

Energy plan for the City of Växjö



Contents

About the energy plan	4
Targets	4
The Covenant of Mayors	4
Current situation	6
Future prognosis for Växjö.....	7
Focus areas and action plan	9
Focus area 1: Renewable energy	9
Strategy A: Increased small-scale renewable energy production.....	10
Strategy B: Increased opportunities for developing the industry and business sector	11
Strategy C: CHP and central district cooling	11
Strategy D: Establishment of wind power	11
Strategy E: The role of peat	11
Focus area 2: Energy efficiency.....	12
Strategy A: Energy efficient renovation of existing building stock	12
Strategy B: Energy efficient new buildings.....	13
Strategy C: Changing behaviour	13
Strategy D: Optimised energy use.....	14
Focus area 3: Renewable vehicle fuel and energy efficient vehicles	15
Strategy A: Increased access to renewable vehicle fuel	15
Strategy B: Increased share of environmentally friendly vehicles.....	16
Focus area 4: Reliable and sufficient energy supply.....	17
Strategy A: Sufficient supply on renewable energy	17
Strategy B: Reliable deliverance of energy	17
Focus area 5: Other energy and climate aspects.....	18
Strategy A: Energy efficient industry and business sector	18
Strategy B: Fossil fuel free city administration	18
Strategy C: Increased possibilities for local energy and climate work.....	18
Strategy D: Research and education.....	19

Preface

Long-term work

The environmental work of the City of Växjö has been going on for a long time. The restoration of the lakes started in the 70's, the introduction of renewable energy in the 80's and the decision on a fossil fuel free community in the 90's are some important milestones in this work. At the same time, the epithet "the greenest city in Europe" obligates us to make continuous improvements, and take steps to keep our position as a leading environmental city.

Energy and environment

A reliable and sufficient supply of energy is central in a modern well-functioning community. We use energy for transportation, heating, lighting, industrial processes, production of goods and services etc. This energy use causes many times emissions of carbon dioxide and air pollutions. One way of reduce the environmental impact is to choose renewable energy sources and use more environmentally friendly modes of transportation. However, this is not enough, and we also need to be more efficient in our energy use. The best energy is the one that is not used, and by changing behavior, build and renovate energy efficiently, and use efficient vehicles, Växjö can contribute to decreased environmental impact.

The role of the energy plan

The environmental programme is a central part of Växjö's strategic environmental work. Its targets and actions are important in the realization of the greenest city in Europe. The energy plan is a concretization of the environmental programme within the field of energy and climate. In the plan we focus on areas where we need to improve, but we have also gone further in the areas where we already are good. The energy plan is an important tool for us in the work with the greenest city in Europe, and in order to reach our vision of a fossil fuel free community.

Bo Frank

Mayor

Anna Tenje

Member of the executive board

Åsa Karlsson Björkmarker

Member of the executive board

About the energy plan

According to Swedish legislation, every municipality must have an energy plan that deals with supply, distribution, and use of energy in the municipality. The plan shall promote efficient use of energy, ensure secure and sufficient energy supply, and it shall be approved by the City Council. This energy plan was approved by the City Council 2011-12-20.

The energy plan deals with the entire geographical area of the City of Växjö. This includes the city administration, the citizens, companies, and other public authorities. Since the energy plan is approved by the City Council, only actions that are within the responsibility of the city administration and the municipally owned companies are included. However, in some cases the actions are related to how the City of Växjö can work together with other actors in the community in order to reduce the energy use and climate impact from citizens, companies, and others.

The energy plan is structured according to the strategies and actions that will contribute to the fulfilment of the targets in the environmental programme. The energy plan is supposed to be revised once every fourth year.

The City of Växjö also has a transportation strategy which includes strategies and actions for how to achieve a sustainable transport situation in Växjö. Therefore, most transportation related issues are not included in this energy plan.

Targets

In 1996, it was unanimously decided that the City of Växjö is going to be a fossil fuel free city, meaning that our energy use and transportation shall not use any fossil energy sources. As the environmental programme was revised in 2010, it was specified that the fossil fuel free target shall be reached by year 2030 (and the city administration by year 2020). The overarching targets in the environmental programme show the

direction towards a fossil fuel free community, and are also the basis for the energy plan:

- We shall cease the use of fossil fuels
- We shall use energy efficiently

These targets are then broken down into goals to achieve by year 2015. The fossil fuel free targets with most relevance to the energy programme are:

- The energy use shall be reduced by 15 per cent per capita between 2008 and 2015
- The use of electric energy shall be reduced by 20 per cent per capita between 1993 and 2015
- The emissions of fossil carbon dioxide shall be reduced by 55 per cent per capita between 1993 and 2015
- The total energy use in the municipally owned premises and dwellings shall be reduced by 17 per cent between the average of 2003/2004 and 2015
- The emissions of fossil carbon dioxide from the city administration's transports shall be reduced by 30 per cent between 1999 and 2015

The Covenant of Mayors

The City of Växjö has signed the Covenant of Mayors, meaning that we have committed to achieving energy and climate targets that go further than the targets of the EU. The EU targets, also known as the 20-20-20 targets, say that by the year 2020 the share of renewable energy shall be 20 per cent in the EU, the emissions of carbon dioxide shall be reduced by 20 per cent compared to 1990, and the energy use shall be 20 per cent more efficient.

As a signatory to the Covenant of Mayors, the City of Växjö is adopting a Sustainable Energy Action Plan (SEAP) and follow-up the energy use and emissions of carbon dioxide. This energy

plan will work as the SEAP of Växjö. Within the Covenant of Mayors, the City of Växjö must also set a climate target for the year 2020:

- The City of Växjö shall, within the framework of the Covenant of mayors, reduce the fossil carbon dioxide emissions by 65 per cent per capita between 1993 and 2020.



Current situation

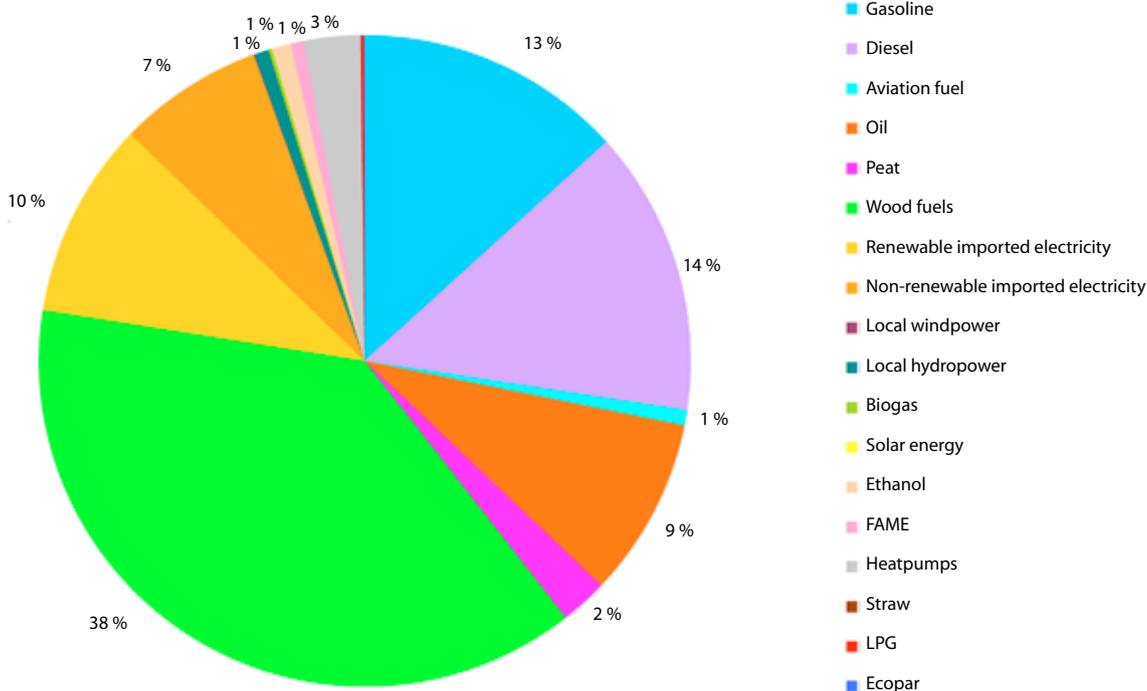
An annual energy inventory is the basis for an annual energy balance of the City of Växjö. The energy balance displays the energy supply and energy use in the geographical area of the city of Växjö.

The total energy use in 2010 was 2 711 GWh. This amount also includes the energy used for transportation. In spite of a growing population, the total energy use has stayed more or less at the same level, meaning that the use is becoming more efficient. The share of renewable energy sources was over 53 per cent in 2010. The use of renewable energy is most used within heat

consumption, while the energy for transport is dominated by fossil fuels.

The combined heat and power plant in Växjö, as well as the smaller district heating plants in the surrounding villages, are mainly using wood fuel as energy source. Oil is used for peak load only. The electricity produced in the combined heat and power plant represents about one third of the total electricity consumption in Växjö. There is also local production of electricity from running water, wind, sun and biogas, together representing almost 3 per cent of the total electricity consumption.

Energy supply in the City of Växjö in 2010



The energy use in different sectors has been quite stable over the years. During 2010, 30 per cent of the energy was used for transportation and machinery, 35 per cent was used in households, and 35 per cent was used in industry, business and public sector. District heating is the most common means of heating.

Carbon dioxide emissions

The overall target for the City of Växjö is to become a fossil fuel free city. In 2010, the emissions were 3 524 kg per capita, a decrease by 23 per cent compared to 1993, but an increase compared to 2009, when the emissions were 3 015 kg per capita. Compared to the rest of Sweden, Växjö is at a low emission level. 68 per cent of the emissions come from transports and machinery, 12 per cent from households, and 20 per cent from industry, business and public sector.

Future prognosis for Växjö

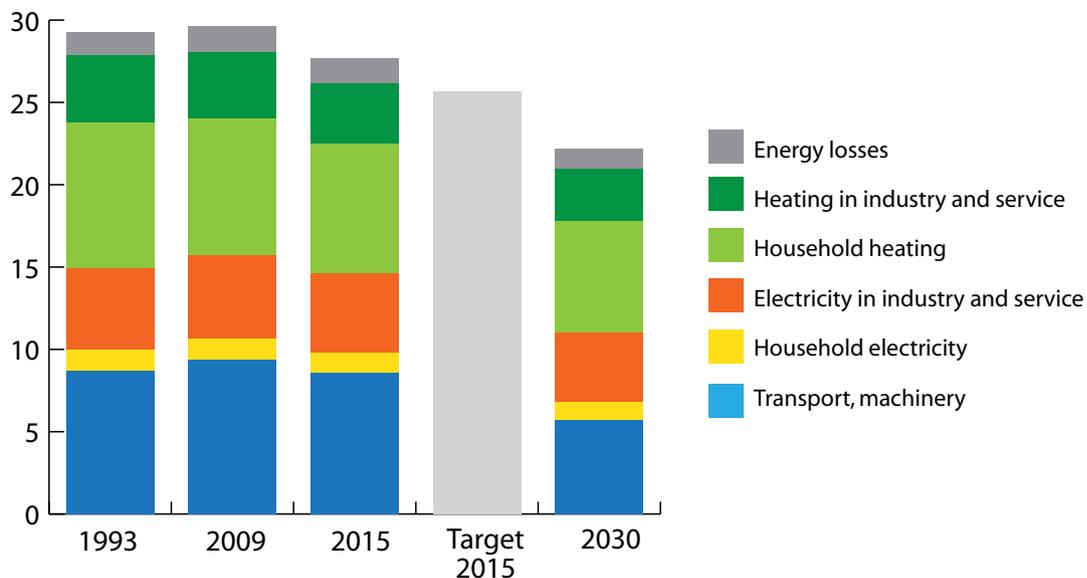
Before starting the work with the energy plan, a prognosis of the future development of energy supply, energy use and emissions of carbon dioxide was made. The prognosis covers the geographical area of Växjö until year 2030.

The prognosis shows a reduction of energy use per capita by 24 per cent, an 81 per cent share of renewable energy, and a reduction of fossil carbon dioxide emissions per capita by 76 per cent. It also shows that the energy and climate targets for 2015, and the climate target for 2030, will not be reached, unless this energy plan will be carried out.

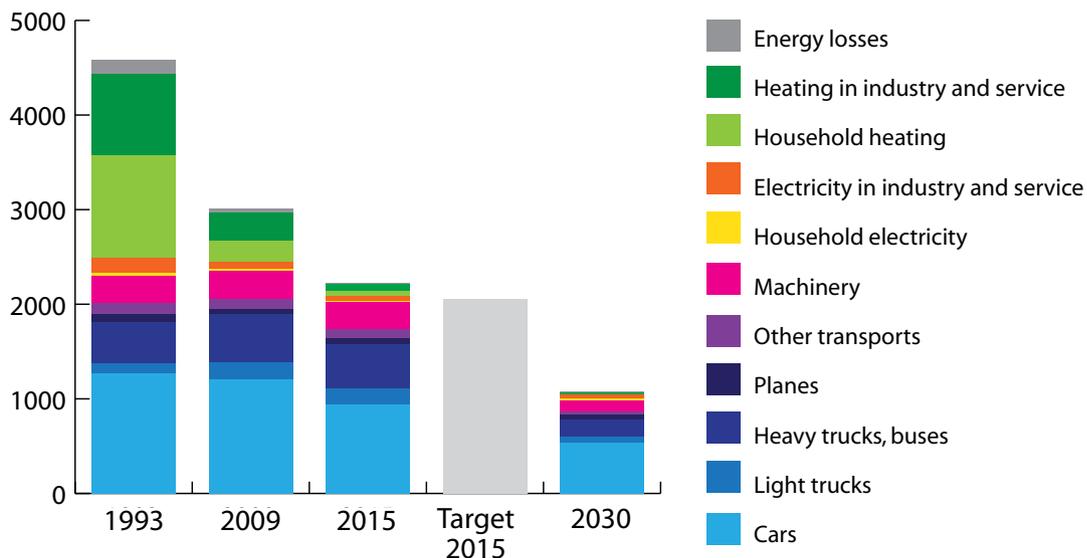
By using the energy plan, we increase the possibility to reach the targets for 2015. The plan can also be basis for even more ambitious actions in upcoming revisions of the energy plan, in order to reach the long term targets.



Energy use in Växjö (MWh/capita), result and prognosis



Emissions of carbon dioxide in Växjö (kg/capita), result and prognosis



Focus areas and action plan

On the following pages we present the five different focus areas of the energy plan. Every focus area contains a vision, strategies and actions. The five focus areas are:

- Renewable energy
- Energy efficiency
- Renewable vehicle fuels and energy efficient vehicles
- Reliable and sufficient energy supply
- Other energy and climate aspects

The actions are named according to the following structure:

F1-5 = Focus area 1-5

Sa-e = Strategy A-E under respective focus area

1-5 = Action number under respective strategy

Focus area 1: Renewable energy

In the Greenest City in Europe we are net producer of electricity and heat, made from renewable energy sources. We mix small and large-scale energy solutions and our aim is that all citizens should have the possibility to contribute to an increased production of electricity and heat from renewable energy sources. A sustainable use of resources is considered in all production of electricity and heat.

In the Greenest City in Europe biomass based central district heating is the primary source to heat households and other buildings. In those parts of the municipality where central district heating is not an option, other renewable energy solutions are used.





Strategy A: Increased small-scale renewable energy production

In the Greenest City in Europe we work to continuously increase the share of renewable energy. The municipality organization already has good experiences from small-scale electricity production on our real estates. We continue to examine small-scale renewable energy solutions within our municipally owned real estates, at the same time as we support other local operators to do the same.

Action F1Sa1

The municipally owned real estate companies allocate 0,2 per cent of total net annual turnover to investments in renewable energy production. Local small-scale production is prioritized.

Responsibility: VKAB

Schedule: Start 2012

Action F1Sa2

An improvement of the hydropower plants within the municipality is done by upgrading and increasing the capacity in existing plants.

Responsibility: The technical services board

Schedule: Start 2012

Action F1Sa3

The technical services board and the municipally owned real estate companies shall be more self-supporting on renewable electricity. This may include investments in larger wind turbines or production of electricity from local systems. During the present political mandatory period the City of Växjö will construct so called "positive energy buildings" that generate more energy than they use.

Responsibility: The technical services board and VKAB

Schedule: Start 2012

Action F1Sa4

From their own prerequisites Växjö Energy encourages small-scale electricity production to the electricity grid, such as small-scale wind turbines or PVs.

Responsibility: VKAB

Schedule: Start 2012

Action F1Sa5

The City of Växjö encourages private building entrepreneurs to investments in small-scale energy production.

Responsibility: The planning board, the executive board, and the technical services board.

Schedule: Start 2012

Strategy B: Increased opportunities for developing the industry and business sector

In the Greenest City in Europe we believe that renewable energy solutions are important for the industry and business development.

Action F1Sb1

Within the industry and business development, the City of Växjö functions as a driving force and support solutions on renewable energy production.

Responsibility: The executive board

Schedule: Start 2012

Strategy C: CHP and central district cooling

In the Greenest City in Europe the central district heating is well developed, both in the city and in larger communities in the countryside.

This expansion continues and also involves central district cooling. We wish to use as much as possible of the heat load as a basis for the electricity production. This could also include smaller local district heating plants.

Action F1Sc1

The City of Växjö aims to support as many areas as possible with central district heating. A dialogue concerning this expansion is carried out with private central district heating companies.

Responsibility: The executive board, VKAB

Schedule: Start 2012

Action F1Sc2

The network of central district cooling is extended so it includes more customers.

Responsibility: VKAB

Schedule: Start 2012

Action F1Sc3

Växjö Energy tries bio-oil in one local district heating plant. These experiences are used to decide upon possible use in the other plants too.

Responsibility: VKAB

Schedule: Start 2012

Strategy D: Establishment of wind power

In the Greenest City in Europe there is a plan that points out areas designated for the establishing of wind turbines. There is a large potential for wind power in the municipality that can be used with the aim to contribute to increased production of renewable electric energy. Investments in wind turbines can also have positive development effects on the countryside.

Action F1Sd1

The City of Växjö keeps an active dialogue with companies and private persons concerning the possibility to invest in large-scale wind power according to the wind power plan.

Responsibility: The executive board

Schedule: Start 2012

Strategy E: The role of peat

In the Greenest City in Europe we consider peat as an energy source that contributes to the greenhouse effect. This consideration follows the position of the Swedish Nature Protection Agency, the Covenant of Mayors and The Intergovernmental Panel on Climate Change (IPCC).

Action F1Se1

The use of peat shall be minimised and then phased out by 2020.

Responsibility: VKAB

Schedule: Start 2012



Focus area 2: Energy efficiency

In the Greenest City in Europe the citizens live in energy efficient, smart dwellings and they make energy efficient choices while a high living standard is maintained. Through business and industry networks, the City of Växjö supports companies. This contributes to the fact that we have the greenest business and industry sector in Europe.

Strategy A: Energy efficient renovation of existing building stock

To reach the energy efficiency targets in the environmental programme, large-scale actions must be carried out in existing building stock, since it is here the largest part of energy in real estate sector is used. In the Greenest City in Europe we therefore strive to reduce energy use in our existing building stock.

Action F2Sa1

Before each larger renovation, municipally owned companies shall do a calculation to see whether the energy levels stated below are possible to reach. By 2015 these levels has been achieved for at least 50 per cent of the larger renovation projects. If the levels cannot be reached this should be explained during the annual follow up of the energy plan.

Dwellings: 75 kWh/m² and year (40 kWh/m² for electricity heated dwellings)
Premises: 70¹ kWh/m² and year (40 kWh/m² for electricity heated premises)
Responsibility: VKAB
Schedule: Start 2012

Action F2Sa2

The City of Växjö provides an active energy and climate counselling where citizens, companies, real estate owners, organisations and associations get access to advice and support when undertaking energy efficiency measures.
Responsibility: The executive board and the technical services board
Schedule: Start 2012

Action F2Sa3

The City of Växjö investigates how larger renovation projects of buildings, with the purpose of reducing energy use, more explicitly take life-cycle cost perspective into consideration.
Responsibility: The executive board and VKAB
Schedule: Start 2012

Action F2Sa4

Before larger renovation projects have begun, an analysis is done in order to find possible flexible solutions, such as joint use of several municipal functions.
Responsibility: The planning board, the executive board and VKAB
Schedule: Start 2012

Strategy B: Energy efficient new buildings

In the Greenest City in Europe we strive to be frontrunners when it comes to building energy efficient new buildings, as well as heating our real estates with renewable energy sources.

Action F2Sb1

The municipally owned companies only build dwellings with an energy use lower than 55 kWh/m² and year (30 kWh/m² for electricity heated dwellings).
Responsibility: VKAB
Schedule: Start 2012

Action F2Sb2

The municipally owned companies only build premises with an energy use lower than 50² kWh/m² and year (30 kWh/m² for electricity heated premises).
Responsibility: VKAB
Schedule: Start 2012

Action F2Sb3

The City of Växjö investigates how new building projects more explicitly can take life cycle cost perspective into consideration, with focus on energy use.
Responsibility: The executive board and VKAB
Schedule: Start 2012

Action F2Sb4

Before new building projects have begun, an analysis is done in order to find possible flexible solutions, such as joint use of several municipal functions or construction of multi-storey schools.
Responsibility: The planning board, the executive board and VKAB
Schedule: Start 2012

Strategy C: Changing behaviour

In the Greenest City in Europe we strive to reduce the energy use from the tenants and the users of premises.

Action F2Sc1

Individual metering of electricity and water in dwellings should be carried out and visualised where it is possible. Charging of electricity and heat is connected to actual consumption.
Responsibility: VKAB
Schedule: Start 2012

Action F2Sc2

An investigation is carried out considering how energy use in premises can be more accurately charged to the correct user within the municipal organisation. Economic incitement models that reinforce more energy efficient behaviour are developed.
Responsibility: VKAB
Schedule: Start 2012

¹ This does not include the highest supplement for hygiene airflow that is 30 kWh/m² and year.

² This does not include the highest supplement for hygiene airflow that is 30 kWh/m² and year.



Action F2Sc3

The City of Växjö carries out new energy saving campaigns based on previous positive experiences. Our aim is that these campaigns include a child and youth perspective.
Responsibility: The executive board and VKAB
Schedule: Start 2012

Strategy D: Optimised energy use

In the Greenest City in Europe we understand both the value of saving energy, and saving it at the right time. We strive to use the right kind of energy carrier for the right kind of purpose.

Action F2Sd1

The City of Växjö investigates potential development projects that aim to also support very energy efficient dwellings with central district

heating. This could include techniques for heat driven domestic appliances (dish and washing machines).

Responsibility: The executive board and VKAB
Schedule: Start 2012

Action F2Sd2

We strive to optimise the energy use in one of our new residential areas with smart grids. This can include smart solutions in the electric grid and/or central district heating grid.

Responsibility: The executive board and VKAB
Schedule: Start 2012

Focus area 3: Renewable vehicle fuel and energy efficient vehicles

In the Greenest City in Europe we use energy efficient vehicles that run on renewable fuels. Before year 2020 the construction of a larger local production unit for renewable vehicle fuels has started.

Strategy A: Increased access to renewable vehicle fuel

In the Greenest City in Europe the access to renewable vehicle fuel is natural and not an issue. The City of Växjö takes an active part to initiate and support projects that increase and enhance access on renewable vehicle fuels. This strategy includes both the production and distribution of renewable vehicle fuels.

Action F3Sa1

The possibility to build a production unit for renewable vehicle fuel at the combined heat and power plant is investigated.

Responsibility: VKAB

Schedule: 2012

Action F3Sa2

By working together with different organisations and participation in relevant projects, the City of Växjö contributes to the development of the biogas market within the region.

Responsibility: The technical services board

Schedule: Start 2012

Action F3Sa3

The City of Växjö contributes to improved infrastructure for renewable vehicle fuels and





charging possibilities for electric vehicles. All larger municipal workplaces offer employees possibility to charge electric vehicles.

Responsibility: The executive board, the technical services board and VKAB

Schedule: Start 2012

Strategy B: Increased share of environmentally friendly vehicles

The use of energy efficient and climate friendly vehicles is fundamental if the Greenest City in Europe shall become fossil fuel free. Therefore, we prioritise activities that increase the amount of vehicles run on renewable fuels or electricity.

Action F3Sb1

Citizens, companies, and employees within the municipal organisation are offered to try an electric vehicle during a short period, with the purpose to increase the interest for, and knowledge about electric vehicles.

Responsibility: The executive board and VKAB
Schedule: Start 2012

Action F3Sb2

Demonstration projects are carried out with the purpose of investigating the possibilities of using renewable fuels or electricity with municipally owned heavy vehicles, machinery, and public transportation.

Responsibility: The executive board, the technical services board and VKAB

Schedule: Start 2012

Action F3Sb3

In the procurement of vehicles, we steer towards energy efficient and climate friendly vehicles. A strategy for environmentally friendly vehicles is developed.

Responsibility: The executive board

Schedule: Start 2012

Focus area 4: Reliable and sufficient energy supply

In the Greenest City in Europe the supply of renewable vehicle fuels, electricity, and heat produced from renewable energy sources is sufficient, and the citizens can rely on the distribution.

Strategy A: Sufficient supply on renewable energy

The competition on renewable energy is increasing due to higher global demand. For the Greenest City in Europe this could mean a reduced availability of energy at the same time as the energy prices increase. By maintaining an efficient use of renewable energy in combination with increased local energy production, we reduce the risks of being affected negatively from an increased competition.

Action F4Sa1

A strategy describing sufficient delivery of heat, cooling, electricity, and vehicle fuels from renewable energy sources is presented.

Responsibility: The executive board

Schedule: Latest 2014

Strategy B: Reliable delivery of energy

In the Greenest City in Europe we ensure delivery of energy to customers.

Action F4Sb1

A strategy describing how Växjö Energy can maintain reliable delivery of heat, cooling, and electricity to their customers is presented.

Responsibility: VKAB

Schedule: Latest 2014

Action F4Sb2

Actions within the risk and vulnerability analysis, aiming to ensure a sufficient delivery of electricity and heat everywhere in Växjö, are carried out.

Responsibility: Concerned boards

Schedule: Start 2012



Focus area 5: Other energy and climate aspects

This section includes strategies and actions that do not fit under any of the other focus areas.

Strategy A: Energy efficient industry and business sector

In the Greenest City in Europe we also have the greenest industry and business sector. The business support office and Sustainable Småland play an important role for the achievement of this.

Action F5Sa1

Through company networks, the City of Växjö informs the business and industry sector about the energy services that Växjö Energy offers. Responsibility: The executive board and VKAB
Schedule: Start 2012

Action F5Sa2

The City of Växjö starts a project to focus on energy and climate within the municipal control of environmental hazardous industry. Within this work, the City of Växjö in cooperation with the Energy Agency for Southeast Sweden, identifies energy intensive companies and keeps a dialogue with these about possible energy efficient solutions. Responsibility: Environmental and public health board
Schedule: Start 2012

Action F5Sa3

A climate network consisting of different companies is started, which functions as an arena for sharing experiences and discussing energy and climate issues. Within this network, benchmarking in energy efficient buildings can be done between private and municipally owned real estate companies. An annual event for the companies, with energy and climate focus, is organised in Växjö. Responsibility: The executive board
Schedule: Start 2012

Strategy B: Fossil fuel free city administration

In the Greenest City in Europe the city administration serves as a good example when it comes to phasing out fossil fuels. As more operation units are carried out by entrepreneurs, it is of great importance that the City of Växjö influences these entrepreneurs by having strict energy and climate requirements within the procurement process.

Action F5Sb1

Every board presents a strategy describing how to phase out fossil fuels in their activities. Responsibility: All boards
Schedule: 2012

Action F5Sb2

The City of Växjö designs procurements in such a way that energy use and climate effects from entrepreneurs and services are minimised from a lifecycle perspective. Responsibility: VKAB, the technical services board and the executive board
Schedule: Start 2012

Strategy C: Increased possibilities for local energy and climate work

In the Greenest City in Europe we are well aware that the city administration alone cannot make all decisions necessary to reach our energy and climate goals. The City of Växjö therefore has a responsibility to support changes and create conditions for new projects. This can sometimes take place through external financing.

Action F5Sc1

The City of Växjö takes an active role in influencing national and international energy and climate politics.

Responsibility: The executive board

Schedule: Ongoing

Strategy D: Research and education

In the Greenest City in Europe we are frontrunners within the area of energy and climate protection. Close cooperation with the university and participation in development and research projects, are therefore fundamental. It is important that these ambitions are shared by all citizens in the municipality, making education efforts necessary elements.

Action F5Sd1

With a focus on citizens, employees, students and politicians, the City of Växjö carries out educations and campaigns about energy and climate issues.

Responsibility: Concerned boards

Schedule: Ongoing





The Greenest City in Europe

Executive Office
Strategic Planning

Box 1222
351 12 Växjö
phone +46 470-410 00
www.vaxjo.se

Photo: Mats Samuelsson, Sofia Ernerot, Hans Runesson