recommendations of the Ministry of Trade and Industry, which had been issued in 2000. The Ministry of Employment and the Economy's guidelines were shared with all local councils and a significant proportion of central government bodies. The guidelines are also available in an electronic version on the websites of the Ministry of Employment and the Economy and Motiva. The guidelines were updated in June 2011, in line with the new obligations arising from the Ecodesign Directive.

Motiva has been commissioned by the Ministry of Employment and the Economy to produce precise procurement guidelines for several equipment groups and sectors as well as models for calls for tender and tools for calculating the life-cycle costs of the equipment that is the object of the procurement. These specific guidelines and calculation tools are available electronically on Motiva's website. In addition to actual procurement, some of the guidelines also deal with the energy-efficient and appropriate use of equipment and systems. One of the major subjects of the guidelines is the use of the ESCO service by local councils.

An environmental technology procurement advice service connected to Motiva was established in 2009. As part of its advice service, there is a dedicated website[34] on Motiva's web pages, which brings together comprehensive guidelines and tools relating to environmental and energy-efficient procurement. Motiva's procurement service also offers advice for large, one-off procurement procedures.

There are also guidelines on the environmental and social perspectives to be taken into account in public procurement and the responsibility of public procurement, in the state procurement strategy approved on 8 October 2009 by the strategic steering group on state procurement activities. There are further instructions in the 2010 state procurement manual, and in the guidelines produced by the Ministry of the Environment.

The Ministry of Finance is responsible for the strategic management and development of state procurement activities at group level, and for preparing a general strategy and operating policies for procurement activity. The Ministry of Finance also decides what procurement is to be put out to tender centrally, and manages Hansel Oy, which operates as the state's joint procurement unit, and the publicly

[34] http://www.motivanhankintapalvelu.fi [Finnish and Swedish only].

owned Senate Properties, which provides premises-related services to agencies and departments in state-owned properties, as well as other property-related services.
Hansel Oy, as the state's joint procurement unit, is responsible for all competitive tendering of procurement for central government and it is in charge of drafting and maintaining agreements. Its aim is to ensure that the targets set out in the Government resolution of 8 April 2009 on promoting sustainable choices are considered in all its new framework agreements. Additionally, all the valid framework arrangements have been evaluated from the environmental perspective. Procurement that meets the environmental criteria can be monitored through Hansel Oy's reporting system.

The state procurement strategy essentially states that, when implementing procurement, the framework arrangements put out to competitive tendering by the joint procurement unit Hansel Oy should primarily be exploited, and that the unit's own competitive tendering should ensure that the end result is financially beneficial overall, considering environmental perspectives. The operational programme for the strategy, the implementation of which is monitored by the Ministry of Finance and the National Audit Office, contains the following measures with regard to energy efficiency:

- Central government is to consider environmental perspectives in at least 70% of its own procurement in 2010, and in all its procurement in 2015;
- Journeys and the need to travel by car are to be reduced by means of travel tickets as employment perks, and by exploiting remote and video conference technology;
- In the procurement and leasing of energy-consuming equipment, criteria corresponding to the level required for energy and environmental labelling are to be used as the technical specifications or as the basis for an overall comparison;
- In the procurement of services, the impact on the environment during the life cycle of the service will be reduced *inter alia* by taking into account the criteria developed for services for the purposes of Nordic or EU environmental labelling;
- Procurement packages and procedures support the introduction of life-cycle, usable lifetime and eco-efficiency principles in the implementation of procurement.

4.5 Exchange of best practice

The exchange of best practice is promoted as a continuous activity in local government by gathering and sharing information about measures that have been found to be good. However, the construction of networks of experts for active local councils, and joint events for experts, have been deemed to be the most important measures. A key permanent mode of action is that of liaison officer days linked to the local government energy efficiency agreement. This two-day event is organised on an annual basis, with participation by practically all local councils that have signed up to the agreement. Another long-term activity is the Local Government Climate Campaign coordinated by the Association of Finnish Local and Regional Authorities, which involves 46 local councils and two municipal federations. Two annual meetings are arranged within the framework of the Climate Campaign, as well as a Local Government Climate Conference every other year.

In addition to permanent modes of action, the exchange of information is promoted by several projects. The first phase (Hinku) of the Carbon-Neutral Local Government project[35], which is funded by Tekes and coordinated by the Finnish Environment Institute, was implemented in 2008–2010. There are 11 local councils involved in the second phase of the project (Prohinku) in 2010–2012. There are 34 local councils taking part in a project entitled Entity Management and Climate Change in Local Government Decision-Making (2010–2011), which is coordinated by the Association of Finnish Local and Regional Authorities. In addition to this, several regional events are organised every year by energy agencies and others.

[35] http://www.ymparisto.fi/default.asp?contentid=385715&lan=FI

4.6 Measures to improve energy efficiency in the public sector (Annex VI to the ESD)

The implementation of energy efficiency activities in central government is based on the Government resolution of 8 April 2009 on the promotion of sustainable choices in public procurement. The measures that are mandatory for central government relate to the procurement of public transport services, cars and equipment, energy audits of buildings, and renovations and leased properties. In practice, the Government resolution obliges central government to implement three of the six measures listed in Annex VI to the Energy Services Directive.

The obligations under the local government energy efficiency agreement scheme include energy efficiency guidelines for public procurement, guidelines for design that considers energy efficiency, energy audits, new financing procedures for investments (ESCO service), consumption monitoring, new operating models, education and information activities, the introduction of renewable energy sources, and annual reporting, through which the implementation of the contractual obligations is monitored. In practice, local councils that are signed up to the agreement scheme are committed to implementing five of the six measures listed in Annex VI to the Energy Services Directive.

4.7 Information and advice for energy end-users

Article 7 of the Energy Services Directive contains an obligation to increase the amount of information and advice intended for energy end-users. Information and advice concerning energy efficiency is provided by nearly all energy companies, energy agencies, environmental information and service centres, The Consumer Agency, research institutes, many associations and organisations, building control departments of local councils, and building centres in Finland. One of the key players is Motiva, which was founded in 1993 and designated by the Ministry of Employment and the Economy in 2010 to act as the national coordination centre for consumer energy advice. Basic public funding for information and advice activities is approximately EUR 1.5 million per annum, in addition to which approximately EUR 2 million of additional public funds have been earmarked in 2010–2011 for start-up projects on a permanent energy advice scheme for consumers. Communication and advice activities linked to energy efficiency for energy end-users are described in more detail in sections 2.2.8 and 3.3.9, and in the more detailed descriptions of Annex 3.

4.8 Obligations of energy companies

The obligations of energy companies under the Energy Services Directive are regulated by the Electricity Market Act (386/1995) and the Decree issued pursuant thereto (518/1995), the Natural Gas Market Act (508/2000) and the Decree issued pursuant thereto (622/2000) as well as the Act on Energy Efficiency Services of Companies Operating in Energy Markets (1211/2009) and the Council of State Decree on the Reporting and Measuring of Electricity Supplies (66/2009).

These regulations are supplemented by the HÖYLÄ III energy efficiency agreement for heating and liquid fuel distribution, and by the Energy Production and Energy Services programmes of measures connected to the energy efficiency agreement for business.

All six fuel oil distribution companies and three sector organisations are involved in the Höylä III energy efficiency agreement.

The Energy Production operational programme may be joined by electricity and heat producers. Its obligations are aimed at improving the efficiency of primary energy use and the overall efficiency of energy production.

The Energy Services operational programme may be joined by operators that provide district heating and district cooling to end-users, and by companies engaged in the transfer, distribution and retail of electricity. The main aim of the programme is to implement energy services in conjunction with custom-

ers, which will be of significant help in achieving an energy saving of 9% in these customers' own energy use, in line with the Energy Services Directive.

4.9 Supply of energy services

In Finland, energy services are widely regarded as all typical services offered to energy end-users that are well recognised as having an impact on improving customers' energy efficiency. Energy services may thus take the form of procurement of or investment in the end-users' equipment and systems, or their use and maintenance, provided that the agreement contains energy saving targets. Energy audits are one form of energy service. Energy services may also include energy consumption monitoring and reporting services, as well as information, advice and education, when their aim is to improve the energy efficiency of the end-users that are the targets of the measure.

When defined as above, the supply of certain types of basic energy efficiency services in Finland has been at a qualitatively and quantitatively good level for 10–15 years now. The growth in energy-efficient business has been more dependent on demand than on supply. The development of basic services is now progressing to a certain extent driven by professional operators and the principles of sustainable business. In Finland, energy service providers are mainly operators other than energy companies. Within the framework of the energy efficiency agreement scheme, energy companies have their own obligations, with regard to energy services directed to customers. Such energy services are described in more detail in Annex 3 (EP–02–TEM).

Irrespective of the level of basic energy efficiency services in Finland there has been investment in the development of new, innovative business concepts, for example in Tekes's Tesla (1998–2002), Cube (2002–2006) and Sustainable Community (2007–2012) programmes and Sitra's Energy programme (2008–2012).

4.10 Designated parties as required by the ESD

The Standing Orders of the Council of State state that energy policy falls under the jurisdiction of the Ministry of Employment and the Economy. On this basis, the Ministry of Employment and the Economy has administrative and implementation responsibility for the general monitoring and control of the framework laid down for the objective referred to in Article 4(1) of the Energy Services Directive, and for the public-sector obligations under Article 5(1) of that Directive. On 14 May 2008, the Ministry of Employment and the Economy transferred to Motiva the responsibility for monitoring and reporting energy savings. At the level of local government, activities under the energy efficiency agreements are also supervised by a steering group for that agreement area under the leadership of the Ministry of Employment and the Economy.

5 Reporting under the Energy Performance of Buildings Directive (EPBD)

5.1 Nearly zero-energy buildings

5.1.1 National targets for nearly zero-energy buildings

During 2011, the Ministry of the Environment is producing a road map for improving the energy efficiency of new buildings, the aim of which is to have nearly zero-energy construction by 2020. The road map will define the dates and interim targets for using the building regulations to phase in the targets for 2018 and 2020 set in Article 9(1) of the EPBD.

5.1.2 National plans for increasing the number of nearly zero-energy buildings

During 2011, Finland will prepare a national plan to increase the number of nearly zero-energy buildings. The road map for improving the energy efficiency of new buildings is part of the national plan, which will be prepared in the manner prescribed by Article 9 of the Directive.

5.1.3 Funding measures to promote an increase in the number of nearly zero-energy buildings

There are no special funding measures currently in use or being planned to increase the number of nearly zero-energy buildings. The need and/or opportunity for funding measures is considered as part of the preparation of the national plan.

5.2 Exemplary role of the public sector in the EPBD

5.2.1 Nearly zero-energy buildings

There are not currently any separate measures or targets for the public sector to promote nearly zero-energy buildings in new construction or renovations. The role of public buildings will be discussed when the national plan for nearly zero-energy buildings is prepared.

The public sector has made an active start in promoting nearly zero-energy buildings. In 2010, for example, energy efficiency was one of the criteria in the international design competition organised by Senate Properties and the Finnish Environment Institute (SYKE). The object of the competition was SYKE's new head office, and the goal was a "nearly zero-energy building" and material efficiency, in other words a small carbon footprint for the building's main materials.

5.2.2 Energy certificates

Energy certificates must be displayed in public buildings of more than 1 000 m^2. Public buildings are not, however, required to implement the energy-saving measures proposed in the energy certificate while the certificate is valid.

5.3 Alternative measures to inspecting heating and air-conditioning systems

Following on from the original EPBD (2002/91/EC), Finland uses mandatory inspections of cooling equipment for air-conditioning systems. The financial impact and the equivalence of the alternative advice option made possible by the new Directive, in relation to the mandatory inspections, are being clarified. Once this has been done, Finland will make a decision as to whether to keep inspections of air-conditioning systems mandatory or whether to switch to an alternative advice option.

Boiler inspections are not mandatory in Finland, with the alternative approach being applied in accordance with Article 8(b) of the original EPBD. The new Directive extends the inspection obligation to boilers that use fuels other than oil or gas. Finland has not yet made any decisions as to whether to move towards mandatory inspections for boilers that use wood or pellets, or whether to use a solution based

on an alternative approach for these boilers too. Once the relevant impact assessments and other reports have been prepared, a decision will be made on the approach to be selected.

5.4 Measures to support implementation of the EPBD

The public sector uses various financial incentives to encourage energy-efficient construction in both the renovation of housing stock and new construction. Energy subsidies granted from state funds for repairs to residential buildings are aimed at measures used to improve energy efficiency, reduce emissions and introduce renewable energy. The energy subsidies for residential buildings are described in Annex 2 (RA–02–YM). Improving energy efficiency is also taken into significant consideration when granting subsidies for repairs to residential buildings, even when the main objectives of the subsidies lie elsewhere, such as assisting those needing social or financial support.

State-supported production of housing favours high-quality, energy-efficient residential buildings that make the community more tightly-knit. The stringent energy efficiency requirements set for projects are taken into account, for example, when prioritising project applications for which interest subsidies are granted from public funds (Housing Fund of Finland). When interest subsidies are granted to housing associations for basic improvements, higher subsidies are granted for work that improves energy efficiency. Interest subsidies granted on the basis of a social needs assessment for the construction or purchase of a new single-family dwelling are granted only for low-energy homes.

As part of its support for housing production, in both new construction and renovation building, the state has implemented and is implementing various test and pilot projects relating to improving energy efficiency, including zero-energy targets. Information on good practice is shared in the course of aid activities. Efforts are also made to present the subsidised building projects as examples of improved energy efficiency for all other construction.

5.5 Designated players as required by the EPBD

Following on from the original EPBD, the Ministry of the Environment has designated two organisations (FISE Oy and KIINKO Real Estate Education) to award qualifications to energy certificate issuers. The Ministry of the Environment has also charged the Regional Government Information Management Service Unit (AHTI) to gather statistical data concerning energy certificates. Following on from the new EPBD, no further organisations have currently been designated for national functions.

The legislation relating to energy certificates will be amended following on from the new Directive. The regulations will designate players charged to implement independent monitoring systems and perform maintenance and inspection duties. The legislative reform has started, and the aim is for the regulations to be ready in summer 2012.

If it is decided to have mandatory inspections of the energy efficiency of heating and air-conditioning systems, a new law will be laid down concerning mandatory inspections of boilers, as well as amending the law on inspections of cooling equipment for air-conditioning systems in Uusimaa. The new regulations will then designate operators for an independent monitoring system in a similar way as for energy certificates.

ANNEX 1 CATEGORIES OF MEASURES AND EXAMPLES OF ENERGY EFFICIENCY MEASURES

MEASURE CATEGORY	EXAMPLES*
1 Rules and regulations	• Building regulations • Traffic regulations • Public procurement • Energy labelling for household appliances • Ecodesign Directive
2 Financial instruments	• Tax guidance • Aid
3 Energy audits	• Energy audits and analyses for industry, the service sector and the energy sector • Energy audits for blocks of flats and terraced houses • Energy plans and energy audits for farms
4 Energy efficiency agreements	• Energy efficiency agreement for business • Energy efficiency agreement and energy programme for local government • Energy efficiency agreement for the property sector – Residential properties and business premises • Energy efficiency agreement for the oil sector • Energy efficiency agreements for transport • Energy programme for farms
5 Education and training	• Energy efficiency at different levels of education • Energy auditor training • Energy certificate issuer qualification • Farm energy planner training
6 Information and advice	• Procurement • Regional energy agencies • Motiva • Consumer energy advice • Energy advice for businesses • Communication and advice for renovations • Tools and web-based services • Established communication activities and campaigns
7 Research, development and innovation	• Several programmes by Tekes, the Academy of Finland and Sitra, where energy efficiency is one of the themes • Clusters of strategic cutting-edge expertise (SHOK) • Centres of Excellence programme (OSKE) • TransEco research programme
8 Community planning and zoning	• National and regional collaboration • Methods for evaluating the energy efficiency of the social structure • Pilot subjects for energy-efficient regional construction
9 Miscellaneous	• Other programmes and measures

*This list is not exhaustive.

ANNEX 2 DESCRIPTIONS OF ENERGY-SAVING MEASURES AND ASSESSMENTS OF THEIR IMPACT

TABLE OF CONTENTS

Agriculture (MA)

Horizontal measures (HO)

Energy sector (EP and ET)

RA–01–YM

MEASURE	MEASURE CLASS	MEASURE CODE
Energy efficiency regulations for new construction 2003, 2008, 2010 and 2012	1	RA–01–YM

MEASURE IMPLEMENTATION PERIOD		Start	2003–	End	ongoing
MEASURE SUBJECTS	Construction companies, designers, independent builders, developers				

MEASURE AIMED AT	Heating	2003–	Electricity	2012–	Fuels	2003–	Water	

MEASURE FUNDING AND BUDGET

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of the Environment, building control departments of local councils

MEASURE DESCRIPTION

For new construction, the energy consumption of buildings is guided by regulations and guidelines in the National Building Code of Finland (SRMK). The energy efficiency of buildings has been guided by national regulatory management since 1975. The regulations relating to energy efficiency were amended in 1978, 1985, 2003, 2008 and 2010. The 2008 amendment was structural, and did not involve any significant changes in terms of energy efficiency**.**

The next round of increased stringency measures relating to energy efficiency will enter into force in 2012, upon which there will be a switch to overall energy audits that also consider the way in which energy is produced. The impact on savings in 2012 will be examined separately, since the overall structure of the regulations will be changing, in addition to the level required.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, the principle of which was also used in the calculation for NEEAP-1. The calculation system has been developed at the Tampere University of Technology with aid from the Ministry of the Environment. The model is used to define specific energy consumption for each part of a building, for each house type and age group, and considering any changes in heating methods. Total energy consumption is defined on the basis of specific consumption data, the amount of new production and renovation, and demolition of building stock.

Starting points and assumptions of the calculation

The starting point is that all buildings are built in accordance with the regulations in force each time. The energy saving generated by a level of construction better than the required level is not the aim of the building regulations. Owing to the good level of building control in Finland, we judge there not to be any energy efficiency lower than the required level in new construction.

The annual impact on savings is assumed to remain constant. The ageing of buildings is not considered to worsen their energy efficiency significantly, since windows and ventilation heat recovery equipment, among other things, are repaired where necessary. The management and maintenance of buildings in Finland are largely carried out on a professional basis.

The impact on savings achieved by making the thermal insulation regulations more stringent will last for the building's entire lifetime. The lifetime of building stock constructed after 2003 is assumed to be at least 50 years, and that of ventilation machinery equipped with heat recovery 20–25 years, which is the normal technical usable lifetime of such equipment in Finland. When equipment and structures are renovated and repaired, a product that is at least as good in terms of energy efficiency is nearly always selected.

The impact on savings that can be achieved in the specific consumption of heating energy in buildings has been calculated using the heating needs figures, weighted according to the volume of building stock and the location.

Agricultural production buildings have been excluded from the review on the assumption that the majority of them are unheated.

Fifty per cent of the annual new building capacity for industrial buildings has been included in the calculation, since some buildings are unheated and some industrial buildings fall within the emissions trading sector (non-ESD). In this respect, the saving presented is likely to have been underestimated to some extent.

Initial data

The amount of building stock for each house type and age group is based on construction statistics from Statistics Finland. It is estimated that the future quantitative trend for new construction will be the realised average of 10

years' production.

Overlap

None.

Impact assessment

The estimated impact on energy savings for 2010 is based on existing monitoring data on the quantitative trend in building capacity (ex-post), and the impact on energy savings for 2016 and 2020 is an estimate of future trends (ex-ante).

The regulations issued in 2011 will enter into force in July 2012, so the impact will only be felt in new stock in 2013. The calculation has assumed that heating energy consumption by residential and service buildings will fall by 20% owing to the impact of the new regulations. The regulations will only apply to new construction, and the key change that they will bring about is a switch to overall energy reviews, which will relate to all energy consumption in the building. It will therefore also consider, in addition to heating, all use of electricity and hot water that has not previously been included when defining whether new construction complies with the regulations. The impact on savings of the regulations for new construction in 2012 cannot yet be evaluated in any great detail, since the structure of the regulations will change to be based on primary energy, and savings will be calculated at building level. The change in the structure of the regulations will change heating choices, which will have a significant impact on energy savings.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of the Environment/Tampere University of Technology, Faculty of Built Environment, Department of Civil Engineering.

ENERGY SAVING GWh/a			2010	2016	2020
ESD		Energy efficiency regulations for new construction 2003, 2007, 2010	1 560	2 390	2 390
ESD		Energy efficiency regulations for new construction 2012	0	2 160	4 320
ESD TOTAL	RA–01–YM	Energy efficiency regulations for new construction 2003, 2007, 2010 and 2012	**1 560**	**4 550**	**6 710**

RA–02–YM

MEASURE	MEASURE CLASS	MEASURE CODE
Energy subsidies for residential buildings	2	RA–02–YM

MEASURE IMPLEMENTATION PERIOD		Start	2003	End	ongoing
MEASURE SUBJECTS	Owners of residential buildings				

MEASURE AIMED AT	Heating	Yes	Electricity		Fuels		Water	

MEASURE FUNDING AND BUDGET

Energy subsidies for residential buildings granted before 2006 are paid from the resources of the Housing Fund of Finland. In 2003–06, these subsidies amounted to approximately EUR 64 million.

In 2006–11, the subsidies were paid using the Ministry of the Environment's appropriations. In 2010, EUR 29 million in cyclical energy subsidies was granted, and 15% of repair costs were granted as cyclical subsidies. In 2006–10, a total of EUR 32 million was granted in subsidies other than cyclical subsidies.

In 2011, the state budget has an appropriation of EUR 30 million for the introduction of heating methods that use renewable energy in residential buildings. EUR 14 million has been earmarked for other energy subsidies for residential buildings, EUR 2 million of which is aimed at needs-assessed energy subsidies for single-family dwellings.

Maximum energy subsidies for changing a home heating method so that it uses renewable energy were 20% of the costs, usually equipment and material costs, in 2011. Beneficiaries that have joined the operational programme for residential lettings associations under the energy efficiency agreement for the property sector may receive a larger amount of aid.

Needs-assessed energy subsidies for single-family dwellings are no more than 25% of the costs excluding labour.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of the Environment and the Housing Finance and Development Centre of Finland (ARA)

MEASURE DESCRIPTION

Every year, subsidies are granted for energy repairs to residential buildings for various purposes.

An early measure was the basic adjustment of radiators in blocks of flats, which has been promoted since the 1990s. Owing to the good impact that it has had on savings (5–15%), which is based on monitoring, the measure became part of the energy subsidies during the 2000s.

In 2003–2006, energy subsidies for residential buildings were allocated mostly for blocks of flats and terraced houses.

In 2006–2008, subsidies were granted for the costs of changing to environmentally-friendly heating methods used in single-family dwellings.

In 2010, from the start of April, cyclical energy subsidies were granted mainly for energy repairs to blocks of flats and terraced houses. The subsidies were used to support both repairs that aim for an energy saving and changes in heating methods, including the switch to using renewable energy sources.

Since 2009, needs-assessed energy subsidies for single-dwelling families have been granted to low-income households for measures to improve the energy economy of the home and to reduce emissions caused by energy use, as well as introducing renewable forms of energy.

Since 2011, the introduction of heating methods that use renewable energy have been supported by a new energy subsidy that is granted to the owner of a residential building in year-round use, usually a private household. The aid is granted when oil or electric heating designed for the main heating of the building is replaced by building a heating system that mainly uses renewable energy. The introduction of additional heating systems is supported with regard to solar-powered heating and electricity.

Other energy subsidies are granted, in particular, for energy audits of residential buildings, repairs to the external building envelope and for improving energy efficiency, the building of ventilation heat recovery other than in new production, and connecting residential buildings to district or regional heating. In practice, these subsidies are only granted for repairs to blocks of flats and terraced houses.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method. The calculation is based on the actual savings reported for each measure

on the basis of a sample survey.

Starting points and assumptions of the calculation

The energy savings for each measure are defined on the basis of a sample survey. The sample of blocks of flats and terraced houses that have received energy subsidies was 700 in 2007 and approximately 200 additional targets in 2009. Incomplete data have been excluded from the sample.

On the basis of subsidy statistics gathered by the Housing Finance and Development Centre of Finland (ARA), the energy savings have spread to cover the whole country.

The sample of single-family dwellings in receipt of energy subsidies was approximately 2 200 in 2007, covering 70% of all subsidy targets. In particular, the survey conducted by ARA clarified the changes in heating methods, which forms of renewable energy were introduced, and which form of energy had previously been used.

The extent to which the subsidies brought about an energy saving for each measure in terms of the subsidy amount was defined on the basis of the sample research.

Initial data

ARA's duties include maintaining monitoring statistics relating to aid decisions and funding. The statistical data are based on information submitted by local councils, which in turn obtain the information from the subsidy beneficiaries on a monitoring form about the implementation of the energy-saving measure, which they are obliged to submit after a year has elapsed from the energy saving measure. The Ministry of the Environment has also commissioned sample studies at the Tampere University of Technology, based on ARA's material.

The subsidised energy-saving measures vary each year, in accordance with the "measure description" above. The house types and numbers of subjects supported have also fluctuated each year.

ARA has gathered the following data on energy subsidy beneficiaries:

- the buildings and number of homes that are energy subsidy beneficiaries;
- the energy-saving measures implemented at the sites, and the dates on which they were implemented;
- annual consumption data for heating energy, electricity and water before and after the repairs;
- information about the sites where which energy audits have been conducted, and the audit information;
- the total amount of aid granted for each energy-saving measure.

The consumption data are very reliable. Nearly all blocks of flats in Finland are connected to the district heating network, and the quantities of energy used in properties are measured. Electricity consumption is also measured both for each property and for each home. In general, property management in blocks of flats is the responsibility of professional landlords, whose tasks include monitoring and reporting energy consumption. It is also possible to obtain energy consumption information for each customer from utility companies. The monitoring does not consider the impact on consumption of variables such as the number of residents and the impact of household appliances and equipment.

Overlap

There are some overlaps, but they have been taken into consideration and eliminated (cf. RA–03–TEM).

Impact assessment

The estimated impact on energy savings for 2010 is based on existing monitoring data (ex-post) and the impact on energy savings for 2016 and 2020 is an estimate of future trends (ex-ante).

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of the Environment/Tampere University of Technology, Faculty of Built Environment, Department of Civil Engineering.

ENERGY SAVING GWh/a			2010	2016	2020
ESD		Energy and cyclical subsidies for blocks of flats and terraced houses	238	651	651
ESD		Energy and cyclical subsidies for single-family dwellings	44	354	354
ESD TOTAL	RA–02–YM	Energy subsidies for residential buildings	**282**	**1 005**	**1 005**

RA–03–TEM

MEASURE	MEASURE CLASS	MEASURE CODE
Heat pumps for single-family dwellings	2	RA–03–TEM

MEASURE IMPLEMENTATION PERIOD		Start	2000	End	ongoing
MEASURE SUBJECTS	Single-family dwellings				

MEASURE AIMED AT	Heating	Yes	Electricity	Yes	Fuels	Yes	Water	

MEASURE FUNDING AND BUDGET

Since 2001, households have been able to make “household deductions” in their tax returns for the installation of heat pumps. The deduction is no more than 60% of the cost of the work and EUR 3 000/pa per couple. In 2011, energy subsidies were granted to single-dwelling houses containing no more than two homes for replacing electric and oil-heating systems with primary heating systems by installing geothermal heat or air-and-water heat pump systems. In 2011, a total of EUR 30 million was earmarked for aid for renewable energy heating systems. Energy subsidies were also granted for the procurement of geothermal heat pumps in 2006–08.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of the Environment, the Housing Finance and Development Centre of Finland (ARA) and local councils (granting of energy subsidies), the Ministry of Finance and the Finnish Heat Pumps Association (SULPU).

MEASURE DESCRIPTION

Heat pumps are installed as an energy-saving measure in existing single-dwelling houses and as energy-efficient basic heating systems in new construction. Sales of heat pumps started to increase significantly in 2000, when their use started to be promoted by the Finnish Heat Pumps Association and by Motiva. Approximately 60 000 heat pumps were sold in 2010, whereas fewer than 1 000 were sold in 1999. A total of 335 000 heat pumps had been installed in single-dwelling houses by the end of 2010. Of these, 82% were air heat pumps, 12% were geothermal heat pumps, 4.5% were exhaust air heat pumps, and 1.5% were air-and-water heat pumps. The quantities sold are estimated to remain at a high level throughout the 2012–20 period. Heat pumps for single-family dwellings are one of the key measures in Finland for achieving the target of 38% renewable energy by 2020.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

According to the RES Directive (2009/28/EC), the quantity of renewable energy produced by heat pumps is to be calculated using a calculation method developed by the Commission. Since the energy saving to be achieved in final energy consumption by means of heat pumps is of practically the same size, the calculation has used the preliminary calculation method set out by Eurostat and the Commission’s Directorate-General for Energy in December 2010.

Starting points and assumptions of the calculation

When calculating the impact on savings, information on annual sales of heat pumps collected from importers and manufacturers by the Finnish Heat Pumps Association is used, and this is used as the basis on which Statistics Finland generates data on the energy produced by heat pumps, for official statistics. The sales information is gathered for each type of heat pump and each efficiency class. The calculation has used the mean efficiency of heat pumps installed, for each type of heat pump. The distribution of heat pumps for each building type is based on the annual survey study (RTS).

A separate project that started at the beginning of 2011 clarified the energy savings that can be achieved by heat pumps in a cold climate. The common view of VTT, which coordinated the project, Aalto University, and the Finnish Heat Pumps Association, is that the energy saving is 19.8 MWh/a for geothermal heat pumps (MLP), 4.8 MWh/a for air heat pumps (ILP), 11.6 MWh/a for outdoor air heat pumps (UVLP), and 5.8 MWh/a for exhaust air heat pumps (PILP). The calculation applied the following national $Q_{usablefactor}$ values on the basis of these results. Figures in parentheses are from Eurostat.

- $Q_{usablefactor}$ = ILP 1 500 and UVLP 2 000 (Eurostat 2 500 hours)
- Qusablefactor = MLP 2 500 (Eurostat 3 500 hours)

For exhaust air heat pumps (PILP) that are excluded from the RES calculation, the $Q_{usablefactor}$ is 3 500 hours.

For all heat pump types, SPF = 3. The calculation has used the following lifetimes for the impact on savings:

- MLP: 20 years;
- ILP: 10 years;
- UVLP: 15 years;
- PILP: 15 years.

The impact on savings for 2010 has been calculated on the basis of the heat pumps in use. With regard to the impact on savings calculated for 2016 and 2020, it has been assumed that the number of heat pumps sold each year remains at the current level in the next few years. It is estimated that the growth in the overall number will even out after 2014, especially with regard to air heat pumps, the savings of which will also start to be affected by the Commission's guideline lifetime of 10 years.

Initial data

When calculating the impact on savings of heat pumps in single-family dwellings, the following mean heating efficiencies and numbers of heat pumps used in single-family dwellings have been applied. The "installed heat pump efficiency" used to calculate Q_{usable} (the formula applied in assessing the impact) is calculated using this information for each heat pump type. The mean efficiency and numbers of heat pumps set out in the table are rounded up/down.

Year	MLP (11.9 kW)	ILP (4.8 kW)	UVLP (11.6 kW)	PILP (3.4 kW)	Total
2010	47 000 pumps	266 000 pumps	6 000 pumps	16 000 pumps	335 000 pumps
2016	125 000 pumps	521 000 pumps	32 000 pumps	30 000 pumps	708 000 pumps
2020	196 000 pumps	545 000 pumps	54 000 pumps	39 000 pumps	834 000 pumps

Overlap

Energy subsidies for single-family dwellings also incorporate savings produced by heat pumps. The overlap in savings is of the order of magnitude of approximately 30 GWh (2010), 60 GWh (2016) and 80 GWh (2020). There is another overlap in the building regulations for new construction in 2012. Some of the heat pumps sold will be installed in new construction, so their impact on reducing delivered energy may be counted as a benefit in indicating the maximum amount of the total energy need. Since this impact has not been isolated in the 2012 building regulations, a deduction of 160 GWh has been made in the energy saving from heat pumps in single-dwelling houses for 2016, and a similar deduction of 320 GWh has been made for 2020. The deduction has been calculated on the basis of the impact on savings from geothermal heat pumps installed at a rate of 2 000 per annum starting in 2013.

Impact assessment

In estimating the impact on savings (E_{res}), four different types of heat pump used in single-family dwellings have been examined, and for each of these the impact on savings has been calculated in accordance with Eurostat's preliminary calculation method, but using the national $Q_{usablefactor}$ values described above.

$E_{res} = Q_{usable} * (1-1/SPF)$ [GWh/a], where

Q_{usable} = installed heat pump efficiency * $Q_{usablefactor}$

The impact on savings (GWh/a) for each type of heat pump is as follows:

Type/Year	**2010**	**2016**	**2020**
MLP	923	2 500	3 900
ILP	1 267	2 500	2 600
UVLP	73	360	630
PILP	93	170	230
Total	2 358	5 530	7 360
Total deductions	-30	-220	-400

The impact on savings for 2020 is in line with the target set for renewable energy produced by heat pumps in Finland's climate and energy strategy.

Player(s) responsible for the impact assessment and conducting the assessment

Ministry of Employment and the Economy, VTT and the Finnish Heat Pumps Association (SULPU)

ENERGY SAVING GWh/a			2010	2016	2020
ESD	RA–03–TEM	Heat pumps for single-family dwellings	2 326	5 310	6 960

RA–04–TEM

MEASURE	MEASURE CLASS	MEASURE CODE
Heat pumps for terraced houses and blocks of flats	2	RA–04–TEM

MEASURE IMPLEMENTATION PERIOD		Start	2000	End	Ongoing
MEASURE SUBJECTS	Terraced houses and blocks of flats				

MEASURE AIMED AT	Heating	Yes	Electricity	Yes	Fuels	No	Water	No

MEASURE FUNDING AND BUDGET

Since 2001, households have been able to make “household deductions” in their tax returns for the installation of heat pumps. The deduction is no more than 60% of the cost of the work and EUR 3 000/pa per couple. The household deduction may also be made for the cost of work to install heat pumps in terraced houses and blocks of flats, provided that the procurement is done by the individual household and not a housing association.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of the Environment, Ministry of Finance, Finnish Heat Pumps Association (SULPU)

MEASURE DESCRIPTION

In Finland, air heat pumps and exhaust air heat pumps are procured as an energy-saving measure for electrically-heated terraced houses and, to some extent, for blocks of flats. The number of geothermal heating systems may also be estimated to increase significantly in terraced houses and blocks of flats outside the district heating network by 2020, but the impact of these on savings is included in the estimate of energy subsidies granted for terraced houses and blocks of flats.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

According to the RES Directive (2009/28/EC), the quantity of renewable energy produced by heat pumps is to be calculated using a calculation method developed by the Commission. Since the energy saving to be achieved in final energy consumption by means of heat pumps is of practically the same size, the calculation has used the preliminary calculation method set out by Eurostat and the Commission’s Directorate-General for Energy in December 2010.

Starting points and assumptions of the calculation

When calculating the impact on savings, information on annual sales of heat pumps collected from importers and manufacturers by the Finnish Heat Pumps Association is used, and this is used as the basis on which Statistics Finland generates data on the energy produced by heat pumps, for official statistics. The sales information is gathered for each type of heat pump and each efficiency class. The calculation has used the mean efficiency of heat pumps installed, for each type of heat pump. The distribution of heat pumps for each building type is based on the annual survey study (RTS).

A separate project that started at the beginning of 2011 clarified the energy savings that can be achieved by heat pumps in a cold climate. The common view of VTT, which coordinated the project, Aalto University, and the Finnish Heat Pumps Association, is that the energy saving is 4.8 MWh/a for air heat pumps (ILP) and 5.8 MWh/a for exhaust air heat pumps (PILP). The calculation applied the following national $Q_{usablefactor}$ values on the basis of these results. Figures in parentheses are from Eurostat.

- $Q_{usablefactor}$ = ILP 1 500 (Eurostat 2 500 hours)

For exhaust air heat pumps (PILP) that are excluded from the RES calculation, the $Q_{usablefactor}$ is 3 500 hours.

For both heat pump types, SPF = 3. The calculation has used the following lifetimes for the impact on savings:

- ILP: 10 years;
- PILP: 15 years.

The impact on savings for 2010 has been calculated on the basis of the heat pumps in use. With regard to the impact on savings calculated for 2016 and 2020, it has been assumed that the number of heat pumps sold each year remains at the current level in the next few years. It is estimated that the growth in the overall number will even out after 2014, especially with regard to air heat pumps, the savings of which will also start to be affected by the

Commission's guideline lifetime of 10 years.

Initial data

There are both exhaust air heat pumps and air heat pumps in terraced houses. There are only air heat pumps in blocks of flats, and they only account for one quarter of the whole impact on savings. The following mean heating efficiencies and numbers of heat pumps in use have been used as the initial data for calculating the impact of heat pumps on savings.

The "installed heat pump efficiency" used to calculate Q_{usable} for the model used in the impact assessment is calculated using this information for each heat pump type. The mean efficiency and numbers of heat pumps set out in the table are rounded up/down.

Year	ILP (4.8 kW)	PILP (3.4 kW)	Total
2010	54 000 pumps	2 000 pumps	56 000 pumps
2016	104 000 pumps	3 000 pumps	107 000 pumps
2020	109 000 pumps	4 000 pumps	113 000 pumps

Overlap

The impact on savings from air heat pumps and exhaust air heat pumps in terraced houses and blocks of flats does not have any overlap with other measures. Geothermal pump systems for these buildings are discussed in connection with the energy subsidies associated with them.

Impact assessment

In estimating the impact on savings (E_{res}), air heat pumps and exhaust air heat pumps have been examined, and for each of these the impact on savings has been calculated in accordance with Eurostat's preliminary calculation method, but using the national $Q_{usablefactor}$ values described above.

$E_{res} = Q_{usable} * (1-1/SPF)$ [GWh/a], where

Q_{usable} = installed heat pump efficiency * $Q_{usablefactor}$

The impact on savings (GWh/a) for each type of heat pump is as follows:

Type/Year	2010	2016	2020
ILP	253	496	518
PILP	10	18	24
Total	263	514	542
0.5 x blocks of flats	-35	-68	-71

The consistency of the grounds for calculating the impact on savings has been checked with Statistics Finland. When calculating the final impact on savings, half the energy saving calculated for air heat pumps in blocks of flats has been deducted, since some of these heat pumps are deemed to be procured primarily for cooling purposes.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Employment and the Economy, VTT and the Finnish Heat Pumps Association (SULPU)

ENERGY SAVING GWh/a			2010	2016	2020
ESD	RA–04–TEM	Heat pumps for terraced houses and blocks of flats	228	446	471

RA–05–YM

MEASURE	MEASURE CLASS	MEASURE CODE
Mandatory water meters for homes	1	RA–05–YM

MEASURE IMPLEMENTATION PERIOD		Start	2011	End	ongoing
MEASURE SUBJECTS	Builders and owners of residential buildings				

MEASURE AIMED AT	Heat-ing	Yes	Elec-tricity	Yes	Fuels	Yes	Water	Yes

MEASURE FUNDING AND BUDGET

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of the Environment

MEASURE DESCRIPTION

The Decree on Water and Drainage Systems for Properties, part D1 of the National Building Code of Finland (SRMK), was amended by Decree of the Ministry of the Environment so that during new construction meters are installed in each home at properties containing more than one home, in addition to the main water meter, in order to measure the hot and cold household water coming to the home. In addition to homes, the meters are also to be installed in office and business properties. It should be easy to monitor water consumption and to use the reading as the basis for billing.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method. A calculation model developed for the energy consumption of building stock by the Tampere University of Technology has been used to check the calculation and the results. The model calculation is based on building stock information from Statistics Finland and the calculation guidelines in part D5 (Calculation of power and energy needs for heating of buildings, 2007) of the National Building Code of Finland.

Starting points and assumptions of the calculation

Research into energy renovations to residential building stock by the Tampere University of Technology (2010) was used to assess the number of water meters installed during renovations. The sample was extended to include all building stock.

The calculation assumes the following:

- Measuring and monitoring of water consumption per home reduce water consumption per building by 10% in new production and 20% in renovations;
- Hot household water accounts for 40% of total water consumption;
- The underlying assumption of the calculation of energy savings was that 30% of hot-water energy consumption becomes thermal stress for the rooms, and 70% of this thermal stress is exploited for heating (SRMK D5).

For new construction, the following is also assumed:

- Water meters are installed per home in all new blocks of flats, and the saving is generated in full, since measurements of water consumption per home in blocks of flats have not previously been particularly widespread;
- Approximately half of all new terraced houses generate savings, since it is estimated that water meters for each home have been installed voluntarily in every other terraced house prior to the entry into force of the regulation;
- No savings are generated for office and business properties, owing to the already existing measurement and monitoring of water consumption. There are some deficiencies in the comprehensiveness of the data available.

For renovations, it is assumed that:

- During renovations, water meters are installed in approximately 2% of the stock of blocks of flats and terraced houses every year;
- In renovations, the potential for savings in water energy consumption per building owing to the installation of water meters is 20%. The saving is larger than for new construction, since old water fittings are also replaced with water-saving fittings. The energy savings for renovations have been calculated on the basis of actual water consumption data for 2010.

Initial data

The 10% reduction in water consumption per building that has been assumed is based on the Ministry of the Environment report prepared in conjunction with the preparation of the regulations: “Ministry of the Environment (2009). The Use of Water Meters Per Home, and Their Impact on the Energy Consumption of Buildings. Working Group Report. Helsinki. 17 pages.”

The initial data for the bottom-up calculation for renovations are based on a study: “Heljo, J. & Vihola J. (2010). The Potential for Energy Savings in Residential Properties in Helsinki. Tampere, Tampere University of Technology. 19 pages + 7 pages of annexes.”

Reports by experts and players in the sector have also been used to determine and check the savings for renovations.

Overlap

None.

Impact assessment

The regulation entered into force at the start of 2011. In accordance with the above, it is estimated that additional savings will be generated in new construction of all blocks of flats and half of all terraced houses as of 2011. No additional savings are estimated to be generated by single-family homes or half of all terraced houses, since a system for measuring water consumption per home was already in use in these homes prior to the entry into force of the regulations in the Decree.

The data on building stock for 2010 serves as the starting level for renovations.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of the Environment/Tampere University of Technology, Faculty of Built Environment, Department of Civil Engineering.

ENERGY SAVING GWh/a			2010	2016	2020
ESD	RA–05–YM	Mandatory water meters for homes	0	74	128

RA–06–TEM

MEASURE	MEASURE CLASS	MEASURE CODE
Energy labelling of windows	6	RA–06–TEM

MEASURE IMPLEMENTATION PERIOD		Start	10/2006	End	ongoing
MEASURE SUBJECTS	Builders and decorators				

MEASURE AIMED AT	Heating	Yes	Electricity	Yes	Fuels	Yes	Water	No

MEASURE FUNDING AND BUDGET

This is a market-based activity, with the exception of the labelling development stage.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Window manufacturers, Motiva/Ministry of Employment and the Economy/Ministry of the Environment

MEASURE DESCRIPTION

In October 2006, as the result of a development project funded by the Ministry of Trade and Industry (now the Ministry of Employment and the Economy), the Ministry of the Environment and businesses voluntary energy labelling for windows was introduced in Finland, the aim of which is to facilitate choices between various window solutions by builders and decorators. As part of this labelling, windows are divided into classes A-G using the scale familiar from household appliances. A comparison figure is also calculated for windows, showing how much of a heating need the window structure creates each year. In May 2011, the labelling was reformed by adding two new classes, A+ and A++, since the level required by the 2010 building regulations already requires at least class-A windows with a U value of no more than 1.0 W/m^{2}K.

The energy efficiency of windows is significant from the perspective of the energy consumption of buildings, since windows account for approximately 15–25% of the need for heating, irrespective of the age of the building; windows are, after all, the weakest part of the building in terms of heat insulation. Windows are also manufactured in large quantities, since they are also used for renovation as well as new building. Only some of the double-glazed windows have been replaced in existing building stock.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, which was also used for the NEEAP-1 calculation.

Starting points and assumptions of the calculation

The starting point of the impact assessment is the following data and assumptions:

- Estimate of the number of windows manufactured (separately for new construction and renovation);
- Estimate of the U values of double-glazed and triple-glazed windows used in renovation;
- Estimate of the mean U values in the windows markets;
- Estimate of the proportion of single-family dwellings that are subject to new builds and renovation;
- Estimate of the impact of energy labelling on the U value of windows on the market (separately for new construction and renovation);
- Mean resident-weighted heating needs figure for Finland.

In general, the energy efficiency of windows is expressed by a heat permeability factor, i.e. a “U value”. Some of the other factors that affect it include the tightness of the window structure and the material and structural solutions selected. The energy labelling of windows takes the various factors mentioned above into consideration, and gives a clear, comparable overall picture of the window’s properties. However, in the survey that follows, only the impact of energy labelling on the U value has been examined, owing to the absence of initial data.

Initial data

The Book of Window Fitting (VTT/Hemmilä K. & Saarni R., 2001) has estimated that 1.2 million m² of windows are manufactured every year, corresponding to a mean window size of 0.9 m², since annual production amounts to 1.35 million windows. According to an oral estimate obtained from an expert (Hemmilä K./VTT, 2007), annual production grew to 1.5 million windows in 2007, half of which were used in new construction (750 000), and half in renovations (750 000).

The volume of new construction is assumed to remain at the current level throughout the period examined. Accordingly, 675 000 m^2 of windows are needed every year. According to the building regulations when the labelling was introduced, the maximum U value of windows in new construction was 1.4 W/m^2K, but the requirement was made more stringent in 2010, so that it became 1.0 W/m^2K. The energy labelling of windows is assumed to guide consumer choices, so that in practice the windows sold are slightly more efficient than the minimum level required by the regulations. This was particularly obvious in the market, especially at the start of the period studied, when the level required by the building regulations was not quite as demanding as it is now. The windows currently supplied mainly have a U value in the order of 1.0 W/m^2K, and according to an industrial estimate (Luhanka/RTT, Pernu/Fenestra, 2011) 10–15% of products sold are more efficient than this (0.8 W/m^2K). For the purposes of the calculation, the market share of more efficient windows is assumed to rise to 35% by 2016 and to 55% by 2020. The saving that can be achieved is the difference between the basic scenario corresponding to the building regulations and this scenario of increased efficiency. The calculation takes into consideration the fact that the labelling mainly guides the activities of single-family house builders and not of construction companies. For new construction, 35% is used as the proportion of new homes accounted for by single-family dwellings. For the heating needs figures, the mean resident-weighted value in Finland in 1971–2000, i.e. 4608 Kd, is used (Source: Odysseus database). Therefore, for example, the "new" saving for 2016 is obtained as follows:

675 000 m^2 • (1.0-0.8) W/m^2K • 24 h/d • 4 608 Kd • 0.35 = 1.8 GWh.

The use of windows at renovation sites is assumed to rise to 1.02 million units per annum by 2016 and similarly to 1.14 million by 2020. Thus 675 000 m^2 of windows were required in 2007, 918 000 m^2 in 2016 and 1 026 000 m^2 in 2020. It has been assumed as a basic scenario in the case of windows used in renovation that the mean U value will fall from 1.4 W/m^2K in 2006 to 1.0 W/m^2K in 2010, and will remain at that level throughout the period studied. Since, in practice, the level prevailing in the windows markets is already 1.0 W/m^2K, only any efficiency over and above this level may be counted as a benefit achieved by the labelling of windows in the case of renovation windows, also. The assumptions about the trends in the market share of more efficient windows are the same as under new construction above. The calculation takes into consideration the fact that the labelling mainly guides the inhabitants of private houses (approximately 55% of residential stock), and not housing associations. The saving that can be achieved is the difference between the U values of the old windows that are to be replaced and those of the new windows. For the heating needs figures, the mean resident-weighted value in Finland in 1971–2000, i.e. 4608 Kd, is used (Source: Odysseus database).

The savings lifetime for windows as recommended by the Commission is 25 years, so the saving for all windows that are replaced applies for the whole period studied as of 2007.

Overlap

There is no overlap with, for example, the impact of the building regulations, since for new construction the estimate has taken account of only the savings generated by efficiency in excess of the level required by the regulations. No building regulations have been issued for renovations, and the overlaps with Höylä III (RA–07–TEM/YM) have been taken into consideration by evaluating only windows that are better than the level required by the building regulations for new construction.

Impact assessment

Cf. initial data

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Employment and the Economy/Motiva

ENERGY SAVING GWh/a			2010	2016	2020
ESD	RA–06–TEM	Energy labelling of windows	59	80	129

RA–07–TEM/YM

MEASURE	MEASURE CLASS	MEASURE CODE
Höylä III energy efficiency agreement – oil-heated single-family dwellings	4	RA–07–TEM/YM

MEASURE IMPLEMENTATION PERIOD		Start	(1997)2008	End	2016
MEASURE SUBJECTS	Oil-heated single-family dwellings				

MEASURE AIMED AT	Heating	Yes	Electricity	No	Fuels	Oil (KPÖ)	Water	No

MEASURE FUNDING AND BUDGET

Since 2001, households have been able to make “household deductions” in their tax returns, which also apply to the renovation of oil-heating systems. The deduction is no more than 60% of the cost of the work and EUR 3 000/p.a. per couple. In 2006–08, energy subsidies were granted for solar-powered heating systems connected to oil-heating.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Employment and the Economy, Ministry of the Environment, the Finnish Petroleum Federation, the Heating Energy Association, Öljyalan Palvelukeskus Oy [the Oil Industry Service Centre Ltd.], the Finnish Federation of Petrol Retailers and Transport Service Sectors, all major companies selling liquid fuels for heating and transport in Finland, Motiva.

MEASURE DESCRIPTION

The Höylä III energy efficiency agreement is a continuation of the Höylä I (1997–2001) and II (2002–07) energy savings programmes. The Höylä III agreement is broader than the previous Höylä programmes, and also covers liquid fuels for transport. This description applies to oil-heated single-family properties and the energy-saving measures to be implemented in them.

The aim of the Höylä III agreement is a saving of at least 9% in heating-oil consumption in 2005–16. The framework of the agreement promotes the maintenance of oil-heating systems, the replacement of boilers and other improvements to buildings in terms of energy economy. Another goal of the agreement is to increase the use of renewable energy in parallel with oil heating, and to increase the proportion of heating oils sold accounted for by bio-oil to 10% by 2016.

As part of the implementation of the Höylä III agreement, regular boiler inspections are carried out under Article 8 of the Energy Performance of Buildings Directive and training and certification of those conducting the inspections.

The quantitative objective of the Höylä agreements (1997→) was to repair 100 000 oil-heating systems by 2010. This target has been exceeded by nearly ten thousand boilers. Repairing heating systems can achieve a saving of 10–30% per site in the consumption of liquid fuels for heating.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, which was also used for the NEEAP-1 calculation.

Starting points of the calculation

In calculating the impact on savings, oil-heated single-family dwellings have been examined according to the decade of construction (5 age groups: 1950s, 1960s, 1970s, 1980s and 1990s). The mean computational energy consumption of single-family dwelling in each age group has been defined on the basis of the method of construction in use at the time (Senewa Oy/Pääjärvi, 2009). With the exception of solar-powered heating systems, the impact of the measures on savings is calculated for single-family dwellings in each age group separately.

The energy efficiency of oil-heated single-family dwellings is improved by means of the following measures under the Höylä agreement:

- replacing the old oil-fired boiler or oil burner and regulator and the pumps and pipe-work with new ones, and insulating the pipes, tanks and valves in the heat distribution room. Thermostatic radiator valves are generally fitted at the same time;
- increasing the heat insulation of the roof and/or walls;
- new windows;
- connecting a solar-powered heating system to the oil-heating system (to reduce delivered energy).

The lifetime of the savings from all the measures implemented since 1997 extends to 2020. The mean lifetime of boilers in Finland is more than 30 years. The addition of a solar-powered heating system, for which the savings lifetime is 20 years according to the Commission's guidelines, has been taken into consideration for the calculation from 2003 onwards. The impact assessment has not taken account of any factors that reduce the impact of the measure on savings, or of any other factors that might affect the amount.

Starting points and assumptions

The mean heating energy consumption of single-family dwellings in each age group of buildings (Senewa Oy/Pääjärvi, 2009):

- 1950s (45.3 MWh/a), 1960s (38.8 MWh/a), 1970s (35.8 MWh/a), 1980s (29.1 MWh/a) and 1990s (26.2 MWh/a).

In 2006, the impact of renewing oil-fired boilers was verified by field measurements taken by Suomen Lämmitystieto Oy [Finnish Heating Information Ltd.] as part of the Tuula project. In 2007, Senewa Oy checked the grounds for calculating the impact on savings on this basis. In calculating the impact of the Höylä agreements on savings, the following initial data was used:

- total impact on energy consumption of repairs to oil-fired boilers, burners and other heating system repairs: 1950s (28.0%), 1960s (29.4%), 1970s (29.7%), 1980s (29.9%) and 1990s (19.3%);
- impact of additional roof insulation, the change in U value corresponding on average to 200 mm additional insulation: 1950s (8.5%), 1960s (5.3%), 1970s (4.4%), 1980s (4.7%) and 1990s (3.5%);
- impact of additional wall insulation, the change in U value corresponding on average to 100 mm additional insulation: 1950s (8.5%), 1960s (5.8%), 1970s (4.4%), 1980s (3.1%) and 1990s (3.5%);
- impact of renewing windows: the U value of new windows in buildings constructed during the 1950s, 1960s and 1970s is assumed to be 1.4, as required by the 2003 building regulations, and that for buildings constructed during the 1980s and 1990s is assumed to be 1.1: 1950s (9.0%), 1960s (12.8%), 1970s (9.5%), 1980s (11.7%) and 1990s (11.2%);
- the impact on savings of adding a solar-powered heating system is 2.5 MWh/a for each site.

The impact of solar-powered heating on savings (MWh/single-family dwelling) has been calculated on the basis of the energy yield from solar-powered heating (Statistics Finland) and information on solar panel surface area from Solpros Ay, and also using information from an expert in solar-powered heating (Motiva) on the typical solar panel surface area (7.5 m^2/restoration site). The impact on savings is the same for single-family dwellings in all age groups.

The figures for renovation measures in oil-heated single-family dwellings constructed in different decades are based on an annual survey of approximately 2 000 people conducting repairs on single-family dwellings, carried out by Rakennustutkimus RTS Oy [RTS Construction Research Ltd.]. The number of oil-fired boilers replaced has been checked using annual sales information.

The energy saving for the 1997–2009 period is based on the figures from the annual surveys mentioned above, and on forecast data for these surveys dating from 2010. For 2016 and 2020, the estimate has made the following assumptions from 2010 onwards:

- the new energy saving that can be achieved each year through replacing boilers will fall as newer renovation sites are adopted, and the number of boilers needing restoration also falls;
- savings for roofs, walls and windows may fall somewhat from the mean value of the last ten years;
- the saving from renovations of solar-powered heating systems will increase by 1.6 times by 2020 in comparison with 2009, as a result of the clear increase in the number of installations of solar-powered heating systems since 2008 (Solpros Ay, The Use of Solar Energy in Finland, separate report).

The annual impact on savings for each of the various measures implemented is estimated on the basis of the information set out above.

Overlap

There is no overlap with, for example, Energy labelling of windows (RA–04–TEM), since the assessment only includes restoration sites and the replacement of windows is only up to the standards applied in new construction.

Impact assessment

The impact on savings of various measures (replacing boilers, additional roof insulation, additional wall insulation, replacing windows) is calculated for oil-heated single-family dwellings divided into the five different age groups set out above.

The impact is assessed by calculating the "type saving" (S_{50}, S_{60}, S_{70}, S_{80}, S_{90}) for each measure type in oil-heated single-family dwellings constructed in different decades (1950s–1990s).

The type saving (S) for a solar-powered heating system and the grounds for it are presented in the "Starting points and assumptions" section.

In addition to type savings, the energy-saving calculation also requires annual restoration figures for oil-heated single-family dwelling stock for each measure type and decade (L_{50}, L_{60}, L_{70}, L_{80}, L_{90}). With regard to adding solar-powered heating systems, the figures have not been divided up into different decades.

The aggregate of the impact on savings brought about by the various measures under the Höylä agreement is obtained by calculating the annual impact on energy savings for each of the different measures, e.g. $ES_{replacing\ boilers} = S_{50}*L_{50} + S_{60}*L_{60} + S_{70}*L_{70} + S_{80}*L_{80} + S_{90}*L_{90}$ [GWh/a], and by adding together the impact on savings of the different types of measure. The energy saving from replacing boilers and the impact on savings of other repairs relating to energy economy (additional roof and wall insulation, replacing windows, adding solar-powered heating systems), and the total impact of savings, are set out separately in the table.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Employment and the Economy/Motiva, Senewa (initial data)

ENERGY SAVING GWh/a			2010	2016	2020
ESD		Höylä III, replacing oil-fired boilers	1 254	1 471	1 569
ESD		Höylä III, other repairs relating to energy economy	845	1 251	1 569
ESD TOTAL	RA–07–TEM/YM	Höylä III energy efficiency agreement – oil-heated single-family dwellings	**2 099**	**2 722**	**3 085**

RA–08–YM

MEASURE	MEASURE CLASS	MEASURE CODE
Energy efficiency agreement for the property sector – residential lettings associations	4	RA–08–YM

MEASURE IMPLEMENTATION PERIOD		Start	2/2010	End	12/2016
MEASURE SUBJECTS	Residential lettings stock owned by residential lettings associations				

MEASURE AIMED AT	Heating	Yes	Electricity	Yes	Fuels	Yes	Water	Yes

MEASURE FUNDING AND BUDGET

The operational programme relating to residential lettings associations in the property sector started at the beginning of 2010.

It is possible for the associations that have signed up to receive higher levels of aid for energy audits and for normal investments in energy savings. The aid for energy audits for these companies has been no more than 50% of approved audit costs (no more than 40% for others) and aid for normal investments in energy savings has been no more than 20% of approved costs (no more than 15% for others). The aid granted for promoting renewable energy has been no more than 20%.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of the Environment, ARA, RAKLI, Motiva, companies that have joined

MEASURE DESCRIPTION

The energy efficiency agreements for 2008−2016 and the energy saving agreements that preceded them (1997−2007) have had an important role in Finland's climate and energy policy since 2001.

The energy efficiency agreement for the property sector was signed in late 2009. The agreement is a framework agreement and it has been signed by the Ministry of the Environment, the Ministry of Employment and the Economy, and the Finnish Association of Building Owners and Construction Clients (RAKLI). The energy efficiency agreement for the property sector contains two operational programmes, one of which relates to residential lettings associations, and the other of which relates to business premises associations. This description of the measure relates to the operational programme for residential lettings associations, which began at the start of 2010. The agreement activities have been signed up to by 20 residential lettings associations.

Companies that join the operational programme for residential lettings associations may set an energy savings target of either at least 9% or 7%, calculated using their energy use when they joined, depending on the period for which the energy-saving measures are approved. Monitoring the achievement of the 9% target takes into consideration measures to improve the efficiency of energy use implemented in 2005–16 and the impact of which on savings will still apply in 2016, while monitoring the achievement of the 7% target takes into account measures implemented during the 2010–16 period.

The companies are committed, among other things, to identifying subjects for making energy use more efficient in their own properties and production facilities, for example by means of energy audits, the preparation of plans to make energy use more efficient, and the implementation of viable energy-saving measures, as well as, *inter alia*, staff training relating to energy efficiency, communication of energy efficiency, and the consideration of energy efficiency in planning and procurement. They are also committed to implementing measures and promoting tenants' energy use, and to considering energy efficiency when defining tasks relating to property services, and in competitive tendering and contracts. Further information on the agreement activities may be found at http://www.energiatehokkuussopimukset.fi [English version at http://www.energiatehokkuussopimukset.fi/en/].

The companies that have signed up to the energy efficiency agreement activities submit a report each year to the web-based monitoring system concerning their energy use, the energy-saving measures that they have implemented, and their fulfilment of other obligations connected to the implementation of the agreement. The energy-saving measures that are to be reported may include either energy-saving measures discovered during energy audits or measures that the companies have found in other ways.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, which was also used for the NEEAP-1 calculation.

Starting points and assumptions of the calculation

The operational programme started at the beginning of 2010, so monitoring data for one year are available.

This assessment includes all reported measures. Unlike inspection activities, the lifetime of individual technical measures is not assessed separately, but a mean lifetime of 6 years is used for the reportedly implemented measures. The lifetime is clearly shorter than in the assessment of the operational programme for the business service sector, and it is also shorter than in the assessment relating to business premises, since some measures are reported as "type measures" for which a type saving connected to the number, extent, etc. is calculated, and in residential buildings there are also many measures relating to operating technology. The savings brought about by type measures account for approximately one quarter of the total savings reported in 2010.

From 2017 onwards, no new savings are assumed to be generated by the current energy efficiency agreement activities (2008−2016). The reported information for the first year currently covers approximately 70% of all those who have signed up to the agreement activities.

Initial data

The initial data for the calculation are obtained from data collected in the monitoring system from the annual reports submitted under the energy efficiency agreements by those who are signed up to the agreement scheme, and the equivalent information from the previous agreement period.

Every company that is signed up to the agreement scheme reports the following, among other things, every year:

- general information (e.g. contact details, sector, whether the premises have an emissions trading scheme, etc.);
- detailed information about energy use;
- energy-saving measures implemented, and among other things, the following details about them:
  - estimated energy saving (electricity, heating, fuels) MWh/a;
  - the year in which the measure was implemented, the investment that it required, payback period, etc.;
  - type measures implemented, and the initial data that they required (e.g. number, m^2, etc.);
- information relating to energy efficiency activity schemes, including information on, *inter alia*, monitoring of energy consumption, energy efficiency plans and environmental schemes;
- other issues relating to, *inter alia*, the use of renewable energy, the consideration of energy efficiency in planning and procurement, staff training on energy matters, communication relating to energy savings and efficiency, etc.

The accuracy of the calculation of savings from the energy-saving measures reported separately corresponds to the accuracy that can be achieved in normal field work – some of the initial data are design data or estimates, since measurements are not always possible. The impact of type measures on savings is calculated on the basis of the numbers and/or qualitative data provided in the monitoring system by those who have signed up. The savings achieved by the energy-saving measures are not usually verified by subsequent measurements, since it is often difficult to take measurements in practice and it generates excessive costs.

Once the reporting has been completed, the order of magnitude of the data and other validity are checked at Motiva and, if necessary, the companies are asked to supplement the information or provide further information.

Overlap

There are no overlaps with other estimated measures.

Impact assessment

The estimate relates to the impact of energy-saving measures under the energy efficiency agreement activities for residential lettings associations. The annual energy saving (ES) generated is based on the reported impact on energy savings (electricity + heating + fuels) of the measures reported to have been implemented (T) by those who have signed up and on the impact on savings for future years estimated on that basis.

The annual energy saving (ES) is calculated using the model

ES[GWh/a] = ES(heating+fuels) + ES(electricity)

The total impact on energy savings given in the table below is obtained for the years shown in the table by adding together the impact on energy savings (ES) that applied at the time, calculated using the grounds set out above for the years in question.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of the Environment/Motiva

ENERGY SAVING GWh/a			2010	2016	2020
ESD	RA–08–YM	Energy efficiency agreement for the property sector – residential lettings associations	26	194	78

KU–01–TEM

MEASURE	MEASURE CLASS	MEASURE CODE
Local government energy efficiency agreement and energy programme	4	KU–01–TEM

MEASURE IMPLEMENTATION PERIOD		Start	1/2008 (1997)	End	12/2016
MEASURE SUBJECTS	Local councils, towns and municipal federations				

MEASURE AIMED AT	Heating	Yes	Electricity	Yes	Fuels	Yes	Water	Yes

MEASURE FUNDING AND BUDGET

In 2008−2010, local councils that have signed up to the local government energy efficiency agreement and energy programme have received a total of EUR 0.95 million in aid for energy audits and EUR 4.39 million in investment aid for the implementation of energy saving measures.

Energy audit aid for those who have signed up to the agreement has been 50% of the approved costs of work for the audit. Those who have signed up to the agreement may, on a case-by-case basis, receive investment aid for the implementation of normal investments in energy saving, in which case the aid is generally no more than 25%. Aid for projects implemented using the ESCO service may be no more than 30% if the applicant has signed up to the energy efficiency agreement. Local councils that have signed up to the energy efficiency agreement activities are also granted aid for renewable energy audits at local council level, such aid amounting to no more than 60% of the approved cost of the work.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Employment and the Economy, ELY Centres, Motiva, the Association of Finnish Local and Regional Authorities, local councils and municipal federations that have signed up

MEASURE DESCRIPTION

The energy efficiency agreements for 2008−2016 and the energy saving agreements that preceded them (1997−2007) have had an important role in Finland's climate and energy policy since 2001.

In the local government sector, there are separate energy efficiency agreements for large and medium-sized local councils, and an energy programme designed for small local councils. The energy efficiency agreements for local government are entered into between the local council or municipal federation that is joining and the Ministry of Employment and the Economy. The signatories to the energy programme designed for small local councils are the local council or municipal federation that is joining and Motiva. All local councils and municipal federations may sign up to the agreement.

Sixty-one local councils or municipal federations have signed up to the local government energy efficiency agreement, and 39 have signed up to the energy programme. Those who have joined account for 67% of all residents.

The local council energy efficiency agreement activities for 2008–2016 endeavour primarily to improve energy efficiency, but they also include targets and measures for promoting the use of renewable energy.

The key target of the agreements is to achieve, by the end of the agreement period in 2016, an annual energy savings target (MWh/a) to be set upon joining and corresponding to at least 9% of the energy use at the time of joining. Energy use includes all other energy use by local councils in addition to energy used for buildings.

The local councils and municipal federations that have signed up to the agreement activities are also committed, among other things, to identifying subjects for making energy use more efficient by means of energy audits or analyses, the preparation of plans to make energy use more efficient, and the implementation of viable energy-saving measures, as well as, *inter alia*, staff training relating to energy efficiency, communication of energy efficiency, and the consideration of energy efficiency in planning and procurement. They are also committed to mapping out additional opportunities for the use of renewable energy sources and to introducing renewable energy in buildings and in other places where energy is used, wherever possible. Further information on the agreement activities may be found at http://www.energiatehokkuussopimukset.fi [English version at http://www.energiatehokkuussopimukset.fi/en/].

The local councils and municipal federations that have signed up to the energy efficiency agreement activities submit a report each year to the web-based monitoring system concerning their energy use, the energy-saving measures that they have implemented, and their fulfilment of other obligations connected to the implementation of the agreement. The energy-saving measures that are to be reported may include either energy-saving measures discovered during energy audits and analyses or measures that the local councils or municipal federations have found in other ways.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, which was also used for the NEEAP-1 calculation.

Starting points and assumptions of the calculation

The calculation includes energy-saving measures reported as implemented (T) in the annual report, found during other energy efficiency agreement activities than energy audits. For local councils and municipal federations involved in the previous energy-saving agreement (1997−2007), the measures also reported as implemented during the previous agreement period, and their impact on savings, have also been taken into account. Until 2010, the savings used for the calculation (MWh/a) were the savings brought about by the measures that businesses reported as implemented during the agreement activities. From 2011, the annual saving will be estimated on the basis of experience gained from the accrual of mean savings achieved during the last six years and the previous agreement period. From 2017, no new savings are assumed to be generated through the current energy efficiency agreement activities (2008−2016).

In practice, the measures to be reported in the annual report as part of the agreement activities, other than energy audit measures, do not include measures relating to operating technology. The lifetimes of individual technical measures is not assessed separately. A mean lifetime of 12 years is used for the measures reported as having been implemented; this is conservative in comparison with the lifetime of 15 years set out for many technical measures in the Commission's calculation guidelines.

Of the impact on savings from proposed measures that are reported for implementation, half is estimated to be achieved in the year of implementation, and similarly half of the impact on savings will continue in the year following the mean lifetime of 12 years. Data on emissions trading sites that have been added to the database are also used.

Initial data

The initial data for the calculation are obtained from data collected in the monitoring system from the annual reports submitted under the energy efficiency agreements by those who are signed up to the agreement scheme, and the equivalent information from the previous agreement period.

Every company that is signed up to the agreement scheme reports the following, among other things, at premises level every year:

- general information (e.g. contact details, sector, whether the premises have an emissions trading scheme, etc.);
- detailed information about energy use:
- information about the state of implementation of the energy-saving measures proposed during energy audits: T implemented, P decided to implement, H considering implementation, E decided not to implement;
- energy-saving measures implemented that were found other than during energy audits, and among other things, the following details about them:
- estimated energy saving (electricity, heating, fuels) MWh/a;
- the year in which the measure was implemented, the investment that it required, payback period, etc.;
- information relating to energy efficiency activity schemes, including information on, *inter alia*, monitoring of energy consumption, energy efficiency plans and environmental schemes;
- other issues relating to, *inter alia*, the use of renewable energy, the consideration of energy efficiency in planning and procurement, staff training on energy matters, communication relating to energy savings and efficiency, energy efficiency in transport and logistics, etc.

The accuracy of the calculation of savings reported corresponds to the accuracy that can be achieved in normal field work – some of the initial data are design data or estimates, since measurements are not always possible. The savings achieved by the energy-saving measures are not usually verified by subsequent measurements, since it is often difficult to take measurements in practice and it generates excessive costs. Once the reporting has been completed, the order of magnitude of the data and other validity are checked at Motiva and the local councils and municipal federations are asked to supplement the information or to provide further information, if necessary.

Overlap

The overlaps with energy audits have been taken into consideration. The impact of measures found during energy audits are only included in the assessment of the impact of local government energy audits.

Impact assessment

The assessment is of the impact of activities under local government energy efficiency agreements, when the measures are other than those found during energy audits.

The annual energy saving (ES) generated is based on the reported energy saving impact (electricity + heating + fuels) of the measures reported to have been implemented (T) each year by those who have signed up. In accordance with the preceding section, the mean lifetime of the measures is 12 years, for the purposes of the calculation.

The annual energy saving (ES) is calculated using the model

ES[GWh/a] = ES(heating+fuels) + ES(electricity)

The total energy savings impact given in the table below is obtained for the years shown in the table by adding together the impact on energy savings (ES) that applied at the time, calculated using the grounds set out above for the years in question.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Employment and the Economy/Motiva

ENERGY SAVING GWh/a			2010	2016	2020
ESD	KU–01–TEM	Local government energy efficiency agreement and energy programme	216	475	343

KU–02–TEM

MEASURE	MEASURE CLASS	MEASURE CODE
Energy audits – local government	3	KU–02–TEM

MEASURE IMPLEMENTATION PERIOD		Start	1992	End	ongoing
MEASURE SUBJECTS	Local government property stock				

MEASURE AIMED AT	Heating	Yes	Electricity	Yes	Fuels	Yes	Water	Yes

MEASURE FUNDING AND BUDGET

The energy audit programme started in 1992, and since then aid has been granted for audits of local government properties. In total EUR 6.2 million in aid was granted to local government in 1992–2010. In 2009 and 2010, the aid amounted to approximately EUR 0.45 million per annum. The aid is 40% of the approved cost of the work for all local government players, and 50% for local government players that have signed up to the energy efficiency agreement.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Employment and the Economy, ELY Centres, Motiva

MEASURE DESCRIPTION

Energy audits have long had a key role in Finland's energy policy. They were an obligation in the local government energy-saving agreement (1997–2007), just as they also are in the local government energy efficiency agreement (large councils) and the energy programme (small councils) for 2008–16.

The energy audits include an assessment of the current situation of energy and water use, proposed measures relating to energy savings and the estimated savings, as well as their reporting. Energy audits are conducted by consultants who have obtained energy auditor training and qualification from Motiva.

For local government, there are four models in use for energy audits of buildings: property energy reviews, property energy audits, property monitoring inspections, and property commissioning inspections. Since 2005, the local government sector has also used renewable energy audits of councils, where additional opportunities for the use of renewable energy are mapped out for the whole area covered by the council.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, which was also used for the NEEAP-1 calculation.

Starting points and assumptions of the calculation

The calculation makes use of information on the energy-saving potential (KSP) of the measures set out during energy audits and input into the energy audits database, as well as information on the implementation (TA) of measures proposed in audits, which is collected from all those who are signed up to the agreement, when they submit their annual reports as part of the energy efficiency agreement activities.

The information on the implementation of the measures is used to estimate the implemented proportion of all audit-related energy-saving potential, even when it is implemented outside the scope of energy efficiency agreements.

The information on energy-saving potential arising from energy audits in 1995−2009 is from reported audits. The mean data on implementation of the energy-saving potential of the measures set out during audits has been calculated on the basis of the annual reporting by councils under the 2010 energy efficiency agreement and energy programme. The proportion of all local government energy audits accounted for by energy audits relating to energy efficiency agreement activities has been over 95% in recent years.

The energy-saving potential from audits in 2010−2011 has been estimated to be at the mean level of the five preceding whole reporting years (2004−2008), 30% more than this in 2012−2016, and falling back down to the 2010 level in 2017−2020. The estimate is based on the number of audits started in 2009−2010(2011 1st quarter) and on information from the previous agreement period (1997−2007) concerning the impact of the agreements on audit volumes and on the trend in energy-saving potential.

By way of deviation from the NEEAP-1 estimate, the energy-saving potential and information on the implementation of the measures have been calculated separately for "operational" measures and other measures, i.e. techni-

cal measures. The lifetime of individual technical measures is not estimated separately, but a mean lifetime of 12 years is used, which is still very conservative compared to the lifetime set out for many technical measures for the private service sector in the Commission's calculation guidelines. The lifetime of measures linked to operating technology has been set at 5 years, thanks to good monitoring of consumption and reacting to deviations - one of the obligations set in the agreement. Approximately one third of the measures proposed in energy audits in the private service sector are measures linked to operating technology. The energy-saving impact of the measures proposed in the audits is assumed to be achieved in the year following the energy audit.

Initial data

The initial data for the calculation are obtained from the monitoring system for energy audits and the energy efficiency agreements. Data from the objects of the energy audits are collected there in three stages.

From the application and the aid decision:

- capacity, year of construction, building type, accession to energy-saving agreement, audit aid granted.

From the energy audit report:

- information on energy and water use for the year preceding the audit;
- information about each of the proposed measures, including:
  - brief description/name of the measure and its classification, which distinguishes between operating technology measures and technical measures;
  - the heating, electricity and/or water saving in energy units (kWh/a) and in terms of cost (EUR/a);
  - investment estimate and direct payback period for the measure (EUR, a);
  - implementation data for the proposed measures (implemented T, decided P, under consideration H, not being implemented E).

From the annual reports connected to the energy-saving agreements:

- information on the implementation of measures proposed during energy audits, on the basis of which the implementation data (T, P, H, E) for energy-saving measures proposed during the audits are updated.

The data collected from the energy audit reports are data explained and/or measured on the spot by energy auditors who have obtained a qualification during energy audit training, as well as calculations performed on the basis of that data. The accuracy of the savings calculation corresponds to the accuracy that may be achieved in normal field work. The savings achieved by the energy-saving measures are not usually verified by subsequent measurements, since it is often difficult to take measurements in practice and it generates excessive costs.

For each of the measures proposed during an audit, information is sought from the annual report under the energy-savings agreements on whether the measure has been implemented (T), decided for implementation (P), is being considered for implementation (H), or whether it has been decided that the measure will not be implemented (E). When local councils calculate the degree of implementation (TA) of the energy-saving measures proposed during the energy audits, they will take into account the full savings impact of the measures that have been implemented, or on which an implementation decision has been made and one third of the savings impact of those that may be implemented.

TA [%] = T+P+0.33*H

The degree of implementation is calculated separately for measures that save heating and electricity and for measures linked to operating technology and technical measures. The degrees of implementation (TA) of the savings potential from energy audits in local government, based on annual reporting data under the 2010 agreements, are:

- for measures linked to operating technology: 79% for measures aimed at heating energy and fuels (L+PA), and 81% for measures aimed at electrical energy (S);
- for technical measures: 55% (L+PA) and 56% (S).

Overlap

The overlaps with the local government energy efficiency agreement and the energy programme have been taken into consideration in assessing the agreement activities.

The energy auditor proposes a schedule for the subject to implement the energy-saving measures and, in this context, considers any overlap with the impact of individual measures.

Impact assessment

The assessment relates to the impact of local government energy audits. The new energy savings impact (ES) generated each year is assessed using the overall energy-saving potential (KSP) for heating and electrical energy of the energy-saving measures proposed during the energy audits reported each year, and the implementation data (TA) for the energy-saving measures proposed during the audits. The starting points and assumptions for the calculation are set out in the preceding sections.

The new energy saving (ES) for the year in question from the overall energy-saving potential (KSP) for a given monitoring year is calculated for both measures linked to operating technology and technical measures for each year as follows:

ES [GWh/a] = TA(heating)*KSP(heating) + TA(electricity)*KSP(electricity)

The total impact on energy savings given in the table below for each year is obtained by adding together the impact on energy savings (ES) that applied at the time, on the grounds set out above.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Employment and the Economy/Motiva

ENERGY SAVING GWh/a			2010	2016	2020
ESD	KU–02–TEM	Energy audits – local government	72	88	80

VA–01–VM

MEASURE	MEASURE CLASS	MEASURE CODE
Making the use of space more effective in central government	8	VA–01–VM

MEASURE IMPLEMENTATION PERIOD		Start	11/2005	End	ongoing
MEASURE SUBJECTS	Premises used by central government				

MEASURE AIMED AT	Heating	Yes	Electricity	Yes	Fuels	No	Water	No

MEASURE FUNDING AND BUDGET

Improvements in the effectiveness of space are funded by landlords when measures are implemented in conjunction with construction projects. In other cases, the funding comes from either landlords or tenants.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Council of State, Senate Properties, organisations representing users of spaces, and players in construction activities (developers, planners and implementers of working environments).

MEASURE DESCRIPTION

The government premises strategy of 2005 sets out the target of improving the efficiency of the use of space in central government premises by approximately 20–25%. In order to achieve this, the strategy outlines, *inter alia*, a specific target in square meters (target 25 m^2/person) for office-type premises. The target in the strategy should always be taken into consideration in connection with basic repairs or new investments for state-owned premises. The strategy should also be complied with when office premises are leased to the state by external lessors.

According to the principles of the premises strategy, any significant known change factors must also be taken into consideration during the procurement of premises for central government. The most crucial of these is the central government productivity programme, which endeavours to improve productivity at work and reduce staff numbers. The implementation of the productivity programme aims at reducing the government's manpower requirement by approximately 14 000 man years by 2015, i.e. by approximately 12% from the 2005 level.

The use of space is being made more efficient in two ways, both of which require measures to be taken. When planning new construction and repair projects, consideration is given to the development of the work environment, which at the basic level aims to improve the use of space and at the overall level comprehensively aims to improve organisational productivity and regeneration capacity. The process programs efficient space solutions that are appropriate to the organisation's operating models, which have been developed as described above. Since the long cyclical process of construction projects does not make it possible to improve the space efficiency of central government completely during the target period, improvements to the use of space are also implemented in organisational restructuring situations and whenever possible from the perspective of practical commitments as well as commitments relating to the premises. Spaces are thus made more efficient using fewer measures than in standard repair projects, either in existing spaces or by replacing inappropriate premises with ones offering more efficient use of space and more flexibility.

The impact of the measure on energy savings is based on the fact that premises' energy consumption falls in almost direct relation to increased space efficiency.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

The calculation uses a dedicated national BU calculation method, the principles of which are described below.

Starting points and assumptions of the calculation

The efficiency of premises is currently approximately 30–35 m^2/person, with a target of 25 m^2/person. In increasing the efficiency of the use of space by 30%, it has been found on the basis of the calculations and experience discussed above that specific energy consumption in spaces increases by 5%. Increasing the efficiency of the use of space does, however, reduce energy use in an almost linear manner, and the overall saving is estimated to be considerable if the target in the premises strategy is achieved.

The impact on energy savings is based on the mean energy consumption of property stock taken out of use through the increased efficiency of space, this being approximately 200 kWh/m^2, and on consumption monitoring data from Senate Properties. The stock taken out of use is assumed to compensate for an increasing need for space

elsewhere, or alternatively to be eliminated.

According to the principles of the premises strategy, the procurement of premises for central government must also consider any crucial change factors that are known. The most important of these is the central government productivity plan, which endeavours to make productivity at work more efficient and reduce staff numbers, as described above. A reduction in staff numbers has not been taken into account in the improvement of energy efficiency.

Initial data

The amount of new construction by Senate Properties is currently approximately 18 000 m^2 (gross square metres) per annum. The stock where space is to be made more efficient through repair projects is estimated on the basis of the number of repair projects by Senate Properties every year, which is on average 135 000 m^2 per annum. The proportion of increased space efficiency coming from other sources than construction projects has been calculated on the basis of office-type premises being repaired in 2010-2020, which is 1.47 million m^2 for Senate Properties and approximately 0.5 million m^2 for property leased to central government by other property owners.

It is also assumed that space can be made more efficient in every other project, on average, and in half of the space-saving programmes for the projects in question. The savings review therefore assumes that it is possible to improve space efficiency in one quarter of the surface area to be constructed or repaired.

Increased space efficiency is thus aimed at 230 000 m^2 per annum, through annual construction projects and other measures.

Data supporting the calculations have also been obtained from project and general reports prepared by Senate Properties, which deal with the energy effects of space efficiency (including Senate Properties' progress plan on the energy efficiency of investments 2011–2020, IPY 5/5/2011).

Overlap

None.

Impact assessment

The use of space is made more efficient both in conjunction with projects and otherwise, spread out evenly over the period so that the same reduction in the volume of space is achieved every year.

The annual energy saving (ES) is calculated using the model:

ES [GWh/a] = mean specific energy consumption of property stock taken out of use [kWh/m^2] * amount of space taken out of use each year [m^2]

The total impact on energy savings given in the table below for each year is obtained by adding together the impact on energy savings (ES) that applied at the time, on the grounds set out above for the year in question.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Finance/Senate Properties

ENERGY SAVING GWh/a			2010	2016	2020
ESD	VA–01–VM	Making the use of space more effective in central government	9	64	101

VA–02–VM

MEASURE	MEASURE CLASS	MEASURE CODE
Renovation of state property stock	8	VA–02–VM

MEASURE IMPLEMENTATION PERIOD		Start	9/2009	End	ongoing
MEASURE SUBJECTS	State-owned properties				

MEASURE AIMED AT	Heating	Yes	Electricity	Yes	Fuels	No	Water	Yes

MEASURE FUNDING AND BUDGET

Repair projects are funded by the landlord (the owner of the property). A new lease agreement is usually drawn up in conjunction with the project, to agree on any impact that the energy-saving measures may have on the rent. This may be relevant, for example, in cases where the tenant pays for all the electricity consumption in the building, and some of the investment in energy efficiency aimed at the property results in a benefit for the tenant.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Senate Properties and other state property entities

MEASURE DESCRIPTION

The proportion of all state construction projects accounted for by repair projects is currently approximately 80%, since measures to improve energy efficiency that are implemented in conjunction with repairs affect final energy consumption more than in new construction, although in other respects it is harder for renovations to achieve the level of specific energy consumption that is achieved in new construction. Since the energy efficiency of renovations is not currently set in building regulations, the consumption targets are based on the energy efficiency progress plan for investments (construction) prepared by Senate Properties for 2011–20.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

The energy saving has been calculated for each part of the building using a dedicated national BU calculation method, the grounds for which are described below. A target level has been set for all significant measures to improve energy efficiency (improvements to the building envelope, improvements to heat recovery, electrical efficiency of lighting, etc.) in the coming years, and the target level is compared to the properties of the stock that is of an age requiring repair.

Starting points and assumptions of the calculation

Senate Properties' buildings are repaired at a rate of 135 000 m^2 per annum, so the repairs are or may be significant in terms of the impact on energy efficiency. The proportion of other state property entities increases this figure by approximately 10%. The same number of repairs are assumed to be carried out each year over the next ten years, i.e. a total of approximately 150 000 m^2 per annum.

As far as is relevant, the calculation has used the requirements of the building regulations aimed at new construction or, failing this, the predicted energy efficiency of the best solutions in use (e.g. lighting). As it is not possible to implement all energy-saving measures in all repair projects, the feasibility of applying individual measures to property stock is estimated as a percentage of the number of building parts in the projects and of other characteristics. Some repair measures can be implemented more comprehensively than others (e.g. updating lighting to make it energy-efficient), and there is limited scope for some to be implemented profitably (e.g. opportunities to add heat insulation to external walls). These proportions are obtained on the basis of experience from ongoing and implemented projects by Senate Properties. The assumptions made have been documented in Senate Properties' progress plan for the energy efficiency of investments for 2011–20, IPY 5/5/2011.

On the basis of the study, the key measures for increasing efficiency are improving the efficiency and coverage of ventilation heat recovery, replacing windows, and improving the electrical efficiency of lighting and ventilation.

Furthermore, when setting the mean target for energy efficiency in repair projects, consideration has been given to the Government resolution on promoting sustainable choices in public procurement (8 April 2009), which also sets general targets for the energy efficiency of repair projects (the target is at least energy efficiency class C for basic repairs to buildings).

Initial data

The volume of annual construction is obtained from the database of Senate Properties' construction projects, which has been analysed for many years. Approximately 135 000 m^2 undergoes repair projects every year.

The level of comparison of the characteristics of parts of the building and technical systems prior to the repairs is obtained from the building regulations for the year of construction of the property stock that is of an age requiring repair or, if there are no such regulations, a typical or normal solution for the property stock is used as a corrective comparison solution. The number of parts of the building and construction technology solutions subject to the energy-saving measures is calculated using a model prepared by Senate Properties, where the total number of key parts of the building and systems for the property stock is obtained in specific relation to the parts of the average virtual building.

Overlap

If, as a result of space efficiency measures or for other reasons, objects are removed in the review period from the property stock, whose energy efficiency has improved owing to renovations, the benefit achieved by the repairs is lost. Efforts are made to prevent this risk by forming portfolios of properties, so that repairs can be targeted at the right objects. The possibility of repairs targeting property stock that is being removed has not been taken into account when calculating the impact on savings, nor has any overlap with the impact of maintenance.

Impact assessment

For the purposes of the calculation, the impact on savings of the individual energy-saving measures is obtained using the principle described above, as the outcome of the total number/extent of the measures and the energy properties of the measures.

The impact on savings of each energy-saving measure per annum ($ES_{Measure}$) is calculated using the model:

$ES_{Measure}$ [GWh/a] = specific saving per measure [kWh/units per measure] * annual number of repairs [units per measure]

and the total saving (ES) is calculated as the sum of:

ES [GWh/a] = $ES_{Measure1} + ES_{Measure2} + \ldots + ES_{MeasureN}$

The total impact on energy savings given in the table below for each year is obtained by adding together the impact on energy savings (ES) that applied at the time, on the grounds set out above for the year in question.

The impact of individual measures has been estimated to improve gradually over the period studied, owing to increasingly stringent regulations and requirements and also because of technical development. The regulation of renovations takes into account the Government resolution of 8 April 2009 and with regard to technical development, in particular the forecast improvement in the energy efficiency of lighting technology.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Finance/Senate Properties

ENERGY SAVING GWh/a			2010	2016	2020
ESD	VA–02–VM	Renovation of state property stock	4	28	57

VA–03–VM

MEASURE	MEASURE CLASS	MEASURE CODE
Improving energy efficiency in new construction for the state	8	VA–03–VM

MEASURE IMPLEMENTATION PERIOD		Start	9/2009	End	ongoing
MEASURE SUBJECTS	State-owned properties				

MEASURE AIMED AT	Heating	Yes	Electricity	Yes	Fuels	No	Water	Yes

MEASURE FUNDING AND BUDGET

New construction is funded by the landlord (the owner of the property). A lease agreement is drawn up in conjunction with the project, to agree on any impact on rent that energy-saving measures over and above the level required by the regulations may have. This may be relevant, for example, in cases where the tenant pays for all the electricity consumption in the building, and some of the investment in energy efficiency aimed at the property results in a benefit for the tenant.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Senate Properties and other state property entities

MEASURE DESCRIPTION

The proportion of all state construction projects accounted for by new construction is currently approximately 20% of all projects. The energy efficiency of new construction is better than that of repair projects, and the increasingly stringent regulations will reduce the specific energy consumption of new construction even further during the period studied. New construction for the state is not currently implemented, except as a result of particular consideration. The impact of new construction in improving the energy efficiency of state building stock is based on the fact that new construction replaces building stock that is sold or demolished, the energy properties of which are average or poorer than average.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, the principles of which are described below.

Starting points and assumptions of the calculation

The annual amount of new construction by Senate Properties is currently 18 000 m^2. The proportion of other state property entities increases this figure by approximately 10%. For the purposes of this study, new construction is assumed to be carried out at the same rate each year over the next ten years.

The impact of new construction on energy has been studied using a method whereby the level of consumption in new construction, which is the result of known building regulations, is known. The energy consumption review is based on the fact that projects in 2011–14 are implemented in line with energy efficiency class A under the Energy Certificates Decree, as passive buildings from 2015 onwards, and as nearly zero-energy buildings from 2019 onwards.

The following regulations are taken into account: the requirements of the 2012 building regulations, the Government resolution on promoting sustainable choices in public procurement (8 April 2009) and the requirements for public buildings contained in the Energy Performance of Buildings Directive (2002/91/EC). The requirements of both the Government resolution and the Energy Performance of Buildings Directive exceed the requirements of the Finnish building regulations As far as ongoing construction projects are concerned, it has been noted that achieving an energy efficiency class of A requires better solutions than the level required by the regulations.

Initial data

The volume of annual construction is obtained from the database of Senate Properties' construction projects, which has been analysed over many years. The energy consumption of stock that is being removed is calculated using information obtained from Senate Properties' energy monitoring system according to the mean building stock, the total specific energy consumption of which is approximately 200 kWh/m^2.

The trend in consumption levels is obtained by means of a calculation, using the energy consumption calculations for projects that have been implemented or are being planned.

On the basis of the reports submitted, the heating energy consumption of new construction projects imple-

mented as described above is 45%, 33% and 27% of the mean current level. For lighting, it has been assumed that its energy efficiency will improve steadily up until 2015 so that consumption then will be half the current level. It is assumed that a further 20% of increased efficiency will be achieved over the next five-year period. Good solutions for improving the electrical efficiency of ventilation may be introduced immediately. An increase in normal cooling will reduce the improvement in electrical efficiency by one third. Cooling that is required all year round may be exploited to reduce heating.

The initial data and assumptions for the calculation have been described in the report “Senate Properties Progress Plan on the Energy Efficiency of Investments 2011–20”, IPY 5/5/2011.

Overlap

With regard to heating consumption, energy efficiency that is better than the current mean level for new construction is based to a fairly large extent on building regulations, in respect of which there is therefore an overlap. However, since planning permission is not sought for all Senate Properties’ construction projects, the measure only partially overlaps with the requirements of the building regulations. To some extent, there is also an overlap for electricity consumption, mainly with regard to the electrical efficiency of ventilation. Not all of the impact of the regulations can yet be predicted for the 2011–20 period being studied. There is also some overlap with the impact on energy savings from the maintenance of state-owned properties.

Impact assessment

Using the principle described above, the calculation gives the energy consumed by new construction stock built each year as the outcome of the specific energy consumption target level for each period (2011–14, 2015–18, 2019–) and the construction volume. The difference between this figure and the consumption of the stock being removed is calculated as the energy saving for building stock.

ES_{Period} [GWh/a] = (current mean specific consumption [kWh/m^2] - specific consumption for each period [kWh/m^2])* amount of property to be built each year [m^2]

The total impact on energy savings given in the table below for each year is obtained by adding together the impact on energy savings (ES) that applied at the time, on the grounds set out above for the year in question.

ES [GWh/a] = $ES_{Period1}$ + $ES_{Period2}$ + $ES_{Period3}$

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Finance/Senate Properties

ENERGY SAVING GWh/a			2010	2016	2020
ESD	VA–03–VM	Improving energy efficiency in new construction for the state	1	11	19

VA–04–VM

MEASURE	MEASURE CLASS	MEASURE CODE
Maintenance activity and user information for state property stock	6, 8	VA–04–VM

MEASURE IMPLEMENTATION PERIOD		Start	1/2006	End	ongoing

MEASURE SUBJECTS	State-owned properties, tenants

MEASURE AIMED AT	Heat-ing	Yes	Elec-tricity	Yes	Fuels	No	Water	Yes

MEASURE FUNDING AND BUDGET

Maintenance is mainly funded by the landlord, and the tenant pays for maintenance in the case of capital leases. With regard to user information, this is agreed separately. More extensive energy cooperation is agreed between the landlord and the tenant by means of a special Green Lease agreement, which in itself is an instrument for guiding property use.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Senate Properties and other state property entities

MEASURE DESCRIPTION

On the basis of experience, maintenance and guidance for property users have a significant role in reducing the energy consumption of property stock and in developing and maintaining energy efficiency. Without continuous action, it will not be possible to include new items in the range of measures or monitor it continuously, and it will not be possible to manage the specific energy consumption of property stock, far less reduce it. The measures already implemented and those that are to be implemented and developed during the review period include:

- the use and further development of reward/penalty models for property management;
- quality audits of property management in connection with the above;
- maintenance and energy repairs;
- improving the coverage of consumption measurements;
- lease agreement models that encourage energy-efficient use;
- Green Office or a similar service to improve the energy efficiency of the tenant's equipment and activities;
- improving tenants' energy awareness by means of information systems, visualisation, etc.;
- comprehensive energy monitoring, reporting and analysis of hourly data for control measures.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, the principles of which are described below.

Starting points and assumptions of the calculation

Although the activity is ongoing and new measures are being included, it has been estimated that, of the target 2% annual reduction in energy consumption for the period studied, approximately half, on average, will return to the original level with regard to the measures achieved previously. The reduction in consumption is therefore approximately 1% per annum of the previous year's consumption, meaning that the overall trend is logarithmic. Care has also been taken to ensure that this target serves to achieve the targets of the energy efficiency agreement for business premises properties, signed by Senate Properties (excluding activities to improve space efficiency), when other measures (VA–02–VM and VA–03–VM) are taken into account. The energy savings implemented through systematic action were on average 1.5% per annum over the 2006–2010 period.

For properties reported by other players than Senate Properties, the trend is assumed to be the same. Capital lessors develop their activities in accordance with their own energy efficiency plans.

Initial data

Energy consumption data have been obtained from Senate Properties' energy monitoring system, and the saving in consumption achieved has been reported in conjunction with Senate Properties' social responsibility report, which is verified by a third party. Senate Properties' energy monitoring system contains consumption data for all buildings maintained by Senate Properties. The trend for other sites is assumed to be consistent with this.

The impact of maintenance and user information has been estimated on the basis of the trend in actual energy consumption. The impact of energy repairs is calculated for each project.

Overlap

The energy-saving activities thus described have some overlap with the savings to be achieved through energy-efficient renovations and new construction. This has been considered when studying the savings.

Impact assessment

The calculation has obtained absolute consumption savings by calculating the percentage saving described above (1.5% per annum) from the current overall energy consumption and by estimating the logarithmic continuum for the impact on savings in future years, which takes into account the impact of future energy-efficient construction.

The savings for future years are obtained from the consumption figure calculated as described above for the previous year and taking account of the savings. The study has also taken into account a reduction in the volume of building stock caused by improvements in space efficiency and a reduction in the level of consumption owing to improvements in the energy characteristics of property stock.

The savings for 2010 have been calculated in accordance with the realised trend, from the 2006 consumption level. The savings for 2016 and 2020 have been calculated as described above using the 2010 energy consumption level.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Finance/Senate Properties

ENERGY SAVING GWh/a			2010	2016	2020
ESD	VA–04–VM	Maintenance activity and user information for state property stock	93	153	179

PA–01–TEM

MEASURE	MEASURE CLASS	MEASURE CODE
Energy audits – private service sector	3	PA–01–TEM

MEASURE IMPLEMENTATION PERIOD		Start	1992	End	ongoing
MEASURE SUBJECTS	Property stock in the private service sector				

MEASURE AIMED AT	Heat-ing	Yes	Elec-tricity	Yes	Fuels	Yes	Water	Yes

MEASURE FUNDING AND BUDGET

The energy audit programme started in 1992, and since then aid has been granted for audits of properties in the private service sector. In total EUR 4.3 million in aid was granted to the private service sector in 1992–2010. In 2009 and 2010, the aid amounted to EUR 0.2−0.3 million p.a.. The aid is 40% of the approved cost of the work for all players, and 50% for small and medium-sized players in the private service sector that have signed up to the energy efficiency agreement.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Employment and the Economy, ELY Centres, Motiva

MEASURE DESCRIPTION

Energy audits have long had a key role in Finland's energy policy. They were an obligation in the energy-saving agreement for the property sector (1997–2007), and they are also one of the measures in the implementation of the energy efficiency agreement for the property sector relating to business premises in 2008–2016.

The energy audits include an assessment of the current situation of energy and water use, proposed measures relating to energy savings and the estimated savings, as well as their reporting. Energy audits are conducted by consultants who have obtained an energy auditor qualification and have been trained by Motiva.

For the private service sector, there are four models in use for energy audits of buildings: property energy reviews, property energy audits, property monitoring inspections, and property commissioning inspections.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, which was also used for the NEEAP-1 calculation.

Starting points and assumptions of the calculation

The calculation makes use of information on the energy-saving potential (KSP) of the measures set out during energy audits and input into the energy audit database, as well as information submitted in connection with annual reporting by all those who are signed up to the agreement, on the implementation (TA) of measures proposed during audits.

The information on the implementation of the measures is used to estimate what proportion of all energy-saving potential is actually implemented, not just in connection with the energy efficiency agreements, but as a result of all energy audits.

The information on energy-saving potential relating to the results of energy audits in 1995−2009 is from reported audits. The mean data on the actual implementation of the energy-saving potential of the measures set out during audits has been calculated on the basis information obtained in the annual reports under the energy efficiency agreements in 2009 and 2010. The proportion of all energy audits in the private service sector accounted for by energy audits relating to energy efficiency agreement activities has fluctuated at 40− 60% in recent years.

The energy-saving potential from audits in 2010−11 has been estimated to be at the mean level of the five preceding whole reporting years (2004−2008), 30% more than this in 2012−2016, and falling back down to the 2010 level in 2017−2020. The estimate is based on the number of audits started in 2009−2010 (2011 1st quarter) and on information from the previous agreement period (1997−2007) concerning the impact of the agreements on audit volumes and the trend in energy-saving potential.

By way of deviation from the NEEAP-1 estimate, the energy-saving potential and information on the implementation of the measures have been calculated separately for measures linked to operating technology and other measures, i.e. technical measures. The lifetime of individual technical measures is not estimated separately, but a mean lifetime of 12 years is used, which is still conservative compared to the lifetime set out for many technical measures for the service sector in the Commission's calculation guidelines. A lifetime of five years has been set for

measures linked to operating technology , based on good monitoring of consumption and reacting to deviations, which is one of the obligations of the agreement. Approximately one third of the measures set out during energy audits in the private service sector are measures linked to operating technology. The energy-saving impact of the measures proposed during the inspections is assumed to be achieved in the year following the energy audit.

Initial data

The initial data for the calculation are obtained from the monitoring system for energy audits and the energy efficiency agreements. Data from the objects of the energy audits are collected there in three stages.

From the application and aid decision, including:

- capacity, year of construction, building type, accession to the energy-saving agreements, audit aid granted.

From energy audit reports:

- information on energy and water use for the year preceding the inspection;
- information about each of the proposed measures, including:
  - brief description/name of the measure, and its classification, which may distinguish between operating technology measures and technical measures;
  - the heating, electricity and/or water saving in energy units (kWh/a) and in terms of cost (EUR/a);
  - investment estimate and direct payback time for the measure (EUR, a);
  - implementation data for the proposed measures (implemented T, decided P, under consideration H, not being implemented E).

From the annual reports connected to the energy-saving agreements:

- information on the implementation of measures proposed during energy audits, which is used to update the implementation data (T, P, H, E) for energy-saving measures proposed during audits.

The data collected from the energy audit reports are data clarified and/or measured on the spot by energy auditors who have obtained a qualification during energy audit training, and calculations performed on the basis of that data. The accuracy of the savings calculation corresponds to the accuracy that may be achieved in normal field work. The savings achieved by the energy-saving measures are not usually verified by subsequent measurements, since it is most often difficult to take measurements in practice and it generates significant additional costs.

For each of the measures proposed during an audit, the annual reporting under the energy-savings agreements will ask for information as to whether the measure has been implemented (T), decided for implementation (P), is being considered for implementation (H), or whether it has been decided that the measure will not be implemented (E). When calculating the degree of implementation (TA) of the energy-saving measures proposed during the energy audits, In audits in the private service sector, the impact on savings of any measures that have actually been implemented, or on which a decision has been made to implement, will be taken fully into account, as well as one third of those that may potentially be implemented.

TA [%] = T+P+0.33*H

The degree of implementation is calculated separately for measures that save heating and electricity and for measures linked to operating technology and technical measures. The degrees of implementation (TA) of the savings potential from energy audits in the private service sector are, for the purposes of the impact assessment and based on the annual report information for the 2009 and 2010 agreements, as follows:

- for measures linked to operating technology: 86% for measures aimed at heating energy and fuels (L+PA), and 81% for measures aimed at electrical energy (S);
- for technical measures: 53% (L+PA) and 61% (S).

Overlap

The energy auditor proposes an implementation schedule for the energy-saving measures for each site and, in this context, considers any overlap with the impact of individual measures.

The overlaps with the agreement activities in the service sector are taken into consideration when assessing the impact of the energy efficiency agreement activities for the business and property sectors.

Impact assessment

The assessment concerns the impact of energy audits in the private service sector. The new impact on energy savings (ES) generated each year is assessed using the overall energy-saving potential (KSP) for heating and electrical energy of the energy-saving measures proposed during the energy audits reported each year, and the implementation data (TA) for the energy-saving measures proposed during the audits. The starting points and assumptions for the calculation are set out in the preceding sections.

The new energy saving (ES) for the year in question from the overall energy-saving potential (KSP) for a given monitoring year is calculated for both measures linked to operating technology and the technical measures for each year as follows:

ES [GWh/a] = TA(heating)*KSP(heating) + TA(electricity)*KSP(electricity)

The total impact on energy savings given in the table below for each year is obtained by adding together the annual impact on energy savings (ES) that applied at the time, on the grounds set out above for each year.

Player(s) responsible for the impact assessment/assessment conducted by Ministry of Employment and the Economy/Motiva					
ENERGY SAVING GWh/a			2010	2016	2020
ESD	PA–01–TEM	Energy audits – private service sector	100	133	118

PA–02–TEM

MEASURE	MEASURE CLASS	MEASURE CODE
Energy efficiency agreement for business – service sector	4	PA–02–TEM

MEASURE IMPLEMENTATION PERIOD		Start	1/2008 (1997)	End	12/2016
MEASURE SUBJECTS	Companies in the private service sector, and their premises				

MEASURE AIMED AT	Heat-ing	Yes	Elec-tricity	Yes	Fuels	Yes	Water	Yes

MEASURE FUNDING AND BUDGET

In 2008–2010, companies that have signed up to the operational programmes for the service sector under the energy efficiency agreement for business have received a total of EUR 0.36 million in aid for energy audits and EUR 1.77 million in investment aid for the implementation of energy saving measures.

Energy audit aid for small and medium-sized companies that have signed up to the agreement has been 50% of the approved costs of work for the inspection. Those who have signed up to the energy efficiency agreement may, on a case-by-case basis, receive investment aid for the implementation of normal investments in energy saving, in which case the aid is generally no more than 25%. Aid for projects implemented using the ESCO service may be no more than 30% if the applicant has signed up to the energy efficiency agreement.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Employment and the Economy, ELY Centres, trade unions in the service sector, Motiva, companies that have joined

MEASURE DESCRIPTION

The energy efficiency agreements for 2008–2016 and the energy saving agreements that preceded them (1997–2007) have had an important role in Finland's climate and energy policy since 2001.

The energy efficiency agreement for business consists of three sector-specific operational programmes for the service sector (trade, tourism and catering services, and automotive), and also one operational programme for the "general" service sector, which may be joined by companies that do not have a dedicated operational programme for their sector.

The energy efficiency agreement for business is a framework agreement signed by the Ministry of Employment and the Economy, the Confederation of Finnish Industries (EK), and the trade unions involved. Approximately 60 companies and nearly 3 000 business premises have signed up for the operational programmes for the service sector under the energy efficiency agreement for business.

With the exception of trade, the companies that have signed up to the operational programmes for the service sector set an energy-saving target of at least 9% of their energy use when they join. The target is 6% in the operational programme for trade, but they cannot take into account early measures, only measures implemented during the 2008–2016 period. The companies are also committed, among other things, to identifying subjects for making energy use more efficient in their properties and production plants by means of energy audits or analyses, the preparation of plans to make energy use more efficient for example by conducting energy audits or analyses, as well as committing to the preparation of plans to make energy use more efficient, the implementation of viable energy-saving measures and staff training relating to energy efficiency, the communication of energy efficiency, and the consideration of energy efficiency in planning and procurement. Further information on the agreement activities may be found at http://www.energiatehokkuussopimukset.fi [English version at http://www.energiatehokkuussopimukset.fi/en/].

The companies that have signed up to the energy efficiency agreement activities submit a report each year to the web-based monitoring system concerning their energy use, the energy-saving measures that they have implemented, and their fulfilment of other obligations connected to the implementation of the agreement. The energy-saving measures that are to be reported may include either energy-saving measures discovered during energy audits and analyses or measures that the companies have found in other ways.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, which was also used for the NEEAP-1 calculation.

Starting points and assumptions of the calculation

The calculation includes energy-saving measures reported as implemented (T) in the annual report as part of the energy efficiency agreement activities, as well as those found during energy audits. For companies that have signed up, other than in the trade sector, and which were involved in the previous energy-saving agreement activities for the property sector (1997−2007), the measures reported as implemented during the previous agreement period, and their impact on savings, have also been taken into account. Until 2010, the savings which were used for the calculation (GWh/a) were savings brought about by the measures reported as implemented in the annual reports of companies signed up to the agreement activities. From 2011, the annual saving will be estimated on the basis of experience gained from the accrual of mean savings achieved during the last 3−5 years and the previous agreement period. From 2017, no new savings are assumed to be generated through the current energy efficiency agreement activities (2008−2016). The information covers nearly all of the companies that have signed up to the agreement activities, since the level of reporting by these companies has been nearly 100% every year.

Because in practice, the measures to be reported in the annual report as part of the agreement activities, other than energy audit measures, do not include measures linked to operating technology, there has been no need to distinguish them in the same way as in energy audit measures. Unlike in audit activities, the lifetimes of individual technical measures are not assessed separately, but a mean lifetime of 12 years is used for the measures reported as having been implemented; this is very conservative in comparison with the lifetime of 15 years set out for many technical measures for industry in the Commission's calculation guidelines.

Of the impact on savings from proposed measures that are reported as implemented, half is estimated to be achieved in the year of implementation, and similarly half the impact on savings will continue in the year following the mean lifetime of 12 years.

Initial data

The initial data for the calculation are obtained from data collected in the monitoring system from the annual reports submitted under the energy efficiency agreements by those who are signed up to the agreement scheme, and similar information from the previous agreement period.

Every company that is signed up to the agreement scheme reports the following, among other things, at premises level every year:

- general information (e.g. contact details, sector, whether the premises have an emissions trading scheme, etc.);
- detailed information about energy use;
- implementation data for the energy-saving measures proposed during energy audits: T implemented, P decided to implement, H considering implementation, E decided not to implement;
- energy-saving measures implemented that were found other than during energy audits, and among other things, the following details about them:
- estimated energy saving (electricity, heating, fuels) MWh/a;
- the year in which the measure was implemented, the investment that it required, payback period, etc.;
- information relating to energy efficiency operating schemes, including information on, *inter alia*, monitoring of energy consumption, energy efficiency plans and environmental schemes;
- other issues relating to, *inter alia*, the use of renewable energy, the consideration of energy efficiency in planning and procurement, staff training on energy matters, communication relating to energy savings and efficiency, energy efficiency in transport and logistics, etc.

The accuracy of the calculation of savings reported corresponds to the accuracy that can be achieved in normal field work. Some of the initial data are design data or estimates, since measurements are not always possible. The savings achieved by the energy-saving measures are not usually verified by subsequent measurements, since it is often difficult to take measurements in practice and it generates excessive costs.

Once the reporting has been completed, the order of magnitude of the data and other validity are checked at Motiva and the companies are asked to supplement the information and/or provide additional information if necessary.

Overlap

The overlaps with energy audits in the private service sector have been taken into account. The impact of measures found during energy audits has not been included in this assessment; it is only included in the assessment of the impact of energy audits in the private service sector.

Impact assessment

The estimate relates to the impact of energy efficiency agreement activities in the service sector for measures other than those found during energy audits.

The annual energy saving (ES) generated is based on the reported impact on energy savings (electricity + heating + fuels) of the measures reported to have been implemented (T) each year by those who have signed up. In accor-

dance with the preceding section, the mean lifetime of the measures is 12 years, for the purposes of the calculation.

The annual energy saving (ES) is calculated using the model

ES[GWh/a] = ES(heating+fuels) + ES(electricity)

The total impact on energy savings given in the table below is obtained for the years shown in the table by adding together the impact on energy savings (ES) that applied at the time, calculated using the grounds set out above for the years in question.

Player(s) responsible for the impact assessment and conducting the assessment

Ministry of Employment and the Economy/Motiva

ENERGY SAVING GWh/a			2010	2016	2020
ESD	PA–02–TEM	Energy efficiency agreement for business – service sector	44	136	122

PA–03–TEM

MEASURE	MEASURE CLASS	MEASURE CODE
Energy efficiency agreement for the property sector – business premises	4	PA–03–TEM

MEASURE IMPLEMENTATION PERIOD		Start	2/2010	End	12/2016
MEASURE SUBJECTS	Business premises				

MEASURE AIMED AT	Heating	Yes	Electricity	Yes	Fuels	Yes	Water	Yes

MEASURE FUNDING AND BUDGET

The operational programme for business premises in the property sector only started at the beginning of 2011, so there is not yet any previous information monitoring the aid.

Companies that have signed up to the agreement may receive energy audit aid amounting to 50% of the approved costs of work for inspections targeting their properties. Those who have signed up to the energy efficiency agreement may, on a case-by-case basis, receive investment aid for the implementation of normal investments in energy saving, in which case the aid is generally no more than 25%. Aid for projects implemented using the ESCO service may be no more than 30% if the applicant has signed up to the energy efficiency agreement scheme.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Employment and the Economy, ELY Centres, RAKLI, Motiva, companies that have joined

MEASURE DESCRIPTION

The energy efficiency agreements for 2008−2016 and the energy saving agreements that preceded them (1997−2007) have had an important role in Finland's climate and energy policy since 2001.

The energy efficiency agreement for the property sector was signed in late 2009. The agreement is a framework agreement and it has been signed by the Ministry of the Environment, the Ministry of Employment and the Economy, and the Finnish Association of Building Owners and Construction Clients (RAKLI). The energy efficiency agreement for the property sector contains two operational programmes, one of which relates to residential lettings associations, and the other of which relates to business premises corporations. This description of the measure relates to the operational programme for business premises, which began in February 2011. It may be joined by private enterprises and corporations that have the actual power to make decisions with regard to their business premises. Since the beginning of February, the agreement has been signed up to by 15 companies that manage properties containing business premises, covering more than half of the property stock falling within the scope of the operational programme.

Companies that join the operational programme for business premises corporations set an energy savings target of at least 6%, calculated using their energy use when they joined. Monitoring achievement of the target takes into consideration measures to improve the efficiency of energy use implemented in 2011–2016 and the impact of which on savings will still apply in 2016.

The companies are committed, among other things, to identifying subjects for making energy use more efficient in their own properties and production facilities, for example by means of energy audits, to the preparation of plans to make energy use more efficient, and the implementation of viable energy-saving measures, as well as, *inter alia*, staff training relating to energy efficiency, communication of energy efficiency, and the consideration of energy efficiency in planning and procurement. They are also committed to implementing measures and promoting tenants' energy use, and to considering energy efficiency when defining tasks relating to property services, and in competitive tendering and contracts. Further information on the agreement activities may be found at http://www.energiatehokkuussopimukset.fi [English version at http://www.energiatehokkuussopimukset.fi/en/].

The companies that have signed up to the energy efficiency agreement activities submit a report each year to the web-based monitoring system concerning their energy use, the energy-saving measures that they have implemented, and their fulfilment of other obligations connected to the implementation of the agreement. The energy-saving measures that are to be reported may include either energy-saving measures discovered during energy audits or measures that the companies have found in other ways.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, based on the assessment used for the NEEAP-1 calculation relating to the agreement activities.

Starting points and assumptions of the calculation

The operational programme only started at the beginning of 2011. There is no monitoring information available, but the starting point for the impact assessment is the energy-saving targets set by the companies that have signed up and the attainment of the targets by 2016.

This assessment also includes measures set out in energy audits, which in this area are estimated to represent approximately half of the measures to be reported in future under the agreement activities. Contrary to audit activities, the lifetime of individual technical measures is not assessed separately, but a mean lifetime of 8 years is used for the reportedly implemented measures. The lifetime is clearly shorter than in the assessment of the operational programme for the business service sector, and it is also shorter than in the assessment relating to business premises corporations, since there are now also assumed to be some measures involved that are proposed in energy audits, approximately one third of which are estimated to be measures linked to operating technology.

From 2017 onwards, no new savings are assumed to be generated by the current energy efficiency agreement activities (2008−2016). The information covers nearly all companies that have signed up to the agreement activities, since the level of reporting by these companies has been nearly 100% every year.

Initial data

The initial data are the target for 2016 under the agreement, calculated from the energy use of those who have signed up to the agreement to date; this is 148 GWh/a.

Overlap

None.

Impact assessment

The impact assessment has been carried out by distributing between the years from 2011 to 2016 the savings target set for the end of 2016.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Employment and the Economy/Motiva

ENERGY SAVING GWh/a			2010	2016	2020
ESD	PA–03–TEM	Energy efficiency agreement for the property sector – properties containing business premises	0	148	123

TE–01–TEM

MEASURE	MEASURE CLASS	MEASURE CODE
Energy audits – industry	3	TE–01–TEM

MEASURE IMPLEMENTATION PERIOD		Start	1992	End	ongoing
MEASURE SUBJECTS	Energy use by industrial properties and processes				

MEASURE AIMED AT	Heating	Yes	Electricity	Yes	Fuels	Yes	Water	Yes

MEASURE FUNDING AND BUDGET

The energy audit programme started in 1992, and since then aid has been granted for industrial energy audits and analyses. In total EUR 15.7 million in aid was granted for industrial energy audits in 1992–2010, of which approximately one third was for projects for medium-sized industry. In 2009 and 2010, the aid amounted to approximately EUR 1.1 million per annum. The aid is 40% of the approved cost of the work for all players, and 50% for small and medium-sized players that have signed up to the energy efficiency agreement.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Employment and the Economy, ELY Centres, Motiva

MEASURE DESCRIPTION

Energy audits have long had a key role in Finland's energy policy. They were an obligation in the industrial energy-saving agreement (1997–2007), and they are also one of the measures in the implementation of the energy efficiency agreement for business for 2008–2016.

The energy audits include an assessment of the current situation of energy and water use, proposed measures relating to energy savings and the resulting estimated savings, as well as their reporting. Energy audits are conducted by consultants who have obtained an energy inspector qualification and have been trained by Motiva.

For industry, there are three models in use for energy audits: industry energy audits, industry energy analyses, and a two-stage energy analysis of process industry. Industrial companies may also use energy audit models for normal buildings, e.g. their office buildings, as developed for the service sector.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, which was also used for the NEEAP-1 calculation.

Starting points and assumptions of the calculation

The calculation makes use of information on the energy-saving potential (KSP) of the measures set out during energy audits, which is input into the energy audits database, as well as information on the implementation (TA) of measures proposed during inspections and gathered from all those who are signed up to the agreement when they submit their annual reports as part of the energy efficiency agreement activities.

The information on the implementation of the measures is used to estimate the implemented portion of all energy-saving potential, from both energy audits and the potential under the energy efficiency agreement.

The savings potential data linked to the results of energy audits in 1995−2009 is from reported energy audits. The mean data on the implementation of the energy-saving potential of the measures set out during audits has been calculated on the basis of information obtained in the 2010 annual reports under the energy efficiency agreement. The proportion of all industrial energy audits accounted for by energy audits relating to energy efficiency agreement activities has fluctuated at 85− 90% in recent years. The savings relate to both medium-sized industry and energy-intensive industry, and have been calculated separately for premises falling within the scope of the ESD, and for those falling within the scope of the emissions trading scheme, the savings of which cannot be taken into consideration for monitoring achievement of the ESD target.

The energy-saving potential from audits in 2010−2011 has been estimated to be the average of the five preceding whole reporting years (2004−2008), 10% more than this in 2012−2016, and falling back down to the 2010 level in 2017−2020. The estimate is based on the number of audits started in 2009−2010 (2011 1st quarter) and on information from the previous agreement period (1997−2007) concerning the impact of the agreements on audit volumes and the trend in energy-saving potential.

By way of deviation from the NEEAP-1 estimate, the energy-saving potential and information on the implementation of the measures have been calculated separately for measures linked to operating technology and other measures, i.e. technical measures. The lifetime of individual technical measures is not estimated separately, but a

mean lifetime of 12 years is used, which is still conservative compared to the lifetime of 15 years set out for many technical measures for industry in the Commission's calculation guidelines. The lifetime of measures linked to operating technology has been set at 5 years, based on good monitoring of consumption and reacting to deviations, which are one of the obligations of the agreement. Only 3–4% of the energy-saving potential from measures set out during industrial energy audits comes from measures linked to operating technology. The energy-saving impact of the measures proposed during the audits is assumed to be achieved in the year following the energy audit.

Initial data

The initial data for the calculation are obtained from the monitoring system for energy audits and the energy efficiency agreements. Data from the objects of the energy audits are collected there in three stages.

From the application and aid decision, including:

- capacity, year of construction, building type, accession to energy-saving agreements, inspection aid granted.

From energy audit reports:

- information on energy and water use for the year preceding the audit;
- information about each of the proposed measures, including:
  - brief description and classification of the measure, which may distinguish between technical measures and those linked to operating technology;
  - the heating, electricity and/or water saving in energy units (kWh/a) and in terms of cost (EUR/a);
  - investment estimate and direct payback period for the measure (EUR, a);
  - implementation data for the proposed measures (implemented T, decided P, under consideration H, not being implemented E).

From the annual reports connected to the energy-saving agreements:

- information on the implementation of measures proposed during energy audits, on the basis of which the implementation data (T, P, H, E) for energy-saving measures proposed during the audits are updated;
- whether the premises fall under the emissions trading scheme.

The data to be gathered from the energy audit reports are data clarified and/or measured on the spot by energy auditors who have obtained a qualification during energy audit training, and the calculations performed on the basis of that data. The accuracy of the savings calculation corresponds to the accuracy that may be achieved in normal field work. Some of the initial data are design data or estimates, since measurements are not always possible. The savings achieved by the energy-saving measures are not usually verified by subsequent measurements, since it is most often difficult to take measurements in practice and it generates significant additional costs.

For each of the measures proposed during an audit, the annual report under the energy-savings agreements will ask for information as to whether the measure has been implemented (T), decided for implementation (P), is being considered for implementation (H), or whether it has been decided that the measure will not be implemented (E). When calculating the degree of implementation (TA) of the energy-saving measures proposed during the energy audits, industrial audits will take into account the full impact on savings of those measures that have been implemented, or which it has been decided to implement, and 5% of those that may potentially be implemented.

TA [%] = T+P+0.05*H

The degree of implementation is calculated separately for measures that save heating and electricity and for technical measures and those linked to operating technology. Furthermore, calculations for industrial energy audits also consider medium-sized energy users (total energy use < 100 GWh/a) and energy-intensive energy users (total energy use > 100 GWh/a) separately. The degrees of implementation (TA) of the savings potential from industrial energy audits are, for the purposes of the impact assessment and based on the annual report information for the 2010 agreements:

- for measures linked to operating technology: 88% for medium-sized energy users for measures aimed at heating energy and fuels (L+PA), and 85% for measures aimed at electrical energy (S), and similarly 83% (L+PA) and 66% (S) respectively for energy-intensive energy users;
- for technical measures: 41% (L+PA) and 55% (S) for medium-sized energy users, and similarly 49% (L+PA) and 28% (S) for energy-intensive energy users.

Overlap

The energy auditor proposes an implementation schedule for the savings measures for the subject and, in this context, takes into account any overlap with the impact of individual measures.

The overlaps with the industrial agreement activities are taken into consideration when assessing the impact of the energy efficiency agreement activities for business.

Impact assessment

The assessment relates to the impact of industrial energy audits. The assessment distinguishes between savings for premises within the scope of the ESD (ESD) and those within the scope of the emissions trading scheme (non-ESD).

The new impact on energy savings (ES) generated each year is assessed using the overall energy-saving poten-

tial (KSP) for heating and electrical energy of the energy-saving measures proposed during the energy audits reported each year, as well as the implementation data (TA) for the energy-saving measures proposed during the audits. The starting points and assumptions for the calculation are set out in the preceding sections.

The new energy saving (ES) for the year in question from the overall energy-saving potential (KSP) for a given monitoring year is calculated for both technical measures and those linked to operating technology for each year as follows:

ES [GWh/a] = TA(heating)*KSP(heating) + TA(electricity)*KSP(electricity)

The total impact on energy savings given in the table below for each year is obtained by adding together the impact on energy savings (ES) that applied at the time, on the grounds set out above.

In addition to the ESD area, the table also sets out the impact on savings of industrial energy audits, calculated similarly, for industrial premises falling within the scope of the emissions trading scheme. The savings from measures proposed by energy analyses for process industry are mainly reported in the annual reports for the industrial operational programmes under the energy efficiency agreement for business, and they are therefore not included in this assessment.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Employment and the Economy/Motiva

ENERGY SAVING GWh/a			2010	2016	2020
ESD	TE–01–TEM	Energy audits – industry	**1 435**	**1 119**	**1 074**
NON-ESD	TE–01–TEM	Energy audits – industry	1 348	848	857

TE–02–TEM

MEASURE	MEASURE CLASS	MEASURE CODE
Energy efficiency agreement for business – medium-sized industry	4	TE–02–TEM

MEASURE IMPLEMENTATION PERIOD		Start	1/2008 (1997)	End	12/2016
MEASURE SUBJECTS	Industrial business premises with a total energy use (electricity + heating + fuels) of less than 100 GWh/a				

MEASURE AIMED AT	Heat-ing	Yes	Elec-tricity	Yes	Fuels	Yes	Water	Yes

MEASURE FUNDING AND BUDGET

In 2008–2010, companies that have signed up to the operational programme for medium-sized industry under the energy efficiency agreement for business have received a total of EUR 1.76 million in aid for energy audits and EUR 5.84 million in investment aid for the implementation of energy saving measures.

Energy audit aid for those who have signed up to the agreement has been 40% of the approved costs of work for the audit. Those who have signed up to the energy efficiency agreements may, on a case-by-case basis, receive investment aid for the implementation of normal investments in energy saving, in which case the aid is generally no more than 25%. Aid may be granted for premises falling within the scope of the emissions trading scheme, unless it has a direct impact on the applicant's emissions rights or the financial significance of such impact on the viability of the investment is small. Aid for projects implemented using the ESCO service may be no more than 30% if the applicant has signed up to the energy efficiency agreement scheme.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Employment and the Economy, ELY Centres, the Confederation of Finnish Industries (EK), industrial trade unions, Motiva, companies that have joined

MEASURE DESCRIPTION

The energy efficiency agreements for 2008–2016 and the energy saving agreements that preceded them (1997–2007) have had an important role in Finland's climate and energy policy since 2001.

The energy efficiency agreement for business consists of five sector-specific operational programmes for medium-sized industry (food, chemicals, plastics, wood, and technology), and also one operational programme for "general" industry, which may be joined by companies that do not have a dedicated operational programme for their sector.

The energy efficiency agreement for business is a framework agreement signed by the Ministry of Employment and the Economy, the Confederation of Finnish Industries (EK), and the industrial trade unions involved. Approximately 200 companies and their nearly 550 business premises have signed up for the operational programmes for medium-sized industry under the energy efficiency agreement for business. The energy use of industrial companies that have signed up to the agreement activities covers a good 85% of industrial energy use, and varies depending on the sector, being on average 50–70% of the energy use in the ESD area for this sector.

The companies that have signed up to the operational programmes for medium-sized industry set an energy-saving target of at least 9% of their energy use when they join. The companies are also committed, among other things, to identifying subjects for making energy use more efficient in their own properties and production facilities, for example by means of energy audits or analyses, to the preparation of plans to make energy use more efficient, the implementation of viable energy-saving measures and staff training relating to energy efficiency, the communication of energy efficiency, and the consideration of energy efficiency in planning and procurement. Further information on the agreement activities may be found at http://www.energiatehokkuussopimukset.fi [English version at http://www.energiatehokkuussopimukset.fi/en/].

The companies that have signed up to the energy efficiency agreement activities submit a report each year to the web-based monitoring system concerning their energy use, the energy-saving measures that they have implemented, and their fulfilment of other obligations connected to the implementation of the agreement. The energy-saving measures that are to be reported may include either energy-saving measures discovered during energy audits and analyses or measures that the companies have found in other ways.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, which was also used for the NEEAP-1 calculation.

Starting points and assumptions of the calculation

The calculation includes energy-saving measures reported as implemented (T) in the annual report as part of the energy efficiency agreement activities, other than those found during energy audits. For local councils and municipal federations that were involved in the previous energy-saving agreement (1997−2007), the measures reported as implemented during the previous agreement period, and their impact on savings, have also been considered. Until 2010, the savings used for the calculation (GWh/a) were the impact on savings of the measures that companies signed up to the agreement activities reported as implemented in their annual reports. From 2011, the annual saving will be estimated on the basis of experience gained from the accrual of mean savings achieved during the last 3−5 years and the previous agreement period. From 2017, no new savings are assumed to be generated through the current energy efficiency agreement activities (2008−2016). The information covers nearly all of the companies that have signed up to the agreement activities, since the level of reporting by these companies has been approximately 95−100% every year.

In practice, the measures to be reported in the annual report as part of the agreement activities, other than energy audit measures, do not include measures linked to operating technology. Contrary to audit activities, the lifetimes of individual technical measures are not assessed separately, but a mean lifetime of 12 years is used for the measures reported as having been implemented; this is conservative in comparison with the lifetime of 15 years set out for many technical measures for industry in the Commission's calculation guidelines.

Of the impact on savings from proposed measures that are reported for implementation, half is estimated to be achieved in the year of implementation, and similarly half the impact on savings will continue in the year following the mean lifetime of 12 years. Information about emissions-trading sites that has been added to the database is also used.

Initial data

The initial data for the calculation are obtained from data collected in the monitoring system from the annual reports submitted under the energy efficiency agreements by those who are signed up to the agreement scheme, and similar information from the previous agreement period.

Every company that is signed up to the agreement scheme reports the following, among other things, at premises level every year:

- general information (e.g. contact details, sector, whether the premises have an emissions trading scheme, etc.);
- detailed information about energy use;
- implementation data for the energy-saving measures proposed during energy audits: T implemented, P decided to implement, H considering implementation, E decided not to implement;
- energy-saving measures implemented that were found other than during energy audits, and among other things, the following details about them:
- estimated energy saving (electricity, heating, fuels) MWh/a;
- the year in which the measure was implemented, the investment that it required, payback time, etc.;
- information relating to energy efficiency operating schemes, including information on, *inter alia*, monitoring of energy consumption, energy efficiency plans and environmental schemes;
- other issues relating to, *inter alia*, the use of renewable energy, the consideration of energy efficiency in planning and procurement, staff training on energy matters, communication relating to energy savings and efficiency, energy efficiency in transport and logistics, etc.

The accuracy of the calculation of savings reported corresponds to the accuracy that can be achieved in normal field work – some of the initial data are design data or estimates, since measurements are not always possible. The savings achieved by the energy-saving measures are not usually verified by subsequent measurements, since it is often difficult to take measurements in practice and it generates excessive costs.

Once the reporting has been completed, the order of magnitude of the data and other validity are checked at Motiva and the companies are asked to supplement the information and/or provide additional information if necessary.

Overlap

The overlaps with energy audits in industry have been taken into consideration. With the exception of energy analyses for process industry, the impact of measures found during energy audits has not been included in this assessment, rather, it is included only in the assessment of the impact of energy audits in industry.

Impact assessment

The estimate relates to the impact of energy efficiency agreement activities in medium-sized industry for measures other than those found during energy audits. The assessment distinguishes between savings for premises within the scope of the ESD (ESD) and those within the scope of the emissions trading scheme (non-ESD).

The annual energy saving (ES) generated is based on the reported impact on energy savings (electricity + heating +

fuels) of the measures reported to have been implemented (T) each year by those who have signed up. In accordance with the preceding section, the mean lifetime of the measures is 12 years, for the purposes of the calculation.

The annual energy saving (ES) is calculated using the model

ES[GWh/a] = ES(heating+fuels) + ES(electricity)

The total impact on energy savings given in the table below is obtained for the years shown in the table by adding together the impact on energy savings (ES) that applied at the time, calculated using the grounds set out above for the years in question.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Employment and the Economy/Motiva

ENERGY SAVING GWh/a			2010	2016	2020
ESD	**TE–02–TEM**	Energy efficiency agreement for business – medium-sized industry	**277**	**386**	**389**
NON-ESD	**TE–02–TEM**	Energy efficiency agreement for business – medium-sized industry	80	93	85

TE–03–TEM

MEASURE	MEASURE CLASS	MEASURE CODE
Energy efficiency agreement for business – energy-intensive industry	4	TE–03–TEM

MEASURE IMPLEMENTATION PERIOD		Start	1/2008 (1997)	End	12/2016
MEASURE SUBJECTS	Industrial business premises with a total annual energy use (electricity + heating + fuels) of more than 100 GWh/a				

MEASURE AIMED AT	Heating	Yes	Electricity	Yes	Fuels	Yes	Water	Yes

MEASURE FUNDING AND BUDGET

In 2008–2010, companies that have signed up to the operational programme for energy-intensive industry under the energy efficiency agreement for business have received a total of EUR 0.94 million in aid for energy audits and EUR 5.53 million in investment aid for the implementation of energy saving measures.

Energy audit aid for those who have signed up to the agreement has generally been 40% of the approved costs of work for the audit. Those who have signed up to the energy efficiency agreements may, on a case-by-case basis, receive investment aid for the implementation of normal investments in energy saving, in which case the aid is generally no more than 25%. Aid may be granted for premises falling within the scope of the emissions trading scheme, unless it has a direct impact on the applicant's emissions rights or the financial significance of such impact on the viability of the investment is small. Aid for projects implemented using the ESCO service may be no more than 30% if the applicant has signed up to the energy efficiency agreement scheme.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Employment and the Economy, ELY Centres, the Confederation of Finnish Industries (EK), Motiva, companies that have joined

MEASURE DESCRIPTION

The energy efficiency agreements for 2008–2016 and the energy saving agreements that preceded them (1997–2007) have had an important role in Finland's climate and energy policy since 2001.

The energy efficiency agreement for business is a framework agreement signed by the Ministry of Employment and the Economy, the Confederation of Finnish Industries (EK), and the industrial trade unions involved. Approximately 38 companies and the nearly 150 business premises that they have have signed up for the operational programmes for energy-intensive industry under the energy efficiency agreement for business. In practice, the energy use of those that have signed up to the operational programme for energy-intensive industry covers nearly all energy use by energy-intensive industry. In addition to the operational programme for energy-intensive industry, the energy efficiency agreement for business also includes five sector-specific operational programmes for medium-sized industry (food, chemicals, plastics, wood, and technology), and also one operational programme for "general" industry, which may be joined by companies that do not have a dedicated operational programme for their sector.

The companies that have signed up to the operational programmes for energy-intensive industry are committed to including continuous improvements to energy efficiency as part of the environmental and/or management system in use or due for introduction at the company. This is done by adding energy matters to these systems in accordance with the Energy Efficiency System (ETJ) defined in the operational programme, and by committing to using the system throughout the agreement period. When the ETJ is introduced, the company also sets energy savings targets for itself. Further information on the agreement activities generally, as well as the continuous improvements and the Energy Efficiency System, may be found at http://www.energiatehokkuussopimukset.fi [English version at http://www.energiatehokkuussopimukset.fi/en/].

The companies that have signed up to the energy efficiency agreement activities submit a report each year to the web-based monitoring system concerning their energy use, the energy-saving measures that they have implemented, and their fulfilment of other obligations connected to the implementation of the agreement. The energy-saving measures that are to be reported may include either energy-saving measures discovered during energy audits and analyses or measures that the companies have found in other ways.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, which was also used for the NEEAP-1 calculation.

Starting points and assumptions of the calculation

The calculation includes energy-saving measures reported as implemented (T) in the annual report as part of the energy efficiency agreement activities, other than those found during energy audits. For companies that were involved in the previous energy-saving agreement (1997−2007), the measures also reported as implemented during the previous agreement period, and their impact on savings, have also been considered. Until 2010, the savings used for the calculation (GWh/a) were the impact on savings of the measures that companies signed up to the agreement activities reported as implemented in their annual reports. From 2011, the annual saving will be estimated on the basis of average implementation in 2005−2010. From 2017, no new savings are assumed to be generated through the current energy efficiency agreement activities (2008−16). The information covers nearly all of the energy-intensive companies that have signed up to the agreement activities, since the level of reporting by these companies has mainly been 100% every year, or very close to it.

In practice, the measures to be reported in the annual report as part of the agreement activities, other than energy audit measures, do not include measures linked to operating technology; therefore there has been no need to distinguish them in the same way as in energy audit measures. Contrary to audit activities, the lifetimes of individual technical measures are not assessed separately, but a mean lifetime of 12 years is used for the measures reported as having been implemented; this is conservative in comparison with the lifetime of 15 years set out for many technical measures for industry in the Commission's calculation guidelines.

Of the impact on savings from proposed measures that are reported for implementation, half is estimated to be achieved in the year of implementation, and similarly half the impact on savings will continue in the year following the mean lifetime of 12 years. Information about emissions-trading sites that has been added to the database is also used.

Initial data

The initial data for the calculation are obtained from data collected in the monitoring system from the annual reports submitted under the energy efficiency agreements by those who are signed up to the agreement scheme, and similar information from the previous agreement period.

Every company that is signed up to the agreement scheme reports the following, among other things, at premises level every year:

- general information (e.g. contact details, sector, whether the premises have an emissions trading scheme, etc.);
- detailed information about energy use;
- implementation data for the energy-saving measures proposed during energy audits and analyses: T implemented, P decided to implement, H considering implementation, E decided not to implement;
- energy-saving measures implemented that were found other than during energy audits, and among other things, the following details about them:
- estimated energy saving (electricity, heating, fuels) MWh/a;
- the year in which the measure was implemented, the investment that it required, payback time, etc.;
- information relating to energy efficiency operating schemes, including information on, *inter alia*, monitoring of energy consumption, energy efficiency plans and environmental schemes;
- other issues relating to, *inter alia*, the use of renewable energy, the consideration of energy efficiency in planning and procurement, staff training on energy matters, communication relating to energy savings and efficiency, energy efficiency in transport and logistics, etc.

The accuracy of the calculation of savings reported corresponds to the accuracy that can be achieved in normal field work – some of the initial data are design data or estimates, since measurements are not always possible. The savings achieved by the energy-saving measures are not usually verified by subsequent measurements, since it is often difficult to take measurements in practice and it generates excessive costs.

Once the reporting has been completed, the order of magnitude of the data and other validity are checked at Motiva and the companies are asked to supplement the information and/or provide additional information if necessary.

Overlap

The overlaps with energy audits in industry have been taken into consideration. With the exception of energy analyses for process industry, the impact of measures found during energy audits has not been included in this assessment, rather, they are only included in the assessment of the impact of energy audits in industry.

Impact assessment

The estimate relates to the impact of energy efficiency agreement activities in energy-intensive industry for measures other than those found during energy audits. The assessment distinguishes between savings for premises within the scope of the ESD (ESD) and those within the scope of the emissions trading scheme (non-ESD).

The annual energy saving (ES) generated is based on the reported impact on energy savings (electricity + heating + fuels) of the measures reported to have been implemented (T) each year by those who have signed up. In accordance with the preceding section, the mean lifetime of the measures is 12 years, for the purposes of the calculation.

The annual energy saving (ES) is calculated using the model

ES[GWh/a] = ES(heating+fuels) + ES(electricity)

The total impact on energy savings given in the table below is obtained for the years shown in the table by adding together the impact on energy savings (ES) that applied at the time, calculated using the grounds set out above for the years in question.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Employment and the Economy/Motiva

ENERGY SAVING GWh/a			2010	2016	2020
ESD	**TE–03–TEM**	Energy efficiency agreement for business – energy-intensive industry	**1 043**	**1 100**	**1 179**
NON-ESD	**TE–03–TEM**	Energy efficiency agreement for business – energy-intensive industry	6 924	7 265	7 011

LI–01–LVM

MEASURE	MEASURE CLASS	MEASURE CODE
Improving the energy efficiency of cars	1, 2, 6	LI–01–LVM

MEASURE IMPLEMENTATION PERIOD		Start	6/2009	End	ongoing
MEASURE SUBJECTS	Car buyers				

MEASURE AIMED AT	Heating	No	Electricity	No	Fuels	Yes	Water	No

MEASURE FUNDING AND BUDGET

Market-based

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Participation in preparation of EU regulations: Ministry of Transport and Communications; taxation: Ministry of Finance; development of information management: Ministry of Transport and Communications

MEASURE DESCRIPTION

The measures for improving the energy efficiency of cars are:

1) EU legislation;
2) taxation; and
3) the development of information management.

EU legislation

Regulation (EC) No 443/2009 of the European Parliament and of the Council setting emission performance standards for new passenger cars (binding limit on CO_2 from cars) entered into force in June 2009. The aim of the regulation is to bring mean carbon dioxide emissions from new car stock down to 120–130 g CO_2/km by 2015 and to 95 g/km by 2020.

Taxation

Finnish car tax was reformed in 2007, and the reforms entered into force on 1 January 2008. The reform meant that car tax was graded according to the car's specific emissions (CO_2/km). The lowest tax rate (12.2%) is collected for cars with carbon dioxide emissions of less than 60 g/km. The highest rate (48.8%) is collected for cars with carbon dioxide emissions of more than 360 g/km.

Vehicle tax was also graded the same year, and according to the same principle. The basic tax rate for emissions-based vehicle tax is EUR 20–605 per annum, depending on the cars specific carbon dioxide emissions. The reformed vehicle tax will enter into force in stages from 2010 onwards.

Information management

In connection with the tax reforms, Finland has developed an A–G labelling scheme for cars; it is familiar from household appliances. The label can be printed for all makes or models of car on sale, from the Ekoake pages of the Finnish Transport Safety Agency website. The introduction of energy labels in car showrooms is being supported by training for sales staff and by customer information management.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, the starting points and principles of which are described below.

Starting points and assumptions of the calculation

The calculation is based on calculations of the potential to reduce CO_2 performed by VTT, where the BAU scenario being compared (= no measures) is assumed to be a continuation of the trend prevailing in 2006–2007 with regard to the distribution of car sales (petrol and diesel) and mean carbon dioxide emissions. As a joint consequence of the measures, the mean carbon dioxide emissions of cars sold have fallen.

When assessing the effectiveness of the measures for 2010, the situation has been calculated at the end of 2010, since it is assumed that the mean carbon dioxide emissions of cars taken into service in 2008 and 2009 is the mean value given in the sales statistics, and that the cars do normal annual mileage. It must be assumed that the large increase in sales of diesel cars (share of sales 28% in 2007 → 50% in 2008) has created a group of users of diesel cars, who drive less than the previous typical annual mileage for diesel cars, since otherwise the total amount

of mileage would have increased. The calculations assume that approximately 30% of cars are continuing to put in the previous "normal" diesel mileage, and the average CO_2 emissions from these cars is consistent with the statistics. Additionally, the remainder of diesel cars put in the typical annual mileage for petrol-engine cars, but their average CO_2 emissions are consistent with the statistics for diesel cars. All cars registered as petrol-operated put in the number of kilometres consistent with typical annual performance, and the mean carbon dioxide emissions figure in the statistics is used for each year calculated. However, only 50% of the emissions from cars sold in 2010 are included, since it is assumed that they were taken into service steadily over the year.

The fall in emissions is the difference in emission levels thus calculated, approximately 93 000 tonnes of CO_2, which is, relatively speaking, a reduction of approximately 9% in the total carbon dioxide emissions of these three most recent years. Similarly, the difference in emission levels for 2016 is approximately 670 000 tonnes of CO_2, and approximately 1 300 000 tonnes of CO_2 in 2010.

The quantities of carbon dioxide have been converted into energy using a conversion factor of 1 tonne CO_2 = 0.00379 GWh. The fall in energy consumption thus obtained is 360 GWh, which means a fall of approximately 1.4% in the energy used by cars every year.

Initial data

Mean carbon dioxide emissions from cars, source: Finnish Transport Safety Agency (TraFi). Annual Driving Performance, source: LIPASTO/ LIISA2009 (VTT)

Overlap

The assessment combines the joint impact of the EU's Objective Programme for CO_2 emissions from cars (measure 1) and Finnish tax management (measures 2 and 3), since it has not been possible to distinguish between the impact of the individual measures.

Impact assessment

The estimated saving for 2010 is therefore approximately 1.4% of annual energy consumption by cars. Similarly, the estimated savings for 2016 and 2020 would be approximately 10% and approximately 20% respectively. These figures are based on rather moderate forecasts of new car sales, which are not sufficient for renewing the car stock in the long term.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Transport and Communications/VTT

ENERGY SAVING GWh/a			2010	2016	2020
ESD	LI–01–LVM	Improving the energy efficiency of cars	360	2 100	4 100

LI–02–LVM

MEASURE	MEASURE CLASS	MEASURE CODE
Training in economical ways of driving in car traffic	5	LI–02–LVM

MEASURE IMPLEMENTATION PERIOD		Start	1994	End	ongoing
MEASURE SUBJECTS	Car drivers				

MEASURE AIMED AT	Heating	No	Electricity	No	Fuels	Yes	Water	No

MEASURE FUNDING AND BUDGET

Training in economical ways of driving included in basic driver training is paid for by the pupils. The Ministry of Employment and the Economy and the Ministry of Transport and Communications have occasionally funded more comprehensive training in economical ways of driving ("further training") on a project basis.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Transport and Communications, driving schools

MEASURE DESCRIPTION

The basics of economical ways of driving are included in two-stage basic driver training, but more comprehensive training in this most often requires the completion of a separate course ("further training").

Basic training in economical ways of driving has been included as a mandatory part of basic driver training since 1994. The "two-stage" training in economical ways of driving included in basic driver training has been organised since 1997, when statistics on further training in economical ways of driving also started in their current form.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, the starting points and principles of which are described below.

Starting points and assumptions of the calculation

The impact assessment has considered separately those taking only basic driver training and those having done further training. The starting points of the assessment have been:

- the numbers trained (statistics on those who have completed the training, and estimates of those who will, divided up into those driving petrol and diesel vehicles);
- annual fuel consumption without training (division into petrol/diesel, considering the impact of future emissions limits);
- estimate of the savings rate achieved by the training and its reduction over time;
- for basic training, an attempt has been made to estimate how large a proportion of those who obtain a driving licence actually use economical ways of driving;
- estimate of the impact of training on ways of driving and on consumption, both immediately after the training and over time.

Initial data

The number of people obtaining a class B driving licence (passenger car driving licence) or above each year is used as the number of people receiving training in economical ways of driving in basic driver training. The data are obtained in the form of a separate survey from the Finnish Transport Safety Agency Trafi). The number of people obtaining a passenger car driving licence in 2000–2006 was 61 000–63 600 each year. From 2007 onwards, the mean value of 62 700 for the 2000–2006 period has been used as the number of people trained.

Motiva has gathered quantitative data from instructors on the number of drivers completing further training each year. The number has fluctuated by 3 000 people, both upwards and downwards. There has been a slight fall in the last few years, so the basis of the estimate is a number of 2 500 people trained per annum.

Observations made by driving instructors who train people in economical ways of driving indicate that economical and predictive ways of driving can be used to reduce the vehicle's fuel consumption by 8–12% on average, and even by as much as 20% straight after the training. There is no precise information on the long-term impact of basic training in economical ways of driving, but the impact is estimated to be halved over time. In calculating the energy saving brought about by further training, it has been estimated at 10% of the mean annual consumption per driver

in the first year, 8% in the second, 6% in the third and 4% in the fourth and subsequent years.

In estimating the savings in the second phase of basic training, the initial assumption is that the mean impact on savings of basic training in economical ways of driving is less than half that of more comprehensive training in economical ways of driving, i.e. 4% in the first year, 3% in the second year, and 2% after that. The calculation also assumes that not all new drivers who have received basic training use economical ways of driving at all. It has been estimated that 50% of those who have received basic training use such ways of driving. This figure has previously been 40%, but it has presumably increased now as fuel prices and environmental awareness increase.

No studied data are available concerning mean consumption of petrol and diesel (l/100 km) for the entire vehicle stock. The mean consumption used in the impact assessment is based on an expert estimate by VTT. The mean consumption of petrol-operated cars has been estimated to be 7.5 l/100 km in 2007 (6 l/100 km in 2020) and that of diesel-operated cars 7.7 l/100 km (5.3 l/100 km in 2020). Mileage has been estimated to develop such that mileage of petrol-operated vehicles, which was 15 900 km/year in 2007 will fall to 14 500 km/year in 2020, and that of diesel-operated cars, 26 800 km/year, will fall to 18 500 km/year.

Overlap

The impact of future emission restrictions on fuel consumption has been taken into account in the estimate, in respect of which there are no overlaps.

Impact assessment

Mileage and mean consumption have been used to calculate mean energy consumption per driver per annum (litres/year and MWh/year) without any training in economical ways of driving, i.e. the “basic scenario”. The savings achieved by the training have been estimated by multiplying this annual consumption by the number of people trained and the saving rates. The calculation is performed separately for drivers of petrol and diesel vehicles, and for basic training and further training.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Transport and Communications/Motiva

ENERGY SAVING GWh/a			2010	2016	2020
ESD	LI–02–LVM	Training in economical ways of driving in car traffic	128	173	198

LI–03a–LVM

MEASURE	MEASURE CLASS	MEASURE CODE
Training in economical ways of driving in bus and coach traffic	5	LI–03a–LVM

MEASURE IMPLEMENTATION PERIOD		Start	1997	End	ongoing

MEASURE SUBJECTS	Bus and coach drivers

MEASURE AIMED AT	Heating	No	Electricity	No	Fuels	Yes	Water	No

MEASURE FUNDING AND BUDGET

Market-based

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Transport and Communications

MEASURE DESCRIPTION

The Act on Professional Qualifications for Lorry, Bus and Coach Drivers entered into force in August 2007. The aim of professional qualifications is to promote the health and safety of employees in the transport sector and of those travelling by road, and to promote environmental awareness. Basic training for professional qualifications is required of all new drivers of vehicles intended for the carriage of goods and people as of 10 September 2008 for passenger traffic and as of 10 September 2009 for goods traffic. Drivers who have obtained their lorry, bus or coach licence before the dates given above need not complete separate basic training. They should, however, undertake 35 hours of further training to maintain the validity of their professional qualifications. This should be done by 10 September 2013 for passenger traffic, and by 10 September 2014 for goods traffic. The further training emphasises predictive, economical ways of driving.

Training in economical ways of driving has been provided to bus and coach drivers since 1997.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, the starting points and principles of which are described below.

Starting points and assumptions of the calculation

The impact assessment has considered drivers in urban and rural traffic separately. The starting points of the assessment have been:

- the numbers trained (statistics from those who have completed the training, and estimates of those who will, divided up into drivers in urban and rural traffic);
- annual fuel consumption without training (division into driving on streets and driving on major roads);
- estimate of the savings rate achieved by the training and its reduction over time.

Initial data

There are approximately 11 000 bus and coach drivers, comprising drivers of member companies of the Finnish Bus and Coach Association and the Finnish Public Transport Association (estimate from the Finnish Bus and Coach Association, 2011). This estimate of driver numbers has been used for the whole period. Mandatory training for HGV drivers in Finland started in 2007. The number of people being trained each year is 2 200 people/year, i.e. one-fifth of drivers. Instructors in economical ways of driving have estimated that approximately 30% of trained drivers drive in urban traffic.

There are no statistics that divide mileage into rural and urban traffic, but the majority of mileage is generally estimated to arise in rural traffic. Here, a 60–40 ratio is applied for rural and urban traffic respectively. According to a rough estimate by YTV, mileage generated by urban bus and coach traffic can be divided equally between driving on streets and driving on major roads.

For the purposes of the calculation, the mean mileage per driver in rural and urban traffic has been estimated to be approximately 41 000 km per annum. The driving kilometres used for the estimate have been taken from the Public Transport Performance Statistics by Statistics Finland. Mileage is not expected to change over the period studied.

No studied data are available concerning mean diesel consumption (l/100 km) in the bus and coach stock as a

whole. Mean consumption of 39.9 l/100 km for driving on streets and 28.9 l/100 km for driving on major roads has been used for the impact assessment for 2008, which corresponds to the mean consumption for previous years assessed using the LIISA calculation system for exhaust gases in road traffic, developed by VTT. For the sake of comparison, it may be stated that the mean consumption of buses and coaches reported by companies that have signed up to the energy savings agreement for public transport was 45.6 l/100 km in urban traffic and 28.9 l/100 in express coach traffic (mainly major roads) (Annual Report on the Energy-Saving Agreement for Public Transport, 2005). VTT has estimated that the mean consumption of new buses and coaches is falling by approximately 0.5–1% at the same time as new standards on exhaust-gas emissions are entering into force (VTT, Making the Energy Use of HGVs More Efficient, A Report, 2005). On the other hand, the increase in vehicle weight compensates for this trend, i.e. the mean consumption set out in the study remains constant throughout the period studied, for the purposes of the calculation.

Observations by instructors in economical ways of driving indicate that economical and predictive ways of driving can be used to reduce the bus or coach driver's fuel consumption by 4% on average. There is no precise information on the long-term impact of comprehensive training in economical ways of driving, but the impact is estimated to be halved over time. The energy saving from mandatory further training, which started in 2008, is estimated to be 4% in the first year after training, 3.5% in the second, 3% in the third, 2.5% in the fourth and 2% in the fifth, calculated using the mean annual consumption per driver. After this, the saving will rise again to 4%/year, owing to new training.

Overlap

The impact of this measure largely overlaps with that of the energy efficiency agreement for public transport, for which, however, no separate impact assessment has been presented.

Impact assessment

Mileage and average consumption have been used to calculate mean energy consumption per driver per annum (litres/year and MWh/year) without any training in economical ways of driving, i.e. the "basic scenario". The savings achieved by the training have been estimated by multiplying this consumption by the number of people trained and the saving rates. The calculation is performed separately for drivers in rural traffic and drivers in urban traffic, and also for driving on streets and driving on major roads.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Transport and Communications/Motiva

ENERGY SAVING GWh/a			2010	2016	2020
ESD	LI–03a–LVM	Training in economical ways of driving in bus and coach traffic	33	42	42

LI–03b–LVM

MEASURE	MEASURE CLASS	MEASURE CODE
Training in economical ways of driving in lorry traffic	5	LI–03b–LVM

MEASURE IMPLEMENTATION PERIOD		Start	1996	End	ongoing
MEASURE SUBJECTS	Lorry drivers				

MEASURE AIMED AT	Heating	No	Electricity	No	Fuels	Yes	Water	No

MEASURE FUNDING AND BUDGET

Market-based

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Transport and Communications

MEASURE DESCRIPTION

The Act on Professional Qualifications for Lorry, Bus and Coach Drivers entered into force in August 2007. The aim of professional qualifications is to promote the health and safety of employees in the transport sector and of those travelling by road, and to promote environmental awareness. Basic training for professional qualifications is required of all new drivers of vehicles intended for the carriage of goods and people as of 10 September 2008 for passenger traffic and as of 10 September 2009 for goods traffic. Drivers who have obtained their lorry, bus or coach licence before the dates given above need not complete separate basic training. They should, however, undertake 35 hours of further training to maintain the validity of their professional qualifications. This should be done by 10 September 2013 for passenger traffic, and by 10 September 2014 for goods traffic. The further training emphasises predictive, economical ways of driving.

Training in economical ways of driving has been provided to lorry drivers since 1996.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, the starting points and principles of which are described below.

Starting points and assumptions of the calculation

The impact assessment has considered separately lorries, lorries with semi-trailers, and lorries with combination trailers. The starting points of the assessment have been:

- the numbers trained (statistics of those who have completed the training, and estimates of those who will, divided up into drivers for the various vehicle types);
- annual fuel consumption without training;
- estimate of the saving in fuel consumption (%) achieved by the training and its reduction over time.

Initial data

Mandatory HGV training started in Finland in 2007. There are currently estimated to be 90 000 lorry drivers falling within the scope of the Professional Qualifications Directive (Finnish Trucking Association (SKAL), 2011). Since all the part-time drivers in the industry are hardly likely to participate in the training in future, but will rather leave the sector, the number of drivers will not rise by the end of the period studied, even though the number of vehicles will increase.

Approximately 10 000 days of training in predictive driving per annum has accumulated in recent years, so the pace needs to pick up in the next few years to reach nearly 30 000 training days per annum. The number of people trained after that is estimated to be one-fifth of drivers per annum (18 000 drivers/year).

The distribution of trained drivers among lorries without trailers, lorries with semi-trailers and lorries with combination trailers is estimated to be the same as the distribution for the actual lorries (Statistics Finland/Statistics on Goods Transport in Road Traffic). In 2008, for example, 77% of those trained would therefore have been drivers of lorries without trailers, 8% drivers of lorries with semi-trailers, and 15% drivers of lorries with combination trailers.

The annual traffic performance of the different vehicle types was collected from the Statistics on Goods Transport in Road Traffic by Statistics Finland until 2009. From 2010, performance is estimated to increase by 1.5% per annum. Performance per driver has been estimated by dividing traffic performance by the estimated number of

drivers for each year. A mean annual mileage performance of 14 300 km per lorry driver has been used, with 34 600 km for drivers of lorries with semi-trailers, and 71 900 km for drivers of lorries with combination trailers.

No studied data are available concerning mean diesel consumption (l/100 km) in the lorry stock as a whole. Mean consumption of 26.5 l/100 km for lorries has been used for the impact assessment, with 36.1 l/100 km for lorries with semi-trailers, and 43.2 l/100 km for lorries with combination trailers, for the 1996–2008 period. This consumption has been estimated using the VEMOSIN simulation program (Finnish Road Administration, 2007). The simulation was performed for a 170 km journey between Helsinki and Vaalimaa (road no. 7), which corresponds to an average major road in Finland; total consumption included a small supplement for idling. The lorry was assumed to be as follows: engine capacity 11 litres, power 250 kW, total weight 20 tonnes, 3 axles. The lorry with a semi-trailer was assumed to be as follows: Scania DT1203, engine capacity 12 litres, power 309 kW, total weight 35 tonnes, 5 axles. The lorry with a combination trailer was assumed to be as follows: Scania DT1202, engine capacity 12 litres, power 345 kW, total weight 50 tonnes, 7 axles. For the sake of comparison, it may be stated that the mean consumption of lorries reported by companies that have signed up to the energy savings agreement for lorry and van transport was 27.2 l/100 km, that of lorries with semi-trailers was 35.5 l/100 km, and that of lorries with combination trailers was 44.6 l/100 km in 2002 (Annual Report Under the Energy-Saving Agreement for Lorry and Van Transport, 2002).

VTT has estimated that the mean consumption of new lorries is falling by approximately 0.5–1% at the same time as new standards on exhaust-gas emissions are entering into force (VTT, Making the Energy Use of HGVs More Efficient, A Report, 2005). Considering that the mean scrappage age of lorries is 15 years, the changes to the standards will not have a significant impact on mean consumption during the period studied, so the consumption calculated using the VEMOSIN model set out above has been regarded as constant for the purposes of the calculation.

Observations made by instructors in economical ways of driving indicate that economical and predictive ways of driving can be used to reduce the lorry driver's fuel consumption by 4% on average. There is no precise information on the long-term impact of comprehensive training in economical ways of driving, but the impact is estimated to be halved over time. The energy saving from mandatory further training, which started in 2008, is estimated to be 4% in the first year, 3.5% in the second, 3% in the third, and 2.5% in the fourth and fifth years, calculated using the mean annual consumption per driver. The overlaps in the study have been eliminated, i.e. the impact on savings of training given in 1996–2007 is estimated to taper out gradually as drivers participate in mandatory further training.

Overlap

The impact of this measure largely overlaps with that of the energy efficiency agreement for the goods transport and logistics sector, for which, however, no separate impact assessment has been presented.

Impact assessment

Mileage and mean consumption have been used to calculate mean energy consumption per driver per annum (litres/year and MWh/year) without any training in economical ways of driving, i.e. the "basic scenario". The savings achieved by the training have been estimated by multiplying this annual consumption by the number of people trained and the saving rates. The calculation is performed separately for drivers of different types of lorry.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Transport and Communications/Motiva

ENERGY SAVING GWh/a			2010	2016	2020
ESD	LI–03b–LVM	Training in economical ways of driving in lorry traffic	102	265	242

LI–04–LVM

MEASURE	MEASURE CLASS	MEASURE CODE
Promoting public transport	1, 2, 6, 8	LI–04–LVM

MEASURE IMPLEMENTATION PERIOD		Start	ongoing	End	ongoing
MEASURE SUBJECTS	People choosing modes of transport				

MEASURE AIMED AT	Heating	No	Electricity	No	Fuels	Yes	Water	No

MEASURE FUNDING AND BUDGET

Public transport aid for major urban areas amounted to a total of EUR 10 million in 2011.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Transport and Communications, Ministry of the Environment, local councils

MEASURE DESCRIPTION

The energy efficiency of transport may be improved considerably by increasing the number of public transport passengers and by replacing driving alone in a car with an efficient, functional public transport system. The measures used to promote the use of public transport are:

1) coordinating land use and transport, particularly in growing urban areas;

2) targeting investment in routes at points that support public transport;

3) developing public transport legislation;

4) increasing financial support for public transport;

5) investing in development programmes for public transport; and

6) the permanent organisation of traffic management activities at both national and major urban level.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, the starting points and principles of which are described below.

Starting points and assumptions of the calculation

The calculation is based on calculations of the potential to reduce CO_2 performed by VTT for the Ministry of Transport and Communications' climate policy programme for 2009–20 (ILPO). The quantities of carbon dioxide have been converted into energy using the relationship of fossil fuels to CO_2 and energy indicated by VTT's Finnish Road Transport Emissions Calculation System (LIISA). The proportion of biofuels is insignificant in this context, since in this respect the same quantity of energy is required to move the car, irrespective of the origin of the fuel.

The conversion factor is as follows: 1 tonne CO_2 = is 0.00379 GWh.

The impact of promoting public transport has been calculated by determining the potential switch to public transport by car users. The target is an additional 100 million journeys by 2020 (currently approximately 500 million journeys/year). The potential for switching to public transport has been estimated separately for major urban areas, other urban areas, and long-distance transport. Consideration has also been given to the adjustment of fleet sizes in rural areas. The number of additional journeys by public transport, as generated by the actual calculation method, has also been assessed from another perspective based on different groups of people and the potential for them to increase their use of public transport. The calculation established that the intended increase in public transport will be achieved, provided that approximately half of the active and the elderly population, especially in major urban areas, increase the use of public transport by 1–2 journeys per week and those living elsewhere by a certain extent.

The development of vehicle technology has been taken into account when calculating the reductions in emissions.

Initial data

Large urban areas

For major urban areas, the calculations are based on the report "Additional Studies on the Efficiency of Public Transport in Major Urban Areas" of January 2009 and an aid level of EUR 80 million per annum. The funding is divided among urban areas in relation to the number of residents. The funding for each area is allocated separately to

aid for tickets, and to improving service levels either on main lines or on new lines. Some of the funding is also aimed at the implementation of right of way for buses at traffic lights and up-to-date information, as well as improving safety, especially in the Helsinki Metropolitan Area.

Contrary to the report on aid for public transport in major towns and cities, where the time frame was 5 years (elasticity of 0.2–0.5), the calculations set out here have estimated the impact of the development of public transport and a fall in prices in the long term (elasticity of 0.5–1.0). The higher elasticity value in the long term, i.e. the effectiveness of the measure, results from the fact that passenger awareness of better services will increase over time, they will have faith in the service and its quality, and other travel-related choices will also gradually adapt to the new situation (e.g. selection of ticket types and choices relating to car use or procurement).

The elasticity calculations have used a division of journeys into three journey groups: work journeys, shopping trips and errands, and leisure trips, and the main modes of transport have similarly been divided into three groups, as follows: walking and cycling, public transport, and cars. Journey yield figures and mean journey distances for these groups, separately for town centres and the outskirts, have been obtained from the municipalities' own research or from the results for each employment area type in the most recent national passenger traffic study, HLT 2004–05. The mean number of passengers per journey group has been considered for calculating changes in vehicle performance.

For the purposes of the calculations, the additional accumulation of ticket revenue has been estimated very roughly, since the calculations have not taken into account any division into ticket types or switching from one ticket type to another.

Other urban areas

The increase in journeys by public transport as estimated for other urban areas has been taken straight from the estimate in the recently completed development programme for public transport in 2009–15, "A Better Day – More Functional Public Transport".

Long-distance transport

For long-distance transport, the assessment has used the aforementioned public transport development programme, estimates by VR, and impact assessments by the Matka.fi [Travel.fi] web service and the survey conducted in conjunction with it.

Overlap

The measure does not have any noteworthy overlaps with other measures.

Impact assessment

The impact assessment is presented under "initial data" above. There is not yet any monitoring information available for 2010, i.e. it is a forecast.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Transport and Communications/VTT

ENERGY SAVING GWh/a			2010	2016	2020
ESD	LI–04–LVM	Promoting public transport	38	230	570

LI–05–LVM

MEASURE	MEASURE CLASS	MEASURE CODE
Promoting walking and cycling	2, 6, 8	LI–05–LVM

MEASURE IMPLEMENTATION PERIOD		Start	Ongoing	End	Ongoing
MEASURE SUBJECTS	People choosing modes of transport				

MEASURE AIMED AT	Heating	No	Electricity	No	Fuels	Yes	Water	No

MEASURE FUNDING AND BUDGET

The current level is approximately EUR 230 million per annum.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Transport and Communications, Ministry of the Environment, local councils

MEASURE DESCRIPTION

The energy efficiency of transport can be improved considerably by replacing short car journeys with walking and cycling. The most important measures for promoting walking and cycling are:

1) coordinating land use and transport, particularly in growing urban areas;

2) reforming planning practices and targeting investment in routes at light traffic routes more than previously;

3) improving the maintenance of light traffic routes; and

4) the permanent organisation of traffic management activities at both national and major urban level.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, the starting points and principles of which are described below.

Starting points and assumptions of the calculation

The calculation is based on calculations of the potential to reduce CO_2 performed by VTT for the Ministry of Transport and Communications' climate policy programme for 2009–20 (ILPO). The quantities of carbon dioxide have been converted into energy using the relationship of fossil fuels to CO_2 and energy indicated by VTT's Finnish Road Transport Emissions Calculation System (LIISA). The proportion of biofuels is insignificant in this context, since in this respect the same quantity of energy is required to move the car, irrespective of the origin of the fuel.

The conversion factor is as follows: 1 tonne CO_2 = 0.00379 GWh.

Initial data

Light traffic – i.e. walking, cycling and other movement using muscle power – is a particularly sustainable mode of transport for many reasons. This measure endeavours to increase the number of journeys made by walking and cycling. An increase in journeys by light traffic is estimated as a shift from short car journeys to walking or cycling. The target is an additional 300 million journeys in 2020 (currently approximately 1.6 billion journeys/year). According to the Personal Traffic Study for 2004–05, one-fifth of journeys of less than one kilometre were made by car, and more than half of all journeys of 1–3 km. Although some short car journeys may be directly linked to longer journey chains, the majority are still independent journeys starting with a cold engine. The calculation has assumed a 30% switch from short car journeys to light traffic.

Overlap

The measure does not have any noteworthy overlaps with other measures.

Impact assessment

The impact of this measure on CO_2 emissions (and converted into energy using the aforementioned factor) has been calculated as the outcome from car journey lengths (<3 km and 3–5 km), the proportion of switching (30% for < 3 km and 10% for 3–5 km), and the mean car emission (g/km) indicated by VTT's LIISA model. The emissions calculations take into account additional emissions from starting cold and the impact of technological development on mean emissions of the whole vehicle stock. There is not yet any monitoring information available for 2010, i.e. it is a forecast.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Transport and Communications/VTT

ENERGY SAVING GWh/a			2010	2016	2020
ESD	LI–05–LVM	Promoting cycling and walking	38	190	460

LI–06–LVM

MEASURE	MEASURE CLASS	MEASURE CODE
Winter speed limits	1	LI–06–LVM

MEASURE IMPLEMENTATION PERIOD		Start	1987/1991	End	ongoing
MEASURE SUBJECTS	Motorists				

MEASURE AIMED AT	Heating	No	Electricity	No	Fuels	Yes	Water	No

MEASURE FUNDING AND BUDGET –

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Transport and Communications/Finnish Transport Agency

MEASURE DESCRIPTION

A general speed limit of 80 km/h is set for most of the Finnish major road network for the winter period (generally from October to the start of April) instead of the 100 km/h speed limit that applies in summer. On stretches of motorway where the speed limit is 120 km/h in summer, speed is restricted to 100 km/h. The lower speeds in winter are used on approximately 80% of the major road network.

The lower speed limits in winter were introduced in Finland as a trial in 1987, and were made permanent in 1991. The main reason for the lower speed limits in winter is an improvement in road safety, but the measure also has an impact on traffic energy consumption.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, the starting points and principles of which are described below.

Starting points and assumptions of the calculation

The calculation has only been performed for cars, since they are the vehicle group for which the measure clearly has the greatest significance. Old vans have a maximum speed of 80 km/h, so they are not affected, nor are HGVs generally, since they have a “top speed” of 80 km/h. Only in new vans is the maximum speed 100 km/h, so they are affected in relation to 100 km/h.

The calculation assumes that the 100 km/h → 80 km/h reduction in the speed limit will cause a reduction of the same size in the actual driving speed, so the winter fuel consumption for these kilometres may be calculated by using specific consumption for a speed of 80 km/h instead of the normal 100 km/h. The impact of reducing the speed in the 120 km/h area, which assumes a reduction to 100 km/h, has been assessed in a similar way. Since the speed is not reduced on all 100 km/h stretches of road, the restriction is estimated to target 70% of road kilometres. The period of validity of the winter speed restrictions has also been taken into account (5 months/a). The differences in mileage in the winter and summer months have not been taken into account, since the necessary initial data have not been available. The estimate is thus slightly higher than in reality, since annual vehicle mileage is not divided equally over the different months, as relatively more driving is done in the summer months than in winter. On the other hand, the proportion of vans referred to above, which has not been considered in the calculation, may be of the same order of magnitude.

The computational fuel saving (L) is converted into energy using a factor of 36 MJ/L, and 0.278 kWh/MJ.

Initial data

The relationship between fuel consumption and driving speed in cars of various ages, published in the final report of the EU ARTEMIS research project (Source:); Breakdown of car journeys on main roads into different speed areas: LIISA data system, calculated using figures from 2006 (Source: VTT)

Overlap

This measure is not assumed to have any overlaps or multiplicative effects.

Impact assessment

The impact of this measure on energy savings is 165 GWh/a, i.e. approximately 0.5% of the total annual energy use of cars. Estimates of the potential in later years (2016 and 2020) are of the same size, since it is to be assumed that although the specific fuel consumption falls, vehicle mileage increases similarly in almost the same ratio.

Player(s) responsible for the impact assessment/assessment conducted by Ministry of Transport and Communications/VTT					
ENERGY SAVING GWh/a			**2010**	**2016**	**2020**
ESD	**LI–06–LVM**	Winter speed limits	165	165	165

LI–07–LVM

MEASURE	MEASURE CLASS	MEASURE CODE
Tyre pressure checks	1	LI–07–LVM

MEASURE IMPLEMENTATION PERIOD		Start	ongoing	End	
MEASURE SUBJECTS	Car and van owners				

MEASURE AIMED AT	Heating	No	Electricity	No	Fuels	Yes	Water	No

MEASURE FUNDING AND BUDGET

This measure does not generate any significant costs

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Transport and Communications

MEASURE DESCRIPTION

According to the legislation in force, vehicles used in year-round traffic in Finland must switch to winter tyres by no later than the start of December, and to summer tyres by no later than one week after Easter or by the end of April, depending on the road conditions. Nearly all cars and vans have their tyres changed twice every calendar year, and the tyre pressure is usually checked at the same time.

Tyre pressure has a significant impact on vehicle energy consumption, and excessively low tyre pressure increases the rolling resistance. Since tyre pressures are usually checked at least twice a year in Finland, the tyre pressure of vehicles in traffic is more seldom below the guideline value than elsewhere in Europe on average.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, which was also used for the NEEAP-1 calculation.

Starting points and assumptions of the calculation

The starting point of the impact assessment is the following information and assumptions:

- The car and van fuel consumption for 2010, 2016 and 2020, estimated using the LIISA 2009 calculation model;
- Commission estimate of the proportion of vehicles having at least one tyre with pressure below the guideline value;
- VTT estimate (2007) of vehicles in Finland with tyre pressure below the guideline value;
- VTT estimate (2007) of excess fuel consumption caused by tyre under-pressure.

Initial data

The impact assessment has used the Commission's estimate, according to which 45–70% of vehicles in traffic have at least one tyre with pressure below the guideline value. Despite the mandatory changing of tyres twice every year, there are also some tyres with under-pressure in Finland. According to VTT's 2008 estimate, 19% of vehicles have tyres with under-pressure, but according to the pressure check campaign organised in 2009 under the HÖYLÄ III energy efficiency agreement, tyres with under-pressure were found in up to 40% of cars. The mean value of these (30%) has been used for Finland's situation. The reduction may be estimated to be 28%, as the difference between the EU's mean value and Finland's situation.

VTT has estimated that the impact of tyres with at least 0.5 bar of under-pressure on fuel consumption is 1.5%. Using VTT's LIISA model, car fuel consumption has been estimated to be 101 PJ in 2010, 109 PJ in 2016 and 111 PJ in 2020. Van fuel consumption has been estimated to be 16 PJ in 2010, 18 PJ in 2016 and 18 PJ in 2020.

Overlap

None.

Impact assessment

The assessment has been carried out for each year studied by multiplying energy consumption, the saving rate

(1.5%) and the estimate of how much a tyre pressure check reduces driving with under-pressure tyres in comparison with the European average (28%).

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Transport and Communications/Motiva

ENERGY SAVING GWh/a			2010	2016	2020
ESD	LI–07–LVM	Tyre pressure checks	134	146	148

MA–01–MMM

MEASURE	MEASURE CLASS	MEASURE CODE
Investments in heating plants	2, 1, 7	MA–01–MMM

MEASURE IMPLEMENTATION PERIOD		Start	1996	End	ongoing
MEASURE SUBJECTS	Farms				

MEASURE AIMED AT	Heating	No	Electricity	No	Fuels	Yes	Water	No

MEASURE FUNDING AND BUDGET

Since 1996, the Ministry has granted investment aid for building heating plants when the switch is made from fossil fuels to biofuels, e.g. wood chips or energy crops.

The investment aid is either an interest rate subsidised loan (maximum amount 50–80%, depending on the object) or a grant (maximum amount 15–30% of eligible costs).

Aid is applied for to the Rural Affairs Divisions of the ELY Centres, and it is paid according to the progress of the work in no more than five instalments, against receipts for the costs incurred.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Agriculture and Forestry, Rural Affairs Divisions of ELY Centres

MEASURE DESCRIPTION

The Ministry of Agriculture and Forestry is developing construction connected to agriculture or to other rural business and the rural population, as well as developing the rural built environment. The aim is to achieve economical, functional buildings and to create a good rural environment. The attainment of the goals is promoted by steering the publicly supported construction, promoting cooperation between authorities and by guiding research and development activities.

The Ministry of Agriculture and Forestry is promoting, e.g. by offering subsidies, the use of wood in construction as well as other building materials and energy sources based on renewable natural resources. Many farms are self-sufficient in the production of wood chips, and changing energy types is generally a worthwhile investment. Other biofuels generated by agricultural activity are also exploited.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, which was also used for the NEEAP-1 calculation. In accordance with the ESD, the saving is based on replacing existing fossil-fuel (oil) boilers on farms with their own renewable energy (e.g. wood chips or energy crops), which thus reduces the need for delivered energy.

Starting points and assumptions of the calculation

The Ministry of Agriculture and Forestry stores data from aid applications in the RAHTU and HANKE databases. The application shows the size of the project (heating plant output being replaced), estimated costs, information about the applicant, and the date on which the application was submitted. The decision on whether to grant aid and any information relating to the decision are entered in the same database.

As heating plant projects the following are considered: new piggery, poultry-rearing establishment and greenhouse projects and the new or extended heating plants connected to them, as well as other heating plants used to replace existing ones.

The calculation method is based on the number of heating plant projects implemented, the mean power, and the estimated annual usage time and efficiency.

The impact assessment has assumed the following:

- in addition to replacing heating plant power produced by oil, heating plants that use biofuels as set out in the application also replace older log and wood-chip boilers- they are assumed to account for 15% of the projects. The saving is calculated on the basis of replacing oil with biofuels in old boilers;
- the utilisation time of a biofuel boiler's annual peak output is approximately 4 500–5 000 hours; the biofuel boiler is rarely designed in accordance with the calculated peak output, and in temperatures well below zero an oil-fired boiler will probably also be used on farms in addition to a biofuel boiler (and the oil-fired boiler also serves as a back-up system at the same time);
- it is assumed that approximately 85% of the projects to update heating plants, for which applications are submitted, will be implemented;

- some applicants do not obtain fuel from their own farms and the heating plant runs on delivered fuel (pellets, purchased wood chips, etc.); it is assumed that 80% use their own fuels;
- the impact assessment assumes that 30% of the projects applied for will have been implemented by the end of that year and the remainder not 'till the following year;
- the output from the heating plants, noted in the applications, is assumed to fall by 5% per annum from 2010 onwards;
- the lifetime of biofuel boilers is 25 years, so the savings apply from 1996 onwards.

Initial data

- The following information has been extracted from the aid applications:
- in 1996–1999, approximately 330 applications were submitted each year, and the total power to be replaced, as stated in the applications, was approximately 5.5 MW per annum;
- in 2001–2005, 200–300 applications were submitted each year; the total aggregate output from heating plants that was being replaced was approximately 28 MW per annum;
- in 2006–2010, no statistics were compiled on output from heating plants, but the mean output was estimated, on the basis of typical power needs, by the Ministry of Agriculture and Forestry, based on the type of investment object and the scope of the investment – the mean power was approximately 170 kW. In 2007, there were an exceptionally large number of applications, since the aid was opened up to piggeries and poultry-rearing establishments, and the total output from the heating plants in the applications was approximately 165 MW. In 2008–2009, total output fell to approximately 40–50% from that amount. In 2010, the output from the heating plants in the applications fell to the level prior to the 2007 peak (approximately 30 MW).

Overlap

None.

Impact assessment

The assessment concerns investments in heating plants on farms in cases where an old boiler that uses fossil fuels (oil) is replaced by a boiler that uses the farm's own renewable energy (e.g. wood chips or energy crops).

The annual energy saving (ES) in compliance with ESD is based on the saving in delivered energy (oil). In accordance with the preceding section, the mean boiler age is 25 years for the purposes of the calculation, i.e. all investments apply for the whole period studied.

The annual energy saving (ES) is calculated using the model:

ES [GWh/a] = installed boiler output per annum [MW] * peak power usage time [h] * a, where

a = 0.58 = correction factor, which takes into account that:

- some of the boilers that are to be restored used the farm's own renewable energy previously;
- some aid applicants do not use their own renewable energy but rather, for example, bought pellets; and
- some projects that have received aid have not been implemented for some reason.

The total impact on energy savings given in the table below is obtained for the years shown in the table by adding together the impact on energy savings (ES) that applied at the time, calculated using the grounds set out above for the years in question.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Agriculture and Forestry/Insinööritoimisto Olof Granlund Oy

ENERGY SAVING GWh/a			2010	2016	2020
ESD	MA–01–MMM	Investments in heating plants	1 210	1 568	1 757

MA–02–MMM

MEASURE	MEASURE CLASS	MEASURE CODE
Fresh grain silos		MA–02–MMM

MEASURE IMPLEMENTATION PERIOD		Start	June 2008	End	ongoing
MEASURE SUBJECTS	Farms				

MEASURE AIMED AT	Heating	No	Electricity	Yes	Fuels	Yes	Water	No

MEASURE FUNDING AND BUDGET

Fresh grain silos are eligible for investment aid from the Ministry of Agriculture and Forestry. The aid is either a subsidised loan (maximum amount 70%, depending on the object) or a grant (maximum amount 10–30% of eligible costs). Aid applications are submitted to the Rural Affairs Divisions and Environment Units of the ELY Centres. The aid is calculated on the basis of the Ministry of Agriculture and Forestry's unit costs, and paid according to the progress of the work in no more than five instalments, against receipts for the costs incurred. The objects of investment that are eligible for support have been defined.

Aid for fresh grain silo towers and clamp silos is determined according to the level of aid for the line of livestock production that the investment serves.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Agriculture and Forestry, Rural Affairs Divisions and Environment Units of ELY Centres

MEASURE DESCRIPTION

The Ministry of Agriculture and Forestry is developing construction connected to agriculture, to other rural business and the rural population, as well as developing the rural built environment. The aim is to achieve economical, functional buildings and to create a good rural environment. The attainment of the goals is promoted by steering the publicly supported construction, promoting cooperation between authorities and guiding research and development activities. The Ministry of Agriculture and Forestry is promoting, e.g. by offering subsidies, the use of wood in construction as well as other building materials and energy sources based on renewable natural resources.

The impact of this measure on savings is based on the fact that animal feed grain need not be dried prior to storage. In livestock production, the storage of fresh feed grain in air-tight silos, or in open silos once it has been treated with a preservative, significantly reduces the use of grain dryers and associated energy consumption.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method based on the number of fresh grain silo projects implemented.

Starting points and assumptions of the calculation

The Ministry of Agriculture and Forestry stores data from aid applications in the RAHTU database at the Information Services Centre. The application shows the size of the project (silo capacity to be built).

The silos falling within the scope of the aid are assumed to store grain that is not dried in grain dryers. The use of fresh grain silos reduces the need to dry grain, thus reducing the energy consumption of the dryers, which usually run on oil. Oil is used to run 90–95% of hot-air dryers. The use of cold-air dryers is no longer very widespread, but they do still exist, particularly on small farms. If a cold-air dryer is equipped with additional heating, electricity or oil is used for the heating and, in some cases, a wood-heated heat exchange system.

The impact assessment has assumed the following:

- the silos considered for the calculation store feed grain that would otherwise be dried;
- approximately 95% of the total capacity of the silo projects applied for is assumed to be implemented;
- some dryers do not use oil but run on renewable energy (pellets or wood chips) → it is assumed that oil-fired dryers account for 95% of energy use;
- that 60% of projects applied for by the end of the year will be implemented that year, the remainder being implemented during the following year;
- the silo capacity stated in the applications is assumed to increase by 10% per annum from 2010 onwards.

Initial data

Fresh grain may be stored in gas-tight tower silos, or in clamp silos when preservatives are used. Statistics concerning gas-tight silo capacity are obtained directly from RAHTU. Grain storage accounts for approximately 5–10% of the storage in clamp silos. Fresh grain storage is increasing and is already 20–30% on large poultry farms. A small proportion of feed grain is stored in cold-air dryers and in dryer silos that have fans equipped with electric motors.

Approximately 20 dryer silos received aid in the late 2000s. Their mean storage capacity was approximately 1 000 m^3. Statistics have not been prepared for the numbers of cold-air dryers and "dryer silos", but they are estimated to be in the same range as for grain storage in clamp silos.

The storage capacity noted in RAHTU is an estimate of the actual storage capacity coming into use. Total silo capacity is 10–20% greater than the actual storage capacity entered in RAHTU.

The following information has been extracted from the aid applications:

- total capacity of fresh grain silo projects implemented:
  - 2008: 10 952 m^3, 2009: 4 777 m^3, 2010: 7 432 m^3;
- total capacity of silage silo projects implemented:
  - 2008: 157 384 m^3, 2009: 380 132 m^3, 2010: 219 624 m^3, of which it is estimated that grain storage is 10% and forage storage is 90% → the proportions for non-dried feed grain are: 2008: 16 000 m^3, 2009: 38 000 m^3, 2010: 22 000 m^3;
- the capacity of cold-air dryers and dryer silos is estimated to be 25 000 m^3 per annum;
- total capacity used to calculate the energy saving for various types of fresh grain silo:
  - 2008: 51 700 m^3, 2009: 67 800 m^3, 2010: 54 400 m^3, and the number is estimated to increase by 10% from 2010 onwards.

When grain is dried, its moisture content is reduced from 23% on average to approximately 14%, using on average 170 kWh/1 000 kg of drying energy (source: Guide to Drying Grain Using Domestic Fuel, Forestry Centres). The mean specific weight of the grain is assumed to be 190 kg/m^3. Drying one cubic metre of grain uses approximately 32.3 kWh/m^3 of oil.

Overlap

None.

Impact assessment

The estimate relates to fresh grain silos on farms that save the energy used to dry feed grain.

The energy savings produced by fresh grain silos started to be calculated in 2008, and the silo lifetime is on average more than 20–25 years, so the savings apply to the whole period studied.

The annual energy saving (ES) is calculated using the model:

ES [GWh/a] = Energy used for drying grain [kWh/m^3] * annual grain capacity of new fresh grain silos [m^3] * a, where a = 0.9 = correction factor, which takes into account that:

- some dryers do not use oil but rather wood chips, for example, from the farm's own forest;
- not all of the projects that have received aid have been implemented for some reason or other.

The total impact on energy savings given in the table below is obtained for the years shown in the table by adding together the impact on energy savings (ES) that applied at the time, calculated using the grounds set out above for the years in question.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Agriculture and Forestry/Insinööritoimisto Olof Granlund Oy

ENERGY SAVING GWh/a			2010	2016	2020
ESD	MA–02–MMM	Fresh grain silos	4	17	31

MA–03–MMM

MEASURE	MEASURE CLASS	MEASURE CODE
Unheated cattle buildings	2, 8	MA–03–MMM

MEASURE IMPLEMENTATION PERIOD		Start	2008	End	ongoing
MEASURE SUBJECTS	Farms				

MEASURE AIMED AT	Heating	No	Electricity	Yes	Fuels	Yes	Water	No

MEASURE FUNDING AND BUDGET

It is possible to obtain investment aid for the construction of unheated livestock sheds. The aid may be paid either as a subsidised loan (maximum amount 50–80%, depending on the object) or as a grant (maximum amount 15–30% of eligible costs). The aid application is submitted to the Rural Affairs Divisions and Environment Units of the ELY Centres.

The aid is calculated on the basis of the Ministry of Agriculture and Forestry's unit costs, and paid according to the progress of the work in no more than five instalments, against receipts for the costs incurred.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Agriculture and Forestry, Rural Affairs Divisions and Environment Units of ELY Centres

MEASURE DESCRIPTION

The Ministry of Agriculture and Forestry is developing construction connected to agriculture, to other rural business and the rural population, as well as developing the rural built environment. The aim is to achieve economical, functional buildings, and animal-friendly buildings for livestock production, and to create a good rural environment. The attainment of the goals is promoted by steering the publicly supported construction, promoting cooperation between authorities and guiding research and development activities. The Ministry of Agriculture and Forestry is promoting, e.g. by offering subsidies, the use of wood in construction as well as other building materials and energy sources based on renewable natural resources. The ministry is also promoting the use of renewable energy and commitment to energy efficiency, as well as using funding to further the construction of unheated livestock sheds where this is possible from an animal welfare perspective.

Cows supply a significant amount of heat, so cattle buildings do not require a separate heating plant. Technical spaces, such as areas where milk is processed or where people gather, require heating, in which case, for example, the heat obtained from cooling milk, energy from heating plants constructed for the other needs of the farm, or electric radiators may be used. In livestock premises, additional heat may be required for calving pens. Electricity consumption for ventilation on farms with adult animals may be reduced by means of curtain wall solutions and natural ventilation, and electricity consumed by lighting may be reduced by means of curtain wall solutions and skylights.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method based on the number of cold and semi-heated cattle sheds completed.

Starting points and assumptions of the calculation

The Ministry of Agriculture and Forestry stores data from aid applications for cattle sheds in the Information Service Centre database. The application documents show the size of the project (number of square metres to be constructed), the intended use (dairy or suckler cows) and the type (cold or cool).

Cold or cool cattle sheds are assumed to replace heated spaces (both existing and new). Traditional cattle sheds are usually at least semi-heated spaces that are heated by means of their own heating plant, or a heating plant that serves the building stock of the whole farm.

The consumption of heating energy by a traditional cattle shed was calculated using the Riuska calculation program. A typical cattle shed was assumed to contain 60–65 cows and have a surface area of 1000 m^2. The specific consumption of 21 kWh/m^2 obtained from the calculation was used as the typical consumption for semi-heated cattle shed structures.

The impact assessment has assumed the following:

- the cattle sheds in the application are replacing at least semi-heated cattle sheds or new structures of a simi-

lar nature;

- approximately 95% of cattle-shed projects applied for are implemented;
- the unheated surface area of the cattle sheds set out in the application is 85% (other areas, such as spaces for milk, etc., have heating);
- some existing, heated cattle sheds are not heated using oil but using renewable energy (pellets or wood chips), and it is assumed that oil-heated cattle sheds account for 70% of energy use;
- the impact assessment assumes that 50% of projects applied for will be implemented by the end of that year, the remainder being implemented during the following year;
- the cattle shed surface area set out in the applications is assumed to increase by 10% per annum from 2010 onwards.

Initial data

The conditions of a typical heated cattle shed and its need for ventilation have been determined on the basis of the reports on the KARVA study at the University of Helsinki. The ventilation counter published in the research project was used to determine the need for ventilation.

The ventilation for cattle sheds was designed using the design calculation table for ventilation of dairy cattle sheds obtained from the website of the Karva research project (The Impact of Cattle Sheds on Animal Welfare, 2009–2010) of the Department of Agricultural Sciences at the University of Helsinki.

Energy consumption was calculated using weather data for South Finland (weather for the reference year, part D3 of the National Building Code of Finland, 2010). A degree of certainty is thus achieved for the calculation of savings, since in practice some of the cattle sheds are situated other than in South Finland.

The following information has been extracted from the aid applications:

- total scope of projects implemented: 2008: 51 099 m^2, 2009: 92 704 m^2, 2010: 72 690 m^2

Overlap

None.

Impact assessment

The assessment concerns cold or cool cattle sheds that replace heated cattle sheds, thus making a saving in the heating energy consumption of heated cattle sheds.

The energy savings started to be calculated in 2008, and the cattle-shed lifetime is more than 25 years, so the savings apply to the whole period studied.

The annual energy saving (ES) is calculated using the model:

ES [GWh/a] = mean energy consumption per cattle shed [kWh/m^2] * cold cattle-shed area constructed in the year in question [m^2] * a, where a = 0.67 = correction factor, which takes into account that:

- not all cattle sheds are heated using oil but rather, for example, the farm's own logs or wood chips;
- not all of the projects that have received aid have been implemented for some reason or other.

The total impact on energy savings given in the table below is obtained for the years shown in the table by adding together the impact on energy savings (ES) that applied at the time, calculated using the grounds set out above for the years in question.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Agriculture and Forestry/Insinööritoimisto Olof Granlund Oy

ENERGY SAVING GWh/a			2010	2016	2020
ESD	MA–03–MMM	Unheated cattle buildings	2	9	17

MA–04–MMM

MEASURE	MEASURE CLASS	MEASURE CODE
Farm land reparcelling projects	8, 4	MA–04–MMM

MEASURE IMPLEMENTATION PERIOD		Start		End	ongoing
MEASURE SUBJECTS	Farmers				

MEASURE AIMED AT	Heating	No	Electricity	No	Fuels	Yes	Water	No

MEASURE FUNDING AND BUDGET

The state provides aid for both the costs of reparcelling and any adjustment measures necessary as a result of the reparcelling, which include arterial and subsoil drainage as well as the construction of farm roads. The aid is funded by sub-item 30.70.40 in the state budget, Expenditure generated by aid for property delivery. Approximately EUR 3.2 million in aid was granted in 2009.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Agriculture and Forestry, National Land Survey of Finland

MEASURE DESCRIPTION

Reparcelling includes field reparcelling, forest reparcelling, regional allocations of private roads and the formation of common forests. Reparcelling is also called land consolidation. This assessment relates to field reparcelling. The size of farms has increased, but the extra land is often situated far away from the economic centre of the farm and is small in size. Reparcelling is a way of updating the structure of farms and of developing rural land use.

Reparcelling is done in collaboration with landowners, the National Land Survey of Finland and other land-use experts. The road and drainage networks are also repaired in conjunction with reparcelling where necessary. During the 1995–2010 period, reparcelling was carried out on a field area of 141 555 hectares. There are currently 71 reparcelling projects and 38 needs assessments in progress.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU method.

Starting points and assumptions of the calculation

The starting points of the assessment are:

- Mean tractor consumption (km/h);
- The reduction in tractor traffic (km) as a consequence of reparcelling in a typical object;
- The number of hectares in one typical reparcelling object;
- The amount of reparcelling done in one year (hectares).

Reparcelling achieves savings in fuel consumption, not just thanks to shorter transit journeys, but also in field work due to the improved shape of the parcels, but this assessment has only included the impact of reduced transit times.

Initial data

15 l/h has been used as the mean tractor consumption. At a speed of 40 km/h this means 0.375 l/km mean consumption during the transit time.

How much on average the transit time falls on one reparcelling site is not known. Instead, the study has been done by applying the results of a very typical reparcelling project. In reparcelling the size of the consolidated land varies between 50 and 3 000 hectares, but in this case the surface area was 730 hectares. In the study, agricultural traffic fell by approximately 30%, i.e. 145 000 km per annum. Fuel consumption will thus have fallen by approximately 54 400 litres or 546 MWh per annum. The saving per hectare was 0.75 MWh.

By generalising the saving calculated per hectare as 0.75 MWh/ha for the total amount of reparcelling done in one year, and considering the accumulation of the saving over the period studied, the saving achieved by reparcelling may be estimated. The calculation has taken into account that reparcelling was done on an area of 10 130 ha in 2010, and that the figure is assumed to increase slightly in future. Growth of 2% per annum is assumed, so the amount of reparcelling assumed by the calculation will increase to 11 400 ha/year in 2016 and 12 350 ha/year in

2020.

Overlap

Promoting reparcelling is also one of the aims of the Farm Energy programme (measure MA–05–MMM).

Impact assessment

Cf. “initial data”.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Agriculture and Forestry/Motiva

ENERGY SAVING GWh/a			2010	2016	2020
ESD	MA–04–MMM	Reparcelling projects	8	56	92

MA–05–MMM

MEASURE	MEASURE CLASS	MEASURE CODE
Farm Energy programme	4	MA–05–MMM

MEASURE IMPLEMENTATION PERIOD		Start	1/2010	End	12/2016
MEASURE SUBJECTS	Farmers				

MEASURE AIMED AT	Heating	Yes	Elec-tricity	Yes	Fuels	Yes	Water	Yes

MEASURE FUNDING AND BUDGET

Funding for the programme comes from sub-item 30.01.40 in the state budget, Subsidies for bioenergy production. This sub-item earmarks EUR 2 million for the preparation of farm energy audits and plans from the 2011 state budget.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Agriculture and Forestry, the Agency for Rural Affairs, ELY Centres, national producer organisations in the agricultural and horticultural sector, the programme operator (currently Motiva), farm energy planners and energy auditors.

MEASURE DESCRIPTION

The Farm Energy programme is based on a programme implementation agreement signed by the Ministry of Agriculture and Forestry and producer organisations. An individual farm may join the programme by sending an accession document to the local ELY Centre.

The Farm Energy programme aims to improve energy efficiency in the use of heating and electricity on farms, and to reduce the use of fossil fuels by promoting the use of domestic renewable energy and biofuels, whilst also taking forest management objectives into consideration. The farms that have joined the programme implement systematic energy management, whilst complying with the self-monitoring plans that they themselves have prepared, or with the energy plan drawn up by a trained energy planner, or they will have a more comprehensive energy audit conducted when such activity begins in 2011.

Farms that have joined the programme are sent an information pack containing guidelines on drawing up a self-monitoring plan, ordering an energy plan or audit, and various brochures on opportunities to make energy use more efficient and on renewable energy.

The aim of the programme is to achieve 80% coverage of farm energy consumption by 2016.

A guideline target for making energy use in the sector more efficient has been set at 9% of the 2005 energy use of the farms that have joined, to be achieved by 2016.

One hundred and eighty-one farms have joined the programme, and 80 have had an energy plan drawn up (situation as at 1 June 2011).

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method.

Starting points and assumptions of the calculation

The starting points of the assessment are:

- Farm energy consumption;
- The programme coverage target, calculated using farm energy consumption;
- The 9% energy saving target, calculated using the annual energy consumption of the farms that have joined;
- The impact of promoting renewable energy has not been included in the assessment, since this would involve a partial overlap with measure MA–01–MMM;
- The programme is assumed to continue after 2016.

Initial data

Energy consumption on farms and outdoor horticultural farms is estimated to be approximately 12 TWh per annum, and approximately 1.8 TWh per annum for greenhouses. There will not be any specific data on consumption until the first statistics on this subject are prepared towards the end of 2011. For this reason, a figure of 13.8 TWh has

been used as the consumption figure throughout the period studied and also for 2005, from the energy consumption of which the target has been defined.

The aim of the programme is to achieve 80% coverage of farm energy consumption by 2016. The farm joining rate has started rather slowly, so the calculation assumes that 50% coverage will be achieved by 2016 and 80% by 2020.

The savings rate achieved by farms by 2016 varies in the estimate, according to when the farm joined the programme. Farms that joined in 2010 are assumed to achieve an energy saving of 9% by 2016 and 14% by 2020, giving an annual saving of approximately 1.3%. The cumulative savings rate during the programme for those who join later is approximately 1.3 percentage points lower every year from 2011 onwards. After 2016, the annual percentage rate is still assumed to be 1.3% per annum.

Overlap

The impact does not overlap with other measures, for example aid for heating plants for farms, since although the energy programme also promotes the use of renewable energy, no assessment has been carried out in this respect.

Impact assessment

The impact on savings each year is estimated as the outcome of the new energy consumption under the programme for the year in question (new joiners) and the annual savings rates. The calculation also takes into account the fact that the saving achieved under the programme in previous years also has an impact in every year studied.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Agriculture and Forestry/Motiva

ENERGY SAVING GWh/a			2010	2016	2020
ESD	MA–05–MMM	Farm Energy programme	0.3	169	440

HO–13–TEM

MEASURE	MEASURE CLASS	MEASURE CODE
Ecodesign Directive and energy efficiency requirements for each equipment group	1	HO–13–TEM

MEASURE IMPLEMENTATION PERIOD		Start	2009	End	ongoing
MEASURE SUBJECTS	Consumers (individuals, businesses and communities) and manufacturers of energy-related products				

MEASURE AIMED AT	Heating	Yes	Electricity	Yes	Fuels	Yes	Water	No

MEASURE FUNDING AND BUDGET

This measure is mainly market-based, but the Ministry of Employment and the Economy has funded some communication projects.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Employment and the Economy, Finnish Safety and Chemicals Agency (Tukes) – monitoring authority

MEASURE DESCRIPTION

The Act Imposing Requirements on Ecological Design and Energy Labelling (1005/2008, the "Ecodesign Act") entered into force on 1 January 2009 and served to enforce nationally Directive 2005/32/EC, (EcoDesign Requirements for Energy Using Products) nationally. The Act was amended to cover the extension of the Directive to apply to requirements imposed on the ecological design of energy-related products (2009/125/EU, EcoDesign Requirements for Energy Related Products). The amended Act (1009/2010) entered into force on 1 December 2010. It creates a framework for ecological requirements in the design and development of energy-related products.

The Directive combines previous regulations on energy efficiency and energy labelling. Its enforcement orders, specific to product groups, set increasingly stringent energy consumption limits for a wide range of products. In the initial stage, the enforcement orders relate mainly to electrical equipment, but in future there will also be provisions on other groups of equipment and products.

It is not expected that there will be separate enforcement orders for office equipment, since the EU participates in the United States Energy Star scheme for office equipment (computers, computer monitors and imaging devices). Since 2001, the United States and the EU have had an agreement on the Energy Star programme, which promotes the energy efficiency of office equipment. This agreement has been implemented in the EU by Regulation 106/2008/EC of the European Parliament and of the Council on a Community energy-efficiency labelling programme for office equipment.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, which was also used previously for national needs.

Starting points and assumptions of the calculation

Estimates were made for the following product groups:

- Televisions (based on the Regulation);
- Simple digital set-top boxes (based on the Regulation);
- Household cooling equipment (based on the Regulation);
- Dishwashers (based on the draft Regulation);
- Washing machines (based on the draft Regulation approved by the regulatory committee);
- Household lighting (based on the Regulation);
- Household and office computers (based on the background report ordered by the Commission);
- Imaging devices (based on the background report ordered by the Commission);
- Chargers and external power sources (based on the Regulation);
- Quiescent current (based on the Regulation);
- Backwater pumps (based on the Regulation);
- Electric motors (based on the Regulation);
- Road and street lighting and other area lighting (based on the Regulation).

For certain product groups (office lighting, heating boilers and water-heating equipment), it has not been possible to produce estimates, owing to the absence of initial data.

The estimate was prepared in 2009, after which several Regulations that were at drafting stage have become final.

Initial data

Televisions

According to a 2006 study of household electricity use, electricity consumption by televisions was 496 GWh/a and approximately 36.2 GWh/a in stand-by in 2006. There were 3 226 000 picture-tube televisions, i.e. their prevalence rate was 132% of households, and there were 479 000 televisions of other kinds, with a prevalence rate of 20%. The mean consumption of picture-tube televisions was 118 kWh per annum, and that of other televisions approximately 240 kWh/a.

It was assumed that the predominant technology will be LCD by 2015, and that picture-tube televisions will be eliminated from the equipment stock by 2020.

The normal trend assumes televisions' stand-by power to be 1 W and power during use to be 170 W (consumption approximately 235 kWh/a). The total consumption of the equipment stock will be 960 GWh and stand-by electricity consumption approximately 14 GWh in 2020.

The enforcement orders will reduce the power consumption of televisions during use, in stand-by and when switched off. Using the limits set in the regulations (see the relevant Regulation), the total consumption of the equipment stock will be 776 GWh and stand-by electricity consumption 12 GWh in 2020. In comparison with the normal trend, the saving will be 184 GWh in 2020. Considering the usable lifetime of the equipment, the savings in 2016 are estimated to be one-third of the savings in 2020, i.e. 61 GWh.

Simple digital set-top boxes

Total consumption by digital set-top boxes in Finland in 2006 was 156 GWh, according to the report "Household Electricity Use 2006" (Adato Energy 2008), of which stand-by electricity consumption accounted for 136.2 GWh/a. In 2006, 82% of Finnish households had a digital set-top box, with a mean consumption of approximately 78 kWh/a.

The "Household Electricity Use 2006" study assumed that the proportion of digital set-top boxes with a recording function will rise to 50% by 2015. It also assumed that digital set-top boxes will gradually be replaced by digital television by 2020. The calculation assumed that 20% of households will have a separate digital set-top box in 2020, of which the majority, i.e. 80%, will have a recording function.

When estimating the normal trend, the stand-by consumption of basic digital set-top boxes in use in 2020 was assumed to be 1 W (6.8 kWh/a), with power during use assumed to be 7 W (9.5 kWh/a). Similarly, the stand-by consumption of digital set-top boxes with a recording function was assumed to be 6 W (40.8 kWh/a), with power during use assumed to be 25 W (34 kWh/a). If 80% of digital set-top boxes have a recording function, their mean electricity consumption is 63.1 kWh/a and their stand-by consumption is 29.1 kWh/a. At national level, electricity consumption by digital set-top boxes will be 33 GWh in 2020, with stand-by electricity consumption at 18 GWh/a.

The digital set-top boxes in use in 2020 will comply with the ecological design requirements that will enter into force from 2013 onwards. The stand-by consumption of basic digital set-top boxes is assumed to be 0.75 W (5.1 kWh/a), with power during use assumed to be 5 W (6.8 kWh/a). Similarly, the stand-by consumption of digital set-top boxes with a recording function was assumed to be 0.75 W, with power during use assumed to be 12.5 W (17 kWh/a). Mean electricity consumption by digital set-top boxes is 20.1 kWh/a and stand-by consumption 5.1 kWh/a. The electricity consumption of digital set-top boxes will be 11 GWh, with 2.7 GWh of this accounted for by stand-by. The saving compared to the normal trend will be 22 GWh in 2020. Since more digital tuners will be used in 2016 than in 2020, the savings are estimated to be at the same level in 2020.

Household cooling equipment

According to the report "Household Electricity Use 2006" (Adato Energy 2008), mean consumption by refrigerators was approximately 227 kWh/a and that by freezers 373 kWh/a in 2006. Total consumption by cold-storage equipment was 1 455 GWh.

In the normal trend, the mean electricity consumption of new equipment was assumed to fall by 2% per annum, and mean consumption by cold-storage equipment was assumed to be 1 375 GWh in 2020.

According to the enforcement orders, the energy efficiency index (EEI) of household cooling equipment should be below 55 from the start of 2010, below 44 from 2012 onwards, and below 42 from 2014 onwards. The corresponding energy consumption limits are given in the table below.

	EEI below 55	EEI 44	EEI 42
Refrigerators, fridge-freezers	165 kWh/a	132 kWh/a	129 kWh/a
Refrigerator freezer cabinets	325 kWh/a	252 kWh/a	248 kWh/a
Freezers	272 kWh/a	203 kWh/a	200 kWh/a

As a consequence of the rules and regulations, the electricity consumption of cold-storage equipment will be 1 262 GWh in 2020. The saving compared to the normal trend is 113 GWh for cold-storage equipment in 2020. Con-

sidering the usable lifetime of the equipment, the savings in 2016 are estimated to be one-third of the savings in 2020, i.e. 38 GWh.

Dishwashers

According to the report "Household Electricity Use 2006" (Adato Energy 2008), electricity consumption by dishwashers was 261 GWh/a in 2006. There were dishwashers in 54% of Finnish households, and their mean consumption was approximately 190 kWh/a. In the background report ordered by the Commission, stand-by energy consumption for dishwashers was estimated to be 12.4 kWh/a.

In 2007, electricity consumption by new dishwashers was approximately 15% lower than that of dishwashers over 10 years old. The useful life of dishwashers is assumed to be 12 years. Taking past trend as the normal trend, it has been estimated that the mean electricity consumption of new dishwashers will fall by 1% per annum, which means that electricity consumption by dishwashers will be 157 kWh/a in 2020. Approximately one-quarter of the machines are estimated to have a timer and display. In the normal trend, electricity consumption by dishwashers will be approximately 302 GWh in 2020, and the stand-by electricity consumption will be 5.8 GWh/a if the data in the Commission's background report are applied.

The estimate is based on the draft Regulation of 2009, which imposed requirements on the energy index of dishwashers in 2010 and 2013. According to the draft and the final Regulation, even the current class A will be eliminated from the market by the end of 2013. Considering the typical consumption of the equipment already on sale in the Finnish markets in 2009, and the draft Regulation, the impact on savings is estimated to be very small (3 GWh/year) in 2020 in comparison with the normal trend. Considering the useful life of the equipment, the savings in 2016 are estimated to be one-third of the savings in 2020, i.e. 1 GWh.

Washing machines

According to the report "Household Electricity Use 2006" (Adato Energy 2008), electricity consumption by washing machines was 277 GWh in 2006. There were washing machines in 91% of Finnish households, and their mean consumption was approximately 130 kWh/a. In the background report ordered by the Commission, stand-by energy consumption for washing machines was estimated to be 11.8 kWh/a.

In 2007, electricity consumption by new washing machines was on average approximately 20% lower than that of washing machines over 10 years old, which was assumed to be the age for replacing washing machines. The mean electricity consumption of new washing machines was assumed to remain at the 2007 level, since consumers will not wash full loads as the machine capacity increases. The mean electricity consumption by washing machines will therefore be 105 kWh/a in 2020. Approximately one-quarter of the machines are estimated to have a timer and display, leading to stand-by consumption of 11.8 kWh/a. In the normal trend, electricity consumption by washing machines will be approximately 265 GWh in 2020, and the stand-by electricity consumption will be 7.2 GWh/a.

The estimate is based on the draft Regulation of 2009, which imposed requirements on the energy index of washing machines in 2010 and 2013. According to the draft and the final Regulation, even the current class A will be eliminated from the market by the end of 2013. Considering the typical consumption of the equipment already on sale in the Finnish markets in 2009, and the draft Regulation, the impact on savings is estimated to be 18 GWh/year in 2020 in comparison with the normal trend. Considering the useful life of the equipment, the savings in 2016 are estimated to be one-third of the savings in 2020, i.e. 6 GWh.

Household lighting

According to the report "Household Electricity Use 2006" (Adato Energy 2008), electricity consumption by household lighting was 2 427 GWh in 2006. Mean lighting consumption per home was approximately 1 000 kWh/a, and the number of different light bulbs per home was on average 27. The majority of light bulbs were filament bulbs.

In the scenarios, the number of light bulbs per household was assumed to increase slightly.

Even in the normal trend, some filament bulbs were assumed to be replaced by compact fluorescent lamps. In the normal trend, electricity consumption for lighting will be 2 002 GWh in 2020. This equates to mean consumption of 758 kWh per household.

As a consequence of the energy efficiency requirements for household light bulbs, filament bulbs will be eliminated from the market by September 2012, and they will therefore also have been eliminated from use by 2020. Electricity consumption for lighting in 2020 will therefore be 867 GWh, i.e. 328 kWh per household.

In comparison with the normal trend, the saving will be 1 135 GWh in 2020. The net saving, however, will be smaller if the impact of heat from lighting is taken into account in electrically-heated buildings. This effect has been estimated to be approximately 223 GWh, so the net impact on savings in household lighting is 912 GWh. Considering the useful life of filament bulbs, they may be assumed to be replaced by 2016, especially in the most used lighting points. Some filament bulbs have, however, been bought for stockpiling, so the total savings potential will not be reached in 2016. For this reason, a cautious estimate of savings for 2016 is taken to be half the net savings estimate for 2020, i.e. 456 GWh.

Household computers

According to the report "Household Electricity Use 2006" (Adato Energy 2008), electricity consumption by computers was 393 GWh/a in 2006, of which approximately 94 GWh was consumption for stand-by and off mode. Sev-

enty-six per cent of Finnish households had a PC, and 47% had a portable computer. The mean consumption of PCs (including monitors) was approximately 191 kWh per annum, and that of portable machines was approximately 33 kWh/a.

In the normal trend, the power of new PCs in off mode was assumed to be 4.5 W (6 W in 2006), but power during use and in stand-by will remain at the previous level (110 W and 6.5 W respectively) in 2020. The mean consumption of portable computers was assumed to increase by 52.4 kWh/a owing to increased use time. Total consumption by computers in the normal trend will be 221 GWh in 2020. Consumption for off mode and stand-by will be 46 GWh/a, i.e. approximately one-fifth of all consumption by computers.

The enforcement order will reduce power consumption by household and office equipment in stand-by and off mode in two stages in 2010 and 2013. Since the useful life of computers and monitors is 5–6 years, the equipment stock in use in 2020 will be in line with the 2013 requirements. The power of new computers is therefore assumed to be no more than 0.5–1.5 W in stand-by and no more than 0.5–1 W in off mode. After 2013, computers must also incorporate the opportunity to use energy-saving space etc., which automatically switches the device to stand-by or off mode after the shortest possible time. The impact of this "automatic switch-off opportunity" on electricity consumption cannot easily be estimated, and the additional savings that this will generate have not been included in the calculation. Owing to the impact of the rules, total consumption by computers will be 182 GWh in 2020. Consumption for off mode and stand-by will be 13 GWh/a or approximately 7% of total consumption by computers. In comparison with the normal trend, the saving will be 39 GWh in 2020. The savings in 2016 are estimated to be approximately one-third of the savings in 2020, i.e. 13 GWh.

Computers in office use

An estimate of the initial situation in 2006 is set out in the table below. The information has been compiled from several sources: The study "Making the Use of Electricity for Equipment in Households and Office Premises More Efficient" by the Work Efficiency Institute and VTT (2000), Motiva's report on opportunities to save electricity in the workplace environment (2006), the Commission's background report (IVF 2007), and the design project implemented at the Finnish Environment Institute with VTT and Motiva (2003).

		Equipment on average			All equipment stock	
	Number	Off + stand-by, kWh/a	Use, kWh/a	Mean consumption, kWh/a	Off + stand-by, GWh/a	GWh/a
PC	1 260 000	16.2	178.2	194.4	20.4	245
Portable	540 000	13.7	83.6	97.6	7.4	53
Picture-tube monitor	514 000	9.3	179.7	189	4.8	97
Flat screen	771 000	5.3	81.2	86.5	4.1	67
Total					36.7	462

Picture-tube monitors are gradually being eliminated from use and the proportion of portable computers has been assumed to rise to approximately 70% of machines used for office purposes. The number of machines was assumed to increase by approximately 10% from the 2006 level. The use of docks will also increase as the proportion of portable computers increases. The calculations have assumed that half of all portable computers are in docks, with a separate monitor connected.

In the normal trend, the computers in use are assumed to comply with the requirements of the current Energy Star labelling in 2020, so their electricity consumption will be approximately 305 GWh.

The enforcement orders will reduce the energy consumption of stand-by and off mode. The equipment stock in use in 2020 will comply with the 2013 requirements. The power of new computers (workstations and monitors) has therefore been assumed to be no more than 0.5–1 W in stand-by and no more than 0.5 W in off mode. After 2013, computers will also have the opportunity to use energy-saving space etc., which automatically switches the device to stand-by or off mode after the shortest possible time. The impact of this "automatic switch-off opportunity" on electricity consumption cannot easily be estimated, and it has not been considered for the purposes of the calculations.

As a consequence of the enforcement orders, electricity consumption by computers in office use will be approximately 298 GWh in 2020, so, in comparison with the normal trend, the saving will be 7 GWh. The savings in 2016 are estimated to be approximately one-third of the savings in 2020, i.e. 2 GWh.

Imaging devices

Since there are no more current data on the equipment stock available for offices, figures as presented in 2000 in the study "Making the Use of Electricity for Equipment in Households and Office Premises More Efficient" by the Work Efficiency Institute and VTT, were used as the starting point. The number of devices has been assumed to increase by approximately 0.5% per annum. One-fifth of photocopiers are assumed to be colour photocopiers. Likewise, one-fifth of printers are assumed to be colour printers. Inkjet printers are assumed no longer to be in office use. A figure of approximately 176 GWh was obtained for the electricity consumption of imaging devices in 2006.

The proportion accounted for by colour printing devices has been assumed to increase to 75% by 2020. The number of devices has been assumed to increase in office use by approximately 5% by 2020. The electricity consumption estimates for the normal trend for imaging devices are based on the consumption figures set out in the Commission's background report (Stobbe 2008). A figure of 205 GWh was obtained for the electricity consumption of imaging devices in office use according to the normal trend for 2020.

Most imaging devices in household use are printers. According to the study "Household Electricity Use 2006", electricity consumption by peripheral devices for computers (mainly printers) was 14 GWh/a. The prevalence rate of printers was 49%, there were approximately 1.2 million of them and mean consumption was 12 kWh/a (Adato Energy 2008). According to the Kotek statistics, more than 260 000 printers of various kinds were sold in both 2007 and 2008, so the prevalence of printers has been assumed to increase to 80% of households by 2020. The majority of new printers (approximately 75%) were multi-purpose printers. The number of printers in household use in 2020 has been estimated to be approximately 2.1 million, and their mean consumption according to the normal trend to be 11.7 kWh/a. The total consumption by printers in households will be 25 GWh/a according to the normal trend.

The falling electricity consumption estimates for imaging devices thanks to the Directive are based on the consumption figures set out in the Commission's background report, which reflect the recommendations given in the report (Stobbe 2008). The electricity consumption of imaging devices in office use is thus estimated to be 146 GWh in 2020, owing to the impact of the Directive.

The number of printers in household use has been estimated to be approximately 2.1 million, and their mean consumption owing to the impact of the Directive to be 5.8 kWh/a in 2020. Total consumption by printers in households will therefore be 12 GWh/a.

The saving in comparison with the normal trend is 59 GWh for imaging devices in office use and 13 GWh for those in household use, i.e. a total of 72 GWh in 2020. The savings in 2016 are estimated to be approximately one-third of the savings in 2020, i.e. 24 GWh.

Chargers and external power sources

The estimated saving for chargers and external power sources was 97 GWh, when the savings at European level, as forecast in the Regulation (9 TWh by 2020), are brought into proportion with the population figures forecast for Finland and the rest of Europe for 2020. The Regulation affects most of the free-standing AC/AC and AC/DC devices with power of no more than 250 W, and will enter into force in two stages, in 2010 and 2011. During the first stage (starting on 27 April 2010), the stand-by (no-load) power of such devices may be no more than 0.5 W. From 2011 onwards, the rules will be harmonised with the EU code of practice relating to power sources and the rules of the current United States Energy Star provisions.

The estimated savings obtained as described above are 97 GWh. Since the useful life of small household and electronic devices that use chargers and external power sources is usually rather short, the majority of them may be assumed to have been replaced by 2016. The estimated saving for that year is taken to be 75 GWh.

Quiescent current

For quiescent current, the savings estimates are set out above as part of the impact assessment for equipment groups, and they no longer need to be presented as part of the savings for quiescent current, in order to avoid an overlap in the assessment. In addition to these product groups, the savings to be achieved for quiescent current in other equipment groups have also been estimated.

The estimates of the amounts of equipment in other equipment groups are based on statistics from Statistics Finland and, failing this, on the amounts of equipment set out in the Commission's background report for the EU region. The consumption estimates are mainly based on the consumption figures given in the background report. The estimates of equipment amounts, for example in the case of ovens, dishwashers and washing machines, have assumed that only some of the equipment stock has functions and technology that cause electricity consumption in stand-by and off mode.

In 2006, electricity consumption for stand-by and off mode in households was approximately 455 GWh, i.e. 4% of household energy consumption (including the product groups already discussed above). For equipment for which there is no estimate of consumption trends for stand-by and off mode, consumption has been estimated to fall by approximately one-third from the 2006 level.

The falling consumption estimates for stand-by and off mode thanks to the Directive are based on the requirements of the Regulation in so far as the equipment group falls within the scope of the Regulation. For other equipment groups, it has generally been assumed that electricity consumption for stand-by and off mode will fall by approximately one-third from the 2006 consumption level. The estimated savings obtained for product groups other than those already discussed above is 112 GWh in 2020. The savings in 2016 are estimated to be approximately one-third of the savings in 2020, i.e. 37 GWh.

Backwater pumps

The regulation will have an impact via new construction and through the renewal of backwater pumps. The current pumps are placed in class D in the Europump classification (EEI = 0.80–1.00), whereas the minimum level set by the Regulation is class A.

Information on the volume of new building and on the trends in the proportion of water-circulation heating has been taken from the number of pumps in new construction in the scenarios in the Long-Term Climate and Energy Strategy (2008). The figure is estimated to be approximately 9 900 pumps/year in 2013 and approximately 17 500 pumps/year from 2015 onwards. The estimate of pump replacements is based on information from Statistics Finland concerning building stock per heating method. This information has been used to calculate the number of buildings with water-circulation heating. The number of pumps replaced each year has been estimated with a useful life of 15 years.

The savings between the requirements of the Directive and the current level were estimated using the Excel-based calculation tool made for the European E+Pump project. It was used to compare new, efficient motors to traditional motors. The project calculated the EEI for efficient motors, and this also forms the basis for the Regulation.

The estimated saving obtained was 92 GWh in 2016 and 209 GWh in 2020.

Electric motors

For electric motors, the saving has been estimated by initially estimating the proportion of electricity consumption in the industrial and service sector that is accounted for by motors. Sixty-five per cent of industrial electricity consumption in Finland is caused by motors (Gaia Consulting Oy: Energy-Efficiency Measures in Reducing Greenhouse Gas Emissions) and services account for 36% at EU level (Lappeenranta University of Technology course template: Uses of Electric Motors). The electricity consumption of motors in industry thus obtained was approximately 29 TWh and that for services approximately 6 TWh in 2008. Electricity consumption for motors has been estimated to increase by 1.5% per annum, corresponding to the mean increase in industrial electricity consumption in 2000–2006.

The useful life of motors has been estimated to be 20 years, and has been used to estimate the electricity consumed each year by motors that are to be replaced, if they were replaced with a similar type of motor.

The savings estimate assumes that:

- the mean saving achieved by means of an AC inverter is approximately 20% (according to various sources, the saving is 10–50%, depending on the object of use);
- the saving achieved by means of an IE2 motor is approximately 2% in comparison with traditional motors;
- the saving achieved by means of an IE3 motor is approximately 5% in comparison with traditional motors.

The estimated saving is 434 GWh in 2016 and 1 012 GWh in 2020.

Road and street lighting

There are estimated to be approximately 1.4 million mercury vapour lamps in road, street and private (e.g. housing organisations and real estate) lighting in Finland (according to Osram Oy), distributed evenly between road and street lighting and lighting for properties. In light of this information, energy consumption by mercury vapour lamps in Finland would be as follows: 1.4 million x 125 W x 4 000 h = 700 GWh. If they were all replaced with, for example, 70 W high-pressure sodium or metal halide lamps, the potential for energy savings could be estimated as follows:

- Replacement lamp consumption is 1.4 million x 70 W x 4 000 h = 392 GWh;
- Energy saving thus obtained (700 GWh – 392 GWh) = 308 GWh in 2020;
- The energy-saving potential is, however, reduced by the variation in annual usage time.

Since mercury vapour lamps have a lifetime of 16 000 hours, it may be assumed that half of them will be replaced by 2020, since the manufacture of mercury vapour lamps will not be permitted after 2015. An accurate assessment of the issue is, however, rendered difficult by the fact that mercury vapour lamps are not generally completely extinguished after 16 000 h of use, even though their output lessens, so the lamps are not necessarily replaced. How long the lamp manufacturers' stocks will last is another matter.

A mere manufacturing ban will not necessary have a great impact by 2016, owing to possible stocks. Instead, preparing for the future change and signing local councils up to the energy efficiency agreement and programme (KU–01–TEM) will probably result in some switching to other lamp types in advance. The impact in 2016 may therefore be approximately one-quarter of the measure's total future impact, i.e. approximately 77 GWh.

Overlap

The impact assessment for road and street lighting does, in principle, have some overlap with the impact of the energy efficiency agreement and programme for local councils, but this overlap has been eliminated by deducting from the impact assessment for the measure in question the reported savings achieved by renewing road and street lighting. (KU–01–TEM).

Impact assessment

The time frame of the original assessment in 2009 was up to 2020, and no separate assessment was performed up to 2016. For the purposes of this action plan, however, the estimated savings from the original scenario calculations for 2016 have been compiled.

The calculation was performed for several product groups using the following steps (exceptions mentioned below):

- The prevalence of equipment at the start of the period studied has been estimated;
- The energy consumption of equipment at the start of the period studied has been estimated;
- An estimate of the "normal trend", i.e. how the equipment stock and its energy consumption would develop until 2020 without the rules laid down by the Directive;
- The improvement in energy efficiency compared to the normal trend owing to the directive has been estimated on the basis of the Regulation, the draft Regulation and the background report.

Backwater pumps are treated differently from other product groups in that it has not been possible to consider a normal trend.

The methods for assessing chargers and external power sources, quiescent current, and street and road lighting are described in the section entitled "Starting points and assumptions of the calculation".

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Employment and the Economy/Motiva

ENERGY SAVING GWh/a			2010	2016	2020
ESD	HO–13–TEM	Ecodesign Directive and energy efficiency requirements for each equipment group	0	1 338	3 130

MEASURE	MEASURE CLASS	MEASURE CODE
Energy efficiency agreement for business – energy services/own activities	4	EP–01–TEM

MEASURE IMPLEMENTATION PERIOD		Start	1/2008 (1997)	End	12/2016
MEASURE SUBJECTS	Companies pursuing the sale and distribution of electricity, district heating and district cooling, and the separate production of district heating				

MEASURE AIMED AT	Heating	Yes	Electricity	Yes	Fuels	Yes	Water	No

MEASURE FUNDING AND BUDGET

In 2008−2010, companies that have signed up to the operational programme for energy services forming part of the energy efficiency agreement for business have received a total of EUR 0.01 million in aid for energy audits and EUR 0.08 million in investment aid for the implementation of energy saving measures.

Energy audit aid for those who have signed up to the agreement has generally been 40% of the approved costs of work for the audit. Those who have signed up to the agreement may also, on a case-by-case basis, receive investment aid for the implementation of normal investments in energy saving, in which case the aid is generally no more than 25%. Aid may be granted for premises falling within the scope of the emissions trading scheme, unless it has a direct impact on the applicant's emissions rights or the financial significance of such impact on the viability of the investment is small.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Employment and the Economy, ELY Centres, Finnish Energy Industries, Motiva, companies that have joined

MEASURE DESCRIPTION

The energy efficiency agreements for 2008−2016 and the energy saving agreements that preceded them (1997−2007) have had an important role in Finland's climate and energy policy since 2001.

The energy efficiency agreement for business is a framework agreement signed by the Ministry of Employment and the Economy, the Confederation of Finnish Industries (EK), and the trade unions involved. Approximately 87 companies with their more than 130 business premises have signed up for the operational programmes for energy services under the energy efficiency agreement for business. A good third of the premises are for electricity sales, approximately one-third are premises for district heating, and the remainder are premises for electricity distribution. The companies that have signed up to the operational programme for energy services cover nearly 90% of all electricity distribution in Finland, approximately 94% of electricity sales and 80% of district heating sales.

The companies that have signed up to the operational programme for energy services set an energy-saving target of at least 5% of their own energy use. Another of their targets is to implement energy-efficiency measures together with the customers who receive their energy services, which will help significantly to achieve the guideline energy-saving target of 9% under the ESD for energy use by these customers over the 2008–2016 period in comparison with the trend if no energy-efficiency measures are implemented. This measure relates to the impact of the energy service [providers'] own activities. The measures with regard to customers under the operational programme for energy services are discussed in Annex 3; EP–02–TEM. Further information on the agreement activities generally and the operational programme for energy services may be found at http://www.energiatehokkuussopimukset.fi [English version at http://www.energiatehokkuussopimukset.fi/en/].

The companies that have signed up to the energy efficiency agreement activities submit a report each year to the web-based monitoring system concerning measures aimed at improving their customers' energy efficiency and energy use for their own activities, the energy-saving measures that they have implemented, and their fulfilment of other obligations connected to the implementation of the agreement. The energy-saving measures that are to be reported may include either energy-saving measures discovered during energy audits and analyses or measures that the companies have found in other ways.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, which was also used for the NEEAP-1 calculation.

Starting points and assumptions of the calculation

The calculation includes energy-saving measures reported as implemented (T) in the annual report as part of the energy efficiency agreement activities, both those found during energy audits and analyses and other efficiency measures reported by companies. For companies that were involved in the previous energy-saving agreement (1997−2007), the measures also reported as implemented during the previous agreement period, and their impact on savings, have also been considered. Until 2010, the savings used for the calculation (MWh/a) were the impact on savings of the measures that companies which had signed up to the agreement activities reported as implemented in their annual reports. From 2011, the annual saving will be estimated on the basis of average implementation over the last three years. From 2017, no new savings are assumed to be generated through the current energy efficiency agreement activities (2008−2016). The information covers approximately 90–95% of information about premises signed up to the operational programme for energy services from the companies that have signed up to the agreement activities, since the level of reporting by these companies has been high.

Because in practice, the measures to be reported in the annual report as part of the agreement activities do not include measures linked to operating technology, there has been no need to distinguish them from technical measures. The lifetimes of individual technical measures are not assessed separately, but for the purposes of this calculation, a mean lifetime of 20 years is used for the measures reported as having been implemented, which relate to investments in networks, etc.

Of the impact on savings from proposed measures that are reported as implemented, half is estimated to be achieved in the year of implementation. For the purposes of this calculation, the impact of all measures is calculated for the emissions trading sector, although, of the premises that have signed up to the operational programme for energy services, only a small proportion of separate district heating production premises are emissions-trading sites.

Initial data

The initial data for the calculation are obtained from data collected in the monitoring system from the annual reports submitted under the energy efficiency agreements by those who are signed up to the agreement scheme, and similar information from the previous agreement period.

Every company that is signed up to the agreement scheme reports the following, among other things, at premises level every year:

- general information (e.g. contact details, sector, whether the premises have an emissions trading scheme, etc.);
- detailed information about energy use;
- implementation data for the energy-saving measures proposed during energy audits and analyses:
  - T implemented, P decided to implement, H considering implementation, E decided not to implement;
- energy-saving measures implemented that were found other than during energy audits, and among other things, the following details about them:
  - estimated energy saving (electricity, heating, fuels) MWh/a;
  - the year in which the measure was implemented, the investment that it required, payback time, etc.;
  - information relating to energy efficiency operating schemes, including information on, *inter alia*, monitoring of energy consumption, energy efficiency plans and environmental schemes;
  - other issues relating to, *inter alia*, the use of renewable energy, the consideration of energy efficiency in planning and procurement, staff training on energy matters, communication relating to energy savings and efficiency, energy efficiency in transport and logistics, etc.

The accuracy of the calculation of savings reported corresponds to the accuracy that can be achieved in normal field work – some of the initial data are design data or estimates, since measurements are not always possible. The savings achieved by the energy-saving measures are not usually verified by subsequent measurements, since it is often difficult to take measurements in practice and it generates excessive costs.

Once the reporting has been completed, the order of magnitude of the data and other validity are checked at Motiva and the companies are asked to provide supplementary and/or additional information if necessary.

Overlap

No overlap with other assessments.

Impact assessment

The assessment relates to the impact of measures by companies that have signed up to the operational programme for energy services to improve the energy efficiency of their own activities. Although some of the savings connected to own activities are in the ESD area, this saving falls completely within the scope of the emissions trading scheme, so it has not been included for achieving the ESD target.

The annual energy saving (ES) generated is based on the reported impact on energy savings (electricity + heat-

ing + fuels) of the measures reported to have been implemented (T) each year by those who have signed up.

The annual energy saving (ES) is calculated using the model

ES[GWh/a] = ES(heating+fuels) + ES(electricity)

The total impact on energy savings given in the table below is obtained for the years shown in the table by adding together the impact on energy savings (ES) that applied at the time, calculated using the grounds set out above for the years in question.

Players responsible for the impact assessment and conducting the assessment

Ministry of Employment and the Economy, Motiva

ENERGY SAVING GWh/a			2010	2016	2020
ESD	EP–01–TEM	Energy efficiency agreement for business – energy services/own activities	0	0	0
NON-ESD	EP–01–TEM	Energy efficiency agreement for business – energy services/own activities*	85	303	321

ET–01–TEM

MEASURE	MEASURE CLASS	MEASURE CODE
Energy efficiency agreement for business – energy production	4	ET–01–TEM

MEASURE IMPLEMENTATION PERIOD		Start	1/2008 (1997)	End	12/2016
MEASURE SUBJECTS	Electricity and heating production				

MEASURE AIMED AT	Heating	Yes	Electricity	Yes	Fuels	Yes	Water	No

MEASURE FUNDING AND BUDGET

In 2008–2010, companies that have signed up to the operational programme for energy production forming part of the energy efficiency agreement for business have received a total of EUR 0.76 million in aid for energy audits and also EUR 0.76 million in investment aid for the implementation of energy saving measures. Energy audit aid for those who have signed up to the agreement has generally been 40% of the approved costs of work for power plant analyses. Investment aid for the implementation of energy-saving measures is considered on a case-by-case basis, and its amount varies. The main emphasis of investment aid associated with energy savings is on the introduction of new technology, for which the aid may be no more than 40%, and in practice it is most often 25–35%. Those who have signed up to the energy efficiency agreement may also, on a case-by-case basis, receive investment aid for the implementation of normal investments in energy saving, in which case the aid is generally no more than 25%. Aid may be granted for premises falling within the scope of the emissions trading scheme, unless it has a direct impact on the applicant's emissions rights or the financial significance of such impact on the viability of the investment is small.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Employment and the Economy, ELY Centres, Finnish Energy Industries, Motiva, companies that have joined

MEASURE DESCRIPTION

The energy efficiency agreements for 2008–2016 and the energy saving agreements that preceded them (1997–2007) have had an important role in Finland's climate and energy policy since 2001.

The energy efficiency agreement for business is a framework agreement signed by the Ministry of Employment and the Economy, the Confederation of Finnish Industries (EK), and the trade unions involved. Thirty-three companies with their nearly 200 business premises have signed up for the operational programme for energy production under the energy efficiency agreement for business. The electricity production of the companies that have signed up to the operational programme for energy production covers more than 90% of all electricity production and nearly 80% of all heating production.

The companies that have signed up to the operational programme for energy production are committed to including the continuous improvement of energy efficiency as part of their existing or soon to be introduced environmental and/or management system. This is done by adding energy issues to the aforementioned systems in line with the Energy Efficiency System, which is defined in the operational programme, and committing to use the Energy Efficiency System for the whole duration of the agreement. When the Energy Efficiency System is introduced, the company also sets company-specific targets to make primary energy use and electricity production more efficient. Further information on the agreement activities generally and the continuous improvements and Energy Efficiency System may be found at http://www.energiatehokkuussopimukset.fi [English version at http://www.energiatehokkuussopimukset.fi/en/].

The companies that have signed up to the energy efficiency agreement activities submit a report each year to the web-based monitoring system concerning their energy use, the energy-saving measures that they have implemented, and their fulfilment of other obligations connected to the implementation of the agreement. The energy-saving measures that are to be reported may include either energy-saving measures discovered during energy audits and analyses or measures that the companies have found in other ways.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Calculation method

Dedicated national BU calculation method, which was also used for the NEEAP-1 calculation.

Starting points and assumptions of the calculation

The calculation includes energy-saving measures reported as implemented (T) in the annual report as part of the energy efficiency agreement activities, both those found during energy audits and analyses and other efficiency measures reported by the companies. For companies that were involved in the previous energy-saving agreement (1997–2007), the measures also reported as implemented during the previous agreement period, and their impact on savings, have also been considered. Until 2010, the savings used for the calculation (GWh/a) were the impact on savings of the measures that companies signed up to the agreement activities reported as implemented in their annual reports. From 2011, the annual saving will be estimated on the basis of average implementation over the last three years. From 2017, no new savings are assumed to be generated through the current energy efficiency agreement activities (2008–2016). The information covers nearly all companies that have signed up to the operational programme for energy production, since the level of reporting by these companies has generally been 100% every year, or very close to that.

Because in practice, the measures to be reported in the annual report as part of the agreement activities do not include measures linked to operating technology, there has been no need to distinguish them from technical measures. The lifetimes of individual technical measures are not assessed separately, but a typical mean lifetime of 25 years is used for the measures linked to investments in production, which have been reported as implemented.

Of the impact on savings from proposed measures that are reported for implementation, half is estimated to be achieved in the year of implementation. The impact of all measures is calculated for the emissions trading sector.

Initial data

The initial data for the calculation are obtained from data collected in the monitoring system from the annual reports submitted under the energy efficiency agreements by those who are signed up to the agreement scheme, and similar information from the previous agreement period.

Every company that is signed up to the agreement scheme reports the following, among other things, at premises level every year:

- general information (e.g. contact details, sector, whether the premises have an emissions trading scheme, etc.);
- detailed information about energy use;
- implementation data for the energy-saving measures proposed during energy audits and analyses:
  - T implemented, P decided to implement, H considering implementation, E decided not to implement;
- energy-saving measures implemented that were found other than during energy audits, and among other things, the following details about them:
  - estimated energy saving (electricity, heating, fuels) MWh/a;
  - the year in which the measure was implemented, the investment that it required, payback time, etc.;
- information relating to energy efficiency operating schemes, including information on, *inter alia*, monitoring of energy consumption, energy efficiency plans and environmental schemes;
- other issues relating to, *inter alia*, the use of renewable energy, the consideration of energy efficiency in planning and procurement, staff training on energy matters, communication relating to energy savings and efficiency, energy efficiency in transport and logistics, etc.

The accuracy of the calculation of savings reported corresponds to the accuracy that can be achieved in normal field work – some of the initial data are design data or estimates, since measurements are not always possible. The savings achieved by the energy-saving measures are not usually verified by subsequent measurements, since it is often difficult to take measurements in practice and it generates excessive costs.

Once the reporting has been completed, the order of magnitude of the data and other validity are checked at Motiva and the companies are asked for supplements and/or additional information if necessary.

Overlap

No overlap with other assessments.

Impact assessment

The assessment concerns the impact of energy efficiency agreement activities relating to energy production. The estimated savings fall within the scope of the emissions trading scheme, so they cannot be included for achieving the ESD target.

The annual energy saving (ES) generated is based on the reported impact on energy savings (increased efficiency of electricity production and increased efficiency of primary energy use) of the measures reported to have been implemented (T) each year by those who have signed up.

The total impact on energy savings given in the table below is obtained for the years shown in the table by adding

together the impact on energy savings that applied at the time, calculated using the grounds set out above for the years in question:

$ES_{\text{increased efficiency of primary energy use}}$ and on the other hand $ES_{\text{increased efficiency of electricity production}}$.

Player(s) responsible for the impact assessment/assessment conducted by

Ministry of Employment and the Economy/Motiva

PRIMARY ENERGY SAVING (PRIM) AND INCREASED EFFICIENCY OF ELECTRICITY PRODUCTION (ELECTR) GWh/a			**2010**	**2016**	**2020**
PRIM	**ET–01–TEM**	Energy efficiency agreement for business – energy production	647	1 605	1 679
ELECTR	**ET–01–TEM**	Energy efficiency agreement for business – energy production	375	1 104	1 157

1 ANNEX 3 DESCRIPTIONS OF ENERGY-SAVING MEASURES – NO IMPACT ASSESSMENT

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HO–01–VM/LVM/YM

MEASURE	MEASURE CLASS	MEASURE CODE
Tax guidance	2	HO–01–VM/LVM/YM

MEASURE IMPLEMENTATION PERIOD		Start		End	ongoing

MEASURE SUBJECTS	All energy users

MEASURE AIMED AT	Heating	Yes	Elec-tricity	Yes	Fuels	Yes	Water	

MEASURE FUNDING AND BUDGET

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Finance

MEASURE DESCRIPTION

Energy taxation

Energy products subject to excise duty are petrol, diesel oil, ethanol, biodiesel, light and heavy fuel oils, and electricity and heat-producing fuels such as coal, lignite, coke, peat and natural gas. However, biomass in solid or gas form, such as wood, is exempt.

Electricity tax is levied on all electricity, regardless of the manner in which it was produced, and it is not based on the specific carbon dioxide emissions of the fuels used to produce the electricity. It is graded into the general tax class I and the lower tax class II, which is applied to electricity for consumption in industry and in greenhouse cultivation. The fuels for use in the production of electricity are untaxed, whereas fuels for use in heating production are taxed.

Energy-intensive industry and agriculture receive partial refunds of energy tax.

2008 increase in energy taxes

Energy taxes for transport, heating and electricity were increased at the start of 2008 by 9.8% on average, whilst keeping the taxation structure unchanged. The tax rise increased energy tax revenue by approximately EUR 300 million.

2011 change in the structure of energy taxes and tax increase

A change in the structure of tax on energy products entered into force at the start of 2011, whereby tax on heating and transport fuels changed so that it is now based on the fuels' energy content and the specific emissions of carbon dioxide generated by their combustion (energy content tax and carbon dioxide tax). In other respects, the structure of the tax retained the same main features. Tax on peat is lower than on other fuels. In order to preserve the competitiveness of energy-efficient combined production and to reduce the guidance overlap with emissions trading, the carbon dioxide tax on fuels used in combined production is halved. A tax discount is granted for sulphur-free light fuel oil, the use of sulphur-free fuel oil being one of the requirements for the introduction of energy-efficient condensing boilers.

In the context of the structural change in 2011, excise duty on fuel oils, coal, natural gas and electricity was increased by a net amount of approximately EUR 730 million. The basis for calculating carbon dioxide tax increased to EUR 50 per tonne of carbon dioxide for transport fuels and to EUR 30 per tonne for heating fuels.

The main goals of the structural reforms to energy taxation and the increases in tax on fossil fuels and electricity are to encourage energy saving, improve energy efficiency and promote renewable energy.

Transport taxation

Transport tax comprises the car tax to be paid when a vehicle is first registered, the vehicle tax to be paid annually, and fuel tax on transport fuels. It is therefore based on the purchase of the vehicle and on having it available for use, as well as its actual use. Car and vehicle tax are already at present determined according to the vehicle's emissions, in addition to which tax on transport fuels was also changed in 2011 so that it has an environmental basis.

Car tax is a one-off tax that is levied when the vehicle is registered. It is levied on all cars, vans and motorcycles that are registered or taken into use for the first time in Finland.

For car tax, the tax value is taken to be the vehicle's general retail value on the Finnish market. For cars and vans, the tax rate is defined on the basis of the vehicle's specific carbon dioxide emissions or, failing information on emissions, according to the total mass of the vehicle. Tax for cars and vans is 12.2–48.8% of the taxation value. The tax rate for motorcycles is defined on the basis of the cubic capacity of the vehicle's engine, which itself generally correlates to the vehicle's emissions. Tax for motorcycles is 9.8–24.4% of the taxation value.

Car tax based on emissions was introduced for cars at the start of 2008 and for vans in April 2009. After the legal amendment, average carbon dioxide emissions from new cars sold in Finland have fallen by approximately 15% from the 2007 level.

Vehicle tax is a tax per day levied on the time during which the vehicle is in service, and it is pre-determined for a 12-month tax year. It is divided into the basic tax levied on all cars and vans, and a driving force tax for cars not running on petrol.

Basic vehicle tax is currently levied on approximately 2.8 million vehicles, and is based on the vehicle's specific carbon dioxide emissions. The tax is determined on the basis of the vehicle's carbon dioxide emissions or total mass, in the same way as for car tax. The amount of basic tax is EUR 19–606 per annum.

Vehicle driving power tax is levied on cars, vans and lorries that use a fuel other than petrol. In addition to diesel cars, the driving force tax is also levied on fully electric cars, chargeable hybrid cars, and gas-operated cars. In 2009, driving force tax was levied on more than 800 000 cars. The driving force tax is used to even out the different amounts of operating costs to motorists of cars that use fuels taxed in different ways, and it is graded for different driving powers. The new driving force tax rates have been defined considering the mean fuel or energy consumption of every driving force, as well as the mean annual mileage.

Domestic help credit in taxation

A private individual may reduce the costs generated by work commissioned in the private household in his tax return as a "domestic help credit". Since the start of 2009, the maximum amount of the deduction has risen to EUR 3000 per spouse, and the restrictions on the intended use of the deduction have been abolished. The deduction is available for repair work to improve the energy efficiency of a residential building.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

The impact on energy savings has not been assessed.

Overlap

The impact of this measures overlaps with several other measures.

HO–02–OKM

MEASURE	MEASURE CLASS	MEASURE CODE
Sustainable development and energy efficiency in basic education	5	HO–02–OKM

MEASURE IMPLEMENTATION PERIOD	Ongoing activity	Start		End	
MEASURE SUBJECTS	Teachers and pupils in basic education and general upper secondary education				

MEASURE AIMED AT	Heating	Yes	Electricity	Yes	Fuels	Yes	Water	Yes

MEASURE FUNDING AND BUDGET

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PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Inter alia the Ministry of Education and Culture, Finnish National Board of Education, Motiva, universities and other players

MEASURE DESCRIPTION

General education

The current foundations of basic education (2004–), take into account the construction of entities. This is supported by seven priority areas (topics) in education. The topics relating to the treatment of energy matters include participatory citizenship and entrepreneurship, responsibility for the environment, welfare and a sustainable future as well as people and technology. Within the curricula for individual subjects, energy matters appear most commonly in physics, but also in natural history, home economics, chemistry, biology and geography.

Sustainable development is a topic in the foundations of the curriculum for both basic education and general upper secondary education. Feasible energy use is included in the topics in the basics of the curricula. The objectives and content of sustainable development are discussed in various subjects from the perspectives of these subjects. The aim of basic education is to bring up environmentally-aware citizens who are committed to sustainable ways of living. Schools should teach how to think about the future and how to build the future based on ecologically, economically, socially and culturally sustainable solutions. Upper secondary schools should encourage students to adopt sustainable ways of living and to engage in activities on sustainable development. The challenges of sustainable development are to be examined, *inter alia*, from the perspective of preserving the energy cycle, as well as saving energy and materials. General education should, in addition to teaching, promote learning through changes to everyday practices - the topics should also be reflected in the school's operating culture.

Teaching materials

Energy efficiency is promoted in schools, among other things, by preparing teaching materials for schools to use.

There are finished materials using various teaching methods for pre-school, lower and upper schools as well as general upper secondary teaching.

The www.edu.fi portal

The EDU.fi portal (www.edu.fi/teemat/keke [Finnish only]) is a web-based service maintained by the Finnish National Board of Education and aimed at teachers, where web-based teaching materials can be found, as well as other materials to support teaching, including competitions and themed days. The aim of this web-based service is to support everyday teaching work, learning and their common development. Particular goals are to support the meaningful use of information networks in teaching and to develop distance learning. The web-based service approaches the topic of sustainable development through various themes, one of which is energy production and use.

National and regional LUMA centres

The aim of the national LUMA centre is, in collaboration with various partners, to support and promote the teaching and learning of natural history, mathematics and technology at all stages from early education up to university, and to make children and young people engage in these subjects. In addition to the national LUMA centre, which is located in Helsinki, there are also regional LUMA centres in Oulu, Eastern Finland, Turku (Swedish-language) and Tampere. The LUMA centres offer teachers supplementary training and web-based materials for chemistry, biology, physics and mathematics. The teaching materials for physics have units relating to energy.

Motiva has compiled teaching materials, teaching examples and places to visit relating to energy saving and renewable energy sources on its website (www.motiva.fi/julkinen_sektori/koulut_ja_oppilaitokset [English version available at http://www.motiva.fi/en/public_sector/schools_and_colleges/]):

- Secret Letters – Jack Daw Finds Out About Energy (Pre-school):
  - Secret Letters – Jack Daw Finds Out About Energy is teaching material for pre-school pupils, to familiarise children with energy use and energy saving through fairy tales and theatre. The adult tells the story and the children present it as a table-top puppet-theatre play;
- Paavo and Petra at Home and on a Trip (Pre-school);
- Pluggy the Piggy Bank (Pre-school);
- Hey, Everything's Working! teaching material (years 2–6, Children's Centre)
- Active Learning exercises (years 3–9, IEE-funded project):
  - The idea of the Active Learning teaching material is to combine energy saving with teaching goals – by creating the studies. The exercises can be used to make the school's energy use more efficient with the pupils, and to try and achieve financial savings. Comprehensive school pupils aged 9–15 are active players;
- Rainmakers (years 1–6, IEE-funded project):
  - Rainmakers is a series of adventure books designed for children aged 9–12, and an operating model for energy teaching. The three-part series of books familiarises children with themes in sustainable development and energy saving. The series was published as part of the "Kids4Future" project, and there are exercises relating to the series for schools, as well as online games and a club for little rainmakers;
- Lifestyle role-play cards (year 6 –);
- The Quest for the Lost Ecoinfo (Ekokumppanit Oy [Ecopartners Ltd.]);
- W. Alopää's Energy School (North Karelian Electricity, Savo Power and Greater Savo Electricity);
- The Globe Game (Motiva Oy and the Finnish Consumer Agency);
- Energy Net Info Package (North Karelia University of Applied Sciences and Motiva).

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

The impact on energy savings has not been assessed.

Overlap

The impact may have some overlaps with other measures, e.g. those relating to communication and advice.

HO–03–OKM

MEASURE	MEASURE CLASS	MEASURE CODE
Sustainable development and energy efficiency in vocational training	5	HO–03–OKM

MEASURE IMPLEMENTATION PERIOD	Ongoing activity		Start		End			
MEASURE SUBJECTS	Organisers, teaching staff and students of vocational training							
MEASURE AIMED AT	Heat-ing	Yes	Elec-tricity	Yes	Fuels	Yes	Water	Yes

MEASURE FUNDING AND BUDGET

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PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Education and Culture, Finnish National Board of Education, organisers of vocational training

MEASURE DESCRIPTION

Vocational training

In 2010, there were in total 52 vocational upper secondary qualifications, each of which includes one or more training programmes that lead to one or more qualification titles. There were 120 study programmes in 2010. Vocational qualifications may be obtained from vocational education establishments (vocational colleges) or following apprenticeship training or as a competence-based qualification. Further vocational qualifications and specialist vocational qualifications may be obtained after vocational further education and training.

Updating the criteria for vocational upper secondary qualifications

The review of the criteria for vocational degrees was completed in 2010. Under the new criteria, sustainable development is included in basic qualifications as a key life-long learning skill, which is assessed as part of professional competence: “Students or persons following the course are committed to working according to the ecological, economical, social and cultural principles of sustainable development in their profession. They will comply with the key rules, regulations and agreements relating to sustainable development in their work duties in the sector.”

Sustainable development is also included in the vocational modules of the degree criteria in line with the sector-specific priorities. Energy efficiency is included in the sustainable development perspectives of vocational training, especially through the life-cycle approach and eco-efficiency. In the house building sector, for example, the life-cycle approach may be used to deal with ecological construction and to think about various insulation and heating solutions and their impact on the building’s energy consumption during its service life or on the emissions and costs generated by heating. Vocational training emphasises competence in sustainable development that is necessary in the students’ working life and future careers. On-the-job learning and competence testing play a crucial role in promoting competence in sustainable development.

The natural resources and environment sector: case study of a basic degree in agriculture

Nature is the vital force of the natural resources and environment sector. The industries related to it and the combinations thereof are found in agriculture, forestry, horticulture and fisheries as well as in the natural resources and environment sector. In the natural resources and environment sector, the sustainable development challenges that are common to all professional sectors include the application of the life-cycle approach in one's own field, the sufficiency of natural resources and energy, the responsible and feasible use of materials, energy and water, and the application of the best possible viable technology in order to reduce energy consumption and limit emissions.

In the basic agricultural qualification the values in the industry are defined as the welfare of people, nature and animals as well as promoting culture and vitality in the rural environment. Exploitation of natural resources brings into focus environmental perspectives and the relationship of humans to nature.

Farms specialise, follow a trend and/or diversify. They focus on their own expertise and network with other entrepreneurs. More and more professionals in the agriculture sector work as either employers or employees in companies offering, for example, farm tourism, machinery services, further processing of foodstuffs, bioenergy entrepreneurship, stand-in, labour or landscaping services or recreational animal activities.

From the perspective of energy efficiency, the following are among the sustainable development expertise objectives of a degree in this sector:

- to understand the principles of sustainable development in agriculture and the impact of agriculture on the environment;
- for the student to discover and exploit information about various energy production options and their economic and ecological impact;
- to consider eco-efficiency, including sustainability, dependency, energy consumption and occupational safety when selecting construction tools;
- to familiarise oneself with ecological construction and alternative construction methods and solutions, and to exploit the knowledge in work;
- to consider environmental perspectives while at work with regard to heating solutions, e.g. when exploiting geothermal and solar heat;
- to be acquainted with topical issues in agriculture (aid policy, environmental regulations, new technology, etc.);
- to be acquainted with various energy production options and with their economic and ecological characteristics.

Criteria for vocational and specialist vocational qualifications, and their reform

Sustainable development is also included in the vocational modules of the degree criteria in line with the sector-specific priorities. When reforming the criteria for vocational and specialist vocational qualifications, the vocational competence requirements relating to sustainable development are updated.

Sustainable vocational training – perspectives on ecologically, socially, culturally and economically sustainable development

Teaching, teaching materials, management and learning environments must be developed in order to promote sustainable development in vocational training. In addition to working and operating methods that are harmonious with sustainable development, one of the other aims of the teaching is to understand the broader reference framework of environmental questions and sustainable development, and to support the knowledge and skills for examining one's own work and professional field from the perspective of sustainable development. The training organiser, teachers and work-experience periods forming part of the professional training are of great importance for learning the operating methods of sustainable development. Sustainable development practices in educational establishments and work-experience placements broaden students' outlook.

In order to support the creation of an operating system for sustainable development and to incorporate sustainable development as part of the training organiser's quality assurance the Finnish National Board of Education published the guide "Sustainable Professional Training – Perspectives on Ecologically, Socially, Culturally and Economically Sustainable Development" in 2010. The second edition of this book is intended for organisers of vocational training, and it contains plenty of examples of how teachers can include sustainable development as part of their own teaching. Online materials to support the book are available at the edu.fi portal:

http://www03.edu.fi/aineistot/keke [Finnish only].

Energy Sector Training Committee

The task of the Energy Sector Training Committee (2011–2013) is to monitor, evaluate and forecast the development of the training in the sector as well as the competence required in the work environment, to propose initiatives to the Ministry of Education and Culture, the Finnish National Board of Education and other key players concerning the development of the qualifications and the content of vocational studies, and to propose initiatives to universities on taking into consideration employers' needs in terms of competence when developing training content. The members and deputy members of the Training Committee should at least represent educational administration, training organisers, teaching staff, employers and employees.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

The impact on energy savings has not been assessed.

Overlap

The impact may have some overlaps with other measures, e.g. those relating to communication and advice.

HO–04–OKM

MEASURE	MEASURE CLASS	MEASURE CODE
Sustainable development and energy efficiency in university education	5	HO–04–OKM

MEASURE IMPLEMENTATION PERIOD	Ongoing	Start		End	

MEASURE SUBJECTS	Higher education students, and those in further and continuing education

MEASURE AIMED AT	Heating	Yes	Electricity	Yes	Fuels	Yes	Water	Yes

MEASURE FUNDING AND BUDGET

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PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Universities, polytechnics, Ministry of Education and Culture

MEASURE DESCRIPTION

Higher education

In Finland, higher education is offered by 25 polytechnics (AMK) and 16 universities (YO). By their very nature, polytechnics are mainly diverse regional higher education establishments, the work of which emphasises the connection with industry and regional development. The studies pursued there are higher education degrees emphasising vocational content. The essential task of universities is to pursue scientific research and to provide the highest level of teaching on that basis. Universities interact with society and promote the social impact of research results.

Higher education establishments are independent players and decide on the content of their teaching themselves. Every university enters into 3–4 annual agreements on targets and results with the Minister of Education and Culture, which include both general targets common to all universities and polytechnics and establishment-specific targets. Promoting sustainable development is a common objective for all higher education establishments (2010–2012 agreement).

Energy technology studies at polytechnics provide training for various tasks, including work at power plants, energy companies or industrial energy units. Polytechnic studies in electrical technology and PHS technology also prepare students for working in the energy sector. Depending on the priorities of the polytechnic, energy technology may be a specialism in, for example, study programmes on automation technology, machine and process technology and environmental technology. Energy efficiency is also connected to, *inter alia*, the following study programmes, depending on the priority of the polytechnic: study programmes in sustainable development, biotechnology and food technology, wood technology, logistics, rural industry and forestry (see www.koulutusnetti.fi [English version available at http://www.koulutusnetti.fi/?file=315]).

Many universities also offer subjects related to energy efficiency. The study programmes and their priorities vary from one university to another. Study programmes that focus on energy technology include, for example, elec-

trical and energy technology, energy and PHS technology, energy technology, and environmental and energy technology. Energy efficiency is also connected to many other university study programmes (see www.koulutusnetti.fi [English version available at http://www.koulutusnetti.fi/?file=315]).

Postgraduate studies may also be completed on separate Master's-level programmes that may be applied to by those who have completed undergraduate studies, polytechnic or other educational establishment studies, or other previous university studies. There are Master's-level programmes relating to the energy sector at the Helsinki University of Technology at Aalto University (renewable energy schemes) and the University of Jyväskylä (renewable energy).

Continuing education

Higher education establishments organise continuing training for individuals, businesses and other organisations as a fee-based service. The majority of continuing training in the energy sector takes place through this. For example, Aalto University offers continuing training in energy efficiency (study programmes in energy in community planning, and energy-efficient, healthy renovation). Polytechnics may also offer studies relating to energy efficiency as specialisms.

Additionally, since 2009, a new form of education has been on offer - continuing education offered by higher education establishments with an apprenticeship. The Ministry of Education and Culture makes a decision on the study programmes every year, based on proposals from the universities and polytechnics. In apprenticeship training, work-based training and learning play a key role. In 2011, 34 different training programmes are being funded, two of which are related to energy efficiency.

Energy efficiency expert

The objective of the training of energy efficiency experts is to create competence based on the needs of the workplace and the development of specialist expertise in energy efficiency planning at local councils, in industry and at the planning and consultancy agencies which serve them. The programme combines acknowledgement of existing competence with research-based study and the operational development of the employer businesses.

The aim is to offer far-ranging, deeply specialised expertise in energy efficiency and its application to, for example, costs, investment management, the environment, and decisions to reduce greenhouse gases. The training programme is intended, for instance, for people who have a higher education qualification in electrical, process, construction, PHS or power plant technology or in architecture. For example, an engineer with a post-secondary level qualification as well as relevant and extensive experience of working in the property or energy technology sector, may also be selected.

The employer is committed to offering the student a full-time contract of employment for at least the duration of the training, together with work duties in the sector, a mentor for work-based learning, and the opportunity to benefit from contact teaching during working hours.

The energy efficiency expert training was first organised in December 2010. In 2011, Aalto University and the Tampere University of Technology are responsible for its organisation.

Energy-efficient building management

The training leads to a qualification in the design of energy-efficient buildings in accordance with the reformed building regulations, and also increases expertise in the sector's monitoring, implementation and developer organisations. The requirements relating to energy efficiency and renovations will increase considerably in the years ahead. The training is intended for professionals in the construction and property sectors, such as architects, graduate engineers and master builders.

The training provides skills in designing and building energy-efficient buildings in accordance with the reformed

building regulations (2012). The training also deals with improvements to the energy efficiency of existing building stock and computational indications of energy efficiency.

The training is organised by Helsinki Metropolia University of Applied Sciences. The building control departments of Helsinki, Espoo, Vantaa and Kauniainen councils are also involved in the planning and part of the implementation of the training.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

The impact on energy savings has not been assessed.

Overlap

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HO–05–OKM

MEASURE	MEASURE CLASS	MEASURE CODE
Sustainable development certificates for schools	5	HO–05–OKM

MEASURE IMPLEMENTATION PERIOD		Start	2010– 2006–	End	ongoing

MEASURE SUBJECTS	Schools, from nurseries to higher education

MEASURE AIMED AT	Heat-ing	Yes	Elec-tricity	Yes	Fuels	Yes	Water	Yes

MEASURE FUNDING AND BUDGET

The Ministry of Education and Culture supports the activities with EUR 60 000/year

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Sustainable development certification of educational establishments: the Teaching, Education and Training Foundation (OKKA), the Environmental School of Finland (SYKLI), Eco-One, Green Flag, the Finnish National Board of Education, and the Trade Union of Education in Finland (OAJ).

Green Flag: Finnish Association for Environmental Education, Finnish Society for Nature and Environment.

Ministry of Education and Culture

MEASURE DESCRIPTION

There are two sustainable development training strategies in force in Finland (from the Training Division of the Sustainable Development Committee in 2006, and from the working group established by the Ministry of Education and Culture in 2006), and they support each other. They have both set the target of all Finnish schools and educational establishments preparing their own sustainable development action plans. One of the other targets is for 15% to have external recognition or certification of their work on sustainable development by 2014.

In order to support the development work, educational establishments require tools that they can use to assess and further encourage the inclusion of sustainable development in their management, teaching and operating culture. The Finnish National Board of Education portal, www.edu.fi [Finnish only], has guidelines on creating a sustainable development programme (www.edu.fi/teemat/keke > Tools for Development Work [Finnish only]). The Finnish National Board of Education has also, together with interest groups, prepared materials relating to creating sustainable development programmes, and has funded further training on this subject for teachers.

Sustainable development certification for educational establishments

The sustainable development certificate maintained by the OKKA Foundation was introduced in 2010, when it replaced the previous environmental certificate for educational establishments. The certification scheme serves the sustainable development work of schools and other educational establishments, irrespective of the level at which

they start.

Sustainable development certification for educational establishments offers assessment tools, materials, advice and training to support the sustainable development work of schools and other educational establishments. An educational establishment may construct a sustainable development programme that it can use to connect learning about sustainable living to teaching and the everyday life of the establishment. The construction of the programme is supported by themes relating to various sub-areas of sustainable development. The starting point is that the educational establishment may choose the focal points of its development work, based on its own objectives.

It is also possible for educational establishments to aim for certification, i.e. external recognition. Comprehensive schools, upper secondary schools and educational establishments offering basic vocational and adult education as well as those offering liberal adult education may apply for sustainable development certification. The certification is based on the establishment's self-assessment, and also on an audit conducted at the establishment by an external auditor. Approximately 80 teachers and sustainable development experts have been trained as external assessors. One of the assessors' important duties, in addition to certification audits, is to act as developers and regional support persons for schools and educational establishments.

The OKKA Foundation and the certification partners also offer advice, training and individual consultancy for pupils, in order to support the development work. Much of it is free training funded by the Finnish National Board of Education.

Green Flag

The Green Flag is a sustainable development programme for nurseries, schools and other educational establishments as well as other operators running children's and young people's activities. The programme is maintained by the Finnish Association for Environmental Education, and it is an international environmental symbol for the education sector. Participants who meet the programme criteria obtain the right to use a green flag as an indication of their performance. In Finland, President of the Republic, Tarja Halonen, acts as programme patron.

The principles of the Green Flag programme are:

- Inclusion: children and young people are active players in the planning and implementation of the projects, and in evaluating the results;
- Reducing the environmental burden;
- Education in sustainable development as part of everyday life;
- Continuous improvement: long-term, systematic development;
- Collaboration with wider society.

The Green Flag is part of the international Eco-Schools programme that operates in nearly all European countries and is being extended to other continents. The Finnish Association for Environmental Education has developed operating methods and materials for the Green Flag programme that fit into the Finnish nursery and school system.

Green Flag generates considerable savings for the local council, *inter alia* in the form of energy savings and a reduction in waste costs. For educators, Green Flag is a tool for implementing the objectives of sustainable development and inclusion, which are included in teaching and early education plans. There are over 250 nurseries, schools, other educational establishments and other participants taking an active part in the programme.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

The impact on energy savings has not been assessed.

Overlap

Other communication measures and training related to this topic.

HO–06–OKM

MEASURE	MEASURE CLASS	MEASURE CODE
Measures linked to environmental education for young people	6	HO–06–OKM

MEASURE IMPLEMENTATION PERIOD	ongoing activity		Start	1981- and 2006-		End	ongoing	
MEASURE SUBJECTS	Children and young people							
MEASURE AIMED AT	Heat-ing	Yes	Elec-tricity	Yes	Fuels	No	Water	Yes

MEASURE FUNDING AND BUDGET

Ministry of Education and Culture funding: annual subsidies for the operation of national youth centres (2001: EUR 3.6 million) and investment aid (2011: EUR 1.95 million)

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

National youth centres, Rantasalmi Environmental Education Institute, and local council youth units

MEASURE DESCRIPTION

Energy-saving guidance by national youth centres

Pursuant to the Youth Act, the Ministry of Education and Culture supports ten national youth centres and their partnership organisation, the Finnish Youth Centre Association. The youth centres receive state subsidies for activities and construction, and they produce approximately 210 000 days of youth activities every year, the majority of which are camps, nature schools, and activities relating to promoting young people's active citizenship and strengthening their social integration. The first centres commenced their activities in 1981, and the most recent one, the Anjala youth centre, was founded in 2000.

The primary task of the national youth centres is to support the work of educators and trainers, and to serve national and international youth activities. As part of this task, the youth centres provide camps, nature and hobby camps, training, meetings, family and recreational holidays, and services related to the organisation of youth events. The aim is for young people to be offered the opportunity to experience personal success and shared experiences – encounters that will steer young people's development in line with the objectives of youth education. The operation of the youth centres is regulated by the Finnish Youth Act and Youth Decree.

The youth centres are independent units, which form a nationwide network. The centres work in conjunction with the Finnish Youth Centre Association, cooperating with each other directly as well as with the youth sector generally.

The national youth centres and their owners are:

- Ahtela, Sauvo (City of Turku);
- Oivanki, Kuusamo (City of Kuusamo);

- Anjala, Anjalankoski (City of Kouvola);
- Piispala, Kannonkoski (Kannonkoski Council);
- Hyvärilä, Nurmes (Loma-Nurmes Oy, City of Nurmes);
- Syöte, Pudasjärvi and Hailuoto ancillary office (Oulu Region Settlement, registered association);
- Marttinen, Virrat (City of Virrat);
- Vasatokka, Inari (Nuoriso- ja luontomatkailukeskus Inari Oy [Inari Youth and Nature Holiday Centre Ltd.]);
- Metsäkartano, Rautavaara (Rautavaara Course and Camp Centre Foundation);
- Villa Elba, Kokkola (Villa Elba Oy).

Camp and nature school activities are the main way in which the youth centres operate. The centres organise more than 1 000 camps every year, and every centre has its own specialist area and strengths. They implement various nature-based programmes for young people, even some of national importance. Some of the youth centres have also implemented longer-term environmental education activities in the form of nature schools. According to the common strategy of the youth centres, the objective of the centres is, among other things, to reinforce environmental awareness and to bring up environmentally responsible people.

The energy-saving guidance at the centres comprises various energy-saving measures in everyday activities, such as energy-saving light bulbs, the use of louvre blinds, switching lights off, the use of hot water, etc. The energy-saving programme has achieved an energy saving of approximately 10%, which means a total saving for the ten centres of approximately EUR 100 000.

Local councils' environmental education models for youth work

According to section 7 of the Youth Act, environmental education for young people is the responsibility of local councils. The Ministry of Education and Culture has supported the Rantasalmi Environmental Education Institute in producing a guide in Finnish and Swedish (Sustainable Development Education Models for Local Council Youth Work, 2008). The guide contains 30 environmental education models prepared in cooperation with local councils, and it has been sent to all local councils for them to use. The content of the guide consists of education models and expert articles to support sustainable development. The education models have been constructed so that they contain the four dimensions of sustainable development: ecological, economic, social and cultural sustainability.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

The impact on energy savings has not been assessed.

Overlap

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HO–07–TEM

MEASURE	MEASURE CLASS	MEASURE CODE
Motiva	6, 3, 4, 5	HO–07–TEM

MEASURE IMPLEMENTATION PERIOD		Start	1993	End	ongoing
MEASURE SUBJECTS	Central government, local government, businesses, communities and consumers				

MEASURE AIMED AT	Heat-ing	Yes	Elec-tricity	Yes	Fuels	Yes	Water	Yes

MEASURE FUNDING AND BUDGET

Motiva, which consists of Motiva Oy, a central government interest unit (in-house), and Motiva Services Oy, which serves the private sector and local government, had a turnover of EUR 6.1 million in 2010 and employed 58 people at the start of 2011, of whom 44 worked for Motiva Oy. Every year, the Ministry of Employment and the Economy commissions a “work programme” from Motiva, relating mainly to the promotion of energy efficiency (approximately EUR 2.7 million in 2010). The volume of other work to promote energy efficiency that was funded by central government in 2010 amounted to a good EUR 1 million.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

The majority of projects implemented by Motiva Oy are the responsibility of various ministries, the most important of which is the Ministry of Employment and the Economy. At a practical level, Motiva is responsible for implementation together with consultancy firms that act as sub-contractors. There is also a great deal of collaboration with other players in the field, such as trade unions for different areas of activity.

MEASURE DESCRIPTION

Motiva is an expertise and services company that carries out diverse work to increase the sustainable use of energy and materials and the use of renewable energy sources.

The work began in 1993, when the Ministry of Trade and Industry (now the Ministry of Employment and the Economy) established the Energy Savings Service Centre project. Motiva became a state-owned limited company on 1 November 2000. It consists of Motiva Oy, a central government interest unit (in-house), and Motiva Service Oy, which serves businesses, local government, and communities (established on 12 December 2008). Motiva Oy is a limited company fully owned by the state, and similarly Motiva Service Oy is a company fully owned by Motiva. Motiva’s role corresponds to the work of a typical National Energy Agency.

Motiva develops operating models and tools in conjunction with customers to facilitate the achievement of these objectives. Advice, communication, player networking, campaigning and the publication of information materials form part of its active work, a crucial part of which is the monitoring of measures and the conducting of impact assessments.

In its communications, Motiva makes use of many different channels of communication: Internet services, campaigns, publications and information materials promoting energy efficiency, seminars, trade fairs and networking

events. Engaging and serving the media are crucial parts of its communication activity. In 2010, a total of 65 communications were sent out, and 35 new publications were produced. In total, nearly 99 000 publications have been distributed. The web-based services developed and maintained by Motiva had a total of 1.4 million visitors in 2010. Energy advice for consumers is an area of development.

In its services, Motiva supports central government, among other things in the implementation of the national climate and energy strategy and of the EU Directives, such as the Energy Services Directive. Services are also offered to local councils, businesses, communities and consumers. Motiva operates as a national collaboration partner and support point for the Finnish energy agencies. Its operating method is to merge procedures, technology and communication into an efficient entity.

Motiva's main areas of activity are:

- Energy efficiency agreements: administration, development, implementation support, and monitoring;
- Energy audits and analyses: administration, development, customer advice, auditor training, and monitoring quality and results;
- Environmentally-friendly technology: accelerating introduction;
- Energy-use management: management systems, and continuous improvement;
- Advice and communication: influencing attitudes and utilisation habits, good practices, procurement service, coordination of energy advice for consumers, coordination of mobility guidance;
- Monitoring and impact assessments: effectiveness of programmes and measures;
- Training: training programmes and events;
- Renewable energy: increasing sustainable use, and accelerating the introduction of different technologies;
- Material efficiency: efficient use of materials;
- Environmental labelling: The Swan Mark – Nordic environmental label, EU Flower – EU environmental label.

Further information is available at http://www.motiva.fi [English version available at http://www.motiva.fi/en/].

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Motiva's activities are mainly evaluated through the evaluation of the projects implemented by Motiva. The annual batch of projects (the "work programme") commissioned by the Ministry of Employment and the Economy includes an impact assessment as one of the key parts. Among other things, the monitoring programmes for energy audits and energy efficiency agreement activities are maintained and developed by Motiva, and the impact of these programmes is evaluated by Motiva.

HO–08–TEM/YM/LVM

MEASURE	MEASURE CLASS	MEASURE CODE
Energy advice for consumers	6	HO–08–TEM/YM/LVM

MEASURE IMPLEMENTATION PERIOD		Start	1/2010	End	ongoing
MEASURE SUBJECTS	Energy use by consumers (households): accommodation and the procurement of equipment, new building and renovation, choices for heating buildings, mobility				

MEASURE AIMED AT	Heating	Yes	Electricity	Yes	Fuels	Yes	Water	Yes

MEASURE FUNDING AND BUDGET

Energy advice for consumers in 2010–2011 was implemented by means of 14 pilot projects and their coordination: funding from the Ministry of Employment and the Economy was EUR 1.3 million and from Sitra EUR 0.6 million. In 2011, EUR 0.8 million was used to implement ten projects. The development of a permanent energy advice system for consumers, starting in 2011, is estimated to take EUR 1 million/year.

Mobility guidance in 2010–2011 was implemented by means of 13 pilot projects and their coordination: project funding from the Finnish Transport Agency was EUR 0.36 million and from the Ministry of Transport and Communications EUR 0.18 million. EUR 0.055 million was spent on project coordination work.

The Ministry of the Environment reinforces renovation advice as part of the overall communications on renovations, and makes use of the existing advice network for renovations.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Pilot projects for energy advice for consumers

Motiva is the coordinator, and the projects are funded by the Ministry of Employment and the Economy and by Sitra. The permanent system is funded by the Ministry of Employment and the Economy, and the coordination centre is Motiva. The coordination working group consists of the Ministry of Employment and the Economy, the Ministry of the Environment, the Ministry of Transport and Communications, the Ministry of Agriculture and Forestry, the Association of Finnish Local and Regional Authorities, the Finnish National Board of Education, and Sitra. The projects are implemented by organisations, businesses, local councils, energy agencies and the Finnish Regional Councils. Further information may be found at http://www.kuluttajienenergianeuvonta.fi [English version available at http://www.motiva.fi/en/areas_of_operation/consumer_advice_on_energy_issues/].

Pilot projects for mobility guidance

Motiva is the coordinator, and the projects are funded by the Ministry of Transport and Communications and the Finnish Transport Agency. Coordination is managed through the Wise Mobility Coordination Group (VILI): the Ministry of Transport and Communications, the Finnish Transport Agency, the Ministry of the Environment, the Ministry of Employment and the Economy, the Finnish Transport Safety Agency, the Association of Finnish Local and Regional Authorities, the Finnish National Board of Education, the Network of Finnish Cycling Municipalities, and Motiva. The projects are implemented by companies, local councils, energy agencies and consultants. Further information may be found at http://www.motiva.fi/liikkumisenohjauksenohjelma [Finnish only].

Advice network and communication for renovations

The Ministry of the Environment coordinates an advice network for renovations, which currently includes approximately 40 regional players (a total of 500 people), such as public corporations, local councils, provincial museums, renovation centres and players in the property and construction sectors.

MEASURE DESCRIPTION

Energy advice for consumers

Consumers are recognised as one of the key groups for achieving the energy and climate targets. Various players have been aiming information and communication activities at consumers for years, but these activities have not been systematic. The need that consumers have for energy advice has been recognised by several national and sector-specific strategies and programmes. It is clear that there is a need to address the increase in demand by providing reliable advice.

In 2010–2011, energy advice aimed at consumers is implemented in different parts of Finland in 24 pilot projects funded by the Ministry of Employment and the Economy and by Sitra. The experience gained from the pilot projects

and the report written two years ago were used to develop a permanent energy advice system for consumers. In the pilot projects, the advice is mainly aimed at household consumers and is provided on the subjects of restoration and renovation, the selection of heating methods for buildings, residential energy consumption, purchases made by households, and mobility. The advice is provided by local councils, other corporations, national organisations and regional players. The advice and communication methods used in the projects vary (personalised advice, targeted seminars, advice clinics, etc.).

The project management groups involve numerous active cooperation partners of local and regional significance, which reinforces the effectiveness of the activities at national level. Energy companies, officials from local councils' building control departments, vocational colleges and local businesses and corporations are represented, among others. The projects form networks and exchange experiences with each other at various networking and training events, mainly organised by Motiva. During the first year, the pilot projects organised nearly 440 events in different parts of Finland, provided personalised advice to nearly 4 000 Finns, and directly reached more than 35 000 consumers, as well as tens of thousands indirectly. Even according to a cautious estimate, the advisors reached a total of 50 000 – 70 000 people.

In December 2010, the Ministry of Employment and the Economy appointed Motiva the consumer energy advice coordination centre, under a Government resolution. In developing the permanent consumer advice system, one of the key components was the building of a web-based service and the development of any associated e-mail and telephone advice. In addition to coordination and pilot projects carried out in the field, the aim is to conduct quality assurance of tools, training and advice, communication and marketing and to monitor activities and develop impact assessments. The plan is for the permanent advice system to be in full swing from the start of 2013.

Energy advice for consumers is being developed in close cooperation with, in particular, the development of advice on repairs (under the responsibility of the Ministry of the Environment), mobility guidance (Ministry of Transport and Communications), and advice activities aimed at farms (Ministry of Agriculture and Forestry).

Mobility guidance

In 2010–2011, Motiva coordinated 13 pilot projects on mobility guidance, funded by the Ministry of Transport and Communications and the Finnish Transport Agency. The projects were implemented by, among others, Helsinki Regional Transport (HSL), regional energy agencies, local councils and consultants. All the projects have a broad steering group with participation from, among others, the Ministry of Transport and Communications, the Finnish Transport Agency, Motiva representatives and, for each project, the ELY Centres, the Regional Councils, businesses and other expert representatives. The mobility guidance projects are aimed at developing regional mobility guidance, planning workplace mobility, promoting walking, cycling and public transport, promoting car pools and assessing the impact of neighbourhood services. Networking events are organised between projects, and a website is maintained. The mobility guidance expert network LIVE was also established to increase cooperation and exchanges of information. LIVE links Finland up as part of the European EPOMM network (the European Platform on Mobility Management), which the Finnish Transport Agency joined in 2010. Motiva coordinates LIVE and acts as the national EPOMM contact point.

Advice on renovations

In 2011, as part of the renovation strategy implementation plan, the Ministry of the Environment launched the www.korjaustieto.fi [Finnish only] portal to support renovation advice. It contains information on repairs for housing associations and single-family dwellings, official information, and a list of organisations and repair consultants who offer advice on repairs, together with their contact details. The aim of the repair advice is that enquirers be offered commercially independent, impartial and timely advice and guidance. Energy efficiency and the systematic maintenance of properties are key components of communication on renovations.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

An external assessment of the consumer energy advice will be carried out in the latter half of 2011, but this will include an assessment of the impact on energy savings.

HO–09–TEM

MEASURE	MEASURE CLASS	MEASURE CODE
Energy advice for SMEs	6	HO–09–TEM

MEASURE IMPLEMENTATION PERIOD		Start	6/2009	End	ongoing
MEASURE SUBJECTS	SMEs in the chemicals, plastics, food and technology industries and in the tourism and catering sector that have signed up to the energy efficiency agreement.				

MEASURE AIMED AT	Heating	Yes	Elec-tricity	Yes	Fuels	Yes	Water	Yes

MEASURE FUNDING AND BUDGET

Energy advice for small and medium-sized enterprises (SMEs) has been funded by five trade unions that are signed up to the energy efficiency agreement for business, and by the Ministry of Employment and the Economy. The budget for the three actual years of the advice work has been as follows:

2009: Total: EUR 318 000, of which the Ministry of Employment and the Economy funded EUR 271 000 and the unions funded EUR 48 600;

2010: Total: EUR 143 400; funding from the Ministry of Employment and the Economy: EUR 104 400; funding from trade unions: EUR 39 000 (money transferred to 2010 from the previous year is included in the proportion of funding coming from the Ministry of Employment and the Economy);

2011: Total: EUR 105 000; funding from the Ministry of Employment and the Economy: EUR 56 800; funding from trade unions: EUR 48 250.

The proportion of funding from the Ministry of Employment and the Economy in 2009 was large, since that was when the advice work started, and there were also some projects to support the actual advice that were related to it. The figures do not include the costs of any other projects that support the advice.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Energy efficiency advice for SMEs is provided by Motiva (responsibility, coordination, practical implementation, and communication), the trade unions (feedback, guidance, and communication) and the Ministry of Employment and the Economy (feedback, guidance, and communication).

Equipment suppliers and consultants also participate indirectly in the advice work and especially in the actual implementation of increased efficiency measures. The SMEs that receive the advice participate in the development of the service by providing feedback and participating in workshop events.

MEASURE DESCRIPTION

Of the trade unions that have signed up to the energy efficiency agreement for business, the Finnish Plastics Industries Federation, the Chemical Industry Federation, the Federation of Finnish Technology Industries, the Finnish Food and Drink Industries' Federation, and Tourism and Restaurant Services (MaRa), as well as the Ministry of Employment and the Economy, have participated in energy advice for SMEs. The advice work was prepared in collaboration between the aforementioned unions and the Ministry of Employment and the Economy in 2007–2008. The actual advice work started in 2009.

In SMEs, energy matters are often implemented in parallel with their own activities, and the resources used for this are limited. Attention is therefore not always paid to energy efficiency, and measures to improve energy efficiency remain unimplemented and their cost savings unfulfilled. The Energy Services Directive, which entered into force in 2006, and the new challenges that it brought with it are also still new things for many SMEs, as is the energy efficiency agreement for business, which has a key role in the implementation of the Energy Services Directive in Finland.

The survey of medium-sized enterprises conducted towards the end of 2007 and the energy efficiency pilot project implemented in spring 2008 suggest that there is a need for energy efficiency advice.

The energy efficiency advice service was started at Motiva on 1 June 2009. Advice is offered to companies that have signed up to the operational programme for medium-sized industry under the energy efficiency agreement for business and which are members of the aforementioned five trade unions.

Advice activities have been and are being targeted at the following sub-areas in particular:

Annual report under the energy efficiency agreement;

Clarifying the obligations under the energy efficiency agreement;

Identification of the most important factors in the subjects' own energy use, at a general level;

Help in prioritising known increased efficiency measures;
In-house communication and training, and associated materials;
Help in creating contacts between companies and other players in the sector (energy inspectors, ELY Centres, equipment suppliers, etc.).

The energy efficiency advice for SMEs has mainly comprised and still consists of the following measures:

Advice by telephone and e-mail

In addition to providing the actual advice, information is gathered on any questions, problems and practices arising.

Energy efficiency seminars

In 2009, the five seminars associated with the advice service were sector-specific. In 2010, the energy efficiency seminars were local events in which businesses participated across sector boundaries. A total of four local seminars were organised in 2010, as well as a dedicated seminar for tourism and catering companies. In 2011, seminars have been organised for the technology industry, as well as a seminar for companies in the plastics, chemicals and food industries. The main emphasis of the 2011 seminars has been on business examples and sharing practical advice.

Business visits

The need for business visits, as well as their implementation, has increased every year. The aim of business visits, in addition to the advice work, is to become familiar with business activities and/or production so that the practical opportunities and challenges can be highlighted more effectively.

Production of advice-related material

Advice-related material was produced especially in 2009, when sector-specific energy advice materials were prepared for all the aforementioned trade unions. In 2010–2011, the activity has mainly consisted of passing on existing public material and distributing seminar materials. The materials are produced and updated as necessary.

Collaboration between Motiva and the trade unions participating in the advice

The trade unions' contact persons are kept actively informed of the advice work. Similarly, Motiva / the energy efficiency advice [team] need information and feedback from the trade unions and companies. Energy efficiency advice status meetings are arranged as appropriate, in accordance with the agreement. It is thus possible for information and feedback to go in both directions.

Gathering project ideas in parallel with the advice work

During the advice work, ideas are shared with various interest groups regarding possible projects, according to need.

Other activities

In addition to energy efficiency advice for SMEs, there are also projects and activities relating to energy efficiency management for energy-intensive companies, including training in internal audits of energy efficiency systems, seminars on energy efficiency management, and, *inter alia*, a project relating to measurements, and these can also be exploited by SMEs. The projects support the implementation of the obligations set for the companies in the operational programme for energy-intensive industry under the energy efficiency agreement for business.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

The project is particularly aimed at companies that have signed up to the energy efficiency agreements, and its impact on energy savings is therefore included in the impact assessment for the operational programmes for medium-sized industry and the service sector under the energy efficiency agreement for business, and for the energy audits in those areas.

On the other hand, the impact assessment is conducted continuously, for example, in the form of recording contacts and seminar feedback. Additionally, a feedback questionnaire was administered to companies that received advice in 2010.

HO–10–TEM/YM/LVM

MEASURE	MEASURE CLASS	MEASURE CODE
Established communication activities and campaigns	6	HO–10–TEM/YM/LVM

MEASURE IMPLEMENTATION PERIOD		Start	1996	End	ongoing
MEASURE SUBJECTS	Energy users in a broad sense				

MEASURE AIMED AT	Heating	Yes	Electricity	Yes	Fuels	Yes	Water	Yes

MEASURE FUNDING AND BUDGET

The funding for the projects is agreed separately every year. For example, there is approximately EUR 60 000 of public funding for the Energy Savings Week (funded by the Ministry of Employment and the Economy) and approximately EUR 50 000 of public funding for Mobility Week (funded by the Finnish Transport Agency). Campaigns and communication activities are also funded by the players participating in them.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Motiva is responsible for coordinating Energy Savings Week. It is also responsible for communication for Mobility Week, in collaboration with the Finnish Transport Agency and the Ministry of Transport and Communications. The work is guided by the national steering group for Mobility Week, which includes, in addition to the above-mentioned players, the Finnish Transport Safety Agency, Liikenneturva [Traffic Safe], the Association of Finnish Local and Regional Authorities, the Ministry of the Environment, the Ministry of Employment and the Economy, and the Finnish National Board of Education. Businesses and corporations take part in the campaigns, while it is mainly local councils that are involved in Mobility Week.

MEASURE DESCRIPTION

In practice, the implementation of energy efficiency requires long-term, purposeful information and advice. One way of achieving this is to always implement an activity at the same time every year, to offer advice, methods and encouragement for the implementation of energy efficiency measures in different areas of society. These established annual communication measures include, for example, Energy Savings Week and Mobility Week.

The national Energy Savings Week, which is planned and coordinated by Motiva, is traditionally celebrated in the second week of October every year. The aim of Energy Savings Week is to highlight topical matters in energy efficiency and to offer savings tips for businesses, corporations, local councils, and consumers. Energy Savings Week is implemented freely. Every player may implement Energy Savings Week in its own style and concerning subjects that are topical for itself. In 2010, Energy Savings Week had 458 participants, and it has now been celebrated 14 times.

The model for Energy Savings Week is the Energy Savings Week for Second-Years, which was celebrated for the 15th time in 2010. It is aimed at second-year comprehensive school pupils. Annually, it reaches approximately half of this age group. It has proven to be an excellent way of taking energy teaching and attitudes to schools, and furthermore, according to the children, the information reaches homes. By funding the week, energy companies play a key role in its implementation.

In 2010, there were 19 players that participated in Mobility Week, mainly local councils. International Mobility Week is celebrated at the same time. The week ends with the Car-Free Day organised on 22 September, which Finland has celebrated since 2000. Mobility Week has been organised since 2003. The events for Car-Free Day and Mobility Week are organised in several places every year. Local councils and organisations have organised many kinds of events during Mobility Week, such as cycling and local excursions, as well as seminars dealing with the impact of mobility on the environment and health. The aim of Mobility Week is to extend the theme of Car-Free Day by considering mobility options from the perspective of sustainable development. How will my travel choices affect the environment and my own health?

The aim of the Climate Campaign by the Association of Finnish Local and Regional Authorities is to promote measures by local councils to reduce greenhouse gas emissions in accordance with the principles of sustainable development. The campaign is very much based on communication, and is connected to the “Cities for Climate Protection” campaign of the ICLEI, the global environmental organisation for local councils. There are 47 local councils and 2 municipal federations involved in the campaign.

Many targeted communication measures and campaigns are very much based on Internet services, which are described in more detail in the description of measure HO–11–TEM/YM/LVM. For further information, please go to http://www.energiansaastoviikko.fi [Finnish only], http://www.liikkujanviikko.fi [Finnish only], http://www.kunnat.net/fi/asiantuntijapalvelut/yty/ilmastonmuutos/ilmastokampanja [Finnish only].

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

The effectiveness of the communication measures and campaigns is mainly monitored using "communication indicators", such as the number of participants, the feedback received and any media coverage. For example, according to the feedback survey for the 2010 Energy Savings Week, 93% of respondents intended to participate in the Week in the following year. Sixty-seven per cent of participants indicated that the reason for their participation was to get more information, 61% said that it was for reasons of social responsibility, and 57% said that it was because the activities stimulated by the campaign were related to the company's energy or environmental programme.

HO–11–TEM/YM/LVM

MEASURE	MEASURE CLASS	MEASURE CODE
Tools, web-based services and information materials	6	HO–11–TEM/YM/LVM

MEASURE IMPLEMENTATION PERIOD		Start		End	ongoing
MEASURE SUBJECTS	Businesses, companies and consumers				

MEASURE AIMED AT	Heating	Yes	Elec-tricity	Yes	Fuels	Yes	Water	

MEASURE FUNDING AND BUDGET

On a case-by-case basis.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Various ministries, Motiva, other players

MEASURE DESCRIPTION

Through various web-based services and electronic tools, it is possible to offer targeted information in a demonstrative way. Some examples of key web-based services, of which many are now being offered, are given below. It is essential in the case of web-based services and electronic tools that the reliability of the information is checked, as well as the resources for updating the information. Many energy companies, energy agencies and other players have compiled comprehensive lists of web-based services and tools to promote energy efficiency.

General knowledge of energy saving and energy efficiency in the home

Motiva's website, www.motiva.fi [English version available at http://www.motiva.fi/en/], is a popular, reliable source of information that had 241 558 visitors in 2010 and 346 087 individual hits. In addition to this main web-based service, Motiva has also produced many targeted web-based services. The various web-based services maintained by Motiva had a total of approximately 1.4 million visitors in 2010 (more than 1.8 million hits). For example, the www.topten-suomi.fi [Finnish only] service is a web-based search tool aimed at consumers, which lists energy-efficient equipment and products on the market. Large household appliances (cooling equipment, washing machines and dishwashers), office equipment, consumer electronics (in planning), lamps and cars can be found on this service. During this year, the site has had over 17 000 visitors (50 visitors/day on average).

The www.lampputieto.fi [Finnish only] service has been developed in close collaboration with lamp importers, the competent ministries (Ministry of Employment and the Economy, Ministry of the Environment, and the Ministry of Social Affairs and Health) and Tukes. The most popular pages are the guide on selecting lamps, collection points and frequently-asked questions. The service had 26 800 visitors in 2010.

Various counters and test tools relating to energy use have been produced in order to stimulate consumers, such as motiva.fi/energialuokkatesti [Finnish only]. In addition to the energy-use counters, there are also counters designed to measure one's carbon footprint.

Properties and construction

Motiva was commissioned by the Ministry of the Environment to produce a website about energy certificates for buildings, www.motiva.fi/energiatodistus [Finnish and Swedish only], which had a total of 19 050 visitors in 2010. The site contains basic information about energy certificates and, *inter alia*, energy certificate issuers and frequently-asked questions. Questions may also be submitted by e-mail. The energy certificate hotline is available one morning a week.

The www.energiatehokaskoti.fi [Finnish only] website serves to promote low-energy construction by builders of single-dwelling homes and property developers. The monitoring and example sites presented on the website highlight some practical applications.

www.korjaustieto.fi [Finnish only] is a website produced and maintained by the Ministry of the Environment for the maintenance and repair of properties. The website, which was launched in 2011, is intended for residents, owners and housing associations, as well as property management professionals, and it offers practical tools, up-to-date news and tips, and a search engine for professional services. Various counters have also been produced to facilitate comparisons of heating systems.

In order to standardise official guidance on renovations, the Ministry of the Environment commissioned the reporting and analysis of approximately 150 cases of "sore points". Approximately 10% of these related to the energy efficiency of buildings. The case evaluations and procedural guidelines have been published at www.korvo.fi [Finnish only]. The service is particularly aimed at professionals in the construction sector as well as the authorities.

Transport and mobility

Mobility guidance is encouraged in many ways, for example by means of various counters. For domestic travel, various modes of transport may be compared using the Travelling in Finland game (www.matkallasuomessa.fi [Finnish only]) and the Travelling in Finnish Towns game (http://ilmansuojelu.ytv.kaapeli.fi/matkalla/v1.02/ [Finnish only]).

Information on various forms of transport and ways of travelling are offered by, *inter alia*, the www.kulku.info [Finnish only] website, which has a range of information about timetables, maps and route guides as well as car pooling and sensible motoring.

Economical driving is encouraged by, *inter alia*, the www.easyrider.fi [Finnish only] website.

Purchases

Various web-based services have been developed to support energy-efficient buying.

The EkoAKE service (http://ekoake.autoalanverkkopalvelu.fi [Finnish only]) includes new car models that are on sale, and is based on information that the Association of Automobile Importers in Finland and the importers have obtained from the Finnish Transport Safety Agency (Trafi) and the manufacturers.

www.motivanhankintapalvelu.fi [Finnish only] offers information and tools for environmentally-friendly purchases, for example at local councils.

Leaflets and information materials

In addition to the actual web-based services, more and more leaflets and information materials can be downloaded electronically. For example, matters relating to ecodesign and energy labelling have been compiled on Motiva's website in the "Buyer's Guide" section aimed at consumers and other end-user groups at www.motiva.fi/ostajanopas [Finnish only]. The "Buyer's Guide" section of the website supplements the www.ekosuunnittelu.info [Finnish only] website maintained by Tukes.

Diverse information and presentation materials aimed at various target groups are produced by Motiva, energy companies, various organisations and other players. For example, there are approximately 290 leaflets that can be ordered through Motiva's electronic online shop, either in printed form or as products that can be downloaded electronically. In 2010, Motiva produced 35 new publications, two publications were reprinted, and approximately 98 800 publications were distributed. Keeping the information up to date and reliable is crucial.

Leaflets and other information materials are distributed at many events, such as seminars and trade fairs, which are organised in collaboration with various players. The media also seek information actively and, in addition to press releases, the media are also served in many ways in order to disseminate information relating to energy efficiency and to promote action.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

Communication activity is assessed using performance indicators. According to the customer satisfaction survey on the www.motiva.fi [English version available at http://www.motiva.fi/en/] service, for example, visitors feel that Motiva is an independent player, and that the website content and the web-based service as a whole are generally useful (98% of respondents to the visitor survey). The most challenging issue was felt to be actually managing to locate the information sought on the extensive web-based service (83% of respondents did, however, find the information that they were looking for).

In autumn 2010, more than 700 sales people from all over Finland familiarised themselves with the training materials for sales personnel on the lampputieto.fi [Finnish only] service. A total of 326 visitors left feedback concerning the course, 89% of whom felt that the course helped them in their work.

HO–12–YM

MEASURE	MEASURE CLASS	MEASURE CODE
Guidance to make community planning more energy efficient	8	HO–12–YM

MEASURE IMPLEMENTATION PERIOD		Start		End	ongoing
MEASURE SUBJECTS	Local councils, large commercial units				

MEASURE AIMED AT	Heating	Yes	Elec-tricity	Yes	Fuels	Yes	Water	

MEASURE FUNDING AND BUDGET

Infra subsidies may be used in 2010–12 to grant a total of EUR 30 million to designated local councils for municipal engineering works. The subsidy is no more than 30% of the costs. Transfer to State Housing Fund, sub-item 35.20.60.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Local councils

MEASURE DESCRIPTION

Infra subsidies

Infra subsidies are regulated by the Government resolution (965/2009) on state subsidies to be granted in 2010–2012 for municipal engineering works in new residential areas. The aim of the subsidy is to start and advance the construction of new residential areas in areas of growth, to harmonise the social structure, to increase reasonably-priced, energy-efficient home production, and to promote cooperation between local councils. In addition to housing production, another of the objectives is to reinforce the operating conditions for public transport.

Legal amendment on the content of plans guiding the location of commerce

On 15 March 2011, the Finnish Parliament approved an amendment to the Land Use and Construction Act relating to guidance on the location of commercial sites. The starting point was that large commercial units are of vital importance to the sustainability of development in urban areas. The location of commerce has an effect on, among other things, customers' travel needs, transport arrangements and the environmental burden. The amendment requires a more systematic, longer-term approach to guidance relating to the location of commercial sites than is the case at present.

National and local cooperation on social integration

Ensuring regional and social integration and the feasible location of operations are regarded as the most crucial measures to promote energy efficiency. They are also the measures that have the lengthiest impact. National and regional targets have therefore been set, and they are mainly achieved through zoning and by coordinating action by the authorities.

National land use objectives (VATs) were reviewed in 2008 so that they corresponded better with the new challenges faced in land use, especially climate change. VAT is a guidance tool for the Council of State to produce policies on issues of land use that are significant for the country as a whole. The review emphasised sustainable land use, including energy questions relating to land use, the integration of the social structure, and control of traffic volumes (including good transport links and the conditions for rail traffic).

The plans for urban areas under the PARAS project (2007–2012) require local councils to coordinate land use, housing and transport (MAL). The solutions are recorded in a letter of intent called a "MAL agreement" (being piloted in Tampere, Turku and Oulu regions).

The publication "Strategic Guidance of Land Use" (SY28/2010) was issued as a result of the STRASI project (Development of Strategic Guidance for Land Use). The aim is to produce support material for councils' and urban regions' planning and implementation, in order to promote overall control and outline the land use policies as a whole.

In 2009, the harmonisation of land use and transport planning was reviewed by the joint land use and transport forum of various authorities (MaaLi).

Regional administration has been developed so that the areas of business, transport and the environment have worked together as an ELY Centre since 2010. There are also various traffic systems (roads, railways and waterways) that should be examined more comprehensively as an entity when planning land use.

The Ministry of the Environment, the Ministry of Employment and the Economy, and the Ministry of Transport and Communications fund the Kokonainen project of the Association of Finnish Local and Regional Authorities, the

aim of which is for local councils to prepare climate and energy strategies for their areas, make energy use and measurement more efficient, promote energy-efficient construction, integrate the social structure and provide residents with information about local topics.

Methods for evaluating the energy efficiency of the social structure

The Finnish Environment Institute (SYKE) has performed analyses for specific urban regions concerning mobility zones for the social structure (the Urban Zone project). The review is being extended to cover all major urban regions, and an analysis tool will be developed as a planning instrument during the second stage of the project.

SYKE's "Seutukeke" (Sustainable local land use and transport) developed specific criteria, indicators and analysis tools for land use and transport, for use in town planning.

The "Regional Eco-Counters for Towns and Local Councils (KEKO)" project charts existing regional eco-efficiency assessment tools. The information produced by them is being developed so that it is comparable, reliable and applicable to various use situations (Tekes, VTT, Aalto University and SYKE). A development project on assessing the impact of the social structure (YRAVA) has also started.

Regional construction pilot objects

A pilot site for energy-efficient regional building was established in Vaasa in 2008 in the form of the Suvilahti Housing Fair. The energy used in the area is captured from geothermal heat in the layers of earth or sediment in the seabed and from biogas obtained from landscaped landfill sites in the area. The area, which is self-sufficient in energy, produces as much as 20% electricity and 60% heating over and above its own needs, and it has its own power plant. The State of the World publication by the Worldwatch Institute, among others, has made reference to this project.

Another regional construction site, which invests in regional energy efficiency is Skaftskär in Porvoo, which is a city district of 6 000 inhabitants, currently subject to zoning. The project is developing energy-efficient management and planning practices, and charting their effectiveness. Energy efficiency, a reduction in the carbon footprint, and carbon balance calculations are intended to form part of the zoning process. The calculation models will be used to produce information for comparing the options and making a decision.

An example of energy-efficient town planning

ECO_2 – Eco-Efficient Tampere 2020 is a strategic project started in 2010 by Tampere Council, which coordinates and supports energy and climate work being done in the city and launches collaborative projects. The project intends to use eco-efficiency tools in zoning, support passive-construction projects, consider energy efficiency when handing over building plots and develop financial incentives for private builders. The project is also being funded by Sitra, in addition to Tampere City. The project won an international competition at the start of 2011, and the Nordic Council also awarded it the Solutions prize.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

The impact on energy savings has not been assessed. The impact of this measure overlaps with buildings and transport, since community planning and zoning have an influence on them.

HO–14–TEM

MEASURE	MEASURE CLASS	MEASURE CODE
Energy audit programme	3	HO–14–TEM

MEASURE IMPLEMENTATION PERIOD		Start	1/1994	End	Ongoing
MEASURE SUBJECTS	Industrial companies, energy production, private companies in the service sector, local councils				

MEASURE AIMED AT	Heating	Yes	Elec-tricity	Yes	Fuels	Yes	Water	Yes

MEASURE FUNDING AND BUDGET

On average, EUR 1.5 million in energy aid has been granted for energy audits every year. In 2009 and 2010, EUR 2.2 million of energy aid was granted for energy audits. The aid level is 40% for all eligible applicants, and 50% for SMEs and local councils that are signed up to the energy efficiency agreements. The aid level for local council renewable energy audits is 60% for local councils that are signed up to the agreement. The amount of energy aid available has not curtailed the support for energy audits. Energy aid may be applied for on a continuous basis.

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Ministry of Employment and the Economy, 15 regional Centres for Economic Development, Transport and the Environment (ELY Centres), and Motiva

MEASURE DESCRIPTION

The Ministry of Trade and Industry started to provide aid for energy audits of service and industrial buildings in 1992. The energy audit programme in its current form started properly at the beginning of 1994. Since 2008, the administration of energy audits has been the responsibility of the Ministry of Employment and the Economy. Energy aid applications are mainly processed at the 15 regional ELY Centres, but Motiva is responsible for the practical organisation of audit activities, and its tasks include promoting, developing and monitoring audit activities, as well as training energy inspectors and performing quality assurance of the audits. The Ministry of Employment and the Economy confirms the general guidelines for energy audits every year. The granting of energy aid is conditional upon managers who are trained and approved by Motiva being appointed to the energy audit project. Energy audits must also be implemented and reported in compliance with the energy audit models published by Motiva and the implementation guidelines prepared for them.

When the energy audit programme started in 1994, only one general energy audit model with guidance was used. In 2011, energy aid involves four audit models for service buildings, three for industry, and two for the energy sector. In addition to these, there are also two energy audit models with separate guidelines, as well as an energy audit for the transport chain and a local government audit for renewable energy.

Approximately 100 people a year participate in the energy auditor training organised by Motiva. Since 1993, nearly 1500 people have been awarded energy auditor manager qualifications.

The results of energy audits have been monitored through a separate monitoring system since 1994. The key data about all energy audits that have been started and reported are recorded in the monitoring system. Motiva prepares an annual status report on energy audits, based on the information recorded in the monitoring system.

In total, more than 7300 energy audits were carried out in Finland over the 1992–2009 period. Of these, 4000 were conducted in service buildings, 1800 in service buildings in the private sector, 1350 in industrial buildings and 180 in energy production facilities. A total of EUR 26.5 million in energy aid was granted for these energy audits. The measures reported as having been implemented on the basis of the energy audits have achieved cost savings of approximately EUR 650 million. The actual saving is larger than this, since the audit monitoring system does not gather comprehensive data on the savings produced by energy analyses of process industry.

Voluntary agreements have had a rather decisive impact on the volume of energy audits. In 1997, energy audits became an obligation under the energy-saving agreements of the Ministry of Trade and Industry, and they are also a contractual obligation in the current energy efficiency agreements.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

The impact of the energy audit programme on energy savings has not been assessed separately. The impact of energy audits on energy savings is discussed in the sector-specific descriptions.

EP–02–TEM

MEASURE	MEASURE CLASS	MEASURE CODE
Energy efficiency agreement for business – energy services, customers	4	EP–02–TEM

MEASURE IMPLEMENTATION PERIOD		Start	1/2008 (1997)	End	12/2016
MEASURE SUBJECTS	Companies engaged in the sale and distribution of electricity, district heating and district cooling, and their customers				

MEASURE AIMED AT	Heating	Yes	Electricity	Yes	Fuels	No	Water	No

MEASURE FUNDING AND BUDGET

Measures targeting customers under the operational programme for energy services are not supported through the companies that are signed up to the agreement activities. The companies that have signed up may receive aid for energy audits as well as aid for measures related to making their own energy use more effective. Such aid is discussed in Annex 2 (EP–01–TEM Energy efficiency agreement for business – energy services, own activities).

PLAYER(S) RESPONSIBLE FOR AND PARTICIPATING IN IMPLEMENTATION

Companies that have joined, Finnish Energy Industries, Motiva, Ministry of Employment and the Economy

MEASURE DESCRIPTION

In addition to making their own energy use more efficient, the operational programme for energy services also includes a target for the companies that have signed up to implement energy-efficiency measures together with their customers who receive energy services, since these measures will provide considerable help in achieving the guideline energy-saving target of 9% under the ESD in energy use by these customers in the 2008–2016 period, compared to the trend without any energy-efficiency measures. The obligation particularly concerns customer groups that are not otherwise covered by the energy efficiency agreement activities, e.g. households.

Eighty-seven companies with their more than 130 operating premises have signed up to the operational programme for energy services under the energy efficiency agreement for business. Of these premises, just under a third are electricity sales premises, approximately one-third are district heating premises, and the remainder are electricity distribution premises. The companies that have signed up to the operational programme for energy services cover nearly 90% of Finland's total electricity distribution, approximately 94% of electricity sales, and 80% of district heating sales. This description concerns activities aimed at customers under the operational programme. Activities relating to the companies' own energy use are described in Annex 2; EP–02–TEM. Further information on the agreement activities generally and the operational programme for energy services can be found at http://www.energiatehokkuussopimukset.fi [English version available at http://www.energiatehokkuussopimukset.fi/en/].

The companies that have signed up to the energy efficiency agreement activities submit a report each year to the web-based monitoring system concerning measures aimed at improving the energy efficiency of their customers. The measures that are monitored are aimed at action in the following areas: advice, communication, consumption feedback and billing. Quantitative information about the implementation and target groups of each measure is

also reported.

The measures aimed at customers and reported in the annual reports in 2010 as implemented by the companies are set out below. The companies that have joined cover the majority of electricity and district heating/cooling sales in Finland, so that the information describes the comprehensiveness of the activities well. Energy companies in Finland also have a long tradition of implementing measures aimed at customers, and the data for just one year provide a picture of the scope of the activities. The activity is ongoing, and similar data on the measures set out below and their target groups also exist for the previous years of the agreement, 2008 and 2009. The number of measures implemented during the 2008–2016 agreement period and their intended target group will increase very greatly over the whole agreement period.

Advice

Energy-saving advice aimed at customers is reported to be implemented in the agreement period by 99% of the companies that have joined. The most popular advice measures are:

- Energy-saving advice by telephone;
- Lending consumption gauges;
- Advice via e-mail or the Internet;
- Energy-saving advice on premises;
- Events for customers and interest groups.

Communication

Energy-saving communication is being implemented in the agreement period by 96% of the companies that have joined. The most popular communication measures are:

- Writing about energy savings in the customer magazine;
- Energy-saving matters on the Internet;
- Printed matter for customers concerning energy savings;
- Participation in Energy Savings Week.

Consumption feedback

Consumption feedback is being provided by 98% of the companies that have joined. The most popular measures relating to consumption feedback are:

- Opportunity to monitor one's own consumption on the Internet;
- Use of remote readings;
- Energy consumption monitoring report sent to customers.

Billing

Measures relating to billing, which affect customers' energy use, have been reported to be implemented by 88% of the companies that have joined. The majority of companies that have joined bill customers monthly based on actual consumption.

ASSESSMENT OF THE IMPACT ON ENERGY SAVINGS

The impact of this measure on energy has not been assessed at this stage. The monitoring is done by gathering quantitative data on measures aimed at customers and on their target groups. Monitoring is also carried out at the same time to ensure that companies in the energy sector that have signed up to the agreement fulfil the obligations required by the Energy Services Directive.