



# Energy efficiency in Finland

## - A COMPETITIVE APPROACH



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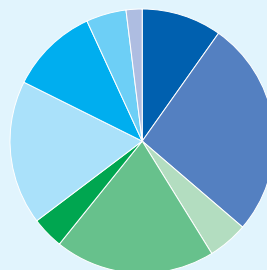
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## TOTAL ENERGY CONSUMPTION IN FINLAND

- Total energy consumption 1,358 petajoule (PJ) or 377 terawatt hours (TWh)
- Electricity consumption 84.9 terawatt hours (TWh)
- Total energy consumption has doubled and electricity consumption has quadrupled since 1970.
- 1 TWh = 1,000,000,000 kWh  
The energy consumption of a medium-sized single-family house is about 20,000 kilowatt hour (kWh) a year. One terawatt hour is enough to provide energy for 50,000 single-family houses for one year.

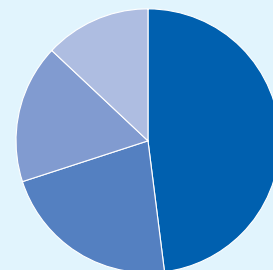
Source: Statistics Finland,  
Preliminary Energy Statistics 2005

## Energy consumption in Finland by energy source in 2005



- Coal 10%
- Oil 27%
- Peat 5%
- Wood fuels 20%
- Hydropower 4%
- Nuclear power 18%
- Natural gas 11%
- Net import of electricity 5%
- Other 2%

## End use of energy in Finland by consumption sector in 2005



- Industry 48%
- Space heating 22%
- Transport 17%
- Other\*) 13%

\*) Use of electricity and fuels by households, the public and private service sector, agriculture and forestry, and construction.

# In energy conservation, every kilowatt hour counts!

Cold climate



Long distances



High standard of living



Energy intensive industry



Finland is a cold and sparsely populated northern country, where energy is consumed in heating, transport, maintaining a high standard of living, and in the energy intensive industry.

*In Finland, efforts have been made for decades to produce goods and services with as little energy as possible. In industrial use of energy, we are among the most energy efficient countries in the world.*

*Energy generation and consumption are the source of 80 per cent of all carbon dioxide (CO<sub>2</sub>) emissions in Finland. Climate change can be curbed efficiently with rational and economical use of energy.*

## FINLAND – A COLD NORDIC COUNTRY

- Capital Helsinki
- Area 338,000 square kilometres.
- Population 5,2 million, 16 inhabitants per one square kilometre.  
In other European countries population density is six times higher on average.
- Mean temperature in February is -5 °C in Helsinki and -14 °C in Lapland.
- The energy need for space heating is 20-25 per cent higher in Lapland than in southern Finland.
- On the darkest days of the year, the sun rises in Helsinki at 9.30 and sets at 15.15.  
In Northern Lapland, the sun does not rise at all for 50 days between November and January.



Parliament House.

## A pioneer in energy saving

*The bases for Finland's energy and climate strategy are improving competitiveness, ensuring energy availability and reducing greenhouse gas emissions. Energy saving aims to halt or decrease the growth of energy consumption.*

### **METHODS OF STEERING ENERGY EFFICIENCY**

- Legislation, regulations and guidelines
- Financial steering methods: energy taxes and subsidies
- Energy efficiency agreements
- Education and communication

**T**he targets and obligations of Finland's energy saving are mainly based on EU directives. The purpose of the national energy and climate strategy is to ensure that Finland will achieve the targets set for reducing greenhouse gas emissions in accordance with the Kyoto Protocol.

### **Energy efficiency agreements play a key role**

In Finland, energy efficiency agreements play a key role in implementing energy efficiency and achieving climate targets.

The agreements cover some 60 per cent of Finland's total energy consumption. In 2006, there were eight energy efficiency agreements signed by ministries and various sector associations.

The results speak for themselves: by the end of 2004, the total impact of saving measures in the agreement companies and communities amounted to

about 6.1 terawatt hours, which equals the annual consumption of electricity and thermal energy of more than 300,000 average-sized single-family houses in Finland.

### **Excellence in energy audits in Finland**

Companies and communities who have joined energy efficiency agreements commit themselves to carrying out energy audits or analyses in their properties and production plants.

In an energy audit, the site's energy use is examined, and its energy saving potential and measures to increase the efficiency of energy use, including a calculation of profitability, are presented.

Finland has acted with initiative in international development work related to energy audit activities. Our expertise in energy audits is highly esteemed throughout the world.

## Finland's energy production is versatile and efficient

The strength of Finland's energy procurement is founded on versatile energy production. More than one-fourth of the country's energy consumption is based on renewable energy sources.

Finland is one of the leading countries in the world in the utilisation of combined heat and power (CHP) generation. More than one-third of the country's electricity is generated in connection with the production of district heat in communities and process heat in industry. Almost half of all Finns live in a house connected to district heating.

About 70 per cent of Finland's primary energy is imported. Future challenges include maintaining the availability of energy supply and raising the degree of energy self-sufficiency.

The target of Finland's energy policy is to maintain a versatile and decentralised energy system also in the future.

## Promoting the use of renewable energy

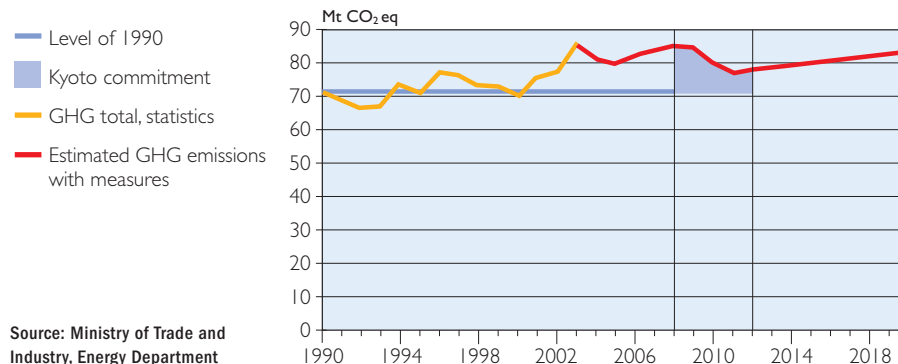
The renewable energy sources used in Finland are hydropower, wind power, geothermal and solar energy and, above all, bioenergy, which includes wood-derived fuels, field biomasses, biogas and the bio-degradable part of recycled fuels.

Renewable energy sources constitute about one quarter of all energy consumption in Finland, when it is in Europe six per cent on average. Finland has set a target to increase the total use of renewable energy by at least a quarter by 2015 and at least by 40 per cent by 2025.

## Finland involved in EU energy programmes

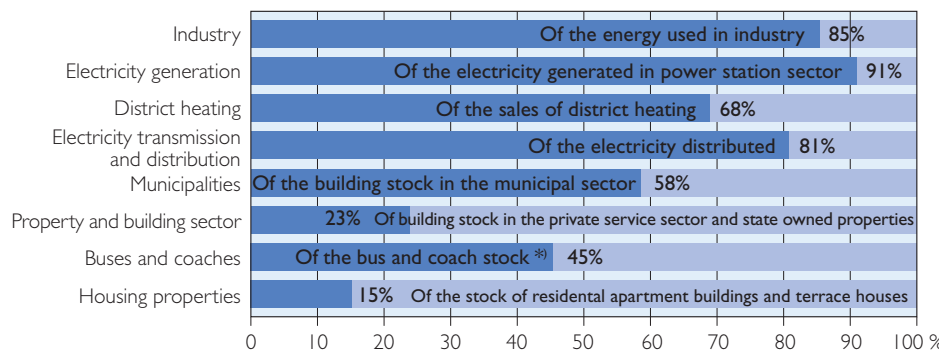
The European Commission has raised energy efficiency as one of its key themes. Finnish companies and research institutes promote energy efficiency by developing new innovations in EU energy programmes. Finland is also an active participant in the preparation of EU regulations and international projects that promote energy efficiency.

## Scenario of the development of Finland's greenhouse gas emissions (GHG)



Source: Ministry of Trade and Industry, Energy Department

## Coverage of energy efficiency agreements in Finland at the end of 2005



\*) In addition to the bus and coach sector, the action plan on energy efficiency for public transport, signed in 2005, also includes the local services of the national railways, tram services, and the underground. The coverage of these is 100 per cent of the sector's energy use in Finland.

In addition to the energy efficiency agreements presented in the diagram, there is an energy efficiency programme concerning truck and van transport, covering almost 70 per cent of truck and van deliveries, and the Höylä II energy efficiency programme for oil-heated properties covering more than 15 per cent of energy used on heating residential, service and agricultural buildings.

Source: Motiva Oy



## Industry leads the way in energy efficiency

*Industry uses about half of the electricity and more than 40 per cent of the fuels consumed in Finland. Energy is also a considerable cost factor for the economy. For example, in the forest industry, energy costs constitute about 15 per cent of turnover.*

### **DID YOU KNOW?**

Electric motors consume more than two-thirds of all electrical energy in industry.

In Finland, energy efficiency agreements have given an excellent boost to energy saving, especially in industry. With an energy efficiency agreement, a company can improve the efficiency of energy use and thus reduce carbon dioxide and other emissions.

Industrial energy efficiency agreements cover about 85 per cent of industrial energy use, with almost 200 industrial companies and about 350 places of business having signed an agreement.

The results are excellent. With investments made in 1998–2004, the companies participating in the agreement have saved 4.4 terawatt hours of fuels and 0.8 terawatt hours of electricity per year. The total energy saved equals the annual

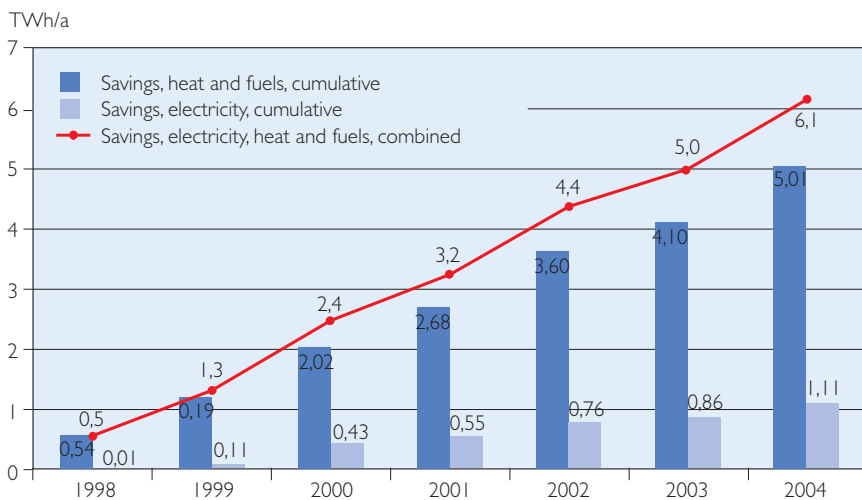
energy need of about 260,000 single-family houses. These savings have required an investment of about EUR 220 million by these companies.

### **Energy analyses on the increase**

Energy efficiency agreements have significantly increased the number of energy audits and analyses, especially in the energy intensive industry in Finland.

The trend is similar in the power plant business. The power plant analysis method designed especially for the energy sector has considerably increased the number of analyses. Many energy companies also provide sustained guidance and feedback on their customers' electricity consumption.

## Results of the energy efficiency agreements



Energy efficiency agreements cover more than 60 per cent of total energy consumption in Finland. Cumulative energy saving impact of saving measures reported as implemented by the industrial, energy, municipal, and property and building sectors in reporting years 1998–2004.

Source: Motiva Oy

### Audit activities provide results

Finland is one of the leading countries in the world in the utilisation of energy audits and analyses. More than two-thirds of industrial energy use has been audited. As a result of the actions detected and implemented in the energy audits, heat consumption in industrial SMEs has diminished by more than 10 per cent and electricity consumption by almost 5 per cent.

### Savings through ESCO services

In the ESCO project, an outside energy expert implements energy saving meas-

ures and investments in the client company, and the ESCO company (Energy Service Company) is responsible for the increased efficiency of energy use.

The European Commission regards ESCO service as one of the future business areas and promotes it actively. The Ministry of Trade and Industry has supported ESCO activities in Finland since the late 1990s as a key method of promoting energy efficiency.

### 'Energy analysis indicated saving areas'

■ Borealis Polymers Oy, which manufactures polyethylene and polypropylene-based plastic products, is taking part in the industrial energy efficiency agreement. As part of the agreement, an analysis carried out at Borealis indicated that greatest savings can be achieved in the use of steam.

The energy analysis of Borealis Polymers is one of the most extensive ones carried out in the process industry in Finland so far. A total of 80 energy-boosting measures having an impact on the units' processes were presented in the analysis. With the proposed measures, the need for steam would fall by 40 per cent and the need for cooling water would be reduced by seven per cent. Overall, the plants could save a total of 10 per cent of energy.

'The company made a big investment in the energy analysis, and the results are significant', says Energy Expert **Matti Marttila**.

Borealis Polymers has already implemented some of the changes in respect of operational technology proposed in the energy analysis, and the first investment projects have been approved. The saving areas brought up in the analysis are part of the company's energy plan for long-term development of energy efficiency.

### 'New area for a district heating company is an example to others'

■ A set of equipment has been designed and built for a building material factory and a local district heating company to utilise waste heat from the flue gases of the gravel furnace in the local district heating network.

'We sell heat that we could not utilise before, while bringing the emissions from the use of recycling fuels under control', states **Jari Mikkula**, Factory Manager of maxit's Leca gravel factory in Kuusankoski.

An active initiator of the project was Kuusankosken Aluelämmitys Oy, a local district heating company, which is owned by the City of Kuusankoski, and its Managing Director **Reijo Matikka**.

'I believe that our example of co-operation between a commercial enterprise and a municipal actor can also be applied elsewhere', explains Mikkula.

The project was implemented as an ESCO project.





City of Tampere

## Municipalities can set an example

*Municipalities still have many opportunities to promote energy efficiency, utilise renewable energy sources, and that way reduce carbon dioxide emissions. A municipality operating in accordance with sustainable development achieves cost savings, is an example to companies and creates an opportunity for its residents to save energy in their everyday activities.*

**M**unicipalities can act in an energy efficient and pro-climate way in the planning, construction and improvement of new urban form, buildings and infrastructure. A progressive municipality can be a trend-setter in the use of renewable energy.

District heating is a suitable form of heating in densely-populated areas. In Finland, more than 75 per cent of district heat is produced efficiently by combined heat and power generation. Environmental emissions are reduced by 30 per cent compared with separate heat and power generation.

### DID YOU KNOW?

Municipalities can have an impact on energy efficiency with their procurements. For example, on average, a laptop uses only about one-tenth of the energy consumed by a traditional tabletop PC.

### Municipal energy and climate agreement

The energy and climate agreement is a tool for developing municipal energy and environmental efficiency. The agreement concerns the energy consumption of municipalities' own operations, which mainly consist of the heat and electricity consumption of municipal buildings. Some 58 per cent of the buildings in the municipal sector are covered by the energy and climate agreement.

### Municipal buildings are audited

In Finland, municipal buildings have been actively audited: in 1992–2005, a total of almost 3,350 buildings were audited, which equals about 56 million cubic metres. Some 80 per cent of the buildings in several larger towns in Finland have already been audited.

In the audited buildings in the munic-

ipal sector, the average saving potential is 13 per cent in heat and electricity, and seven per cent in water.

### Energy efficiency in public procurement

Municipalities and municipal federations are significant procurers. The products and services they use always have a direct or indirect impact on the environment. With energy efficient procurements, municipalities and federations of municipalities achieve cost savings and reduce environmental load.

In Finland, the Ministry of Trade and Industry has given recommendations on energy efficiency in public procurement. Suitable tools to evaluate the energy efficiency of procurements are currently under development in co-operation between various parties.

### 'Long-term work for energy efficiency'

■ Helsinki, the capital of Finland, has actively monitored the energy consumption of public buildings for almost 30 years.

'In the energy saving of public buildings, it is essential to minimise unnecessary use. This applies to air-conditioning, heating, lighting, and office equipment. However, energy savings are not carried out at the expense of, for example, indoor air quality or sufficient lighting', states **Ulla Soitinaho**, Development Manager, City of Helsinki Public Works Department (PWD) Construction Management.

Helsinki was the first city in Finland to test the suitability of the energy efficiency agreement for the municipal sector. Helsinki had reliable information about the energy consumption of all its buildings dating back to the early 1980s, which facilitated the signing of the agreement.

The real estate stock of the service buildings of the City of Helsinki comprises 13 million cubic metres of buildings. The energy consumption of these buildings in relation to costs are compared with life-cycle cost calculations. The City of Helsinki PWD Construction Management Division has prepared planning instructions for day nurseries, schools and health centres with a view to energy saving and consumption.





# Costs under control with the management of energy use in buildings

*Finland has a long tradition in building regulations and guidelines that comply with sustainable development. The control of these regulations provides guidance in energy-efficient construction.*

**M**anagement of energy use in buildings reduces electricity, heat and water consumption, and related costs and environmental impacts. Efficiency in energy use can be increased in connection with building construction, use and improvements.

Nevertheless, energy must not be saved in buildings at the expense of indoor air quality, which must be taken into account in sustainable construction and rational use of energy.

## Energy efficiency agreements and programmes in the property and building sector

In Finland, the energy efficiency agreement in the property and building sector

has gained results in the improvement of energy efficiency. The agreement covers a significant part of the private service sector and state-owned buildings. The improvement of energy efficiency plays a key role in the practical implementation of companies' environmental and social responsibility.

The Housing Estate and Constructor Association ASRA has an energy efficiency agreement for non-profit and municipal housing properties. The agreement aims to reduce specific energy consumption and bring into practice everyday energy efficiency operation models for companies and communities.

An energy programme for farms is under preparation, with the aim of promoting the introduction of renewable energy sources and increasing farms' self-sufficiency in energy matters.

## Energy performance certificates for buildings

The EU directive on the energy performance of buildings will be implemented fully by the end of 2009. The new energy certificate will enable to compare the energy efficiency of buildings and estimate energy costs. The objective of the legislation is to improve the energy efficiency of buildings in a cost-effective way.

## 'Energy efficiency agreement has improved energy consumption monitoring'

■ Kesko Group, a provider of services in the trading sector in the Baltic Sea region, signed the energy efficiency agreement for the property and building sector in 1999. According to Real Estate Manager **Ari Mäkinen**, the agreement has been one of the engines in the development of Kesko's energy consumption monitoring system and has helped allocate saving measures to correct and worthwhile subject entities.

'Almost all of our most significant buildings are remotely monitored in respect of their electricity, heat and water consumption. Consumption variations have been specified for the monitoring, and they can also be used for detecting deviations in specific consumptions from a large number of buildings as well as for defining the correct energy consumption level for each location. In order to find the correct consumption level, simulation calculations are used for calculating the annual energy consumption estimate for each building type', explains Mäkinen.

Kesko has carried out a total of 73 energy audits since 2001, 54 of which have been within the efficiency agreement. In 2004, Kesko ordered a PROMISE environmental classification for three locations, in which the awareness and quality of environmental matters in buildings were examined in a comprehensive way.

### DID YOU KNOW?

You save 10 per cent of heating energy by reducing the room temperature by two degrees.



## Everyone can make a difference

*In Finland space heating accounts for approximately half of household energy demands, while water heating takes up one-fifth. Electric appliances and lighting consume the rest, i.e. one-third of the energy used by a household.*

### DID YOU KNOW?

Energy saving light bulbs use 60 per cent less energy and last up to ten times longer than ordinary incandescent light bulbs.

The amount of electricity used in Finnish households is constantly increasing: currently it is about 10 terawatt hours. This is due to the rising number of electric appliances – the average electricity consumption of new appliances is decreasing. Of electric appliances, refrigerators and freezers are the biggest consumers of electricity – more than one-fourth – and lighting takes up almost as much electricity. The share of entertainment electronics is growing.

Every household can reduce its electricity consumption by choosing energy-efficient appliances and avoiding unnecessary use of appliances or lighting.

### Energy labels for easier choice

Electric appliances, such as refrigerators and washing machines, currently have compulsory energy labels based on EU directives. They provide reliable and comparable information for consumers to make a choice between appli-

ances. The objective is to direct households to favour appliances that consume less energy and considerably reduce their electricity consumption.

### Build an energy efficient home

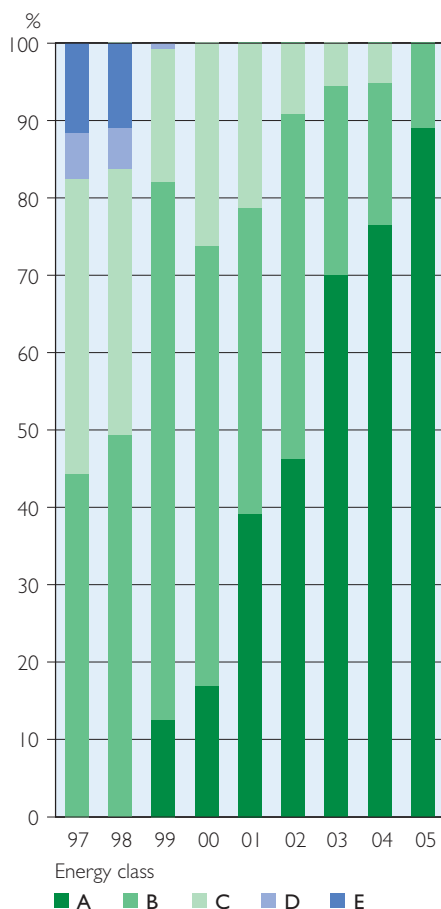
In Finland, there are one million single-family houses with a total annual energy bill of EUR 1-1.5 billion. Today, house builders and renovators have a sufficient amount of information about low energy building.

Energy efficient building includes good thermal insulation, energy efficient windows, efficient and appropriate ventilation equipped with heat recovery, building tightness, as well as expert and careful planning and construction.

### More information about the climate change

The Finnish Climate Change Communications Programme was launched in 2002. The programme aims to increase

### Sales of fridge-freezers by energy efficiency class in 1997–2005



Purchasing of appliances that use less energy has been promoted in Finland mainly with education and marketing. The Finnish authorities also monitor that the energy labels are displayed in an appropriate way and that the information is correct.

Source: Survey for the members of the Association of Electronics Wholesalers

citizens' awareness of the climate change, its impacts and mitigation. The programme has funded dozens of communication projects for target groups: energy and waste companies, communities and municipal actors, teachers, and entrepreneurs in agriculture and forestry.

In 2006, the European Commission implements a climate change awareness campaign aimed at citizens simultaneously in all of the EU countries. The Finnish Climate Change Communications Programme supports this campaign with national measures.

### 'Energy awareness in housing with energy expert activities'

An energy expert is an active resident who wants to promote a pleasant living environment and energy saving. VVO, which provides residential services, has embedded energy awareness in its tenants with energy expert activities.

'Energy experts have, for example, methodically checked the plumbing facilities in the apartments. Any faults have been repaired and that way unnecessary water consumption has been removed. Energy consumption is a difficult area to perceive, but the energy expert activities have helped us to interact with residents in energy saving matters', says Real Estate Manager **Tapio Matila** of VVO's technical unit.

In training events and campaigns aimed at energy experts, VVO has provided extensive information about energy use and its impacts on, for example, the climate change.

According to Matila, consensus among residents on more efficient energy use has increased considerably.

The energy expert activities are part of VVO's resident co-operation. VVO's houses have a house committee appointed by the residents, with a chairman, an energy and environmental expert and home security experts as members. They organise voluntary work and other events where it is easy to distribute information about energy matters.

### 'Targets of the energy efficiency programme of oil heated properties exceeded'

In Finland, the renovation of ageing oil-heated properties has achieved annual savings of 120 million litres of heating oil.

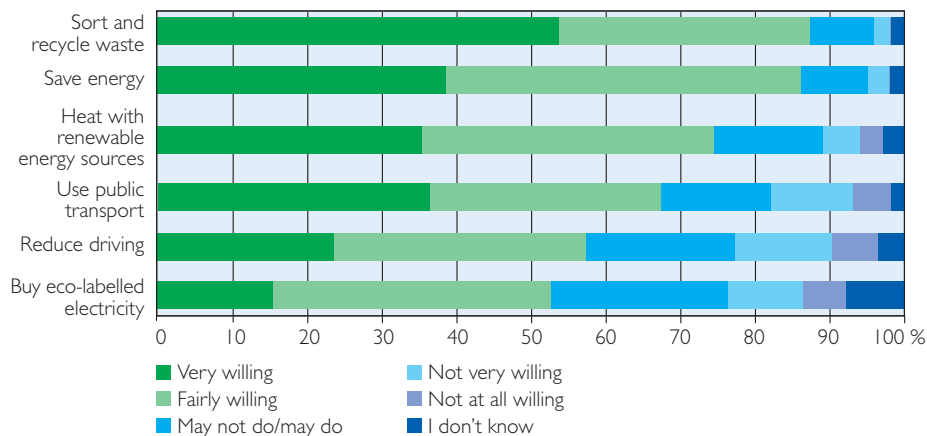
The Höylä energy efficiency programme is carried out by oil and gas sector, the Ministry of Trade and Industry and the Ministry of the Environment, with the key energy saving method being the replacement of ageing oil-heating appliances.

'The renovation of the system provides a saving of 10-30 per cent in the consumption of heating oil, depending on the property. House-specific savings may amount to hundreds of euros a year. Furthermore, the new oil-heating systems are almost care free compared to the old ones. When the appliances function well, there will definitely be enough heat even on the coldest of winter days', emphasises Marketing Manager **Eero Kourula** of the Oil Industry Service Centre.

In Finland, there are about 260,000 oil-heated single-family houses, which is one-fourth of the total number of single-family houses. At the beginning of 2006, it was estimated that the oil heating systems of 80,000 houses need to be replaced in the next few years.

Finns are interested in utilising solar energy in oil-heated houses. According to a survey carried out in February 2006, some 110,000 oil heaters would be prepared to adopt solar energy in addition to oil heating.

### Consumers' willingness to act in an environmentally friendly way



A study on the citizens' views on climate change investigated what the Finns are willing to do in order to curb climate change.

Source: Market research company, Taloustutkimus Oy, Finnish Climate Change Communications Programme



# Cutting down energy consumption in transport is everyone's business

*Transport uses some 17 per cent of the energy consumed in Finland each year. Most of it is used in road transport.*

Of the carbon dioxide emissions caused by road transport, 70 per cent comes from passenger cars and the rest mainly from heavy vehicles.

## Action plan on energy efficiency in transport sector

The action plan on energy efficiency in transport sector cover bus and coach transport, underground and tram services, and the local services of the national railways in Finland. The action plan aims to reduce energy consumption in transport and improve the efficiency of other transport related energy use by five per cent from the 2000 level by 2010.

Energy savings in public transport are sought, for example, by procuring vehicles that use less energy and are environmentally friendly, by monitoring their energy consumption and by increasing the use of transport telematics.

### DID YOU KNOW?

With an economical driving style, you get every seventh tankful of petrol free.

The objective of the energy efficiency programme of truck and van sector is to promote efficient energy use in truck and van transport and to reduce fuel consumption in transport and traffic by five per cent from the 2005 level by 2010.

The focus areas of the truck and van programme are environmental training in the transport industry, co-operation with customers and interest groups, and research, development and monitoring.

An energy audit procedure for transport has been prepared. It is possible to reduce costs, energy use and carbon dioxide emissions by improving the efficiency of the operation of transport chains.

## Energy savings with economical driving

Private motorists can follow the example of professional drivers and considerably reduce their fuel consumption and the resulting carbon dioxide emissions with economical driving habits. Anticipatory driving also improves road safety.

In Finland, economical driving is taught annually to some 50,000 people as part of their driving lessons. Moreover, since 1996 almost 15,000 passenger car drivers, more than 8,000 truck drivers and 6,000 bus and coach drivers have been trained in economical driving.

## 'Savings in fuel costs'

Transport company Kuljetusliike R. Stenvall Ky has provided training in economical driving for two years. All of the company's 35 drivers have taken part in the training with excellent results.

'We have achieved savings of 5-10 per cent in fuel costs with very simple measures. The annual carbon dioxide emissions of our entire fleet have fallen by more than 140 tonnes', says Managing Director **Raimo Stenvall**.

'Drivers should under no circumstances drive against the speed limiter of their vehicle. Wind resistance increases with more speed, in which case fuel consumption rises considerably.'

'All of our drivers monitor their vehicle's fuel consumption on a monthly basis. Eco-driving also improves road safety and is less wearing for the vehicle', Stenvall reasons.

Stenvall's transport company has estimated that one year's economical driving can save enough money to pay for one vehicle's fuel for 1.5 years.



## Communication boosts energy saving

*Habits in energy use can be seen at home, at work and in leisure time. Information and attitudes have an impact on consumer habits. In Finland energy saving is promoted with communication by distributing basic information about consumption levels and by providing various target groups with examples of good practices.*

Actors in the energy industry provide information in various forms for different target groups. Consumers need information, for example, about household issues and construction, as well as when choosing a heating system or a car. In order to support their decision-making, companies and communities need information that activates to energy savings and energy efficient activities.

The first steps of energy saving are taken as early as in pre-school years and in basic education for schoolchildren. With their own actions, parents and teachers can have an impact on the way children and young people adopt environmental values.

Making energy use more efficient means co-operation with various actors in the energy industry. Networking is a good way of utilising the best available expertise and obtaining information and distributing good practices in an efficient way.

The Energy Agencies promote energy efficiency and the use of renewable energy sources. They serve the companies, communities and consumers in their area in a versatile way, and carry out co-operation in various energy projects. In Finland, there are eight local and regional Energy Agencies.

### Publicity with campaigns

Various communication campaigns and events are organised each year to promote energy saving.

The objective of the annual national Energy Awareness Week in Finland is to increase awareness of rational energy use. During the week, companies and communities organise individual campaigns to improve their energy use or to increase their customers' awareness of efficient energy use. As part of the Energy Awareness Week, a campaign for second form primary school pupils has taken place for several years. The campaign is supported by about a hundred energy companies and communities throughout Finland.

The European Commission has declared 22 September to be a European Car Free Day. With the initiative, it wants to draw attention to the environmental hazards of increasing traffic and to the development of public transport. The Car Free Day, which concludes the European Mobility Week, has been organised in Finland since 2002 in several localities.

### 'Energy Agency helping municipalities'

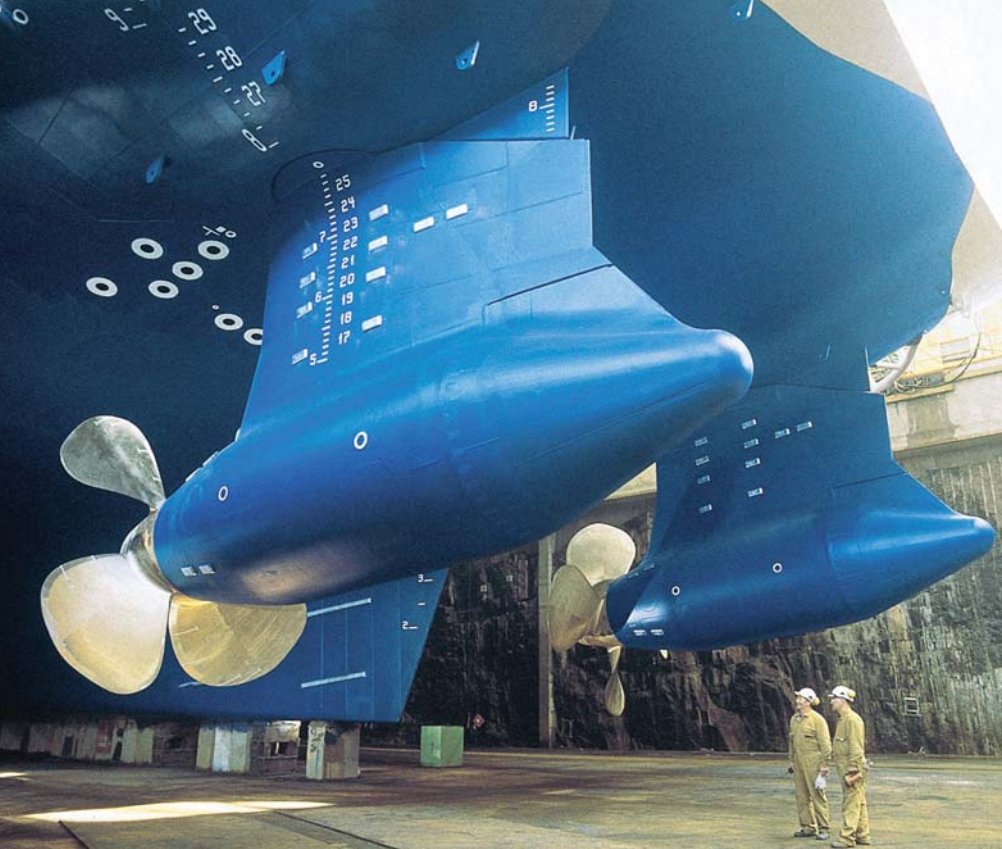
■ 'The Energy Agency of Southwest Finland has carried out long-term work and gained the role of an expert. Municipalities, schools and the media know how to contact us in energy saving issues', **Anne Ahtiainen**, Director of the Agency explains.

The Energy Agency of Southwest Finland provides guidance, training and information related to energy saving, renewable energy sources and the climate change. The key target group is the municipal sector.

'The most important achievement of our work is the fact that eleven municipalities and two municipal federations have signed the energy and climate agreement. Municipalities have also carried out energy saving measures, such as energy audits, and 16 municipalities have joined the climate campaign for municipalities', Ahtiainen states.

In addition to municipalities, the Energy Agency of Southwest Finland focuses on comprehensive schools and polytechnics. Ahtiainen tells enthusiastically about a project that focused on increasing energy saving awareness among the personnel of an entire school.

'We managed to gather the teachers and maintenance staff of the school round the table. In these common meetings, the representative of the municipal real estate department told the schools how much energy and water was being consumed and where it was used. This was an rewarding experience because the information made the schools change their consumer habits', Ahtiainen says.



## Energy efficiency in paper industry processes

■ Ecopump Oy supplies technical process and equipment solutions for the paper industry throughout the world. The vacuum and dewatering monitoring systems for paper manufacturing processes developed by Ecopump achieve considerable runnability benefits and savings in water and energy consumption. Due to Ecopump's measurement equipment supporting process management, it has been possible to increase the running speed of the paper machines and minimise production interruptions.

Ecopump's latest innovation, vacuum pump Ecopump Turbo, saves both energy and water. It has extensive options to regulate its properties to adjust to the conditions at the customers' paper mill.

'The vacuum pump in paper machines consumes a lot of energy. We consult our customers in order to gain an optimal pumping capacity: only the necessary amount of vacuum pumping is carried out on the paper machine. Furthermore, our turbo blower system is more energy efficient than the conventional water-packed pump because all the energy is used in air transfer,' states Ecopump's Managing Director **Jyrki Uimonen**.

Replacing a conventional pumping system with Ecopump's vacuum pump has brought client companies savings of 30–70 per cent. According to Ecopump's estimates, the repayment period of a new pumping system is two to three years.

## Frequency converters save energy and equipment

■ In Finland, there is significant exportable technology know-how in power electronics. These include frequency converters that improve energy efficiency for stepless speed control of squirrel cage induction motors, which are a common electric motor solution in industry.

Frequency converters provide considerable savings in energy consumption. As more than 65 per cent of electricity in industry is consumed by electric motors, accurate speed regulation of motors with a frequency converter can reduce the electricity consumption of conventional electric motors by as much as 30–70 per cent. As a result of the reduced energy consumption, the investment pays itself back very quickly.

The most typical application areas for frequency converters are pumps and fans. Other applications include cranes, lifts, paper machines, air-conditioning equipment, winders, compressors, and winches.

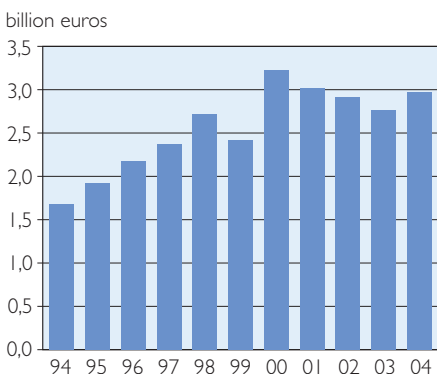
ABB Ltd, Vacon Plc and Verteco Ltd are currently the main exporters of Finnish frequency converter technology.

# Internationally competitive innovations from Finland

*The development of energy efficient and innovative technology into a commercial product and the funding of research and development operations are the key methods of achieving the national targets in the Finnish energy and climate policy. In Finland, energy related research and development is funded each year with some EUR 60 million.*

Finland's long-term research and development in energy technology has brought to the market new solutions on combined heat and power generation, industrial and decentralised energy production, and efficient use of energy.

### Development of Finland's energy technology exports in 1994–2004



Source: Statistics Finland

State funding of the development of energy technology is mainly allocated through the activities of Tekes, the Finnish Funding Agency for Technology and Innovation. It is also planned that the innovation activities will be linked with energy efficiency agreement activities.

### New business activities through climate change mitigation

In the ClimBus technology programme, launched by Tekes in 2004, cost-effective solutions for reducing greenhouse gas emissions are being developed. The projects within the programme improve and create new opportunities for companies operating in Finland to succeed in the climate change mitigation business.

# Key actors

## **NATIONAL ENERGY POLICY AND ITS IMPLEMENTATION**

Ministry of Trade and Industry  
PO Box 32  
FI-00023 Government  
Tel. +358 9 160 01  
Fax +358 9 1606 3666  
[www.ktm.fi](http://www.ktm.fi)

## **ENERGY USE IN BUILDINGS**

Ministry of the Environment  
PO Box 35  
FI-00023 Government  
Tel. +358 9 160 07  
Fax +358 9 1603 9545  
[www.environment.fi](http://www.environment.fi)

## **ENERGY USE IN TRANSPORT**

Ministry of Transport and Communications  
PO Box 31  
FI-00023 Government  
Tel. +358 9 160 02  
Fax +358 9 1602 8596  
[www.mintc.fi](http://www.mintc.fi)

## **ENERGY USE IN AGRICULTURE**

Ministry of Agriculture and Forestry  
PO Box 30  
FI-00023 Government  
Tel. +358 9 160 01  
Fax +358 9 1605 4202  
[www.mmm.fi/en](http://www.mmm.fi/en)

## **EXPERT SERVICES TO PROMOTE ENERGY EFFICIENCY AND USE OF RENEWABLE ENERGY**

Motiva Oy  
PO Box 489  
FI-00101 Helsinki  
Tel. +358 9 8565 3100  
Fax +358 9 8565 3199  
[www.motiva.fi/en](http://www.motiva.fi/en)

## **FUNDING FOR RESEARCH AND PRODUCT DEVELOPMENT**

Tekes, Finnish Funding Agency for Technology and  
Innovation  
  
PO Box 69  
FI-00101 Helsinki  
Tel. +358 10 60 55000  
Fax +358 9 694 9196  
[www.tekes.fi/eng](http://www.tekes.fi/eng)

## **ENERGY SUPPORT**

15 regional Employment and Economic  
Development Centres  
[www.te-keskus.fi](http://www.te-keskus.fi)

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