POLIS
Identification and mobilisation of Solar POtentials via Local strategies

Intelligent Energy Europe

Solar urban planning

The National state of the art in Sweden

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INDICE

1. Political, Legal and economic framework

1.1. Describe the National policy in force regarding energy and renewable energy technologies.

Long-term measures
In June 2006, the Parliament set the target that specific energy use in residential buildings and commercial premises should be reduced by one fifth by 2020, further reducing to half of present day levels by 2050. In addition, by 2020, the dependence of the built environment on fossil fuels for energy supplies should be broken.

The electricity certificate system was introduced in 2003, with the objective of increasing the use of electricity from renewable sources by 17 TWh between 2002 and 2016. The planning objective for wind power production includes a requirement that local authorities must have agreed plans for 10 TWh of wind power production by 2015.
In addition, the 2002 Energy Policy Decision also includes measures to improve the efficiency of energy use, such as energy advisory services, technology procurement projects and the market introduction of energy efficient technology.
A special conversion grant, available from 2006 until 2010, was introduced in the beginning of 2006 in order to reduce the use of oil and electricity for heating purposes in residential buildings and certain commercial premises. The grant is available for conversions to district heating, biofuel fired heating systems, heat pumps or solar heating. However, grants for conversion away from oil were withdrawn from the beginning of 2007, because all funding had been used up. Until the end of 2008, owners of public premises could apply for grants for conversion and energy efficiency improvement measures.

Investment grants of 70% for installation of PV for use by public premises was available between 2005 and 2008. In June 2009 a scheme including all buildings was started with a grant for 60% of the investment. A grant for solar heating in commercial premises and detached houses is also available until the end of 2010.

The previous tax reduction concession for the installation of biofuel fired heating systems and higher performance
windows in new detached houses has been replaced by a corresponding grant, which was available until the end of 2008. A cash subsidy of SEK 10 000 has also been available from April 2007 to private buyers of new low-environmental-impact cars.

On the political level, current policy is still that nuclear power production shall be phased out, but no specific date has been set.

As part of this strategy, Parliament has set a Swedish objective for greenhouse gas emission reductions that goes beyond its agreed allocation under the EU Burden Sharing Agreement. Under the terms of the EU allocation, which is legally binding, Sweden's emissions over the period 2008–2012 may not exceed 104 % of its emissions in 1990. Sweden has gone further and, as its target, has elected that its greenhouse gas emissions shall not exceed 96 % of 1990 emissions (i.e. an actual reduction of 4 % in its emissions), achieving this without compensation for uptake in carbon sinks (uptake of greenhouse gases in vegetation and the ground), or by using flexible mechanisms. This objective was confirmed by Parliament in 2006.

1.2. National thermal building energy certification or building regulations.

The actual building regulation (BBR) was taken in 2006 and has the overall requirement: Buildings shall be designed in such a way that energy consumption is limited by low heat losses, low cooling demands, efficient use of heat and cooling and efficient use of electricity.

Dwellings shall be designed so that the specific energy consumption of the building does not exceed 110 kWh per m^2 of floor area (Atemp) per year in the Southern climate zone, and 130 kWh per m^2 of floor area ((Atemp) per year in the Northern climate zone. For single and two-dwelling houses with direct electrical heating as the main source of heating, the specific energy consumption of the building must not exceed 75 kWh per m^2 of floor area (Atemp) per year in the Southern climate zone and 95 kWh per m2 of floor area (Atemp) per year in the Northern climate zone. *(BFS 2006:12).* Household electricity is not included in the specific energy consumption of the building.

The maximum average heat transfer coefficient (Um) must not exceed 0.50 W/ m^2 K for parts included in the building envelope (Aom).

The requirements in should be verified partly by calculating the predicted specific energy consumption of the building and average heat transfer coefficient at the designing stage, partly by measuring specific energy consumption in the finished building.

Non-residential premises shall be designed so that the specific energy consumption of the building does not exceed 100 kWh per m^2 of floor area (Atemp) per year in the Southern climate zone, and 120 kWh per m^2 of floor area (Atemp) per year in the Northern climate zone. For premises with a flow of external air above 0.35 l/s, m^2 an addition may be made corresponding to 70(q-0.35) kWh per m^2 of floor area (Atemp) per year in the Southern climate zone and 90(q-0.35) kWh per m^2 of floor area (Atemp) per year in the Northern climate zone, where q is the average flow of external air
during the entire heating season (l/s, m^2). *(BFS 2006:12)* Operational electricity is not included in the specific energy consumption of the building.

The maximum average heat transfer coefficient (Um) must not exceed 0.70 W/ m^2 K for parts included in the building envelope (Aom).

1.3. Existing national renewable/solar thermal/solar photovoltaic ordinances.

No existing ordinances.
Building permission might be necessary, depending on community and plan conditions for the actual real estate.

1.4. Describe the available subsidies at national level to solar technologies adoption.

Investment subsidy for solar thermal collectors. The actual scheme started in January 2009 and will continue to 2013. The subsidy can be applied for all glazed collectors with a liquid heat carrier and is

based on the expected heat production. Maximum 7500 SEK/single family dwelling or 3 million SEK /project is possible to apply for and 2,50 SEK/produced yearly kWh is paid.

Investment grants of 70% for installation of PV for use by public premises was available between 2005 and 2008. In June 2009 a scheme including all buildings was started with a grant for 60% of the investment. Maximum subsidy is 2 million SEK/plant (about 200 000€) and the total amount is 50 million SEK per year during 2009, 2010 and 2011. The amount for 2009 was very quickly reserved, mainly from projects that did not receive funds for the previous grants, the public buildings. A minor part was for dwellings.

1.5. Financing mechanisms to solar technologies adoption.

Mainly the investment subsidies for solar thermal and PV.

There is a scheme for green certificates for electricity production from renewables, but the costs for the mandatory hourly measurements and reporting are so high so in practice only a few PV-plants has got this certificate. During the year 2003-2008 the green certificates for PV was totally corresponding to 43 000 SEK compared to the 15 000 million SEK for hydropower, biomass and vindenergy. (0.0003%).
Taxes on electricity and fuels.

1.6. National barriers hindering solar technologies adoption.

For solar thermal: For existing dwellings – knowledge, lack of information, lack of installers, costs – but this is connected to method of economical calculations. Special for multifamily dwellings is the high rate of district heating with often has low prices in the summer or summer production from waste heat. In new multi-family dwellings there is often one constructer and another part is operating the building, which often gives a low investment cost and a high operating cost.
For PV: Costs

2. Technical Framework

2.1. Existing standards for solar systems and components.

In order to get the investment subsidy for solar thermal the solar collector has to be tested and approved by SP, the Technical Research Institute of Sweden. The standard for testing is EN 12975 and the collectors may be tested in other institutes.

2.2. Certification and other quality systems for solar systems products.

SP gives a P-mark for solar collectors in Sweden since 1990. In 2001 revisions were made in order to harmonize for the European market. SP can also give the Solar Keymark certificate.
The certification rules set out the requirements for P-marking and Keymark of thermal solar collectors. The emphasis is on production control of quality in the factory (for prefabricated

collectors) and at the building site (for site-built collectors). It also includes requirements relating to thermal performance, reliability, durability, material quality and other factors.
Responsibility for quality control rests mainly with the manufacturer. In turn, the standard of the manufacturer's own internal quality control is checked by inspections carried out by SP, both in the factory and at the building site. The purpose of quality control is to ensure that the performance and materials of all products are in accordance with existing design and performance specifications, manufacturing drawings and other documents.

2.3. Existing certification schemes for solar systems installers and planners.

No available schemes. There are courses for installers to get a certificate for installing solar collectors but this is not mandatory yet. For PV normal certificates for working with electricity is applied.

2.4. Are there R&D Centres working in solar technologies in your country? Please specify which and their working field. How is their interaction with the national solar market? Can they impulse the national solar market?

SP, the Technical Research Institute of Sweden for testing and certification (as above).
Research and Education in several Universities:
Solar Energy Research Centre in Högskolan Dalarna, Borlänge, Different research projects, combination with biomass, simulations
Energy and Building Design, and Building Physics in Lund University, outdoor laboratory with solar collectors, indoor testing with artificial solar irradiance with direct beam, energy-efficient buildings, combination with heat pumps
Chalmers, Technical University in Göteborg
KTH, Royal Technical University in Stockholm
Vattenfall Utveckling

Svensk Solenergi - Solar Energy Association of Sweden (SEAS) – the national organisation with more than 50 professional members representing Swedish industry, as well as Swedish research institutes. The following activities is included:

Calls on authorities in order to improve the conditions for solar energy in Sweden.

Develops **information material** for the public and decision-makers, etc.,

Awards annually a **Solar Energy Award** (Solenergipriset) for an exemplary plant and an exceptional contribution to the development of solar energy in Sweden.

Organises **meetings for the solar industry** in order to discuss common activities,

Collects branch **statistics** together with SP,

Organises **research seminars** together with the Swedish Energy Agency et al in order to facilitate the exchange of knowledge between researchers and the industry,

Stimulates **enhanced knowledge of installers** and other professionals in co-operation with member companies and SP,

Supports product quality via **Solar Keymark** – voluntary EU-certification – took early part in the definition of the requirements for **P-labelling** of collectors (a Swedish concept for quality labelling) together with SP,

Is member of **Swedish Standards Institute** (SIS), that administrates standardization work within ISO och CEN,

Is member of the **European Solar Thermal Industry Federation** (ESTIF) – www.estif.org,

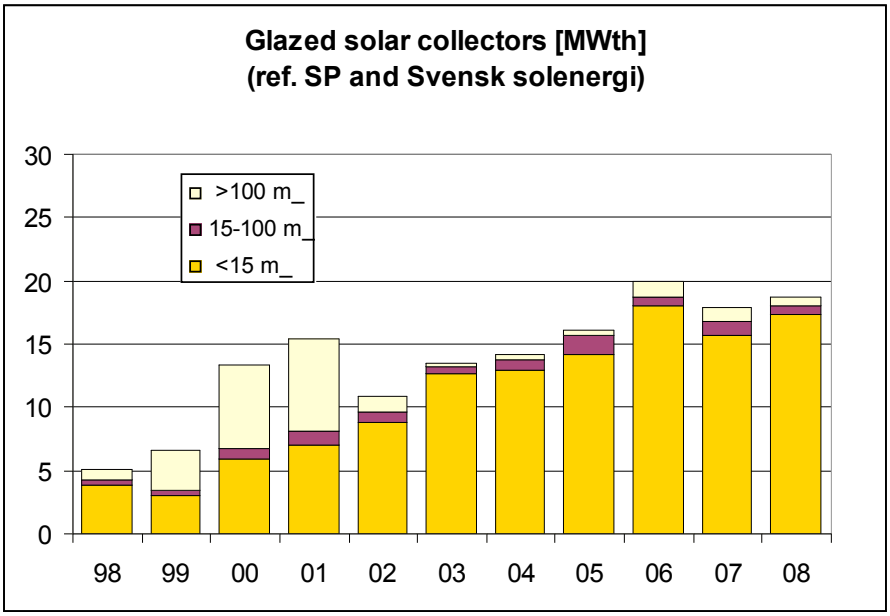
Is associated member of the **European Photovoltaic Industry Association** (EPIA) – www.epia.org,

Is **Swedish section** of the **International Solar Energy Society** (ISES) – www.ises.org,

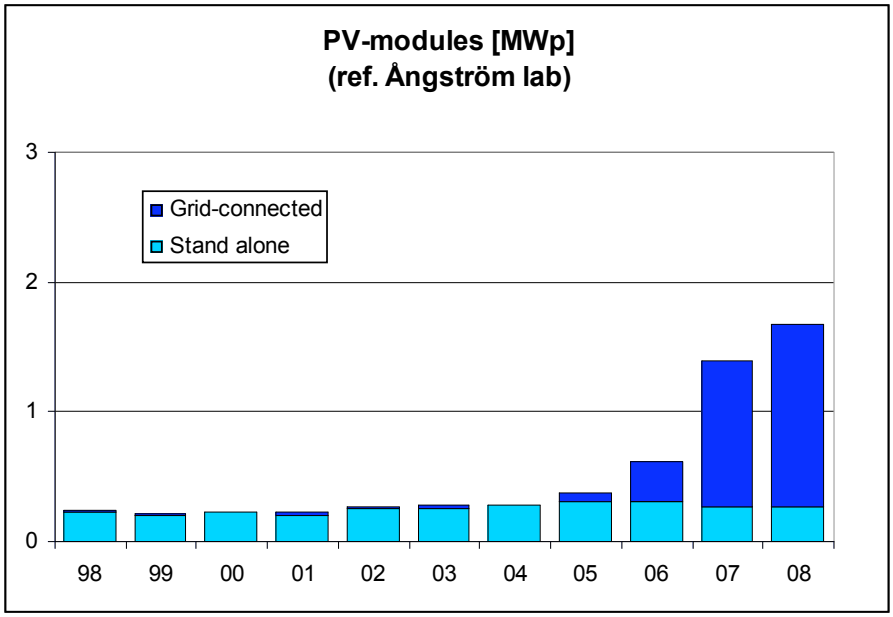
Has about 100 individual members and provides **Energimagasinet** as a news magazine for all members.

3. Solar Market and Potential

3.1. Installed solar (thermal/photovoltaic) capacity at national level.



Yearly installed glazed solar collectors in MW_{th} (Statistics based on m^2 aperture area: 1 m^2 = 0.7 kW IEA SHC et al)



Yearly installed PV in Sweden in MW_p.

3.2. Effective contribution of solar energy (thermal/photovoltaic) for the national energy mix.

All figures is for 2007 if nothing else is written.
Total energy supply in Sweden 624 TWh
Total final use in Sweden 404 TWh
Total final in residential and service sector 143 TWh
Electricity use in residential and service sector 70 TWh
Solar collectors installed 230 MW_{th} (2008) (according to IEA calculations)
Solar heat 0,01% of total energy supply
Solar electricity 1 GWh (2009) = 0,0014% of electricity use in residential and service sector
Solar electricity 0,00016% of total energy supply

3.3. Technical/economical potential at national level (thermal/photovoltaic).

Technical potential for kombi-systems with 10 m^2 solar thermal collectors on single family dwellings and 4 m^2 solar collector/flat in multifamily dwellings (including a minor part on public buildings and industry) and the solar collectors on the roofs without seasonal storage: 12 TWh/year.
Economical potential is much less, but a starting point may be solar collectors on all new constructions and a small part of the existing. The development to 2020 if the conditions are not changed points to the installation of 680 MWth or 0.33 TWh/year. If the development may be pushed in different forms the potential may be 4100 MWth or 2 TWh/year.

The technical potential for PV is 5 TWh/year if the capacity of storing water in reservoirs for hydropower is taken into account. If only the available areas on roofs are considered, the potential is 60 TWh/year (with the efficiency of the PV-system 15%) and calculating the areas

on the roofs which are at least gaining 70% of the maximum irradiation. If taking the land area into account – there is a lot of area in Sweden – but the available area is mainly in the north with e dense population and less irradiation. The economical potential is given by the subsidy as the price of electricity is not high in Sweden.

3.4. Percentage of energy demand to be covered if such capacity would be reached (thermal/photovoltaic).

Thermal: 2-12 TWh/ 143 TWh in building and service sector = 1-8% or 2-12/624 = 0,3 - 2% of total supply
Electrical: 5-60 TWh/ 143 TWh in the building and service sector = 3 – 42% or 5-60/ 624 = 1-10% of total supply

3.5. Are there renewable technologies which are widely diffused in your country and that can therefore contribute in a renewable obligation?

Hydropower 67,5 TWh/year
Windpower 1,4 TWh (2007)
Biofuels 70 TWh (2007)
Share of renewable of total energy use: 44% (2007)

4. Stakeholders

4.1. Which are the stakeholders involved in promoting solar urban planning and what is their attitude towards renewables obligation (e.g. are building companies used to renewables)?

A new interest is growing fast in Sweden regarding passive houses, with or without solar thermal collectors. Building companies are interested and they also might include solar collectors.

4.2. Which networks are available to promote and disseminate solar urban planning?

Solar City Malmö/Solar Region Skåne
Sunrise in the West (Soluppgång väst)
Ekocentrum
Energy advisers in communities (Energirådgivare)
Solar Energy Association of Sweden (see above)