Energy Efficiency Agreements in Finland 1997–2005

Results of an Expert Evaluation

Evaluation clarified effectiveness of agreement scheme

The Finnish energy efficiency agreement scheme covers 60% of total energy consumption in the country. But what was the general impression of the energy efficiency agreement scheme, operational in 1997–2005?

The Ministry of Trade and Industry commissioned an overall evaluation reflecting impact of the agreement scheme and its future development.

In autumn 2004, the Ministry of Trade and Industry (MTI) initiated an overall evaluation of the energy efficiency agreements it administers. The objective of the evaluation was to quantify the impact and results of agreement activity, and to produce perspectives and suggestions for future developmenrt of agreement schemes.

The evaluation was based on an extensive online survey and personal interviews. They were used to map the views of companies and communities that have joined the agreement scheme, on topics such as implementation, resourcing, reporting and results of the agreements.

With the exception of the overview of the energy efficiency agreement scheme, this publication is based on the overall evaluation of the energy efficiency agreements in the industrial sector, energy sector, municipalities and property and building sector, and reporting carried out on it.

Based on the overall evaluation of the agreement scheme and feedback received from the organisations, it was decided that the agreements terminating in 2005 would be extended by two years, during which time new tools and methods would be developed. The aim is to launch the third generation agreement scheme from the beginning of 2008.

Energy efficiency agreements are voluntary framework agreements between branch associations, enterprises and communities on the one hand and the government on the other.

- Branch associations undertake to promote energy efficiency and participation in the agreement scheme among their memberships.
- Companies and communities undertake to carry out energy audits or analyses in their premises and production plants, draw up an energy efficiency plan, and implement cost-effective saving measures. They report annually to their branch associations, providing information on energy usage and measures to improve energy efficiency.
- The government provides subsidies for energy audits and analyses, and under certain conditions energy-saving investments.

The goal of the energy efficiency agreements is to reduce normal energy consumption and to introduce operational models that help to make energy efficiency a part of everyday life in companies and communities.

Objectives of all agreement sectors:

- to include as much of the sector's energy consumption under the agreement as possible.
- to improve energy efficiency so that normal consumptions are reduced.
- to audit a certain proportion of energy consumption, property volume or stock by the designated date.

Objectives of each agreement sector:

- e.g. coverage of monitoring of consumption, improving energy efficiency in other activities and improving normal consumption.

Voluntary energy efficiency agreements play a crucial role in implementing energy efficiency under Finland's Climate Strategy (2001) and the associated Energy Conservation Programme (2003–2006). The target set for all energy saving measures was to reach about a quarter (3-4 million tonnes CO_2eq) of Finland's greenhouse gas reduction targets by 2010.

In the updated National Energy and Climate Strategy approved by the Government in November 2005, energy efficiency agreements are deemed to be an important means of reaching the climate targets, and drafting of next generation agreements is expected to progress at a good pace.

What and how much?

In terms of coverage, achieving its objectives, and according to views expressed by agreement parties, the energy efficiency agreement scheme has worked well. However, there are agreement sector-specific differences in e.g. commitment of various parties and functionality of agreements.

During the first round of the energy efficiency agreement scheme, it was natural to set as goals good coverage in each agreement sector, as well as extensive implementation of energy audits, in order to establish the baseline situation in energy consumption and the savings potential.

The energy efficiency agreements were signed by a notable proportion of representatives of different agreement sectors. At the end of 2005, energy consumption of companies and communities signed up to energy efficiency agreements (excluding transport), covered almost two thirds of Finland's total energy consumption, (excluding energy consumption of transport).

Coverage of energy efficiency agreements at the end of 2005:

- 85% of industrial energy consumption
- 58% of municipal sector public property stock
- 23% of Finland's private and public service building stock
- 91% of electricity generation, 81% of electricity distribution and 68% of district heating sales

Significant savings achieved

At the launch of the efficiency agreement scheme, the total savings potential of the various agreement sectors (industry, energy sector, municipal sector and property and building sector) was calculated at 11 TWh at the end of 2005, of which electric energy would account for around ten percent. Of this savings potential, about half was estimated to be realised by the year 2010.

Based on data from agreement sector-specific annual reports, the impact of efficiency measures implemented in companies and communities participating in the agreements by the end of 2005 totalled approx. 7.1 TWh/a. Measures implemented in the different agreement sectors in 1997-2005 save as much energy a year as is consumed by more than 350,000 average detached houses in Finland.

This is clearly in excess of the result estimated at the launch of the agreement scheme.

Annual impact of implemented energy saving measures at the end of 2005:

- in heating energy and fuels – saving of 5.6 TWh
- in electric energy – saving of 1.5 TWh
- in energy costs - saving of 135 million euros
- in carbon dioxide emissions - reduction of 2.3 million tonnes

Reporting of energy-saving impacts of implemented measures:

- 82% in industry
- 14% in power plant sector
- 4% in other agreement sectors

Subsidies, costs and investments in 1998-2005:

- 28.6 million euros awarded in energy subsidies
  - 12.1 million euros awarded for energy audits
  - 16.5 million euros awarded in investment subsidies
- administrative costs approx. 4 million euros (based on participants' estimates of working hours used)
- over 350 million euros invested in implementation of saving measures

ESCO project an option

Some of the projects granted investment subsidies are ESCO projects. The ESCO company (= Energy Service Company) always guarantees realisation of energy saving and takes overall responsibility for implementation of the project. If the client so wishes, the ESCO company will also take care of financing the project. The investment is repaid by the savings produced by the measures during the service term.

Agreement parties

At the close of 2005, eight energy efficiency agreements signed by ministries and industry associations were in force, as well as two energy efficiency programmes.

Energy efficiency agreements	Ministry responsible	Branch Association
industry	**Ministry of Trade and Industry**	**Confederation of Finnish Industries EK**
energy sector power industry district heating sector electricity transmission and distribution sector	**Ministry of Trade and Industry**	**Finnish Energy Industries**
local authorities and joint municipalities	**Ministry of Trade and Industry**	**Association of Finnish Local and Regional Authorities, municipalities and joint municipalities**
property and building sector	**Ministry of Trade and Industry**	**Finnish Association of Building Owners and Construction Clients RAKLI**
residential property sector	**Ministry of the Environment** Ministry of Trade and Industry	**Federation of Housing Property Owners and Developers ASRA**
public transport	**Ministry of Transport and Communications** Ministry of Trade and Industry Ministry of the Environment	**Finnish Public Transport Association,** **Finnish Bus and Coach Association**

Energy efficiency programmes		
truck and van transport sector	**Ministry of Transport and Communications** Ministry of Trade and Industry Ministry of the Environment	**Finnish Transport and Logistics SKAL**
oil-heated properties	**Ministry of Trade and Industry** Ministry of the Environment	**Finnish Oil and Gas Federation** **Finnish Oil and Gas Heating Association**

“Energy efficiency needs tools”

Photo: Riitta Skytt

The first voluntary energy efficiency agreements, called formerly energy conservation agreements, were signed in Finland in the early 1990s. The activity really took off in 1997, when on updating the Energy Conservation Programme, the principal industry associations of our economy decided to join it.

The energy efficiency agreements have played a decisive role in raising Finnish energy efficiency to the present level. Under the umbrella created by the agreements, the actors have formed networks and consolidated new kinds of common activities that benefit all parties.

Development of monitoring into a real tool has been crucial for the credibility and commitment potential of the energy efficiency agreements. The reported results may be small in percentage terms, but their scale is impressive. After all, the measures implemented by the industrial, energy, municipal and property and building sectors to date save as much energy as that used by 350,000 Finnish average detached houses.

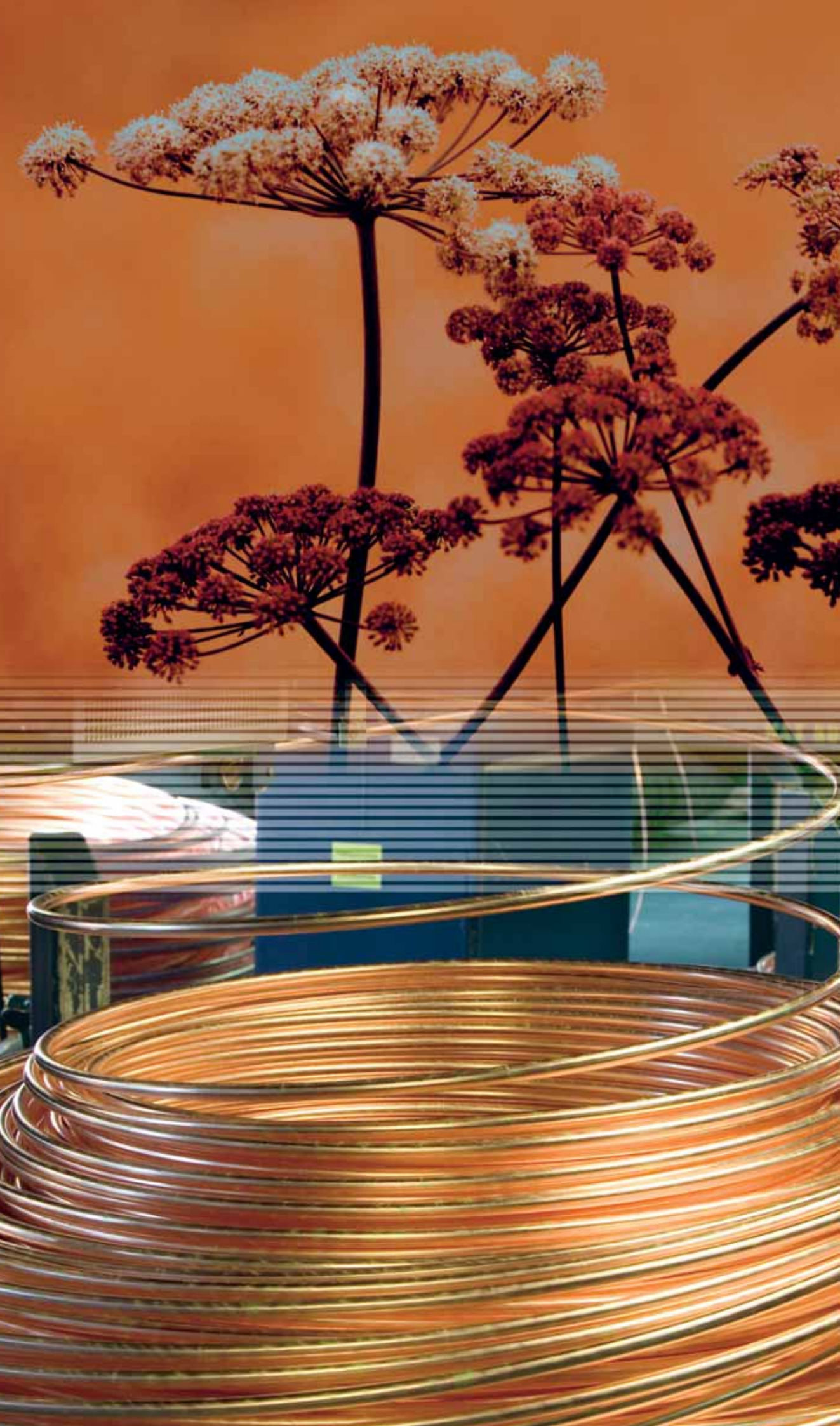
Finland’s energy efficiency agreements also serve as an international example of action that is productive, takes into account the actors’ different starting points, is reasonable in terms of administrative costs, and successfully combines a variety of tools. Our down-to-earth operational method has aroused interest, and e.g. the energy audit procedures are already being productised for export.

Good experiences and results raise the expectations in drafting the next generation of energy efficiency agreements, starting in 2008.

With the aid of various precision tools, coverage of the energy efficiency agreements will be increasingly extended also to medium-sized operators and energy consumers. Product development and procurement processes must be linked to agreement schemes better than before. Streamlining of the administration of agreements and team management will ensure functionality of the expanding agreement system. By integrating control of energy consumption to companies’ management systems, better information will also be gained for monitoring and evaluation of results.

Finns will never be able to significantly influence the world market prices of oil or gas. By investing in control of our own energy consumption instead, as well as in energy efficiency and commercialisation and adoption of new innovations, we are able to increase our competitive edge and reduce our need to buy emission rights.

Pentti Puhakka
Senior Engineer
Ministry of Trade and Industry, Energy Department



Companies and communities perspectives:

The energy efficiency agreement scheme contains successful elements

Voluntary participation is positive

In Finland, the energy efficiency agreement scheme is based on voluntary uptake, which is seen as a good thing in companies and communities.

The voluntary nature of the scheme is seen as positive, and often a company or community that has joined the scheme wants, as pioneer, to promote the voluntary participation idea in order to avoid possible later coercive measures. Participation in a voluntary agreement is mostly interpreted as binding, and every effort is made to reach set targets within the resources available.

Simple and functional agreement structure

The structure of the agreement is mostly the same in different sectors. The agreement parties are Ministry of Trade and Industry MTI and the association representing the sector. Companies and communities have joined in the framework agreement signed by the industry association. However, in the municipal sector, each local authority or municipal federation signs its own agreement with the Ministry of Trade and Industry.

The framework agreement proved to be a functional and simple solution. Joining the agreement was relatively easy, and its administrative structure remained lightweight. The branch associations covered their own sectors well, with the exception of the property and building sector. However, the Finnish Association of Building Owners and Construction Clients RAKLI was an administratively distinct agreement party.

Applications for energy subsidies were processed via Employment and Economic Development Centres governed by the MTI. Motiva took charge of monitoring, promotion and development of the efficiency agreement scheme. The arrangement

Monitoring of compressed air a continuous process

Luvata Pori Oy manufactures copper products. To follow on from energy analyses, the company wanted to improve efficiency of compressed air production and use in the factories.

Luvata Pori (formerly Outokumpu Poricopper Oy) works use compressed air in process control systems, motion control of production machines, packaging, cleaning of products and equipment cooling.

The PATE – Compressed Air Efficiently project analysis identified a savings potential of almost 80,000 euros a year. Leakages were found in the compressed air system. It also turned out that neither the minimum compression level nor all alternative methods had been fully investigated.

The primary development goals set were reduction of compression levels, mapping and repair of all leakages, and minimisation of cooling water usage at the compressed air stations. The company also wanted to direct the costs of compressed air to the correct cost categories.

- Now monitoring of compressed air production and usage is a continuous process. We achieve large savings e.g. by utilising appropriate nozzle technology, and in some cases we have replaced compressed air blowing with low pressure fans, says Kari Mäenpää, the energy manager.

Photos: Luvata Oy and Elisa Putti / Vastavalo.fi

increased the number of parties to the agreement scheme and made conceptualisation of the roles of the various parties a little more difficult.

Motivation from flexible goals

Companies and communities signing up to energy efficiency agreements were given the opportunity of establishing and analysing their potential and possibilities for improving their energy efficiency, and of setting their own numerical targets.

The flexible framework proved to be clear and functional. More rigidly defined, binding and homogenous targets might have reduced the number and motivation of companies and communities joining the scheme.

The energy efficiency agreements succeeded well in attaining the goals set for energy audits. Our audit activity, begun as far back as the early 1990s, has been of a high standard and brought results. Finland is renowned as one of the leading countries in the world in utilising energy audits and analyses.

Uptake of operational models that improve energy efficiency and reduction of normal energy consumptions turned out to be more difficult goals to attain and monitor. Organisations that had signed up to the agreements developed their operations and created new practices, but showing concrete results is difficult.

Many companies and communities signed up to the agreements, particularly those in the service sector, set their own numerical targets for reducing their normal energy consumption. However, the constantly changing situation hampered their realistic assessment. Targets that proved to be too challenging were easily deemed to be negative and impossible to realise or prove, due to the many variables impinging on the issue.

The energy efficiency agreement did not oblige companies and communities to implement the saving measures identified by energy audits. Implementation of saving measures and energy-saving results they made possible were monitored, measure for measure, from annual reports of companies and communities.

Energy audits and energy subsidies encourage onwards

Energy audits play a central role as tools of efficiency agreements. They provide companies and communities with information on their energy consumption, its critical points and savings potential.

The energy efficiency agreements have clearly increased demand for energy audits and analyses. During the course of the efficiency agreement scheme 1998-2005, on average 90% of government audit subsidies granted were related to projects of companies and communities participating in the scheme.

The majority of the companies and communities deemed the economic benefit to be the most important or almost the most important reason to sign up to the agreement. This took a concrete form expressly as energy audit subsidies and savings in energy costs. The subsidy application procedure was seen as easy and processing of the applications as sufficiently speedy.

One of the goals of energy efficiency agreements is to draw as much energy consumption as possible into the energy audit scheme.

The energy audit is usually carried out by an auditor from outside the organisation. The energy audit ascertains the total energy consumption and energy-saving potential of the audit site, and proposes the saving measures complete with feasibility calculations. It also examines possibilities of using renewable energy and reports on the impact of the proposed measures on CO_2 emissions.

The energy audit should always be linked to the organisation's other operational processes, so that it can also be utilised later in monitoring and maintaining energy efficiency.

Establishing the baseline situation of energy consumption and identification of potential savings was seen as useful and productive. The majority of the companies and communities that had joined the efficiency agreements commissioned energy audits, and considered the government energy subsidy spent on audits and efficiency investments a positive incentive. Many interviewees said that without the subsidy, the energy audits would not have been carried out at all, or in smaller numbers. In the industrial and district heating sectors, some of the audits and analyses were conducted without MTI support.

Although energy audit subsidies have been available also without agreement activity, at least in the municipal sector the agreement often ensured that sufficient self-funding was set aside each year for auditing and follow-up measures.

In addition to audit subsidies, the MTI also awarded support for energy-saving investments. Most prominent were projects on adopting new technology promoting energy-saving and renewable energy sources. Under certain conditions, companies and communities participating in energy efficiency agreements also received investment subsidies for customary energy-saving technology projects.

The bulk of the uptake of MTI investment subsidies for saving measures identified in energy audits and analyses was in the industrial sector. In the power industry and district heating sector, there were significantly fewer subsidised projects, but they were often sizeable, especially in the power industry. Compared to industry, single municipalities and joint municipalities had a lot of small projects. Very few investment subsidy applications were received from private service sectors, and none at all from the electricity transmission and distribution sector.

In 1997-2002, the government awarded all participants in efficiency agreements a 50% subsidy against approved costs of energy audits and analyses. From 2002, the subsidy was 40% for companies and 50% for single municipalities and joint municipalities.

Comprehensive monitoring system reveals results

Reliable information from monitoring system

Reliable assessment of productivity and impacts of energy efficiency agreements demands both sufficiently comprehensive and high-quality monitoring and reporting. Consequently, a great deal of effort was invested in developing a monitoring method and system in the early stages of the agreement term.

Companies and communities that had joined the agreement scheme supplied annual monitoring information for each unit relatively fully and on time. After the difficulties of the early years, reliability of reported information rose to a good level, as the in-house monitoring of consumption of companies and communities in the scheme developed.

The current monitoring system is still up-to-date and functional. It provides useful summaries for the needs of ministries and industry associations. Monitoring creates a graphic picture of the expansion and development of energy efficiency agreement activity. The need of ministries, agreement parties and media to make use of information available from the monitoring system continued to grow throughout the agreement period.

ESCO concept accelerated energy efficiency

New frequency converters and motors on process fans cut electricity consumption at Kemira GrowHow Oyj's Uusikaupunki fertiliser plant by 4,000 MWh per annum. The purchases are funded under the ESCO concept through energy savings.

On the basis of the process industry energy analysis, the Kemira GrowHow Uusikaupunki plant started investigating control and savings possibilities of process fans. Calculations showed that electricity consumption of the five fans could be considerably reduced by changing their control mechanisms to frequency converters.

Kemira signed an ESCO service agreement with the energy services company Inesco, under which it planned and procured the equipment and subcontracting. The MTI granted the project a 25% investment subsidy.

Over the three-year service term, Kemira GrowHow pays Inesco a service charge, amounting to 80% of the savings achieved in energy costs. After this, Kemira GrowHow will keep all the savings benefits.

- Implementing the project as an ESCO project speeded up its execution. We were immediately able to reduce our electricity consumption and to improve operational security of the factory, says Jari Lintula, the automation manager.

Methodical approach required from commitment to monitoring

Whole organisation must be committed

There were two main reasons for signing up to the energy efficiency agreements: to get the organisation committed to improving its energy efficiency and to save costs. The improved image brought about by the efficiency agreement – energy efficiency and environmental friendliness – was also of interest.

While the main incentives to signing up in the municipal and property sectors were economic, in the industrial sector the most weight was on company image, seamless integration of energy efficiency with environmental management systems, and the wish to act as pioneer jointly with other companies.

An organisation participating in energy efficiency work often wanted the support of a higher authority for its actions. Along with reporting and monitoring, joining up to efficiency agreements made energy issues a part of decision-making at a higher level. In many organisations, the energy efficiency agreement elevated the status or work that had gone on for years, in effect constituting an official commitment.

Interviews conducted at the time of the evaluation revealed that the entire organisation must be committed to energy efficiency measures. An agreement signed by management without motivation at the operative level or adequate resources does not lead to results. On the other hand, it is difficult for the operative level to become active without management support and funding set aside for the purpose.

Energy audits good and beneficial

Companies and communities signed up to energy efficiency agreements commissioned large numbers of energy audits and analyses, in order to assess energy usage and savings potential of properties and production processes.

Usually, saving potential was found both in technology and usage habits. Often, the organisations were already basically aware of the

Photos: Kemira GrowHow

Kesko focused on monitoring energy consumption

Kesko Oyj, a versatile provider of trading sector services (e.g. grocery, building and home improvement, agricultural and machinery trade) in the Baltic Sea area, has participated in the property and building sector energy efficiency agreement since 1999. Three quarters of the 73 energy audits conducted in the group have been linked to the energy efficiency agreement.

According to Maintenance Manager Ari Mäkinen, the energy efficiency agreement has served as one of the drivers of Kesko's energy consumption monitoring system, as well as helping to target saving measures to correct and profitable areas.

- Electricity, heating and water consumption at almost all our most important properties is linked to our remote monitoring system. For monitoring purposes and in order to pick up possible deviations, approved lower and upper limits have been defined for consumptions of different property and store types.

- In order to find the right level, we make use of simulation calculations for each property type to estimate annual levels of energy consumption, Mäkinen says.

In 2004, Kesko commissioned Promise -environmental classifications at three sites, where an overall assessment of environmental characteristics of the properties and factors affecting them was made.

energy-saving measures, but the perspective of an external auditor and conversations on the subject refined the ideas into precise proposals for practical measures. Numerically proven savings potential was necessary to realise the ideas. Furthermore, pinpointing new areas for savings is easier for an outsider than for a person working on the site every day.

Typically, the energy audit revealed errors in usage and shortcomings in the functioning of the system, which were rectified through simple measures and usually at low cost. The interviewees did not underrate such suggestions for savings linked to operational technology: even easy measures might remain unnoticed, if they were not listed in the audit.

Expertise of those conducting the audits was deemed to be high and the audits useful. Instruction of operatives during the audit was considered especially important both in public and private service sectors and in SME industry.

Implementation of saving measures challenging

Taking forward measures suggested in audits is the most challenging element of the obligations under energy efficiency agreements.

The simplest energy-saving actions are often taken immediately at the time of the audit. Besides these, audit reports contain many other proposals for improvements, but the systematic approach required for further processing of saving measures is often lacking. The audit report may be left on a shelf to gather dust and the savings potential unrealised, if there is no definite procedure for taking the measures forward.

Among companies and communities that own large numbers of properties, commissioning of energy audits has become routine, and utilisation of the results become integrated as part of the property maintenance process. Nevertheless, limited personnel resources and lack of financing may prevent implementation of the measures.

Improved energy efficiency alone is rarely a sufficient justification for investments or purchases, and more extensive improvements in all agreement sectors are generally linked to renovation and repair projects. In industry, linking energy issues to production development is challenging, and requirements of return on investments tight.

Activities promoting energy efficiency more common

Organisations participating in energy efficiency agreements developed many kinds of operational models to improve energy efficiency. In local authorities in particular, energy-saving competitions, organising an energy-saving week or event,

Photos: Heikki Tuuli / Kesko and Jari Kurvinen / Vastavalo.fi

Lifecycle reviews adopted in Helsinki

Helsinki, the capital of Finland, has been at the forefront in the drafting process of the current municipal sector energy efficiency agreement, as well as the one presently under preparation. Lifecycle calculations help to compare energy consumption of service buildings relative to costs in Helsinki.

The City of Helsinki has actively monitored energy consumption of public buildings for a good 30 years. Four fifths of its properties have been audited.

- Energy-saving in public properties concentrates on minimising unnecessary consumption in both air-conditioning, heating, lighting and office equipment. Nevertheless, savings must not be sought at the expense of e.g. good indoor air quality or adequate lighting, stresses Development Manager Ulla Soitinaho.

Helsinki City Public Works Department Construction Management has prepared planning instructions for day-care centres, schools and health centres, taking energy-saving and consumption into account. Lifecycle cost analysis, gradually becoming more common, permits comparison of their energy consumption to investments.

- Additional costs caused by energy-saving are usually a fraction of the total costs of the project. Yet they can have a major impact on operational costs, says Soitinaho.

and education and information campaigns were tried. The industrial sector also designated an energy awareness week during the agreement period.

Integration of energy issues to become part of implementation of an environmental system increased the visibility, weighting and continuity of energy efficiency measures in many organisations.

However, it is difficult to quantify the impact of operational models on improving energy efficiency.

Monitoring of energy consumption in organisations improved

Many interviewees cited development of their own organisation's activities and improvements in monitoring of consumption as beneficial effects of the agreement.

To support monitoring of consumption, various company and organisation-specific energy efficiency benchmarks were developed in recent years. Comparing of best practices became common in different sectors of industry, but establishing easily applicable benchmarks is not easy.

Commitment to the agreement scheme raises the organisation's awareness of the focal points and real costs of energy consumption. Productive implementation of the agreement requires integration of energy efficiency measures as part of the organisation's other activity, and commitment of the entire organisation.

Increased energy efficiency awareness often influences the internal practices of companies or communities. Measures such as training in energy use and various incentive schemes might be considered.

Along with the agreements, cooperative networks and information exchange between companies and communities were established. Understanding of energy efficiency increased, as did application of a systematic approach to improving energy efficiency.

Photos: Mika Lappalainen / City of Helsinki photo archives and Mari Hirsikallio / Vastavalo.fi

Kuopio implements energy efficiency plan

City of Kuopio has drawn up a climate strategy and carried out energy audits in more than a third of the city's properties. The city is currently implementing its energy efficiency plan.

Kuopio signed up to the municipal sector energy efficiency agreement in 2001. Subsequently, it completed its climate strategy and energy efficiency plan included in the efficiency agreement.

The efficiency plan includes training of city personnel, with the objective of reducing energy consumption of office premises and functions, as well as environmental loading. The training covered areas such as purchase of computers and other office equipment and user habits.

- If we could reduce our electricity consumption by 10%, annual carbon dioxide emissions would fall by 1,390 tonnes and the cash savings would be in excess of 100,000 euros, calculates Lea Pöyhönen, Director of the Kuopio Environmental Centre.

The project, targeted at SMEs, endeavours to improve the link between energy-saving and environmental management.

The energy efficiency plan is currently implemented by collecting information on the impacts of energy saving measures put in place in premises owned by the city, as well as neighbouring local authorities and property companies that are partners in the project. The project provides source data for implementation of the coming EU Directive on Energy Efficiency and Energy Services.

Characteristics and assessments per agreement sector

Industry

The industrial energy efficiency agreement is an excellent example of the outcome of commitment and enthusiasm at company and association level and other organisations involved in marketing, developing and implementation of the agreement scheme. The work was characterised by a systematic approach, a long-term view, and a good knowledge of the agreement field and its personnel. The Confederation of Finnish Industries EK, formerly Confederation of Finnish Industry and Employers, assumed a central role in the whole process.

Commitment leads to big savings

Immediately at the signing stage, the biggest industrial energy users were included under the agreement, and about 60% of all industrial energy consumption. During the agreement term, 85% of industrial energy consumption was included in the agreement scheme.

More than 85% of respondents to the online evaluation survey on the agreement scheme said that they had commissioned energy audits in their companies. They said that savings realised through audits were significant and the implementation rate of saving measures rose to a very good level.

Many and varied development projects

Several development projects were launched in connection with the industrial energy efficiency agreement. Notable examples are development of an energy analysis model for the process industry, production of an energy-saving guide for SMEs, and the PATE – Compressed Air Efficiently project. The ETIS, project charted variables, calculation methods and challenges of energy efficiency benchmarking.

Photos: Niilo Hartikainen and Risto Antikainen / Kuopio Tourist Service

In addition, a number of companies implemented their own projects, producing functional and duplicable operational models of energy efficiency work.

Participation in the energy efficiency agreement increased understanding of the importance of energy costs, and affected companies' in-house procedures, such as training and incentive payment schemes.

PATE brings structure to compressed air use. Compressed air is a commodity, the production of which in Finland is estimated to consume 1.4 terawatt hours of electricity every year. Yet only scant attention has previously been paid to its use.

The PATE - Compressed Air Efficiently project, implemented jointly by the MTI, Motiva and suppliers and consultants of the sector, found a savings potential of one fifth in industrial use of electricity for compressed air. The tool developed was the PATE analytical model, which reveals e.g. excessively high compression levels and other potential savings in compressed air use and production.

Municipalities and joint municipalities

Most representatives of local authorities cited economic factors as reasons for joining the energy efficiency agreement, such as identification of potential savings and the government energy subsidy.

Development of consumption monitoring and implementation of energy audits were simple and fairly easily realisable aims, provided that allocated funds and resources were adequate. Over the agreement term, monitoring of consumption developed considerably in many municipalities, and 80% of municipalities or joint municipalities signed up to agreements commissioned audits.

Financial arrangements of energy-saving investments in municipalities were variable. Some local authorities reserved a clear annual budget for implementation of energy-saving measures. Consequently, measures suggested in audits could usually be taken forward. Financing of measures identified in audits from investment subsidy was not common, as application of the subsidy to numerous subjects and measures was considered complicated.

Municipalities and joint municipalities were proactive in developing various operational models to improve energy efficiency. Many energy-saving competitions and events were organised, and collaboration was initiated both within municipalities and between them. At best, different administrative authorities were assembled around the same table to plan energy efficiency measures and indicators of energy consumption.

Schools have been particularly active in promoting energy efficiency. In several municipalities, energy-saving education has been organised for comprehensive school second form pupils, as well as school energy awareness weeks and various competitions.

The Association of Finnish Local and Regional Authorities and Motiva organised numerous educational events, including a training tour designed for property managers, and regional seminars on energy saving and utilisation of renewable energy sources.

New operational models actively created

Reduction of specific energy consumption difficult

Common targets set for the municipal sector energy efficiency agreement were reduction of specific consumption of heating energy (kWh/m^3) (from 1990 level -10% by 2005 and -15 % by 2010) and stabilising the growth of specific electricity consumption and turning it to decline by 2005.

Monitoring of realisation rate of challenging targets has proved difficult, even though each local authority has been able to determine its targets regarding specific consumption based on their own parameters. Often, the targets set were overoptimistic, and it was impossible to predict energy consumption caused by e.g. increased usage rate of premises, tightening of indoor air quality requirements, increased technology and quantity of equipment. Regardless of saving measures implemented, in most cases specific energy consumption has risen.

Property and building sector

The property and building sector energy efficiency agreement was initially joined by private service sector user and investor owners and service managers, then public properties. Their roles and interests in the property business vary, as do their opportunities of influencing energy consumption in the properties.

The property and building sector efficiency agreement is the only one of the sectors under scrutiny here, where the agreement covers less than half of the sector's property stock in Finland. According to the 2005 annual reporting, the energy efficiency agreement covers almost a tenth of the whole private service sector property stock and a good quarter of the service property stock of the membership of the Finnish Association of Building Owners and Construction Clients RAKLI.

At the end of 2005, the audits covered three quarters of the property stock signed up to reporting of the property and building sector agreement companies. Usually properties selected for auditing were ones whose owner is committed to long-term ownership. They also took good care of implementation of the saving measures identified in audits. Investment subsidies have been very rarely used to finance saving measures.

Audits more common

Lively collaboration and development work

Collaboration and development work among operators in the property and building sector has been lively and diverse.

The energy efficiency agreement is included in the information and development work on environmental issues and sustainable development carried out by RAKLI. The active role of Senate Properties, representing public properties, in development projects of environmental efficiency brought an extensive network of expertise and knowledge to the sector.

The property and building sector joint development programme, Visio 2010, elevated environmental and lifecycle expertise as one of the visions for the future. Efficiency of energy use, its quantification and improvement are key questions of many development initiatives and cooperation projects.

Energy sector

There are three separate energy efficiency agreements in the energy sector: the district heating, power plant, and electricity transmission and distribution sector agreements.

In the district heating and power plant sector, the aim of the agreement was commissioning of audits. A common goal in all the energy sector agreements has been to adopt measures and technology promoting energy efficiency.

In the energy sector, energy efficiency, improvement of the cost-benefit ratio and minimisation of losses form a substantial part of profitable business operation. Consequently, the goals of the energy efficiency agreement did not provide significant added value or new challenges.

As benefits of the agreement, the companies cited quality and environmental issues, improved image, improved efficiency of their own operation, and increased awareness of energy efficiency.

Essential part of profitable business operation

Power plant energy analysis model adopted

Notable development initiatives facilitating implementation of energy sector efficiency agreements are the energy-saving group, the model energy efficiency plan and the training package. The SäästöEKSTRA data bank was developed for energy sector association websites primarily for energy efficiency contact persons, but also to serve company management and environment and public relations managers.

A dedicated energy analysis model was developed for the power plant sector, and basic elements of a power plant energy efficiency index were identified.

A number of companies have increased their energy advisory services to customers over the agreement term, in an effort to influence user habits of energy end consumers.

District heating audit showed the right way

Tammisaaren Energia, an energy company in southern Finland, began district heating production in 1992, and the operation has continued to grow from then on. The heating plant, which burns forest chips, was audited in spring 2006.

- As demand for district heating in Tammisaari is constantly growing, we intend to almost double our present district heating production in the next few years by building a new 15 MW heating plant.

- Before making the investment, we wanted to identify the strengths, weaknesses and opportunities for improvement of our current district heating production and distribution, explains Roald von Schoultz, Energy Manager.

The energy audit in connection with implementation of the energy efficiency agreement showed Tammisaaren Energia district heating production and network to be quite efficient. Savings potential was found mostly in electricity usage related to production. Efficiency of production can be improved by investing in heat recovery from combustion gases. In addition, temperature of the return water coming from customers should be lowered.

- The audit result was a pleasant surprise. On this foundation, we can confidently set out to build a new combined heat and power plant.

Good scheme made even better

Our results and evaluations of agreement parties encourage us to develop the good energy efficiency agreement scheme, to make it better still. Drafting of the new agreement scheme is already well under way.

Big savings or wide front?

Based on the overall evaluation of the energy efficiency agreement scheme, there is strong support for continuation and further development of the scheme.

A fundamental dilemma in the coming agreement period will be whether to aim at as great energy-saving and reduction of emissions as possible, or improvement of energy efficiency across as wide a front as possible. The decision will affect both agreement participants and the resources required.

If the goal is a big saving, the agreements should be targeted at large energy consumers, whereby the greatest benefit is likely to be gained through the smallest investment. Because the fixed costs of creating and launching the agreement scheme are relatively high, a small number of signatories should be significant in terms of energy consumption. The limited number of operators would also make individual targets and indicators for each company a feasible prospect.

If the aim is to extensively increase energy efficiency awareness, the savings potential will probably not rise much, but the need for resources will be considerably greater. In this case, significant inputs are required for instruction and guidance of agreement parties and creation of concrete models.

The agreement sectors might in the future have different goals, structures, actors and methods of implementation. In addition, each agreement sector might contain different agreement structures, depending on energy consumption or organisation size of signatories.

Photos: Tammisaaren Energia and Olli Toivonen / Vastavalo.fi

Energy analysis keeps us on our toes

At Porvoon Energia Tolkkinen power plant, heat from combustion gases is carefully recovered. The spur for the investment was the power plant energy analysis included in implementation of the energy efficiency agreement.

In spring 2004, Porvoon Energia conducted a power plant energy analysis at its Tolkkinen power plant.

- A couple of years earlier, we had converted a 53 megawatt boiler purely for biomass use. We decided to thoroughly investigate the potential targets for energy-saving, once we had gained adequate experience of fluidised bed combustion, explains Christer Allén, head of the heating and production unit.

The energy analysis indicated that heat recovery from combustion gases would enable an increase in district heating capacity by a good third. Porvoon Energia decided to go ahead with the investment, with a projected pay-back period of a couple of years.

- As well as identifying new areas for potential saving, the task of the energy analysis is to keep the company on its toes with regard to spotting the scope for increased efficiency in its operation. Energy efficiency is a continuous process, Allén reminds us.

More binding and concrete targets

Increasing the binding nature of efficiency agreements is advocated by representatives of companies and communities in various agreement sectors – primarily organisations that have been active and achieved results. In return for commitment, the new energy efficiency agreement scheme should bring notable benefits, such as more comprehensive subsidies, image benefits from positive publicity, and expert help in implementation.

More than half of the respondents to the online survey carried out for the evaluation expressed the view that the goals of the new agreement term should be defined in more concrete terms than is currently the case. A more binding agreement scheme and concrete targets would be likely to accelerate implementation of saving measures and development of activities in organisations.

We should create targets that are as simple and clear-cut as possible and preferably numerical, for factors that the agreement parties can influence. In addition, for more general goals – among them education and uptake of operational models and technology – a scale should be defined to reflect the extent and level of actions.

Energy efficiency a permanent way of life

The challenge for the future is utilisation of the savings potential identified in audits and integration of energy efficiency measures as part of other operation of organisations.

Effective implementation of the efficiency agreement demands commitment by the whole organisation. Commitment and motivating attitude of higher authorities is especially important, as is the concept of achievability of real benefits.

Continuous process, not one-off project

What is required is an energy efficiency system appropriate for the organisation's needs and management system and supportive of its primary operation, which as a systematic and constantly developing process covers e.g. monitoring of consumption, commissioning of audits, implementation of saving measures and education and training on energy efficiency.

Many possibilities of energy subsidies

One of the key questions of the new efficiency agreement term concerns forms of subsidy. Should energy efficiency in financial difficulty be subsidised, or improvements in energy efficiency

Photos: Porvoon Energia and Tarja Hoikkala / Vastavalo.fi

rewarded? The question also arises as to whether subsidy should be targeted in the same form at new signatories to the agreement scheme and to companies and communities already acting as long-time pioneers in energy efficiency.

Subsidies available in advance do not necessarily guarantee realisation of savings. This was evident during the last agreement term, when the subsidies were focused on audits. A lot of energy audits were carried out in various agreement sectors, but implementation of measures suggested in them did not always make progress.

Linking the subsidy to actual savings made or at least to an implemented saving measure would reward an active approach. This form of subsidy raises a problem of verification, and a precondition of a successful scheme is creation of functional game rules. Because the savings potential is not known before commissioning of the audit, it may be difficult to commit to implementation of measures.

An alternative operational model for consideration is scaling of investment subsidies according to the age of the audit behind the saving measures – larger subsidies for quickly implemented measures.

The energy subsidy must arouse interest, be flexible and encourage to implementation of measures. As well as energy audits and investments, the subsidies should also be targeted at e.g. education, hiring of experts and development of monitoring of consumption. Tax benefits may also provide an interesting possibility in the future.

Resources and commitment must be increased

Many people have been surprised by the tasks involved in implementation of the energy efficiency agreement and the work input demanded by efficient operation. Nevertheless, sufficient personnel resources and securing of financing become key issues, if measures identified in energy audits are to be implemented.

Three quarters of the respondents thought the resources for implementation to be insufficient or relatively meagre. Lack of dialogue between different organisational levels was also seen as a problem.

Management commitment essential

In the new, planned agreement term, securing of resources and commitment of all organisational levels immediately at signing the agreement are crucial factors.

Companies and communities that have signed the agreement need individual expert help, particularly in taking saving measures forward. Small organisations and SMEs in particular need a support person who would provide them with both general information on the efficiency agreement scheme and specialist advice on their own sector.

Long-term activity to promote energy efficiency

Energy efficiency agreements, term I

- 1992 • energy audit programme and subsidy scheme
- • industrial energy efficiency action programme
- 1993 • public sector energy efficiency programme
- • first Motiva energy audit model
- • City of Helsinki energy efficiency agreement
- • Rautaruukki Oy Raahe steel works energy efficiency action programme
- • operation of Motiva launched
- 1994 • energy audit programme monitoring system
- 1995 • building energy audit model
- • industrial energy audit and analysis models

Energy efficiency agreements, term II

- 1997 • industrial, energy sector and municipal sector energy efficiency agreements
- • oil-heated properties energy efficiency programme Höylä I
- • public property cooperation programme for promotion of energy efficiency
- 1998 • energy inspection model
- • two-phase energy analysis model for process industry
- 1999 • energy efficiency agreement monitoring system
- • property and building sector energy efficiency agreement
- • truck and van transport sector energy efficiency agreement
- • post-acceptance energy audit model
- 2000 • follow-up energy audit model
- • first annual reports of individual agreement sectors
- 2001 • district heating audit model
- • bus transport energy efficiency agreement
- • interim evaluation of industrial and energy sector agreements
- • evaluation of oil-heated properties Höylä I programme
- 2002 • evaluation of public sector energy efficiency agreements
- • evaluation of truck and van transport energy efficiency agreement
- • municipal sector agreement continues as energy and climate agreement
- • public sector properties included under property and building sector agreement
- • residential property sector energy efficiency agreement
- • oil-heated properties energy efficiency programme Höylä II
- • energy audit model for residential apartment blocks
- 2003 • energy analysis model for power plants
- • integration of renewables to energy audits
- • truck transport energy efficiency programme
- 2004 • regional audit on renewable energy
- 2005 • overall evaluation of industrial, energy sector, municipal sector and property and building sector
- • evaluation of bus and coach transport energy efficiency agreement
- • new energy efficiency agreement for public transport
- • extension of industrial, energy sector, municipal sector, property and building sector and truck and van transport sector agreements to the end of 2007
- 2006-2007 • development and piloting of tools and procedures for next generation efficiency agreements

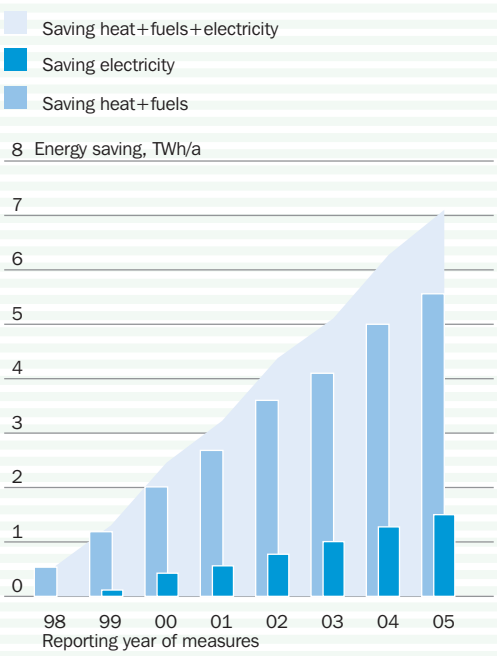
Energy efficiency agreements, term III

- 2008 • launch of next generation agreement scheme

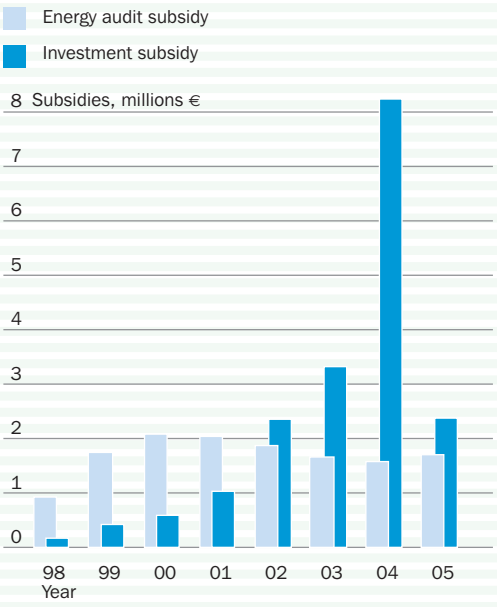
Publisher: *Ministry of Trade and Industry, www.ktm.fi and Motiva Oy, www.motiva.fi*
Editing: *Epiteetti*
Translation: *Audipek Translation Agency*
Graphic Design: *Meridian X*
Printing: *Erweko, Helsinki, October 2006*
Circulation: *3000*

Industrial, energy sector, municipal and property and building sector energy efficiency agreements

Cumulative impact of saving measures

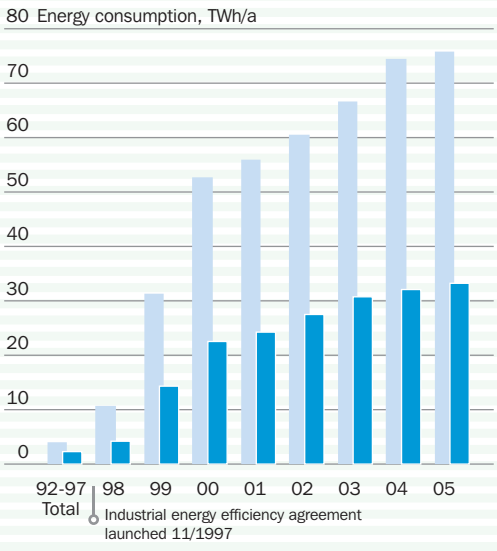


Energy audit subsidies and investment subsidies awarded annually by MTI for saving measures

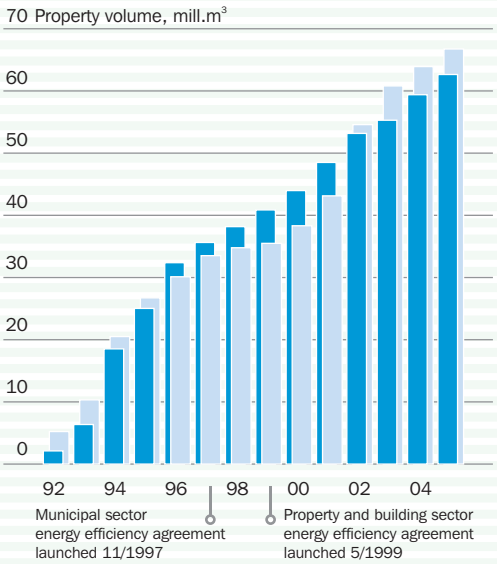


Energy consumption or property volume under energy audit scheme

Industry

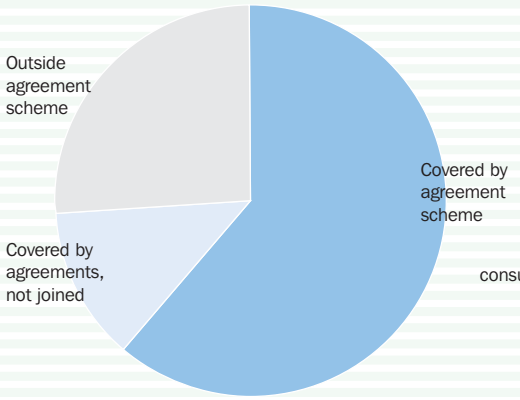


Municipalities, joint municipalities and private service sector

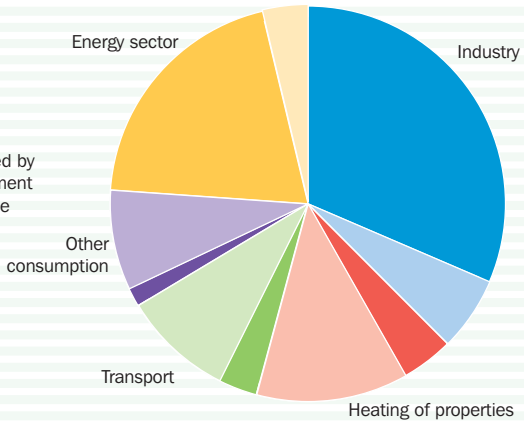


Coverage of the energy efficiency agreement scheme in Finland

Coverage of total energy consumption approximately 60%

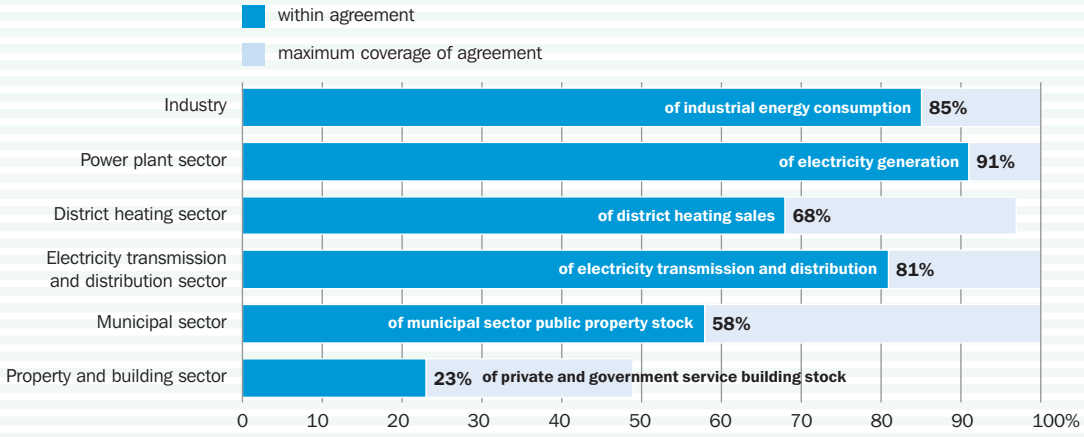


Proportion of the total energy consumption covered by agreement scheme per sector



Darker areas are covered by the sector´s agreement scheme

Coverage by sector at the end of 2005



In addition:

- **public transport energy efficiency agreement** covers 45% of bus and coach stock and all of national railways local services, tram services and the metro
- **residential property sector energy efficiency agreement** covers 15% of domestic apartment block and terraced housing stock
- **energy efficiency programme for truck and van transport** covers almost 70% of actual truck and van transport services
- **Höylä II energy efficiency programme of oil-heated properties** covers more than 15% of heating energy consumption of residential, service and agricultural buildings

MINISTRY OF TRADE AND INDUSTRY

Motiva