

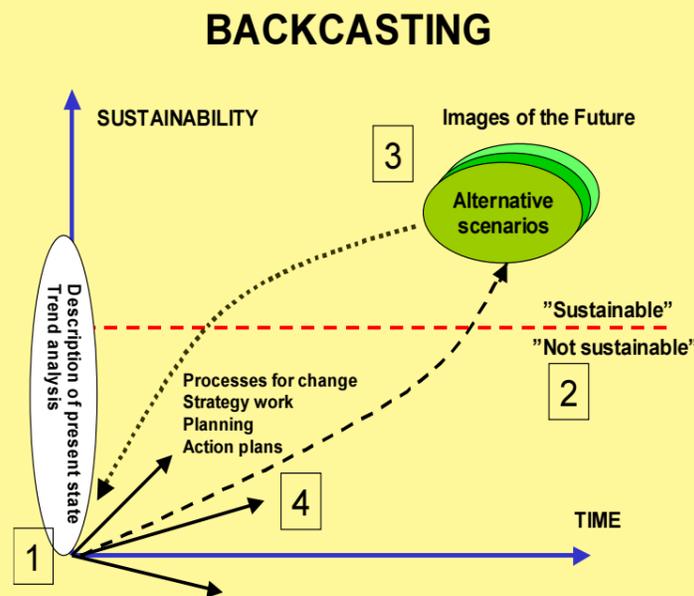
# Solar City Göteborg 2050

## Solstad Göteborg 2050

### Using visions and images of the future for strategic energy planning

The use of visions and images of the future can be an important tool for developing long-term strategies for the supply and use of energy. In the project GÖTEBORG 2050 we apply this tool to the Göteborg region. The project gives input into the energy planning process in the City of Göteborg.

The Solar City Göteborg 2050 vision has been developed in the spirit of a methodology called backcasting. In the backcasting method an analysis is made of the present state and trends in the energy sector and criteria for a sustainable energy system in a sustainable society are developed. Images of the future are developed and visualised, using workshops and other input. The visions are then compared to the present state and trends and are used for strategic planning, as an input to action plans and to speed up processes of change.



### The project GÖTEBORG 2050

This visionary project, aiming to speed up the development towards sustainability, is carried out in co-operation between the Chalmers University of Technology and Göteborg University, Göteborg Energi AB, and The City of Göteborg. Additional support is received from the Swedish National Energy Administration (STEM) and The Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas), Västra Götalandsregionen and Renova. The project coordinators are:

#### Hans Eek

Göteborg Energi AB  
Box 53

SE-401 20 Göteborg, Sweden

Tel: +46 (0) 31 62 69 50  
Fax: +46 (0) 31 62 68 85

#### Johan Swahn

Department of Physical Resource Theory  
Chalmers University of Technology and  
Göteborg University

SE-412 96 Göteborg, Sweden

Tel: +46 (0) 31 772 3130  
Fax +46 (0) 31 772 3150

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## Solstad Göteborg 2050

### Visions and Scenarios for Sustainable Energy in the Göteborg Region



**Sustainable Energy Systems:**

- Smart and efficient use of energy ✓
- Renewable energy supply ✓
- Changing life-styles and shifts in values ✓
- Energy efficient urban planning ✓
- Energy storage in a Hydrogen Society ✓

# Solar City Göteborg 2050

**Developing sustainable energy systems for a sustainable society.** During the coming decades the City of Göteborg and the surrounding regions will be actively working to develop a sustainable energy system. The tradition of working together is strong in the region. The energy of the city, its industry and its universities will achieve substantial results. The threat of climate change from the use of fossil fuels will be confronted with progressive strategic planning, active decision-making and strong action.

**Smart and efficient use of energy** is necessary in a sustainable energy system. The energy use per person in a sustainable Göteborg region will be half of that of today. Achieving this without loss of welfare is a challenge, but possible. Large-scale rapid implementation of the best technology, available today, will decrease the energy needed for heating, services, transportation and production.

**Renewable energy supply** will rapidly expand and by the year 2050 we will have come a long way towards only using energy from renewable sources; biomass, wind, hydropower, marine currents as well as solar electricity and heat.

**Changing life-styles and shifts in values** will give lower energy use. Decisions in our daily lives help to reduce energy use. We will buy food and products with an energy focus. To own a personal car will be out and we will join a car pool, for freedom and variation in car sizes. We will walk and bicycle more. And, what happened to the consumption society?

**Energy efficient urban planning** with a city and a region developed by concentration in nodes will allow the development of lively neighbourhoods and good public transportation. If work, services and leisure are closer to home, we can reach them by foot or bicycle.

**Energy storage in a Hydrogen Society.** In a global energy system relying on solar electricity and wind power for a major proportion of the energy supply there is a great need for energy storage. The reversible fuel cell makes hydrogen for storage when there is an excess of renewable electricity and makes electricity from hydrogen when needed. The hydrogen storage and fuel cells can be found on all levels, from large central plants to smaller plants in the neighbourhood and in houses. The mopeds, cars, buses and trucks all use fuel cells.

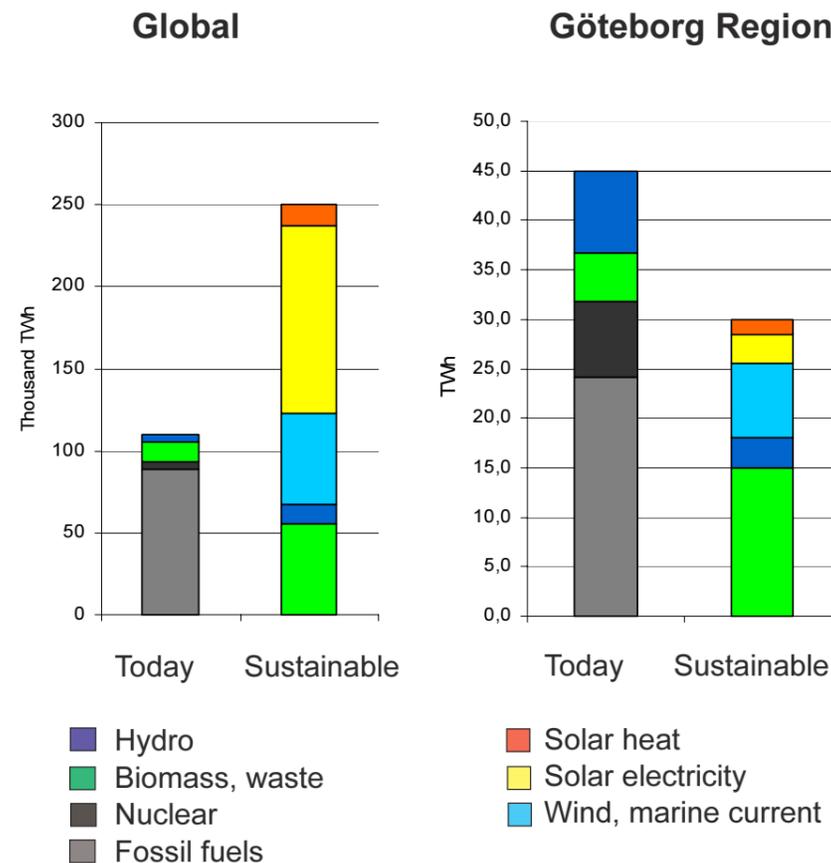


Energy efficient housing without conventional heating at Lindås, a suburb of Göteborg.



Solar cells on the Göteborg Energy AB office building.

## Sustainable Energy Scenarios



**Globally** the population increases from 6 to 10 billion people in a sustainable world in the future. An equitable energy use of 25 000 kWh per capita is assumed. This means that the global energy supply will be double that of today. This energy is supplied with renewable energy resources. A breakthrough in the use of solar electricity is assumed, as are the energy storage systems inherent in the Hydrogen Society.

**In the Göteborg region** the population increases from 850 000 to 1.2 million inhabitants in a future sustainable society. Each person uses 25 000 kWh which is half of that of today. This means that the region's energy supply is reduced by one-third. The energy will come from biomass, wind and marine current energy, solar electricity and hydro power. Solar heat will apply half the yearly hot water supply and some of the district heating.

## Renewable energy in Göteborg 2050

*Climb the hill up to Skansen Kronan and admire the view! Can you see the glimmering reflections in the roofs and facades of the buildings in Göteborg? Many old saddle-roofs have been converted into "solar attics" where the roof surfaces faces south are tiled with solar panels for hot water and solar cells that produce electricity. Smart windows with a semi-transparent solar cell coating let in light from the roof. The new attics are used as green-houses and meeting places.*

*Look towards the Skagerack Sea in the west! The harbour entrance is full of wind power plants and out at sea are large groups of larger wind power parks. The silhouette of the Vinga Light House with wind mills in the background is one of Göteborg's most popular picture postcards. In the archipelago the Wind Mill Wedding Island, which has a small but spectacular wedding hall placed on the cliffs, is popular as a site for sustainable marriages.*

*In the horizon we glimpse the impressive hydrogen harbour, with the huge storage and electricity generation plant. Closer up, west of the Älvsborg Bridge the woods have expanded and the old Rya Forest Reservation has grown in size and has spread towards the bridge. It is a popular recreational area.*

*The old fossil fuel refineries on the north bank of the river west of Rya Skog are but a memory. The biomass energy and material combine has taken its place to produce electricity, hydrogen, heat, fertilisers and paper. And sniff the air! The wind brings no bad smell as in the fossil past!*

## visions in words

### Winter efficiency in daily life

*It is minus 16 degrees Celcius and a beautiful winter night. The houses around us are built or renovated to have minute energy losses. With low-loss windows and heat recovery in the ventilation and sewage systems, the heat from the inhabitants and appliances are enough to keep warm inside. Look! There are open windows in the flat where the party music seeps out. The guests, the mulled wine and the many lit candles made it too hot.*

*The next morning as we bike along to work on winter tires we pass our "home square" where we can get most of our daily activities done. The local bicycle shop for the monthly bike safety check-up is just opening. We reach the weather-protected high-speed bike path to the city. Only the fuel-cell mopeds are faster.*

*It is the weekly meeting day at the city office. As we sit around the Göteborg video meeting table, the offices in Milano and Freiburg join us. We work on the interior design and functions of the new high-speed recreational train that will run from Berlin to Beijing. It is time for lunch! We leave the office building for the Swahili restaurant in the square around the corner. As we sit down outside to eat, the snow starts falling on the well-insulated glassed roof.*