

EL-EFF REGION

WP 2: Regional summary report

Västra Götaland, Sweden

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Overview Table

Region of: Västra Götaland		Year	Remark/Explanation
Electricity consumption <u>Households</u> (domestic sector)	5 452 GWh	2004	
Electricity consumption <u>Service Sector</u> (commerce & trade)	3 740 GWh	2004	
Electricity consumption <u>Public Sector</u>	1 844 GWh		
Electricity consumption <u>Industry</u>	8 321 GWh	2004	Incl. building construction
Electricity consumption <u>Agriculture, forestry and fishing</u>	475 GWh	2004	
Electricity consumption <u>Transports</u>	344 GWh	2004	
Total Electricity consumption in the region	20 176 GWh	2004	
Total Energy Consumption in the region	68 586 GWh	2004	
Share of electricity in total energy consumption	29 %		
Data on the region			
Number of inhabitants	1 538 284	2006	
Number of households (most recent data)	731 539	2005	
Number of 1-person householders	338 837 (46%)	2005	Share of Sweden
Number of 2-person householders	198163 (27%)	2005	
Number of 3-person householders	72 808 (10%)	2005	
Number of 4 or more-person householders	65 066 (9%)	2005	
Number of households (predicted for 2010)		2010	N.A.
GDP	44 696 MEuro		1 € = 9,43 SEK
GDP/inhabitant	29 390 Euro		

Introduction

Short description of the region

Västra Götaland is the third largest region in Sweden with 1.5 million people representing 17 % of the Swedish population. Västra Götaland consists of 49 municipalities where Göteborg is the largest city and the major centre of growth in the region. Here are sparsely-populated areas, big cities, landscape of forest- and coast united with large flat countries. Västra Götaland is the most prominent industrial region and is also the fifth biggest producer of provisions and is containing half of the fishing industry in the country. The industry is mainly focused on export, has lots of international contacts and is in close cooperation with universities. The region has also the largest harbour in Scandinavia, a strong shipping industry and the second biggest airport which contributes to make the region to a real hub for transports. Västra Götaland is one of the most visited tourist areas in Scandinavia with a rich cultural heritage and a strong environmental awareness.



Existing regional energy policy targets (especially energy efficiency):

The regional authority has a brief action plan for energy and environment for 2005-2007. However, there are no quantified targets set and the measures proposed are mainly supporting and promoting the development of renewable energy and energy efficiency. However, a lot of initiatives are taken in both their own organisation (hospitals etc) and at municipalities and commercial actors. The development is not lacking behind due to the missing of a dedicated regional strategy but the actions are not fully coordinated in between themselves.

During 2006 the regional administration has initiated a strategy work in the field of energy beginning with a study of the potential, barriers and possibilities for the region to become a “low carbon society”. The study has been carried out by ECON Analyse AS and KanEnergi Sweden AB on behalf of the Environmental Board of the regional administration.

The report, finalised in February 2007, from the study will be a base for the development of a regional energy strategy with an action plan. During 2007 a stakeholder dialogue will be carried out. During the dialogue a suggestion on regional strategy will be formed. The strategy shall incorporate how all together can speed up the phase out of fossil fuels from the regional economy. The suggestion on strategy will than be sent out to relevant actors for comments and during 2008 be adopted by the Regional Council and others.

The partner organisation:

KanEnergi is a consultancy specialising in services related to energy, climate change and sustainable development. KanEnergi has 20 employees and offices in Skara, Gothenburg and Stockholm in Sweden and Oslo in Norway. Working with government authorities, private companies and NGO's KanEnergi strive to support sustainable and rational development of the society, in particular in relation to generation and use of energy. KanEnergi's role in this context is to provide return on investment advice based on the principle of sustainability.

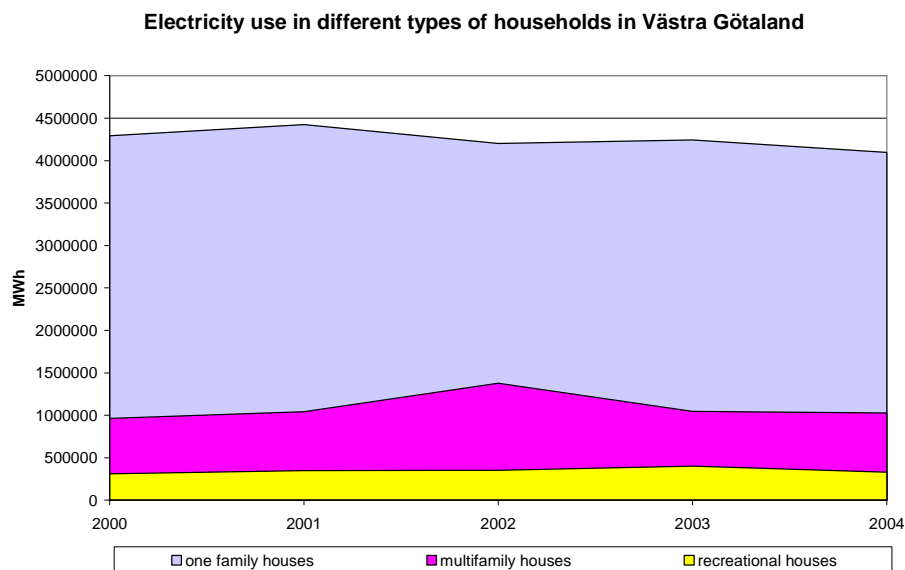
Electricity consumption in households

Use of electricity

The electricity used in households (excluding electricity for heating) has increased for every year. The average electrical consumption for one family houses is about 6 200 kWh or 41 kWh/m² (2005). Almost 40 % of all small houses use electricity as the only source (including heat pumps). Since 1975 the electricity consumption for households has increased with 60 %. The total electricity consumption in the region was 20.2 TWh (2004) which is 29 % of the total energy consumption.

The total amounts of used electricity for households in Västra Götaland increased with almost 7 % during the years 2000 and 2002 but have since then decreased during 2003 and 2004 to the level for year 2000 as shown in the graph below. OBS! These figures are not corrected on conditions on the weather.

The main reason for the decrease is the development of the electricity prices and taxes. This has enhanced the incentives for energy conservation as well as fuel switches. The last few years a lot of houses use a heat pump instead of electricity for heating their buildings. The heat pump reduces the required amount of electricity from 2 to 3 times depending on heating source and temperature outside. Also a lot of houses using oil have switched to heat pump which has lead to increases in electricity use at the same time. Still the dominant energy carrier for heat in one family houses is electricity.



The preliminary observations from the ongoing project, “Measure of electricity in 400 households”, operated by the Swedish Energy Agency is showing that:

- The electricity consumption for cold appliances in one dwelling buildings has almost reduced with 50% compared to 1994 because of the energy labelling system.
- The consumption for lights is almost the same which indicates a poor use of low energy light bulbs. Approximately 60 % of all lights in households are ordinary light bulbs and only 10 % are low energy light bulbs.
- Research results show that it is possible to reduce energy use in the building sector by 30 per cent by using the most energy efficient construction materials and appliances. An additional 20 per cent can be reduced by using materials and appliances in an energy saving way.

Policy measures

- Since 1997 there is governmental support for municipal energy advisors. Today almost all municipalities offers this free of charge service to the inhabitants. The energy advisors give advises on efficient use of energy, fuel switches, insulation of the building envelope etc. They also arrange and carry out local and regional information activities to reach a wider group of people.

The subsidies for energy advisors and regional energy agencies are the responsibility of the Swedish Energy Agency. The agency also carries out a lot of coordination activities and projects to support the local and regional actors. Amongst others they publish dedicated publications for specific areas and target groups. They develop their website with a lot of energy advises and information for households and other target groups.

- Since late 90-ies the former Government (changed in autumn 2006) has annually carried out a so called “Green tax-change” programme which amongst others has affected the tax on electricity. The tax has been increased and the tax on labour etc decreased in the same size. This was a way of stimulating energy efficiency measures and new technologies.
- The owner of one- or multi family houses has possibilities to apply for allowance when changing from electricity to water heating systems. This economic assistance implies that the electricity heating system is changed to district heating, heating pumps (not air) or bio energy. The aim with this economic support is to promote an efficient and environment friendly use of energy and reduce the electricity in households used for heating.
- Since the 1st of October 2006 Sweden has a new law regarding energy declaration of buildings in accordance with the EU directive. This new law implies that energy consumption and indoor environment shall be declared and easy to access for buyers of new buildings. This declaration has several advantages, for examples:
 - It will suggest economical efficient improvement solutions
 - It will form a basis when applying for financial funding
 - It will show reference value which make it easy to compare your own house with others
- The new building legislation which will come in practise from 1 July 2007 is setting new standards on energy performance in new buildings such as single-family- and multi-family houses, commercial and public operations. Only buildings for very specific use and industrial buildings are excluded. The new regulations sets targets which will in practical terms require passive house standard if using electricity as heating source.
- The regional administration of Västra Götaland has through the Environmental board an allocated budget for supporting regional projects in the field of stimulating energy efficiency. Every year regional projects with a range of different actors participating is carried out.

Electricity consumption in the public sector

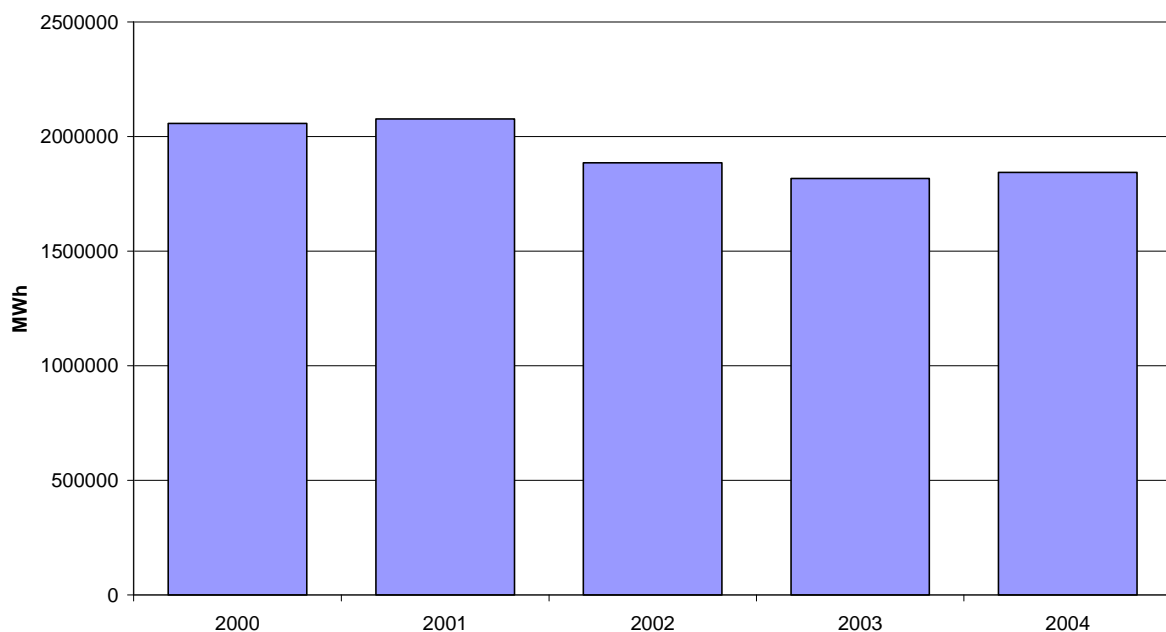
Use of electricity

The Swedish Energy Agency is in the project “stegvis STIL” getting statistics of electricity use in different kind of buildings. At present time they have put together the electricity consumption for office buildings. According to this investigation the electricity used for operation is at the same level as it was 1990. The lighting has decreases because of more efficient light sources but the amount of electricity for ventilation and appliances has increased. The electricity used for cooling has also increased but not as much as it would without the development of district cooling. Computer appliances are in greater number now than 1990 but are in the same time more efficient.

Electricity levels used for locals, the year 1990 compared to 2005:
95 kWh/m² and 93 kWh/ m² respectively. (excl. electricity for heating)

The electricity used for heating has decreased mainly because of connection to the district heating network. Approximately 60 % of all locals are using district heating as heating source. This first investigation showing that the specific operation electricity isn't increasing. Future investigation from stegvis STIL will show if this also is true for other types of buildings. Untill the middle of 1980 the electrical consumption has increased intense for all kinds of public buildings with approximately 3 % per year. Since this period the increase has been approximately 1 % per year.

Electricity use in public operations in Västra Götaland



Policy measures

- Since 15th of May 2005 there is a national investments support for actions which will lead to more efficient and environmental energy consumption. The funding is intending for buildings in the public sector and shall be divided as a special building, is excepted from taxes, is a Swedish embassy or a Swedish consulate abroad or in other case is intended for the public good in at least two year after the measures been performed. The building administrator can receive financial funding for:
 - Energy audits
 - Changing from electricity or fossil fuels to renewable energy sources, heating pump or district heating
 - Connecting to district cooling or installation of “natural cooling” systems
 - Installation of energy efficient lighting and ventilation system
 - Installation of energy control and management systems
 - Efficient measures regarding the building envelope or an improvement of the heat recovery
 - Installation of solar systems (PV)
- Sustainable municipality programme:
Sustainable municipality is an ongoing five year long project aiming to build a sustainable society, focusing on energy related questions. The five participating municipalities are Borås, Solna, Ulricehamn, Vingåker and Örnsköldsvik. These five have been selected, after notification of interest, because they have been able to show that they can provide suitable conditions for good co-operation within their municipality and with local trade and industry. Together, they also represent different “type municipalities” with regards to number of inhabitants, geographical location and character. The municipalities individually draw up their local objectives and action plans for the Sustainable Municipality programme. Two of these municipalities (Ulricehamn and Borås) are located in västra götaland. The program is created by the Swedish Energy Agency and will go on during the period 2003-2007. An investigation within this program in Ulricehamn is showing a big electricity reduction potential. 10 industries were investigated and their average electricity reduction potential were 50 %.
- Almost three of four municipalities in Sweden are actively working with energy planning. All activities are more or less using energy, why a municipal energy plan is an effective tool getting control over the total energy consumption. All Swedish municipalities are since 1977 obligated to have a plan over energy supply, distribution and energy use in the municipality. Trollhättan is one example of a municipality in västra götaland having an active energy plan with long-term goals towards 2010.

Electricity consumption in the service/tertiary sector

Use of electricity

The residential and service sector consists of residential premises, commercial premises and public buildings (excluding industrial premises), holiday homes, land use and other service activities, which include the construction sector, street lighting, sewage treatment plants, electricity and waterworks. Energy use in this sector in 2005 amounted to 145 TWh, representing about 36 % of Sweden's total final energy use, and about 5.8 TWh less than during the previous year.

About 87 % of energy use in the residential and service sector is used in residential and commercial/ public premises, where it provides space heating and domestic hot water and powers appliances and building services systems. Energy used in land use applications accounts for about 6 % of total energy use in the sector; holiday homes account for another 2 % and other service applications for 5 %. Over 60 % of the energy use in the sector is used for space heating and domestic hot water production. As this is affected by temperature conditions, there can be considerable variations in energy demand from one year to another.

The sector "commercial service" share of västra götaland electricity use is approximately 19 % or 3 740 GWh (2004). The electricity consumption has increased with almost 3 % during the years 2000 and 2004.

Electricity consumption in industry

Use of electricity

In Sweden a small number of sectors accounts for the bulk of energy use in industry. The pulp and paper industry uses about 49 %, primarily as electricity or from black liquors (by-products of pulp manufacture used as fuel in special boilers). The electricity is used mainly for grinders producing mechanical pulp. The iron and steel industry uses about 15 % of industry's energy, primarily in the form of coal, coke and electricity. The electricity is used chiefly for arc furnaces for melting steel scrap. The chemical industry uses 8 % of industrial energy use: here electricity is used mainly for electrolysis processes. Together these three energy intensive sectors accounts for over 70 % of total energy use in industry in Sweden.

In Västra Götaland, the industrial electrical use is dominating by a few big industries. The biggest electrical consumer in the region is Vargön Alloys which use more than 700 GWh/year. Vargön Alloys AB is one of Europe's largest producers of ferrochrome, an alloy that gives steel its hardness and corrosion resistance. Three refineries and one plastic industry (Borealis) are superior regarding total energy use. Each one of these uses more than 2 500 GWh/year and the electricity share is about 5-10 %.

The industry uses approximately 8 321 GWh/year (2004) or 41 % of electricity in the region and the consumption has been on a rather constant level the last years.

Policy measures

Sweden has a high electrical consumption per industrial product compared to other countries. The main reason for this is that Sweden use a large amount of electricity to non electricity-specific processes, for example heating, drying, melting etc. Several investigations show that the industry still can decrease their electrical consumption a lot. The report "Systemförändringar av industriell energianvändning i Oskarshamn" has pointed out the potential for 11 companies in Oskarshamn, Sweden, to decrease their electrical consumption with 50 %. Following areas are specially pointed out:

- Lighting.
Take away unnecessary fittings, change old fittings to new modern and introduce presence operation control. With modern fittings it possible to reach a light efficiency from 3 to 10 W/m².
- Compressed air.
Change from compressed air tools to electric driven ones will increase the efficiency from 5 to 90 %. An ongoing project in one of Volvos factories is showing that a company can operate without any compressed air. Lot of studies indicates that use of compressed air in time will disappear.
- Do night wandering.
This makes it easier to find idle running consumption.

Other studies also showing that support processes, such as lighting, ventilation, compressed air, pumping, heating etc. are big electrical consumers (often 50 % or more of the total electricity consumption). The biggest opportunities to save electricity are consequently in these areas.

EnergiFocus is an ongoing regional project with the goal to increase the industrial energy efficiency in the region. About 2/3 of the industrial electrical use have been mapped in the project. The objects are to:

- reduce the energy costs, increase the energy efficiency and improve the daily energy work in the participating industries
- develop tools for the energy work within medium size companies
- spread information, tools and methods to energy advisers, consultants and other industries

The project is mainly sponsored by the Västra Götaland region and the Swedish energy agency.

The first of July 2004 there was a new energy tax for the electricity used in manufacturing industry. The producing industry now has to pay 0.0005 Euro/kWh for electricity. In June 2004, the Government presented an energy efficiency improvement programme, which came into force on 1st January 2005. Companies participating in the five-year programme can receive a full rebate of the energy tax on electricity that they otherwise would have to pay. The two first years the companies commit themselves to map and analyse their energy consumption, introduce an energy management system and routines for buying electrical demanding products. The next coming three years the companies shall apply the energy management system, the new routines and also take action against large energy consumption activities identified earlier in the programme phase. The actions should have a payback less than 3 year.

Electricity prices & market liberalisation

The Swedish electricity market was reformed the 1st of January, 1996. The reform introduced competition in the trade and production of electricity, while the network operation is a regulated monopoly. In recent years the price development in the Swedish and Nordic electricity market has triggered a discussion of the functioning of the electricity market. The profitability of market players and the efficiency of the price formation in the wholesale market are two of the topics under discussion.

Since the reform of the electricity market the price is determined by supply and demand. On Nord Pool's spot market (Elspot) the price of electricity is determined on an hourly basis for the next 24-hour period; this in an auctioning process where the market players submit bids to Nord Pool for the purchase and sale of electricity. There are physical transmission restrictions, for example between countries. To handle situations where the demand for transmission capacity exceeds the available transmission capacity in the market, the Nordic electricity market is divided into bidding areas (Elspot areas).

The electrical market in Sweden is dominating by three big energy companies, Vattenfall, Eon and Fortum. These three are dominating the electrical production, trading and distribution.

The supplier buys the electricity on Nordpool or directly through own contracts. The customer signs a contract with the supplier. The end customer can choose between "fixed" electricity price with different bounding times or "running" contracts. According to regulations today, the end customer has right to change electricity supplier or negotiate for a new contract.

	Price per kWh in Euro	Year	Remark
Typical electricity price household including all taxes (<u>not</u> "special" tariffs for domestic hot water/heat pumps/electric heating etc.)	0,136	2006	
This price consists of:			
Energy costs	0,0285		
Grid charges	0,0430		
Charges/levies for green electricity/CHP etc	0,0028		
VAT	0,0341		
Other taxes (CO2 etc.)	0,0281		
Others :.....			
Typical electricity price household	0,124	2005	
Typical electricity price household	0,127	2004	
Typical electricity price household	0,122	2003	
Typical electricity price <u>service sector</u> (price range for commerce & public sector), including all taxes		2006	N.A.
Typical electricity price <u>industry</u> (price range), including all taxes	0,068	2006	
Relevant special tariffs (e.g. heat pumps, electric heating).		2006	N.A.

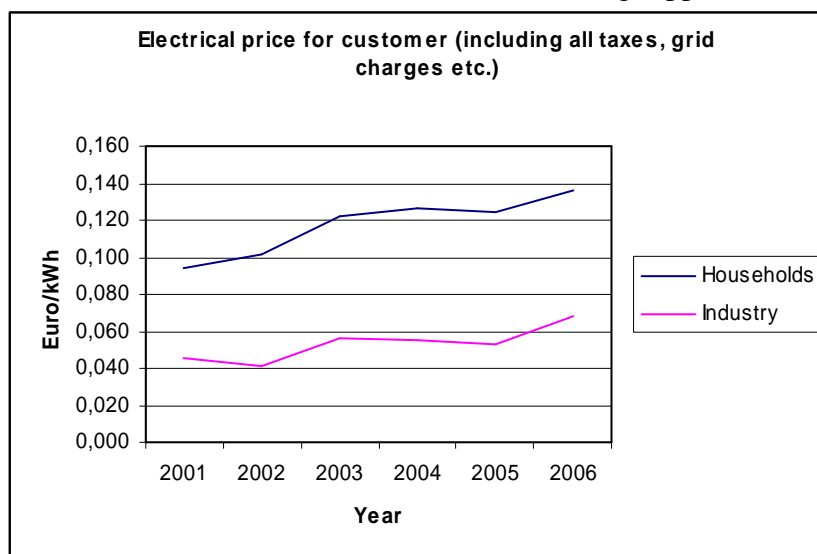
Households:

Since the electricity market reform, a household's total cost of electricity consists of four main parts: electrical energy, grid charges, electricity tax, VAT, and from May 2003 the additional costs of electricity certificate. It's mainly the first of these that the customer can influence. For houses and apartments with low electricity consumption, the economic effects of changing the contract is quite small.

Through to the year 2000 consumer prices fell. However, after the wet year of 2000 consumer costs have risen. There are a number of factors behind the rising cost of electricity, e.g. the increased price of electrical energy and the introduction of electricity certificates. One reason is that the electricity tax, which is ratified by the Swedish parliament, has increased. Since 1996 the tax on electricity has increased by 16.4 öre per kWh, which is just below 170 per cent.

The electrical price for households has increased for the last year. Between 2002 and 2004 the prices had a substantial increase because of less water in the Nordic reservoirs leading to a decrease on the supply side.

The costs for households in graph below is average cost between low consumer (3 500 kWh/year) and high consumer (20 000 kWh/year). The low consumer correspond to a four room and kitchen household (approximately 90 m²) and the high consumer correspond to a five room and kitchen house with electric heating (approximately 120 m²).



Industry:

The electricity price decreased during 1996 to 2001 mainly because of the precipitation which influence the hydro power production. Another reason to the low prices during these years is the surplus in production capacity the first year in the period. After a long period of low electricity prices for the industry the price increased dramatically between 2002 and 2003.

The Energy Markets Inspectorate has since 2002 continuously following the percentage changes in the price of electricity on an annual basis per energy-intensive industry plant. Expressed in öre per kWh the average price of electricity to the basic industry plants was 20 öre per kWh during 2002, 23 öre per kWh during 2003, 24 öre per kWh during 2004 and 26.5 öre per kWh during 2005. These average prices show the scale and significance of the long-term power agreements and/or price-hedge agreements which the electricity intensive industry has.

Stakeholders

- Electricity producers
- Electricity suppliers
- Grid owners and operators
- National, regional and local authorities and agencies
- Municipalities
- NGO's for consumers
- Energy advisors
- Regional energy agency
- Consultants
- Large building/real estate owners
- Large industries
- Manufacturers of technology/products
- Media
- Retailers of household appliances

Some “key”-stakeholder in the region:

Municipality owned utilities (Göteborg Energi AB etc)

Göteborg energi AB is the fourth largest energy company in Sweden and western Sweden's leading energy company. They are owned by the municipality of Gothenburg. They provide their customers with energy services, broadband, district heating, cooling, natural gas and the electricity supply network.

Göteborg Energi AB and a range of other, but significantly smaller, municipality owned local utilities plays a big role in the production, distribution and use of electricity. The utilities are often a good business for the municipality but can also be used as an important tool for implementing the local energy plans and climate strategies. The utilities has, in most cases, the capabilities and resources needed for implementing and supporting their costumers in their work with increased energy efficiency. Due to the political steering of the utilities the economic objectives can be set a side for other issues such as socio-economic impacts of energy efficiency and incresed use of renewable energy.

Energiråd vast

Energiråd Väst - the Energy Agency of West Sweden coordinates the local energy advisors in the county of Västra Götaland. They also run projects on local, regional, national and sometimes European level to promote sustainable energy usage. The objective is to further energy efficiency and the use of renewable energy in Västra Götaland.

Municipal Energy advisors

The municipal energy advisors are for small companies, organisations and also for the public use. The purpose is to supply impartial and locally adapted information and guidance about energy related questions.

Selection of the "second sector" (industry)

Reason for our second selection

The residential sector has the regional energy agency and the municipal energy advisors for project coordination, information activities and individual guidance for electricity savings. This sector also, in some cases, has economic incentives through grants for swithing from electric heating etc.

The public and commercial service sector has the new energy directive for buildings and energy service directive which will increase the incentive for saving electricity. The large companies in this sector, for exemple real estate owners etc, often have quite good knowledge about their own energy consumption, and there are also a lot of consultants working with energy saving measures in these sectors already.

The agriculture sector has “the energy farm” which is a programme aiming to coordinate the different agriculture actors into a common act for changing the energy system. The agricultural sector is also at this moment very focused on the issue of producing renewable energy and to supply the increasing need for alternative vehicle fuels, biomass for district heating planst etc.

The industry sector has no platform for energy saving measures today. Of coarse energy saving projects and other measures are carried out as a natural development of getting more cost eefective production. However, these measures are often carried out individually without any cooperation activities or public support. Also, the industries have limited capabilities and know-how in energy efficiency measures as well as resources to allocate for this purpose. This has lead to a transfer of knowledge and experience between industries and the lack of coordination. This situation together with the fact that near half of the electricity use in the region is within the industry is the main reasons for choosing the manufacturing industry as our second sector. The manufacturing industry in the region is caracherised by a few very large industries like Volvo and SAAB and a lot of smaller industries with 300 employees and less. The latter has very limited resources to work with energy efficiency issues although all experience shows that there is a great potential of both energy as well as cost savings.

Our selections and strategy

Households:

Our strategy is working in close cooperation with municipal energi advisors to reach the households sector in an effective way. The advisors are well known and the natural concact point for all households. However, very limited efforts has been put on electricity savings in households, except from swith from eletric heating, during the latest years. The activities and deliverables in this project will be valuable tools for the energy advisors. A project group consisting of KanEnergi, the regional energy agency and municipal energy advisors has already been set up and a kick-off meeting held.

Manufacturing industry:

Using our existing network we will work directly towards the manufacturing industry. The strategy is to work closely with already existing networks and supporting organisations for the manufacturing industries to effectively communicate the project activities. The activities and deliverables will be important to create a foundation together with prior and other on-going work.

Summary/conclusions

The industry is the major electricity consumer in Västra Götaland and is consequently an important actor when aiming to decrease the electricity use. As been described earlier there is a big saving potetntial espacially when focusing on the support processes such as ventilation, lightning, compressed air etc. After a long period of low electricity prices, the industry is now facing higher prices. This has enhanced the incentives for energy conservation as well as fuel switches.

The big challenge for decreasing electricity consumption in households is to increase the human knowledge level about energy and the connection between electricity use and their everyday behaviour. People in Sweden in general have a bad knowledge of what their consumption behaviour costs, both in kWh and money. The energy companies can contribute to a more efficient use of electricity by simplifies the bills so the customers can refer their use to costs. A higher electricity price is of course an important factor enhancing the incentives for energy saving measures.

The number of appliances and new use of electricity increases for every year. Stand-by functions in a great number of appliances is also a growing problem. The electrical use must be on a very high efficient level to prevent the electrical consumption to increase.

The total energy use per m² will probably decrease in the region because of more efficient heating sources. A consequence of more efficient buildings will be lower cost, less impact of the environment and a safer and secure energy supply.

