

# Non-cost barriers to renewable – *AEON* study

National report Sweden

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# Introduction

Climate issues are a top priority of the Swedish Government's environmental work. If emissions of carbon dioxide and other greenhouse gases are not curbed there will be serious repercussions. Work is being stepped up in both the UN and the EU to reduce emissions and achieve the climate goals that have been set. In Sweden, the Government is investing almost five billion Swedish Kronor in reducing climate impact and adaptation to climate change between 2009 and 2011.

The EU is a platform for Swedish climate policy, and Sweden will make its contribution to achieving the EU's ambitious climate targets. Sweden, like the other Member States, will reduce emissions, increase the efficiency of energy use and increase the proportion of renewable energy. Both the targets and measures are based on scientific findings on the climate change problem. In order to meet the EU targets and maintain a leading role in climate and energy conversion, the Government is implementing a package of measures in the area of climate and energy.

## **Current status of renewable energies**

In Sweden as in most other countries there has been a considerable expansion of renewable energy production within the last years. Sweden has a long history of renewable energy, being a country rich with natural resources such as hydro power and large forests as supply for bio energy. During the few last decades a focused expansion and development of district heating has occurred achieved through burning waste and bio fuel replacing traditional methods of heating from oil and electricity. Geothermal heating and heat exchangers in residential homes has also become very popular. The use and collection of landfill gas is also expanding.

As this report is being written the establishment of wind power is strongly expanding towards the governmental and energy agency target of 30 TWh produced Wind power by 2020.

Solar and wave power is limited in Sweden although research and development is being done at several research institutes and universities.

In general the Swedish inhabitants are considered engaged and interested in environmental development, the climate and energy issues are well known and accepted as part of the everyday life.



Apart from rather general considerations (long lead times, complicated legal procedures) the discussion with a number of stakeholders showed that most of the barriers are quite technology specific. For this reason, after a short introduction of general issues, the barriers are described by technology.

# 1 Issue 1 Administrative Procedures

## 1.1 Introduction

The Swedish authorities and the applicable legislation are transparent with a demand of public insight and influence.

According to the historical development within the renewable area, Sweden has been a country rich in natural resources, such as hydro power and biomass. The historical legislation was designed to facilitate the exploitation of these resources and bring a poor country in to the industrial development.

Sweden has also been a country with a strong and independent peasantry, having access to both woods, land and water assets. This lives on in Sweden in “Allemansrätten”, giving the right for anybody to access private land. This is a value Swedish people take for granted and it reflects the public’s interest when new areas are to be exploited. Therefore there is a legal demand for openness and public influence. The Swedish system gives the inhabitants a more extensive influence on the development than what is common in EU.

The general opinion is that the system is good for the Swedish society but has caused problems when new techniques or plants are established since the public has the possibility to appeal different permits on different levels within the same project.

There are different governmental bodies testing different areas according to new facilities, with sometimes different demands for investigations and sometimes with demand for the same information that can be reused, but consultation processes and the administrative processes handled by different administrative officers makes the process time-consuming.

The legislation is divided into several parts, environmental, planning and building, hazardous or explosives, grid and electricity etc. Each legislation requires a separate permit. Depending on the shape of the planned activity the amount of permits may vary. The different legislations are handled by different authorities from local to governmental. If the planned activity is located to an area of ecological protection or near the coast or a lake, there is also demand for exemptions.

In order to facilitate the administrative procedures for RES installations the following suggestions have been identified:

- Coordinate the permitting procedure when possible
- Put a maximum time limit for the administrative procedure
- Diminish the number of possibilities to appeal
- Reduce the possibility to appeal
- If possible, accept running several permitting processes parallel instead of in a row
- If a region or localization has been pointed out by the government for a national purpose, the governmental decision should be superior regional and local opinions.
- Stop the municipality veto in wind power establishment
- Remove demand for permit for smaller installations
- Coordinate the administrative procedures for smaller installations

According to the environmental issues, the Swedish environmental code is the foundation in almost all RES projects.

#### 1.1.1 Applicable legislation in the RES field

Act no. 2003/113	Lag (2003:113) om elcertifikat
Regulation no. 2003:120	Förordning (2003:120) om elcertifikat
Act no. 1994/1776	Lag (1994:1776) om skatt på energi
Regulation no. 2003:564	Förordning (2003:564) om bidrag till åtgärder för en effektiv och miljöanpassad energiförsörjning
Regulation no. 2007:160	Förordning (2007:160) om stöd till planeringsinsatser för vindkraft
Act no. 1984/1052	Lag (1984:1052) om statlig fastighetsskatt
Act no. 2006/2	Lag (2006:2) om fastighetsskatt avseende vissa elproduktionsenheter vid 2007-2011 års taxeringar
Electricity Act	Ellag (1997:857)
Regulation no. 2009:689	Förordning (2009:689) om statligt stöd till solceller
Environmental Code (1998:808)	Miljöbalken
Housing and planning act	Plan och bygglagen
Act no 1988/868	Lag om brandfarliga och explosive varor.

#### **Bodies of major concern in the RES field:**

- The Ministry of sustainable Development
- The Swedish Environmental Protection Agency
- The Swedish Chemicals Inspectorate
- The National Board of Housing, Building and Planning
- Swedish Civil Contingencies Agency
- The National Board of Forestry
- The Swedish National Heritage Board
- The Swedish Energy Agency

- The Environmental Objectives Council
- The County Administrative Boards (21 CABs)

**Other public authorities with specific tasks related to environmental protection:**

- The National Food Administration
- The Geological Survey of Sweden
- The National Board of Health and Welfare
- The Swedish Board of Agriculture
- The Swedish Business Development Agency (NUTEK)
- The Swedish Consumer Agency
- The Swedish Meteorological and Hydrological Institute (SMHI)
- The Swedish Nuclear Power Inspectorate (SKI)
- The Swedish Parliamentary
- The Swedish Radiation Protection Agency (SSI)
- The Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (FORMAS)
- The Swedish Environmental Technology Council (SWENTECH)

**Other non-governmental environmental organizations**

- The Foundation for strategic Environmental Research (MISTRA)
- Friends of the Earth Sweden
- Greenpeace Nordic
- Swedish Society for Nature Conservation, SNF
- WWF Sweden
- The Swedish Association of Environmental Managers, NMC

## 1.2 Description of barriers & solutions

### 1.2.1 Detailed description of the Barriers and solutions

*Barrier 1 – Inefficient general administrative procedures (including no/insufficient specific rules for building integrated/small scale RES installations)*

**Regarding RES technologies in general the following barriers were identified:**

- Lead times are perceived as too long. There are no quantified deadlines for authorisation of projects, meaning that the permitting procedures can last for several years without the applicant having a possibility to influence the process;
- The principle of expedition of proceedings, which specifies that administrative proceedings should take place swiftly and without wilful delay;
- The need of several applications and permitting processes parallel;
- No possibility for a one-stop shop for large installations. This makes the procedure slow and complex including applications and testing at different legal levels;
- Several possibilities to appeal lead to long and expensive delays;
- Expansions of national interest are treated equally with regional and local interests. This leads to long administrative processes; and

- The administrative process is difficult, costly and complex for smaller facilities. The delays that often occur during the permitting procedures can lead to economical failure for the project before it even started.

#### **Possible solutions:**

- If possible avoid several or parallel consultation processes as well as several referrals for consideration processes with authorities;
- Put a time limit on the application process; and
- Concerning grid systems, transmitting and piping systems etc with many stakeholders and authorities involved, use the same principles as are applicable in the road and railway building process. If the Government decides that a grid or gas tube should be built, sub authorities and local and regional interests should be subordinate and the administrative process focused on the main issues and number of permits reduced and co-ordinated; and
- One-stop shopping for smaller technologies  
On-stop shop is possible for some smaller technologies, as long as no authorisation is required at all. Most of the larger installations (for example wind farms, biomass and biogas plants) are subject to the authorisation procedures according to the Swedish Environmental Code.

This procedure is considered as rather complex, but once a permit is given under the Code, the permit has no time limit. However there is often a need for an application for both planning and building. If the activity includes activities in a water area, the water activity has to be tested at the environmental court etc.

#### **Regarding biomass installations**

##### **The main barriers identified:**

- Biomass installations need many different licenses from numerous different authorities. To build and run a new biomass plant the company need an environmental permit according to the Environmental code. The application can be handled by the County Board or by the environmental Court. The legal processes have a general turnaround time of 12-15 month. They will also need a building permit according to the Building and Planning Act, authorized by the local authorities. Both permits can be appealed. If the activity might be a hazard from handling inflammables or explosives a permit is required from the civil contingencies agency.

These procedures are the same everywhere in Sweden and are quite time consuming. As a consequence, the installation of a small system can be more complicated than a larger one;

- A difficulty to fulfil both Swedish and EG legislation since they are not coordinated (Svebio, Lena Dahlman) Most EG legislation is rapidly amalgamated in to the Swedish legislation, but for people in general it can be difficult to find applicable legislation, and in Sweden the applicant is responsible for fulfilling and be aware of all legal framework embracing their activity .
- The lack of knowledge and experience in regard to administration results in disproportionate administrative requirements and decisions; and

- More research to expand this barrier is foreseen.

#### **Possible solutions:**

- facilitate the administrative procedures for smaller installations and diminish the number of permits required.
- Coordinate EG and Swedish legislation to work as one instead of parallel.

#### **Regarding gas tube installation for bio gas installations**

Gas tube installations are performed by the state owned Swedegas, part of Svenska Kraftnät.

#### **The main barriers identified:**

- The administrative process is complex, takes several years, 2-5, 6 or more and is expensive, 50 000 -500 000 EUR;
- The procedures when there are existing pipes are in general very good. When there is need for installation of new gas pipes, the installation process usually takes several years and is considered very expensive since there is need for acquisition or agreement with landowners, need of an environmental permit and Environmental and social impact assessment, perhaps a new building plan, according to the Building and Planning act, permit for installation for flammable gas, applications for exemptions if ecologically protected areas are affected, verdict according to water activity at the environmental court if ground- or surface water is affected. This makes additional gas pipes and installations for new production plants difficult and may delay the installation;
- The use and expansion for bio gas is dependent on the political climate and public interest. There are few actors on the Swedish market which also make it vulnerable for political and economical variations;
- When building new or connection gas tubes for new production technologies, the administrative process is affecting many actors, at most eight different authorities and many landowners, often as many as 50 per 10 kilometres; and
- Stakeholders in Sweden have a wider possibility to affect the process and expansion than in EU in general. This sometimes leads to longer administrative processes than in EU in general (Swedegas, Anders Hellström).

#### **Possible Solution:**

- Coordinate the different permitting processes, giving the overall picture with focus on predicted main issues and one referral for consideration to the authorities concerned;
- Diminish the number of stakeholders with possibility to appeal, or initiate demand of leave to appeal; and
- Initiate a time limit for the administrative process.

This harmonization would allow for more clarity and would reduce the amount of administrative steps that have to be taken during the authorization procedure of smaller installations.

A centralisation of the process would cause that less administrative clerks would deal with the applications and processes in regard to installations. The gain in experience will also accelerate the procedures (Swedegas, Anders Hellström).

### **Regarding Bio gas production**

Biogas production in Sweden comes mainly from water treatment plants by sludge digestion and from landfill gasification. In 2006 1,2 TWh biogas was produced at 223 biogas plants. There are 14 sites with co-digestion plants, in connection to the municipality waste treatment plant. The wastes that are digested in these facilities are domestic refuse, slaughter house waste and manure.

Theoretically Sweden has an ability to produce 17 TWh biogas each year. Farming has a potential to stand for approximately 80 per cent (14 TWh) of the total potential. In 2008 the total biogas production had increased to 1,4 TWh biogas from 227 digestion facilities. The produced energy correspond to 154 million liters of petrol, which is enough for 130 000 cars with an annual driving distance of 15 000 kilometers a year according to a petrol consumption of 0.8 l per 10 km ([www.biogasportalen.se](http://www.biogasportalen.se)).

#### **Main barriers identified**

- The building and production of biogas plant requires three different permits from three different authorities (environmental permit, planning and building permit and permit for handling inflammable and explosive goods, source S-EPA, Swedish civil contingencies Agency). Today there is no authority that can be considered superior in the total building and installation process, Biogasportalen.
- Notification or permitting procedure take a long time and requires monitoring and investigation that is both time consuming and expensive for the investor.

#### **Possible solutions:**

- Make it possible to make an overall permitting procedure that includes both environmental, inflammable and building regulations and conditions.

### **Regarding on-shore wind power installations**

#### **The main barriers identified:**

- Installations may require both an environmental permit and authorisation according to the planning and building act;
- The local authorities can interpose their veto, meaning that the location of a proposed wind farm or turbine has to be recommended by the local authorities. If not, the establishment is inhibited;
- There are often a large number of stakeholders and landowners concerned with possibility to appeal;
- The local and regional authorities have different attitude and knowledge about both technical issues and impact on the area, since there sometimes is a lack in knowledge from the behalf of the municipality. This lead to unjust and uncertain possibility to establish in different areas;
- Administrative barriers can also be political. Local authorities sometimes put up restrictions for establishment of wind power in their general municipality plan, or

- put up a wind power policy that regulates in detail the approved size, location, performance etc;
- In worst case up to seven different permits might be required.(permit according to the Building and planning Act, Environmental permit, Permit according to the electricity act, the cultural heritage act, connection to the grid, exemption for entering protected areas according to the environmental Code, if water is affected, permit according to water activities, Vindlov.se)
- Requirements for an alternative localisation study according to the environmental code is not applicable but demanding in all environmentally hazardous activities,
- Requirement of an economic security before installation can be made.
- The Swedish air force have the right to deny access to an area without any further specification (Svensk vindenergi); and
- Wind power and hydro power are working together in Sweden, meaning that when wind power increase hydro power will decrease. Today most of the hydro power installations have old permits that need to be renewed to meet up new demands. Unfortunately the new hydro power permits are put up with harder conditions for regulation then earlier, which lead to an administrative process at the environmental court, approximately 12- 15 months, and to more limited conditions for the water regulation process. Wind power expansion plans and hydro power regulations and permitting are not harmonized today. This may lead to problems in the electricity distribution in the near future (Svenska Kraftnät, Bo Krans and Ulrika Sigerud).

### **Complexity of process**

The environmental Code regulates the installation of on-shore wind power. On the 1<sup>st</sup> of August 2009 there was a change in the handling of wind power installations. Earlier wind power installations required both an environmental permit and authorisation according to the planning and building act. (PBA). Today the authorisation due to the PBA is not necessary if the installation requires an environmental permit if the installation is not in an area of competing interests. This has reduced the number of appeals and reduced the legal timeframe.

The Swedish Environmental Code states that the local authority has to recommend the applied wind power installation. If not they cannot obtain a permit.

Wind power regulations hinder in some administrative procedures: The county administrative board prescribe particularly restrictive minimum distances and height restrictions. These requirements are limiting the economic effectiveness of the wind systems and are not justified from the point of preventing hazards. The regulations are not legally binding, but regarded as a recommendation for the administration and have therefore strong practical impact. This obstacle has been described frequently and seems to be one of the main barriers for the expansion of on-shore wind power installations (WPD Scandinavia, Hans Ohlsson).

All installations and environmentally hazardous plants require an economic security that is administrated by the county administrative board. The economic security is a fund used in the event that the company goes into liquidation and the land has to be investigated and



restored (Golder Associates, Maria Gelin, former Senior Administrative Officer at the County Administrative Board).

**Possible Solution:**

- Establishment of wind power should be made from best production areas. These areas should be prioritised to other local or regional interests.
- Diminish the number of stakeholders with possibility to appeal.
- Introduce a time limit for administrative procedures (WPD Scandinavia, Hans Ohlsson)
- Remove a legal demand of alternative location since alternative locations with a comparable production capacity is attractive for another wind farm and is not an option to reject (Svensk Vindenergi, Mattias Rapp)

**Regarding off-shore wind power installations**

The administrative procedures in establishing off-shore are mainly the same as for on-shore, just extended in every direction (WPD Scandinavia, Hans Ohlsson).

**Main barriers identified:**

- The permitting process is often twice as long as on-shore wind power;
- For the grid connection another process is needed; and
- Requires an increasing number of permits compared to on-shore.
- Demand for alternative localisation study

**Possible solutions:**

- The process and issues are the same as for on-shore wind power. Facilitate the administrative procedures and diminish the number of consultations and referrals required.
- investigate to possibility to use a one (or two) stop-shop principle and make an overall permitting procedure (WPD Scandinavia, Hans Ohlsson)
- Remove legal demands of alternative location since alternative locations with a comparable production capacity is attractive for another wind farm and is not an option to reject (Svensk Vindenergi, Mattias Rapp)

**Regarding geothermal heat pumps**

In Sweden shallow geothermal heat pumps are quite common in new houses and when replacing old oil boilers. The investment is in general 10 000-15 000 EUR and is paid within 10 years. The converting from direct electricity heating to geo-or soil thermal heating is connected with a subscription. (<http://www.bergvarme.energi-och-el.se/> , [www.energimyndigheten.se](http://www.energimyndigheten.se))

**The following main barriers have been identified:**

- The authorisation procedures (application, technical specifications etc) for private persons brings with it huge efforts in order to collect all necessary information on authorisation procedures;

- Authorisation procedures are complicated and time-consuming for small systems. Reasons for this are for example the transfer of the applications from authority to authority, cross checking of different authorities or time consuming exploratory enquiries in advance; and
- Authorisation procedures tend to be very expensive, due to irregular and high charges, exaggerated and expensive requirements as for example requirements for geological monitoring of drilling activities or requirements asking for specific materials and techniques for drilling or exaggerated regulations even in cases where drinking water protection is not an issue.

**Possible solutions:**

- Easier procedures for small systems for one-/two-family houses, probably in the form of a “one-stop-shop” for ground source heat pumps
- The requirements should be verified regarding their relevance and loosened if considered exaggerated.

**Regarding hydro installations the following barriers were identified:**

- There are no simplified procedures for smaller hydro installations in the authorization process.
- All water activities within the hydropower area are connected with demand of verdict by the environmental court. The legal process is time consuming and is bound up with both an administrative fee for the process at court and a fee set in accordance with the applied energy production.
- The monitoring, investigations etc are costly and time consuming

**Possible Solution:**

- A possible solution would be to reduce the administrative requirements for small hydro installations. The evaluation of the impact on environment goes beyond the scope of the present study.
- Reduce costs for administrative procedures

**Solar**

Solar energy is still on a research level in Sweden and has no possibility to exist without economical contribution. Since 2005 Sweden has doubled the installed solar effect due to the investment support for public buildings. Since 2009 companies and private persons can apply for economic subscription up to 60 % of the installation cost ([www.energimyndigheten.se](http://www.energimyndigheten.se))

*Barrier 1.2 – Inexistent or insufficient spatial planning*

The Swedish spatial planning process, regulated in the Building and Planning Act (“*Plan- och bygglagen*”) restricts any planning or construction activity. The municipalities have general building and activity plans appointing areas for industrial purpose, roads, areas prohibited for housing etc. In industrial zones, RES installations can generally be constructed if they are regarded as industrial plants as regulated in the act. Building activities often requires a detailed planning for the estate before any building activity can take place.

### On-shore wind power

Regarding wind power establishment, the demand for a detailed planning has been removed if there are no competing interests from other activities such as housing or industry.

The municipalities in Sweden are constructing wind plans as an appendix to the general plans pointing out “priority areas”. In these priority areas, a specific kind of activity, such as for instance the construction of a wind park, is in priority before other interests. However, this means that the permission can be restricted to these priority areas, while no development is allowed in the rest of the municipality. The implementation of these rules has proven to support the development of RES technologies. Nevertheless in some counties they can also lead to specific barriers.

#### *Barrier 1.3 – Competing public interests*

Identified barriers for all RES installation often result from conflicts on regional and local level and due to conflicts between different national interests, ecological, cultural, social etc.

There is also competing interests from residential and housing projects since many of the older industrial areas are situated adjacent to water and watercourses, which are considered attractive for housing and recreation purposes.

There is also a competing public interest for outdoor living and tourism since Sweden has the “Allemansrätt” giving everybody access to woods, lakes and fields.

Regarding wind power installations there is a general opposition for wind power installations in areas attractive for wind power purposes. Social opposition of neighbours is a significant barrier present in Sweden, for wind installation. Most of the opposition is a result of insufficient or inexistent information dissemination and consultation with the local community.

### 1.2.2 Best Practice Elements and Indicators

<b>No.</b>	<b>Technology</b>	<b>Benchmark</b>	<b>Result</b>
1.1	All	Is one stop-shopping possible?	Yes
1.2		Amount of money to be invested in the administrative process (including cost of work and costs like fees) (in €)	
	On-shore		<2-3% of total investment
	Off-shore		< 10 % of total investment
	Hydro		50 000
	Biomass		>50 000

	Biofuel		>50 000
1.3		Time to be spent for the administrative process (duration to get all the main permits) (in months)	
	Biomass		12-18
	Gas tubes		24-60
	Bio gas		12-24
	On-shore		12-18
	Off-shore		15-24
	Geothermal Heat pump		6-12
	Hydro installations		12-15
	Solar		3-6
1.4		Estimated number of permits required (#)	
	Biomass		2
	Gas tubes		5-6
	Bio gas		3
	On-shore		2-3
	Off-shore		4
	Geothermal Heat pump		2
	Hydro installations		2
	Solar		1-2?

## 1.3 Literature

### Interviews

<http://www.bergvarme.energi-och-el.se/>

Bioenergiportalen, <http://www.bioenergiportalen.se>

Biogasportalen, <http://www.biogasportalen.se>

Energimyndigheten, <http://www.energimyndigheten.se>

Energinyheter, <http://www.energinyheter.se>  
Environmental Code

Naturvårdsverket, <http://www.naturvardsverket.se>

### Ny Teknik

### Planning and building Act

Svensk solenergi, <http://www.Svensksolenergi.se>

Svensk vindenergi, <http://www.svenskvindenergi.se>

Vindlov <http://www.vindlov.se>

## 2 Issue 2 Technical Specifications

### 2.1 Introduction

This chapter analyses if the provisions of the renewable Directive 28/2009/EC concerning technical requirements are fulfilled in Sweden.

Notably, following preamble:

“National technical specifications and other requirements [...] in the field of technical standards and regulations [...] relating for example to levels of quality, testing methods or conditions of use, should not create barriers for trade in renewable energy equipment and systems. Therefore, support schemes for energy from renewable sources should not prescribe national technical specifications which deviate from existing Community standards or require the supported equipment or systems to be certified or tested in a specified location or by a specified entity.”

and mainly Article 13 (2):

“Member States shall clearly define any technical specifications which must be met by renewable energy equipment and systems in order to benefit from support schemes. Where European standards exist, including eco-labels, energy labels and other technical reference systems established by the European standardisation bodies, such technical specifications shall be expressed in terms of those standards. Such technical specifications shall not prescribe where the equipment and systems are to be certified and should not impede the operation of the internal market.”

Member states shall clearly define any technical specifications which must be met by renewable energy equipment and systems in order to benefit from support schemes.

The main support schemes available in Sweden are reported below:

- **Quota system:** Sweden introduced the Act Concerning Electricity Certificates (2003:113) in 2003 to increase the proportion of the country's electricity produced from renewable energy sources - solar power, wind power, hydro power and biofuels, and from peat in CHP plants. The electricity certificate is a market based support system for electricity from renewable energy sources. The system is intended to increase the production of renewable electricity and also make the production more cost efficient. The main support instrument for RES-E is a quota obligation with tradable green certificates. This system came into effect in May 2003 and will be valid until the end of 2030. All technologies (wind, solar, geothermal, biogas, biomass, hydro, wave energy) used in generation of RES-E are eligible for the quota system. Norway and Sweden have agreed to aim for a joint green electricity certificate market from 1 January 2012. (Re-Shaping, Renewable Energy Country Profile, Sweden)

- **Tax relief:** A tax relief system is in place to promote biofuels. There are no energy taxes for ethanol or biodiesel. Green taxes such as the CO<sub>2</sub> tax promote biofuels in an indirect way. These support instruments for RES-T are applicable at national level.
- **Fiscal regulation mechanisms:** Sweden also promotes RES-E through fiscal measures: Energy tax exemption for wind energy, reduced real estate tax and subsidies (for solar cells, wind energy projects and research and development in the field of wind energy). These support instruments for RES-E are applicable at national level.

Currently, fiscal measures (exemption from energy, CO<sub>2</sub>, sulphur and the NO<sub>x</sub> taxes) and governmental support through various programs, like the investment program Klimp or grant schemes for investment in solar heating are the main RES-H support instruments in Sweden.

- **Building obligation:** A building obligation is another instrument that supports RES-H development. These support instruments for RES-H are applicable at national level.

In general there has been no identification of barriers according to renewable energy equipment and systems in order to benefit from support schemes.

## 2.2 Description of barriers & solutions

### 2.2.1 Detailed description of the Barriers and solutions

#### *Barrier 2.1 – Weak definitions*

This has not been an identified barrier in Sweden. Technical specifications and requirements to be met by the renewable energy equipment and systems in order to benefit from support schemes are clearly set.

#### *Barrier 2.2 – no EU standards applied*

This has not been an identified barrier in Sweden.

The technical standards are in general expressed in terms of European standards.

#### **Wind power**

Small scale wind power has an international construction standard since 2006, IEC 61400-2 Ed. 2 (< 200 m<sup>2</sup>). It is also harmonizing with the European CENELEC-standard and applicable to the low tension system directive.

There are ongoing discussions about standards for large scale Windpower but today there are none.

**Solar:** For solar SP<sup>1</sup> P-labels sun panels since 1990. Since 2001 the rules for labelling and certification is coordinated with the European standard.

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<sup>1</sup> SP Technical Research Institute of Sweden

Since 2001/2002 SP is accredited for solar panels according to EN 12975-1, EN 12975-2 and since 2004 to promulgate Solar Keymark. The content of the P-labeling and solar key mark is quite the same, but giving actors access to a wider market within Europe.

### Heat pumps

A new standard for heat and cooling equipment, security and environmental demands were implemented in 2008, SS-EN 378. This European Standard is applicable to the design, construction and installing of refrigerating systems including piping, components and materials and including ancillary equipment directly associated with such systems. It also specifies requirements for testing, commissioning, marking and documentation. In case the heat transfer fluid is not gaseous at atmospheric pressure, the requirements for circuits for heat transfer fluids are excluded except for any safety devices associated with the refrigerating system. It is not applicable to refrigerating systems with air or water as refrigerant and does not cover the requirements for equipment to be used in a potentially explosive atmosphere.

### Shallow geothermal heating

None of the NGOs interviewed have commented any barriers according to existing EU standards. It seems like there are no applicable standards in building wind power, hydro power, bio mass installations or bio gas installations in Sweden.

There are several possibilities to label your product or installation on a voluntary basis. For instance Bio gas for transportation is labelled with “Svanen”, and there is also Bra Miljöval.

### *Barrier 2.3 – Specified locations*

This is not an identified barrier in Sweden. None of the technical requirements that must be complied with to be eligible for the support scheme and subsequent amendments requires implicitly or explicitly a certification or a testing in a specific country.

### *Barrier 2.4 – Barrier to trade*

- No relevant barriers to trade have been identified. All the technical specifications required to be eligible for the Swedish support scheme are expressed in terms of international or European standards and do not in general impede on the internal market.
- There are no technical specifications that impede the operation on the internal market.

## 2.2.2 Best Practice Elements and Indicators

Please fill in here the results of the Benchmark indicators:

<b>No.</b>	<b>Technology</b>	<b>Benchmark</b>	<b>Result</b>
2.1		Are specifications expressed in terms of European standards (including eco-labels, energy labels and other technical reference systems), though such European references exist?	Yes

## 2.3 Literature

### Interviewes

SIS, Swedish Standards Institute, Pressrelease 15 December 2008  
<http://sis.se>

SP Technical Research Institute of Sweden,  
Certifieringsregler för P-märkning av Termiska solfångare med tillägg för Keymark,  
<http://www.sp.se/sv/units/energy/Documents/ETk/SPCR138.pdf>

<http://www.Biogasportalen.se>

<http://www.Energinyheter.se>

QUALICERT Common quality certification & accreditation for installers of small-scale  
renewable energy systems Project IEE/08/479

Renewable energy policy, Country profile, October 2009

National Renewable Energy Source Industry Roadmap, Sweden



## 3 Issue 3 Building integrated technologies

### 3.1 Introduction

Building integrated technologies are very much done on a voluntary basis in Sweden. Instead of demanding specific kinds of technology there is a possibility to get financial support when replacing or introducing new RES technology.

In general support schemes are available, and the administrative procedures are appropriate for most of the applicable technologies. The main identified barriers are related to administrative procedures and to spatial planning issues.

Today there is a possibility to build energy efficient buildings. However the rate at which this type of building is being built is low due to the current economic situation. Currently the technology requires further development and the knowledge needs distribution to more people. The Swedish energy council is putting in 21.7 million SEK over a five year period to stimulate the market for both new build and renovations of buildings in an energy efficient way.

In order to contribute to the adaptation the building sector in Sweden has to reduce the consumption of energy. The Swedish target is to reduce the energy consumption in buildings with 20 % to 2020 and a further 50 % to 2050. The Swedish energy agency states that the amount of low energy efficiency buildings has to increase considerably to reach the national target.

It is important that energy efficiency measures are made both in new buildings and under rebuilding, to be economically efficient. Otherwise re-building measures may last another 40-50 years.

The building sector has possibilities to diminish the buildings energy consumption for heating, cooling, hot water use and electricity considerably by using RES technology.

Projects that can receive economic support shall be able to reduce the energy consumption with a minimum of 50 % in comparison with the regulations made by The National Board of Housing, Building and Planning, and also have a demonstration value. This is a part of the Swedish national strategy to promote and follow up the progress of building energy efficient buildings.

For example, the municipality of Motala has decided to run a project together with Siemens to promote an energy efficiency program in their real estates. Siemens will perform an analysis to reduce energy consumption and come up with proposals to energy

efficiency action plan. The analysis will be performed through an Energy Performance Contracting-agreement (EPC).

Siemens state that it is possible to reduce the energy consumption by 20-30 % in most buildings giving both better economy and a positive impact on the environment. This can be done by optimizing the insulation, light, heating- and cooling systems, water and energy distribution.

## 3.2 Description of barriers & solutions

### 3.2.1 Detailed description of the Barriers and solutions

#### *Barrier 3.1 – Inefficient general administrative procedures*

Inefficient administrative procedures do not constitute a barrier to the development of renewable energy building integrated technologies in Sweden. For larger landlords the development is due to economical interests from the building companies and a wish to get a “green” profile to its customers. Economical interests are the driving force also for private houses since most building integrated technologies are made to reduce the dependent of oil, district heating or electricity, and be independent with the possibility to influence the energy cost.

#### **Geothermal heating >10 MW**

In Sweden shallow geothermal heating is quite common in new villas or when converting from oil heated or direct electricity heating. Converting to geothermal heating in existing villas is quite expensive for an ordinary family, 10-20 000 EUR and there is need for an administrative process before getting allowance to install the system. If the house is situated within a water protected area there is a requirement of an environmental permit, otherwise one has to notify the local authority. For ordinary people the process and contact with the authorities can be considered difficult.

For installation < 10 MW there may only be a need for a notification according to the building and planning act (local authorities). The local authorities have information about this on their web sites or instructions to get in contact with the local energy adviser.

The local authorities are easily accessible for the inhabitants and one can get help with information from the administrative officers of the authority. The permitting process is connected with a small fee for handling the application, 100-1000 EUR. You might also need a building permit according to the planning and building act.

#### **Solar and PV installations**

Installation of PV and solar is not very common in Sweden yet, the system is dependent on financial support but are increasing as the electricity fees are rising. For installation of solar or PV there is only a requirement for a permit according to the building and planning act. (According to the appendix of Decree 1998:899). The application is bound up with a fee, according to the local authority fee ordinance.

### **Small scale wind power**

Small scale wind turbines < 2 m diameter do not require a building permit. Larger wind turbines may require technical and environmental assessment depending on the location.

#### *Barrier 3.2 – No/insufficient specific rules for building integrated/small scale RES installations*

Since Sweden is a country with a rather cold climate, the system needs extra input during extreme cold. Therefore there might be need for double systems or a subheating system to avoid getting an indoor temperature below 18 degrees

#### *Barrier 3.3 – Competing public interests*

In some areas there is a wish from the municipality to get all buildings connected to the district heating system instead of installing a separate heating facilities. With regards to the district heating monopoly the consumer has no possibility to influence the price for district heating once getting connected. The municipality owned companies make a large profit out of this and the citizens express anger and disappointment about the system, as well as competitors in the district heating market not being able to enter.

#### *Barrier 3.4 – Renewables obligations insufficient*

Today the legislation is not adopted to the conditions for small scale electricity generators. A market development requires lower admission fees and net metering.

For example, small scale wind turbines have a potential to generate several TWh and there is an interest to develop a market. However a standardisation regarding technology and development of specifications have to be established for small scale wind turbines where the energy output is presented in a standardised way for different wind conditions and applications.

#### *Barrier 3.5 – Exemplary role of public buildings neglected*

There are no regulations concerning implementation of solar or PV on protected buildings, leading to confusion and uncertainty at responsible authorities (SERO).

#### *Barrier 3.6 – RES deployment hindered by spatial planning matters*

In some municipalities there are local regulations regarding where installation is allowed and how they should be adapted.

For **geothermal heating**, there is a limitation on the number of installations if the installation is situated within a water protected area. The regulation is part of the spatial planning aiming to avoid possible mechanical problems with regards to risk of leakage or physical damage when drilling in water protected areas.

**Wind power** installations are regulated by local demands for maximum levels of noise in residential areas. Vibrations in buildings, flicker and impact on the view/landscape are also regulated in the spatial planning process making it difficult for installers to establish RES technology in urban areas.

#### *Barrier 3.7 – Tenancy law and ownership law impedes development of Building Integrated RES technologies*

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### 3.2.2 Best Practice Elements and Indicators

Please fill in here the results of the Benchmark indicators:

<b>No.</b>	<b>Technology</b>	<b>Benchmark</b>	<b>Result</b>
3.1	Geothermal	Is this installation type in normal cases exempted from an authorization procedure (building permit)?	No, a building or environmental permit or notification is almost always needed
3.2		Are legal-administrative requirements adequate for this installation type?	yes
3.3		Number of administrations that must be contacted (#)	In general 1

<b>No.</b>	<b>Technology</b>	<b>Benchmark</b>	<b>Result</b>
3.1	Solar and PV installations	Is this installation type in normal cases exempted from an authorization procedure (building permit)?	No, a building permit or notification is needed
3.2		Are legal-administrative requirements adequate for this installation type?	yes
3.3		Number of administrations that must be contacted (#)	In general 1

<b>No.</b>	<b>Technology</b>	<b>Benchmark</b>	<b>Result</b>
3.1	Small scale wind power	Is this installation type in normal cases exempted from an authorization procedure (building permit)?	No, a building permit or notification is needed
3.2		Are legal-administrative requirements adequate for this installation type?	yes
3.3		Number of administrations that must be contacted (#)	In general 1

## 3.3 Literature

Bill 2009/10:C217, Bygglövs för installation av solfångare

<http://Energinyheter.se>

Small-scale Wind Turbines - Introductory market study for Swedish conditions, Erika Thorstensson, Chalmers Tekniska Högskola, 2009

Tommy Johansson, Elmarknadsinspektionen

<http://boverket.se>, The National Board of Housing, Building and Planning, Boverket

<http://Swedish Energy Agency, Energimyndigheten>

<http://Jordbruksverket>

<http://Svensksolenergi.se>

<http://SERO.se>



## 4 Issue 4 – Promotion of energy efficient renewable energy equipment

### 4.1 Introduction

This issue is related to the provisions of article 13 (6) of the Directive (the selection of the words in bold is ours):

*“With respect to their building regulations and codes, Member States shall promote the use of renewable energy heating and cooling systems and equipment that achieve a significant reduction of energy consumption. Member States shall use energy or eco-labels or other appropriate certificates or standards developed at national or Community level, where these exist, as the basis for encouraging such systems and equipment.*

***In the case of biomass**, Member States shall promote conversion technologies that achieve a conversion efficiency of at least 85 % for residential and commercial applications and at least 70 % for industrial applications.*

***In the case of heat pumps**, Member States shall promote those that fulfil the minimum requirements of eco-labelling established in Commission Decision 2007/742/EC of 9 November 2007 establishing the ecological criteria for the award of the Community eco-label to electrically driven, gas driven or gas absorption heat pumps.*

***In the case of solar thermal energy**, Member States shall promote certified equipment and systems based on European standards where these exist, including eco-labels, energy labels and other technical reference systems established by the European standardisation bodies.*

*In assessing the conversion efficiency and input/output ratio of systems and equipment for the purposes of this paragraph, Member States shall use Community or, in their absence, international procedures if such procedures exist.”*

In order to diminish the energy consumption from fossil fuels and direct heating there is an incentive system called... Information about the incentive system is up-dated and accessible on the energy agency website; <http://energimyndigheten.se>

## 4.2 Description of barriers & solutions

### 4.2.1 Detailed description of the Barriers and solutions

#### **Standardising and Certification of RES technologies**

**Solar:** In Sweden the State supports directly with an incentive system for solar thermal systems and PV that fulfil the requirements of Art. 13(6).

In order to receive subscription for solar installation for heating purposes, the solar panel has to be certified according to Förordning (2008:1247) om stöd för investering i solvärme and the Solar Keymark, which is a European standard.

<http://www.energimyndigheten.se/sv/Hushall/Aktuella-bidrag-och-stod-du-kan-soka/Stod-till-solceller/>

#### **Increased energy efficiency through energy management systems**

On 1 January 2005, the Programme for Improving Energy Efficiency Act (2004:1196) came into force. The programme is intended to increase energy efficiency and create opportunities for tax exemption.

On 1 July 2004, the tax on industrial process-related electricity was raised from SEK 0 to SEK 0.005 per kWh (according to the Tax on Energy Act, LSE, Chapter 11 § 3, this relates to electric power consumed in industrial operations or in commercial greenhouses”). The tax rise, which represents the adoption of the EU’s Energy Tax Directive, does not affect manufacturing processes in the following sectors: metallurgy, electrolysis, chemical reduction (Bill 2003/04:144).

The Directive gives energy-intensive companies in manufacturing industry, which are subject to the tax, the opportunity of being granted tax exemption on their electricity consumption if they take action to improve their energy efficiency. The government has, therefore, adopted a programme of improving energy efficiency in energy-intensive companies (PFE), with the carrot of reduced taxation. Participation in the programme is voluntary, and is open to energy intensive manufacturing companies which meet certain criteria.

The aim of the programme is partly to increase the efficiency of energy use among companies which consume large amounts of energy, i.e. energy intensive companies. One measure to improve efficiency is to introduce an energy management system (EMS), the energy equivalent of an environmental management system.

#### **Best practice:**

##### **Benefits of EMS and PFE**

An energy management system makes it easier for a company to check its energy use and ensure that its energy consumption is more consciously planned and structured. With more conscious planning, improved operating, maintenance and purchasing procedures, companies can reduce their energy consumption and therefore, their energy costs.

In addition to the advantages generated by the management system itself, companies which join the programme are granted tax relief on their electricity costs. When the companies join PFE, the tax is reduced from SEK 0.005 per kWh to SEK 0 per kWh. By



the end of the programme period, the companies have to show that they have achieved an improvement in the efficiency of their electricity consumption.

### **Passive houses**

Many landlords, housing companies and construction companies are performing low energy projects on at least one third of their projects. The companies in the building and construction sector are developing new standards and platforms to build green buildings. All actors involved states that it is possible to reduce the energy consumption with 50% compared to the National Board of Housing, Building and Planning demands for construction and energy consumption in new buildings.

The construction companies are obligated to follow up their commitments within two years after the building is erected by taking measurements, proving the commitments are fulfilled.

The rule was implemented in 2006 and has led to a major change and implementation of new routines within the entire construction and housing sector. Svante Wijk, NCC, Byggvärden March 10, 2010, <http://www.granback.se/tag/energiforbrukning/>

#### *Barrier 4.1 – Non-compliant promotion schemes*

Biomass installations

Heat pumps and solar thermal systems

#### *Barrier 4.2 – Lack of substitution of existing inefficient systems*

Not an identified barrier.

#### *Barrier 4.3 – Use of national procedures*

Not an identified barrier.

#### *Barrier 4.4 – Insufficient information*

Not an identified barrier

### **4.2.2 Best Practice Elements and Indicators**

Please fill in here the results of the Benchmark indicators:

<b>No.</b>	<b>Benchmark</b>	<b>Result</b>
4.1	Are the requirements of Art 13 (6) of the Directive concerning the promotion of efficient bio heat and heat pumps fulfilled? (yes/no)	

## **4.3 Literature**

<http://www.energimyndigheten.se/sv/Hushall/Aktuella-bidrag-och-stod-du-kan-soka/Stod-till-solceller>

Svante Wijk, NCC, Byggvärden March 10, 2010,  
<http://www.granback.se/tag/energiforbrukning>



## 5 Issue 5 Information/awareness raising

### 5.1 Introduction

Information and awareness raising measures with regard to renewable energy sources are in general widely spread in Sweden. Since 1997 there has been a pointed governmental campaign aiming to stimulate initiative towards a sustainable society, including many of RES issues and installations.

On the whole, the general public shows a very positive attitude towards RES and insufficient information cannot be considered as a significant barrier.

Of course, there is still a potential for improvement, particularly with the purpose of motivating different kind of building owners and particularly public and private investors who own large numbers of rental houses- to invest in renewable.

Information on support measures is in most cases made available online in a structured and comprehensible form by the public authorities and by the relevant industry associations. This is a non-exhaustive list.

<http://www.svensk-vindkraft.org/>  
<http://www.energimyndigheten.se>  
<http://www.svebio.se>  
<https://www.vindlov.se/>  
<http://www.svensksolenergi.se/>  
<http://www.lst.se>  
<http://www.naturvardsverket.se>  
<http://www.boverket.se>

All together, there is broad information offer on support measures on a national, regional and local level. Search functions allow for a structured investigation of the suitable programmes by the different target groups.

The local authorities and county administrative board have information on their websites and distribute targeted information to the public without any expense. Swedish authorities are easily accessible for the public and you can visit the officer in charge at the authority and get required guidance for your topic.

Below is an example from the municipality of Solna:

### Get free energy advice

If you live or operate in Solna you can get free and impartial energy advice. The City of Solna is offering this service in collaboration with 27 other municipalities in Stockholm. Counseling is for individuals, organizations and small **businesses**. You can get advice on how you can reduce your energy costs and environmental impact depending on the various existing technical solutions to choose from.

You can reach a counselor on the phone 08-29 11 29 Monday-Friday 9:00-17:00. If they are busy when calling, please leave a message and they will call you back. You can also find information on the energy advice website.

Examples of questions that you may discuss with the Energy Adviser is

- energy sources
- radiator systems
- isolation
- windows
- energy-related grants
- Energy efficiency and energy savings
- lighting
- electricity bill

Sweden introduced the Act Concerning Electricity Certificates (2003:113) in 2003 to increase the proportion of the country's electricity produced from renewable energy sources - solar power, wind power, hydro power and biofuels, and from peat in CHP plants.

The electricity certificate is a market based support system for electricity from renewable energy sources. The system is intended to increase the production of renewable electricity and also make the production more cost efficient. The objective of the electricity certificate system is to increase the production of renewable electricity with 17 TWh by year 2016 compared to year 2002. The system replaces earlier public grants and subsidy systems.

The principle of the system is that there are sellers and purchasers of certificates and market to bring them together.

The government has decided that the electricity certificate system is prolonged till the end of 2035. The quota is proposed to be adjusted to the new RES target, increasing RE to 25 TWh to 2020 compared to 2002 level. The changes will come into force June 1 2010. The Swedish government is also proposing an extension plan for the system to embrace more countries. The direction is to establish a common market with Norway by the 1st of January 2012.

## 5.2 Description of barriers & solutions

### 5.2.1 Detailed description of Barriers and solutions

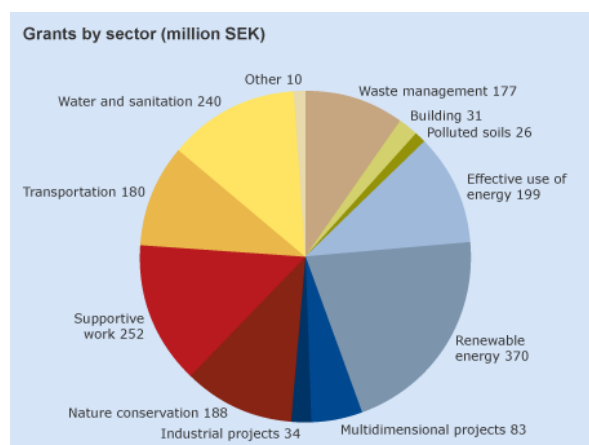
#### *Barrier 5.1 – Insufficient availability of information on support measures*

The insufficient availability of information on support measures is not an identified barrier in Sweden. All authorities from local to governmental have information or links to sites with detailed information about support measures and how to apply for them.

#### *Barrier 5.2 – Insufficient funding for campaigns/programmes*

Insufficient funding for campaigns/programmes is not considered a barrier in Sweden. Since 1997 there has been several information campaigns and incentives for municipalities, companies and private persons in order to reach a sustainable development.

- LIP-, The local investment programmes (LIP) represented Sweden's largest single environmental initiative. The Swedish Parliament earmarked SEK 6.2 billion in grants for LIPs over the period 1998–2002 with the aim of improving ecological sustainability. A total of 211 investment programmes were launched in 161 municipalities between 1998 and 2002. The programmes covered the entire environmental field – from energy efficiency and energy switching to projects aimed at creating good residential environments, treating emissions to air and water and increasing biodiversity. The 211 programmes for which grants were awarded contained 1,835 measures. Work on LIPs was in progress for ten years, and the last programmes were implemented in 2007. The final grants were established in 2008. Nearly SEK 4.4 billion of the grant funds was spent (Swedish EPA. <http://www.naturvardsverket.se/en/In-English/Menu/Legislation-and-other-policy-instruments/Economic-instruments/Investment-Programmes/Local-Investment-Programmes-LIP/>)



As an example the LIP programme made the establishment of the second largest solar heating facility in Europe possible. Since 2002 the solar plant delivers 4 GWh heat/year to the municipality district heating system, reducing the oil consumption by 440 m<sup>3</sup>/year. The area is a total of 10 000 m<sup>2</sup>. The plant also received financial support from the EG commission for building a demonstration project visualizing renewable energy technology. The project could not have been accomplished without support measures.

- **KLIMP** The Swedish Government's support to Climate Investment Programmes, "Klimp", is a tool for reaching the Swedish climate objective as formulated in the Swedish climate strategy in 2002. Klimp has enabled municipalities and other local actors to receive grants for long-term investments that reduce greenhouse gas emissions.

The grants have been distributed five times by the Swedish Environmental Protection Agency between 2003 and 2008. The Government has no plans to make any further grants. The investments are estimated to reduce emissions by 1.1 million tons of carbon dioxide per year.

Klimp is helping Sweden to achieve its climate objective in three ways:

1. The investments lead to reduced emissions of greenhouse gases.
2. The work on a climate investment programme strengthens local climate work and cooperation between various actors.
3. Collecting and disseminating knowledge and experience of climate investments encourages climate work in other parts of the country.

The investments are made in the sectors that have the largest impact on climate. This applies above all to measures in the transport and energy sectors. They include expansion of district heating, transition to biofuels, measures to boost energy efficiency and local information about the climate issue and the ongoing projects. Almost one third of the Klimp grants have been invested in biogas measures. (<http://www.naturvardsverket.se/en/In-English/Menu/Legislation-and-other-policy-instruments/Economic-instruments/Investment-Programmes/Climate-Investment-Programmes-Klimp/>)

Only the best measures in the best climate investment programmes have received funding. The Swedish EPA and the sector agencies, the Swedish Road Administration, the National Board of Housing, Building and Planning and the Swedish Energy Agency have thoroughly assessed the applications received by the EPA. The programmes have been awarded points depending on how well they demonstrate good climate strategies, overall perspectives, collaboration, efficient use of funding and environmental effects. The Council for Investment Support (RIS), whose members are appointed by the Government, decides on the grants.

- Subscription for renewable energy distribution in gas stations according to the Ordinance (2006:1591) om statligt stöd till främjande av distribution av förnybara drivmedel  
Since 2006 all gas stations are obliged to supply a renewable alternative to petrol or diesel, usually ethanol (E85). The goal is to stimulate the establishment of other renewable sources of fuel then ethanol, primarily biogas. The subscription enables distribution of biogas in a wider location of the nation and shall be prepared by the end of 2010.
- Others:

**Solar:** The Government has decided about new incentives for installation of solar cell systems, producing electricity or combined heat and electricity production. The incentive is for privates as well as companies, organizations and municipalities. (<http://www.energimyndigheten.se/sv/Hushall/Aktuella-bidrag-och-stod-du-kan-soka/Stod-till-solceller/>)

### **Windpower**

The budget for 2008 an announcement was made that the government was investing in a national network for wind power which is now being utilized fully. The energy council is at the centre of the initiative with the task of strengthening the regional works with wind power. The exploration of wind power is split into 4 different sectors covering business development, applications and planning, education and training and labour and technical service and maintenance (<http://www.natverketforvindbruk.se/sv/Om-oss/>)

The Swedish Energy Agency runs "the Programme for Improving Energy Efficiency Act", that is intended to increase energy efficiency and create opportunities for tax exemption.

### **Converting direct electricity heating**

There is also possible to get subscription for exchanging direct heating electricity technology to renewable, in private houses. In order to get the subscription the measures have to be according to the Ordinance (2005:1255) om stöd för konvertering från direktverkande elvärme i bostadshus. The incentive is for housing buildings when converting from direct electricity heating to district heating, geo-, hydro-, or soil heating pump systems or biomass combined with water borne heating systems. The incentive is not valid for installation of air thermal heating systems. (<http://www.boverket.se/Bidrag--Stod/Villa/ersatta-direktverkande-elvarme/>)

### *Barrier 5.3 – Insufficient campaign-/programme-design*

Not all RES technologies are implemented in the incentive system, which might favour some technologies as well as the development of the technology.

### **Windpower**

Improved conditions are required to develop wind power further in Sweden, to increase the rate at which wind farms are being built so that goals which are already in place can be reached.

The wind power co-ordinator works to ease the working process and relationship between wind power producer, authorities and other actors from central, regional and local levels to act and promote the processes of wind power in different situations.

### **Biogas**

Biogas can be developed from a number of different waste products, household waste and raw materials, which can be re-used as fertilisers. In many situations bio gas production

can reduce the environmental impacts from the raw material which is used. In order to stimulate the development of such synergy effects and strengthen the profitability in biogas the Swedish authorities have given local governments the task of developing a cross-sectional biogas strategy and provide financial help to the system which is prioritized.

The national governments contribution to increase the percentage of renewable energy should reduce the price of electricity in Sweden as the completion to be the most effective producer increases. Many types of bioenergy are very cost effective and competitive within the market. The electricity certificate system contributes to the fact that Sweden holds an internationally leading position in knowledge and bioenergy is becoming stronger. This favors not only costs, energy and environmental goals; it also increases the export of knowledge and energy technologies. In order to promote the long term development and Swedish competitiveness within the market the Swedish government has significantly increased the research and development investment for large scale production of renewable energy and vehicle fuels which promote the development of cost effective bioenergy.

### 5.2.2 Best Practice Elements and Indicators

<b>No.</b>	<b>Benchmark</b>	<b>Result</b>
5.1	Is sufficient information on support measures available?	yes

## 5.3 Literature

Swedish EPA <http://www.naturvardsverket.se>

<http://www.naturvardsverket.se/en/In-English/Menu/Legislation-and-other-policy-instruments/Economic-instruments/Investment-Programmes/Local-Investment-Programmes-LIP>

<http://www.naturvardsverket.se/en/In-English/Menu/Legislation-and-other-policy-instruments/Economic-instruments/Investment-Programmes/Climate-Investment-Programmes-Klimp>

Ordinance (2006:1591) om statligt stöd till främjande av distribution av förnybara drivmedel

Ordinance (2005:1255) om stöd för konvertering från direktverkande elvärme i bostadshus.

<http://www.natverketforvindbruk.se/sv/Om-oss>

<http://www.svensk-vindkraft.org/>

<http://www.energimyndigheten.se>

<http://www.svebio.se>



<https://www.vindlov.se/>  
<http://www.svensksolenergi.se/>



## 6 Issue 6 Certification

### 6.1 Introduction

In Sweden there is a central certification body called SP Sitac. SP Sitac is a leading approval and certification body working in the construction sector, with capacity to assist clients on National level and within Europe. SP Sitac is appointed by the Swedish government as spokes body in [EOTA](#), a part of EU, thus able to issue European Technical Approvals (ETA) for construction products. SP Sita also represent Sweden in [UEAtc](#), the independent organisation that also see the candidate states as its members.

SITAC are a subsidiary company to the [SP Technical Research Institute of Sweden](#) and issue certificates for construction products and personal skills within the construction industry. The work is based on 10 years experience emerging from the National Swedish Board of Physical Planning and Building as well as the Swedish National Board of Housing, Building and Planning. SP Sitac is well established on the market and has established a vast net of contacts for co-operation with parties involved.

### 6.2 Description of barriers & solutions

#### 6.2.1 Detailed description of the Barriers and solutions

##### *Barrier 6.1 - Lack of a Certification body*

##### **Solar Energy**

The certification scheme is managed by the Solar Energy Association of Sweden (SEAS), a private association and is currently being developed and will be implemented before end of 2009. The certification scheme covers solar thermal installations and will be extended to biomass systems and probably photovoltaic installations at a later stage. The certification is delivered to the installer and its company. However, in the case the installer leaves the company, the label is not valid anymore.

The installer has to fulfil the following requirements in case of application for the installer's certification:

- Provide proof of vocational training or previous experience
- Provide proof of successful training examination
- Provide data on at least three installations recently carried out

The company has to fulfil the following requirements in case of application for the company's certification:

- Provide document attesting the company's existence

- Description of company's activities
- Fulfilment of tax obligation

The certification is valid for 5 years and costs 300€ per certificate and 300€ per one day preparative course (compulsory).

The installer has to attend one-day-training. It is required that the installer has prerequisites in the related area: either professional installer education or at least 5 years of practical experience (proved by providing installation references). The training is only theoretical and the installer should pass a final examination. The training standards have been elaborated through a national initiative and will be updated soon. The certification is granted upon conditional judgment of description of already made installations. The certification may be withdrawn if repeated complaints or no rectifying actions were carried out. The audit standards have been elaborated by a regional working group.

### **Heat pumps**

Sweden operates the EUCERT training program. It is executed by the Swedish Heat Pump Association and Midsweden University as well as by the major manufacturers (QualiCert WP 2 Deliverable D2.1 Summary research of existing schemes in Europe Qualit'EnR)

The Certification scheme was implemented in 2006 and has been active in 10 countries from January 2007: Austria, Czech Republic, France, Ireland, Italy, Slovenia, Sweden, UK, Germany, Slovakia. Since the integration in the EHPA, Finland (2007) and Belgium (2010) joined the program. Each EU-CERT installer is registered on the reference list of certified installers.

### **Small scale wind power**

In general, institutions as well as actors have to improve their efforts in order to create a market for small-scale wind turbines. The prerequisites to become a small-scale electricity provider are much too costly and complicated and the marketing is not convincing enough. The introduction of net metering and third party testing would most likely increase the market for small-scale wind turbines (Small-scale Wind Turbines - Introductory market study for Swedish conditions, Erika Thorstensson, Chalmers Tekniska Högskola, 2009).

### **Grid connection**

In order to have high reliability on the Swedish national grid it is essential that the equipment fulfils basic technical requirements. Svenska Kraftnät have some legislation for connection to the grid. Besides there are Technical Requirements (TR) for construction. The certification and technical specifications for grid connection is made according to directive 98/34/EG June 22 1998 concerning shared information of technical standards and regulations (EGT L 204, 21.7.1998, s.37, Celex 398L0034), revised by the council and directive 98/48/EG (EGT L 217, 5.8.1998, s.18, Celex 398L0048).

Measuring of the installer to the grid system can be done by an other certifier from an other country with in the EES or Turkey if the certification body is accredited according to EN ISO/IEC 17020:2005 and EN ISO/IEC 17011:2005 (ISO/IEC 17011:2004).

The measures are valid for a maximum of six years. (STAFS 2009:8)

### *Barrier 6.2 - Lack of guidelines*

In Sweden the implementation of the CEN proposal for certification for biomass is communicated with SIS in Sweden. The Swedish energy agency has presented a draft to a legal implementation.

### *Barrier 6.3 - Lack of training*

## 6.2.2 Best Practice Elements and Indicators

Please fill in here the results of the Benchmark indicators:

<b>No.</b>	<b>Benchmark</b>	<b>Result</b>
6.1	Are certification schemes or equivalent qualification schemes available for installers?	Yes and no, not for all RES technologies
6.2	Is sufficient training on RES provided during the standard education curriculum of installers?	Yes, for solar, heatpumps and small scale wind power installations

## 6.3 Literature

QualiCert WP 2 Deliverable D2.1 Summary research of existing schemes in Europe  
Qualit'EnR

Sven Hogfors till tidningen Bioenergi 30/9 2009  
<http://www.tradbransle.se/aktuellt.asp>

Small-scale Wind Turbines - Introductory market study for Swedish conditions, Erika Thorstensson, Chalmers Tekniska Högskola, 2009).

SP Technical Research Institute of Sweden  
<http://www.sp.se>

Styrelsens för ackreditering och teknisk kontroll (SWEDAC)  
Författningssamling STAFS 2009:8, föreskrifter och allmänna råd om mätsystem för mätning av överförd el; <http://www.swedac.se>



## 7 Issue 7 Infrastructure Development

### 7.1 Introduction

Identified barriers have been discussed in earlier sections and are mainly focused on administrative barriers, such as different permitting procedures cannot be made parallel, the same issues are being put to trial by different legal bodies, giving possibility to appeal in many different legal levels. Monitoring and investigations are costly and time consuming.

There are also competing public interests where ever physical and structural impact is made upon the land. There is also a risk for conflicts with landowners and present activities such as agricultural, housing areas and forestry.

A problem facing the expansion of wind power and hydro power is the electrical grid network as the grid is not being extended at the same rate as wind power. Extension of the grid system also requires an administrative process, which currently does not harmonize with the technology expansion.

Possible solutions are to simplify the legal procedures.

### 7.2 Description of barriers & solutions

The Swedish grid is run by Svenska Kraftnät, which is a state utility established on the 1st January 1992. The company administers and runs the national electrical grid which in total consists of approximately 15,000 kilometres of 200 kV and 400 kV lines plus installations, interconnectors to neighbouring countries and IT systems. The duties of the system operator include the responsibility for the electricity system being in a short term state of balance and its installations working together in an operationally reliable way. Operations are primarily financed by the fees that power producers and network owners pay to transmit power across the grid.

Since July 2005, Svenska Kraftnät (SK) also has the system responsibility for the national supply of natural gas.

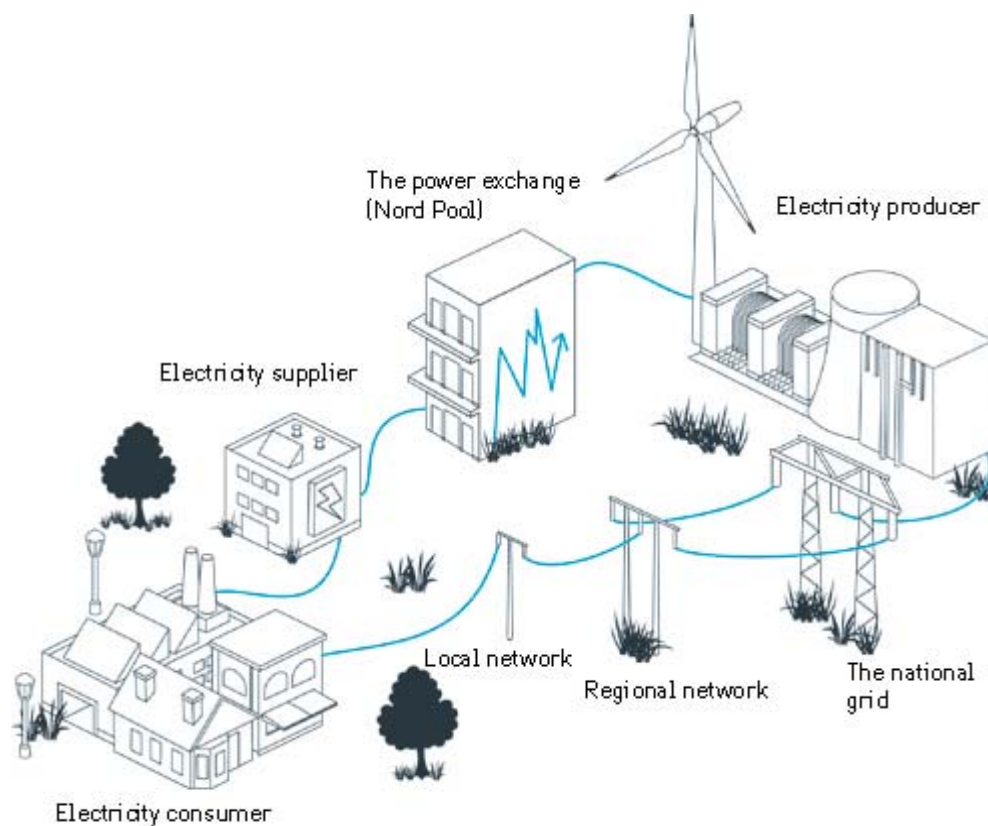
SKs mission is to:

- Provide transmission of power on the National Grid well in compliance with security, efficiency and environmental requirements;
- Perform the System Operator function for electricity and natural gas cost efficiently;
- Promote an open and competitive Swedish, Nordic and European electricity and natural gas market; and

- Ensure a robust nationwide supply of electricity.

The electricity market consists of many separate companies, which can be divided up into:

- final customers
- power trading companies, in the role of
- electricity suppliers
- balance providers
- electricity producers
- network owners
- system administrators



Final electricity consumers, everything from industries to households, must have an agreement with an electricity supplier in order to be able to buy electricity. The picture above shows the entire chain. The bottom part illustrates the physical transfer of power and the upper part the financial transfer, where power is purchased and then sold on. The power trading company can have several roles; electricity supplier as well as balance provider. The electricity supplier has the supply agreement with the final customer. Balance responsibility means that the company is financially responsible for the production and consumption of power always being in balance within the company's commitment. If consumption and/or sales exceed generation and/or purchases, the



balance provider will have to pay for power (balance power) sufficient to restore the balance.

A power trading company can either have the balance responsibility itself or purchase this service from another company. The power trading company can purchase power on Nord Pool - the Nordic power exchange - or directly from an electricity producer or another trading company.

The production plants are owned by the electricity producers. In Sweden, about half the power produced are hydropower and the other half nuclear power.

The network owners are responsible for transmitting the electrical energy from the production plants to the consumers. This is achieved via the national grid, the regional networks and the local networks, which are all owned by different network companies. The regional networks transmit power from the grid to the local networks and sometimes to major consumers, for instance industries. The local networks distribute power to the final customers within a certain area. All network owners report their consumption and production measurements to Svenska Kraftnät's settlement system.

Svenska Kraftnät owns the national grid and has the role of system operator. This means that they ensure that production/imports correspond to consumption/exports and that the Swedish electricity system's plants work together in an operationally-reliable way.

### 7.2.1 Detailed description of the Barriers and solutions

#### *Barrier 7.1 - Problems concerning connection to existing electricity networks*

The possibility to connect to existing electricity network has not been identified as a barrier in Sweden.

Svenska Kraftnät, owned and operated under the Swedish state, has system responsibility. This means that it monitors the Swedish electricity system and is responsible for creating a balance in the short term between the power at points of input and the power at points of output. It also ensures that the various installations in the electricity system all work together in a reliable way. For this reason, Svenska Kraftnät imposes certain requirements on wind power installations and other generation plants. Svenska Kraftnät also has responsibility for issuing tradable electricity certificates for electricity generated from renewable sources.

Network tariffs are the fees and other terms and conditions for the transfer of electrical energy, as well as for connection to a line or a network. Usually these are the fees that the owner of the wind power installation must pay to cover the costs of the installation in the network. The network tariffs for a wind power project can be divided into a connection fee and a transmission fee. On connection to the network, the network operator is entitled to charge a fee corresponding to the costs of the work that must be carried out in the network in order to connect the wind power installation. Note that these costs may be high if the installation is a long distance from the existing network. The network operator incurs costs for the transmission of electricity over the network. These costs include energy losses, higher-level network fees, metering, operating and maintaining the network, and the costs of equipment such as transformers and switches. To cover these costs, the network operator is entitled to receive a transmission fee.

Installations below 1,500 kW are exempt from certain parts of the transmission costs as described in chapter 4, section 10 of the Electricity Act. These installations only need to pay that part of the network fee corresponding to the annual costs for metering, computation and reporting in the concessionaire's network. This means that the concessionaire's annual costs for the operation and maintenance of the network, etc., which other customer must pay (including installations over 1,500 kW), cannot be charged to installations below 1,500 kW. If a number of wind turbines use a shared connection point, this rule applies if each turbine has a maximum capacity of 1,500 kW. (Wind power building and connecting large wind turbines, Swedish energy Agency, <http://www.sweden.gov.se/content/1/c6/11/64/01/0f7c0076.pdf>)

*Barrier 7.2 - Problems concerning development of electricity network infrastructures according to a long-term strategy*

The electricity market is divided into two parts: one part supplies electricity and the other part – network operations – handles the transmission and distribution of electricity. The supply of electricity has been opened up to competition and is handled by electricity suppliers. Consumers and generators are free to decide which electricity supplier to use. Network operations, on the other hand, are a natural monopoly, regulated by the Electricity Act (1997:857) and supervised by the Energy Markets Inspectorate.

The Government have made an exemption from the demand for permit to grid connection ordinance (2007:215) om undantag från kravet på nätkoncession according to the Electricity Act (1997:857), meaning that a wire or cable connecting two or more electrical facilities for energy production shall be able to get exemption from permitting demand (SFS 2008:897) in order to facilitate RES installations.

The Government states that there is no lack of capacity in the grid, but in some areas there might be need for support and reinforcement in areas with a major installation of Res installation such as large wind farms.

*Barrier 7.3 - Problems concerning development of a Trans-European Electricity Network Have not been identified.*

## 7.2.2 Best Practice Elements and Indicators

Please fill in here the results of the Benchmark indicators:

<b>No.</b>	<b>Technology</b>	<b>Benchmark</b>	<b>Result</b>
7.1		Presence of an efficient (in terms of capability of achieving its stated objectives) plan for the reinforcement of the interconnection capacity with neighbouring countries.	Yes
7.2		Presence of an efficient plan for the reinforcement of the connection capacity within the country.	Yes

## 7.3 Literature

Governmental bill. 2009/10:128

<http://www.regeringen.se/content/1/c6/14/24/85/3e6bdec0.pdf>

Wind power, building and connecting large wind turbines,  
Swedish Energy Agency

<http://www.svenskakraftnat.se>

Small-scale Wind Turbines - Introductory market study for Swedish conditions,  
Erika Thorstensson, Chalmers Tekniska Högskola, 2009



## 8 Issue 8 Power Grid Issues

### 8.1 Introduction

The Swedish electric grid system is a complex network and consists of many linked grids for transportation of electricity between the generator and end customer. The system consist of three different parts; the main power grid (220-400 kV), regional power grids (70-130 kV) and local distribution grids (>20 kV). The main grid is owned by Svenska Kraftnät and is used for transportation of electricity over long distances. The regional grids are used to transport electricity from the main grid to the local distribution grids and to large industries etc. The distribution grids are used to distribute the electricity to buildings and industries. (Elnätanslutning av vindkraft till lokal-, region-, och stamnätet, 2007).

Today much of the Swedish energy is produced from large scale hydropower in the north part of Sweden, distributed to the cities and industries in the south part. A large part of the future wind power projects are situated in the north part and demands a large scale rebuilding and maintenance. This process is much slower then the development of windfarms for the moment.

The Swedish goal is to increase the wind energy production about 15 times, and the electric grid s need to be adopted to this.. It is uncertain if the grid will be able to or get difficulties with handling the planned major expansion. There might be need for an infrastructure up-grade, investments and implementation of new technology and grid management concepts. If this won't be taken into consideration it will most likely end up with power cuts, disturbenses and high frequent noise in the phone, radio or TV. This can be avoided by careful planning and investment, however it must be done at the same speed as the wind power development.

### 8.2 Description of the barrier

#### 8.2.1 Detailed description of the Barriers and solutions

##### *Barrier 8.1 - Problems concerning grid connection*

This has not been an identified barrier in Sweden.

The electricity network company has an obligation to connect a customer to its network. The company has at the same time the right to take out a fair fee which is to represent to cost for connection. Those customers who feel that the fees are too high can contact the energy inspectorate (EI) to have the matter investigated.

At present there are a large number of cases with the EI and courts. Approximately 50 cases are awaiting trial, 300 in the administrative court of appeal and 250 cases in the

administrative courts. There are more than 1700 cases that the EI has decided not to investigate prior to case law has been further developed. Approximately 1 600 of the cases are associated with the 3G telecom network.

### **Solution**

The Swedish Power Grid has conducted a threshold investigation and has developed a suggestion whereby they act as a total financier for the expansion and connection to the grid. This will decrease the cost for each separate company and the Swedish Power Grid take the financial risk for the project to avoid unjust financial barriers. In turn the energy companies must pay a fee for these services however they do not have to take out a load for connection (Svenska Kraftnät).

### *Barrier 8.2 - Problems concerning grid access*

The development of the electricity network is not expending at the same rate as the development of new technologies such as wind farms. The administration process needs to be streamlined.

The energy markets inspectorate has introduced a new method for examining the electricity network company's connection costs. This has been designed in order to shorten the handling time and make it easier for both the customers and the electricity network companies to see the costs involved with connection to the network.

According to the general director of the Energy Markets Inspectorate they are anticipating that their new methods will lead to the quick development of case law surrounding the industry so that long drawn out processes in the courts can be avoided. The new methods are built upon a two zone approach.

A power plant should always be connected to the closest transformer station.

The connection fees are dependent upon the distance to connection to the grid with a maximum cost of approximately 2 000 euro for 600 m. Connection distanced longer than 600 m have not been discussed.

The new regulations will decrease significantly the number of cases waiting a decision.

### *Barrier 8.3 (former barrier 9) - Problems concerning TSOs and DSOs*

## **8.2.2 Best Practice Elements and Indicators**

Please fill in here the results of the Benchmark indicators:

<b>No.</b>	<b>Technology</b>	<b>Benchmark</b>	<b>Result</b>
8.1		Are the rules on cost sharing and bearing of grid connection objective, transparent and non-discriminatory ?	Yes/No
8.2		Is the denial of grid connection by TSOs and DSOs a common problem, constituting an important barrier for RES development?	No
8.3		Number of months for getting grid connection (considering also approval of grid connection)	2-6
8.4		Estimated connection costs in Euros (in case producer pays)	

## 8.3 Literature

### Interviews

Energy Markets Inspectorate

<http://www.energimarknadsinspektionen.se/Energy-Markets-Inspectorate/>

Please include in this list only that literature which you actually quoted; preferably by a footnote.

Governmental bill. 2009/10:128

<http://www.regeringen.se/content/1/c6/14/24/85/3e6bdec0.pdf>





## 9 Issue 9 Gas Network Issues

### 9.1 Introduction

### 9.2 Description of barriers & solutions

#### 9.2.1 Detailed description of the Barriers and solutions

*Barrier 9.1 – No encouragement for upgrading*

*Barrier 9.2 – Lack of information*

*Barrier 9.3 – Authorisation procedures*

*Barrier 9.4 – Lack of incentives for infrastructure owners to open to biogas*

- Gas distribution from production units to gas stations is located irregularly throughout the country making it difficult to travel long distances without addition fuel. This weakens the demand for bio gas (general information) since the owner of the gas stations have to finance the piping and distribution chain.

#### 9.2.2 Guideline questions for the interview

#### 9.2.3 Best Practice Elements and Indicators

Please fill in here the results of the Benchmark indicators:

<b>No.</b>	<b>Benchmark</b>	<b>Result</b>
9.1	If green certificates and/or subsidies for biogas are in place, do they de facto make unattractive to feed green gas into the grid due to the high level of subsidy for biogas used for electricity generation?	
9.2	Are the costs of grid connection for producers of gas from renewable energy sources objective, transparent and non-discriminatory?	
9.3	Do transmission and distribution tariffs discriminate against gas from renewable energy sources?	
9.4	Average time needed for grid connection approval (from application for grid connection to formal approval) in months (#).	

Note: green gas is upgraded biogas to natural gas quality for grid injection.

### 9.3 Literature

Please include in this list only that literature which you actually quoted; preferably by a footnote.

## 10 Issue 10 District Heating

### 10.1 Introduction

The Swedish District Heating Association has formulated a collective prognosis for the district heating branch development until 2015. According to the prognosis district heating will grow together with district heating power stations and district cooling systems. Simultaneously heating by the traditional methods of fossil fuels is being phased out, strengthening the method of district heating as it is a climate and environmentally friendly heating alternative.

The prognosis is very positive between the member companies where both large and small production companies plan for an increase in production. Cooperation within the industry between producers and networks distributors is increasing, according to the Lena Sommestad the MD of Swedish District Heating.

The prognosis for expansions within the branch is presented in the report "Fjärrvärmen fortsätter att växa". It is built solely upon the Swedish member companies and is completed with in-depth interviews. A summary includes:

- District heating delivery will increase from the currents 49 to almost 53 TWh by 2015.
- The total network length will increase by 25% to a total of 24 300 km;
- The sales of district heating to apartment buildings and commercial shops are predicted to decrease slightly while the connection and sales to residential houses and industry will increase;
- The fossil fuel branch will decrease by 8% by 2015, an 18% decrease from 2007;
- The carbon dioxide emissions will decrease further to approximately 2.4 million tons per year;
- The equivalent energy production with oil would have produced 19 million tons larger carbon dioxide emissions. (Sweden goal is to reduce carbon dioxide emission by 20 million tons by 2020 from the 1990 level);
- The sectors of uncultivated wood fuel and landfill waste burning are expected to increase greatly in the fuel source. Excess heat generated in large industries is also expected to increase;
- The construction of power plant which can produce district heating and electricity simultaneously has increased over the past few years and member companies anticipate a doubling by 2015, where electricity production will be almost 13 TWh.
- District cooling is expected to increase from the current 0.8 TWh to approximately 1.3 TWh by 2015.

The percentage of bio fuels used in district heating has increased by 5% and contributes 48% of the fuel used in production.

The Swedish District Heating Association has presented new branch statistics in 2008 for the fuel generating district heating. This shows the decrease in fossil fuel usage and decreased carbon dioxide emissions by 10% from the previous year.

## 10.2 Description of barriers & solutions

### 10.2.1 Detailed description of the Barriers and solutions

*Barrier 10.1 – Lack of positive conditions for the increase of the share of renewable in existing DHC systems*

- District heating has today a monopoly market, run by the district heating companies which own the heating tubes. This has become frustrating for many activities that generate excess heat from their processes, such as pulp and paper. Today many Swedish companies with heat generating processes have to cool the excess heat instead of leading it to district heating systems. There is a considerable profit in district heating, consumers pay 0,070 EUR per kWh and the district heating companies pay 0,003 EUR per kWh, giving the companies a profit of approximately 0,065 EUR per delivered kWh. They are today not interested in sharing this market with other actors (Albin Andersson, Södra skogsägarna).

*Barrier 10.2 – Lack of positive conditions for the initiation and expansion of DH systems largely based on renewable*

This is not a barrier in Sweden. The main barrier identified is the monopoly of the distribution and the administrative procedures which are time consuming and costly.

The distribution and construction are made according to spatial planning, regulating the dimension and capacity of the distribution.

### 10.2.2 Best Practice Elements and Indicators

Please fill in here the results of the Benchmark indicators:

No.	Benchmark	Result
10.1	Are there policies to promote the increase of the RES share in existing DH networks? (yes/no)	yes
10.2	Are there policies to promote the initiation / expansion of DH networks? (yes/no)	yes
10.3	Percentage present renewable share (see ECOHEATTOOL)	
10.4	Percentage CHP share (idem)	

## 10.3 Literature and Sources

### Interviews