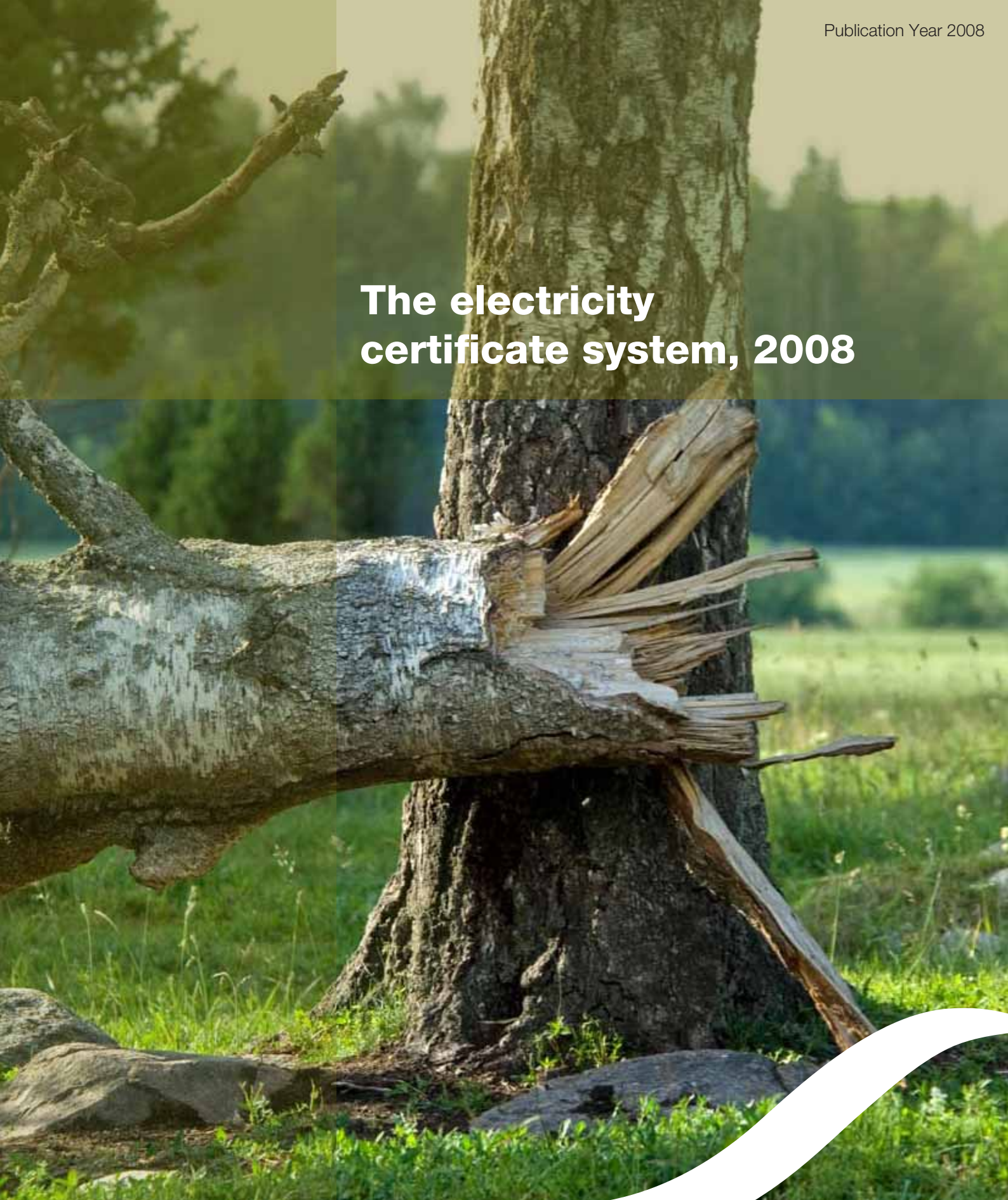
Publication Year 2008

The electricity certificate system, 2008



Books and reports published by the Swedish Energy Agency can be ordered directly from the Agency's publications department:
Order fax: +46 16-544 22 59
E-mail: publikationsservice@energimyndigheten.se
They can also be downloaded from the Agency's web site:
www.swedishenergyagency.se

English language edition: 700
ET 2008:09

Layout and production: Edita Communication
Translation: Angloscan Manuscript Ltd.
Printed by Edita Västra Aros AB
Photo: Per Westergård

Preface

The electricity certificate system is now in its sixth year. Since the start, both the system and the market have developed, and have undergone a number of changes. In January 2007, the Swedish Energy Agency published a report on the system, 'The electricity certificate system, 2006', to provide easily accessible information on the development of the system and to improve general understanding of it. With the passing of another year, it is now time for the third edition, 'The electricity certificate system, 2008', describing the market status of the electricity certificate system, with statistics from 2003 to 2007.

This year's special theme chapter describes current support systems for renewable electricity production throughout the EU. The report also contains expanded information and statistics on biofuels, together with a new chapter that describes planned expansion of renewable electricity production up to 2012. The chapter on consumers' contribution to renewable electricity production has also been updated. A new feature this year is provided in the form of a number of tables at the end of the report, complementing the text.

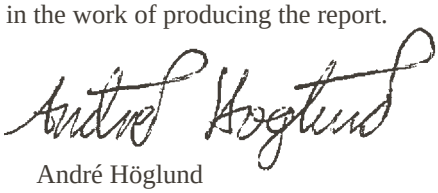
Through annual publication of the report, we hope to create a means of continuously developing the statistical material and analyses, in order to assist those involved in the market, and all other interested persons, to follow achievement of the objectives set out in the Government's Bill No. 205/06:154, 'Renewable electricity with green certificates'. We welcome views on the content and presentation of the report in order further to improve it.

The target for the certificate system is to increase, by 2016, the annual production of electricity from renewable sources by 17 TWh relative to its production in 2002. So far, the actual production of renewable electricity is less than the indicative stage target for 2007. Nevertheless, progress is regarded as good, as there are many planned projects that are likely to come on line in the next few years, while the current price of certificates makes investment in further renewable production more favourable.

The certificate system faces a number of changes in the future. One important aspect is that of extensive overhaul and updating of existing plants, and whether they will be entitled to a further allocation period of certificates. The EU draft directive on encouragement of the use of renewable energy will also probably affect the certificate system.

André Höglund, as the project manager, with Roger Östberg and Martin Johansson, have been responsible for preparing this report, which forms a part of the Swedish Energy Agency's work of monitoring, providing information to, and analysing the electricity certificate market. In addition, Mattias Eriksson, Maria Jöhnemark, Maria Westrin and Ellen Åhlander have assisted in the work of producing the report.

Zofia Lublin
Head of Department,
System Analysis



André Höglund
Project Manager

Table of content

Support systems for renewable electricity production within the EU

In the same way as Sweden has done, other countries in the EU have chosen in one way or other to employ support systems to increase their proportions of renewable electricity production. In January 2008, the EU Commission presented its draft directive for encouraging the use of renewable energy. The proposal suggests a binding objective of delivering 20 % of energy supplies within the EU from renewable energy sources by 2020. Member states' support systems for renewable electricity production will be exceedingly important in achieving this ambitious target.

The amount of energy supplied from renewable sources within the EU has increased noticeably in recent years, with all member states having developed policies and strategies for achieving their objectives. At present, there is no regulatory structure to determine how each state should provide support for renewable electricity production, with the situation differing from one country to another. There are several reasons for the considerable differences between the support systems that the individual countries have chosen to use. These include the fact that the electricity markets vary considerably from one country to another, and that some countries attach greater importance to their labour markets or regional development. There are also physical, administrative and commercial barriers between countries, with the result that each country has evolved its own national support system. There are at present five different groups of support systems within the EU for increasing the production of electricity from renewable energy sources: feed in tariffs, green certificates, tenders, tax incentives and quota based support systems (without certificates).

- **Feed in tariffs** are used by a majority of member states. They have been particularly successful in, for example, Germany and Spain in supporting the expansion of wind power production. Through them, producers of renewable electricity receive a guaranteed price for electricity that they sell to the grid. This price is paid by the electricity suppliers, who are usually the distributors, to the indigenous producers of renewable electricity. Normally, prices are set for a seven year period. A variant of the feed in tariffs principle is that of the bonus system, under which the producers of renewable electricity receive a certain price over and above the price of the electricity that they have produced.

- **Green certificates or electricity certificate systems** are used in several countries within the EU, including Sweden. They vary somewhat in their structure, but all share the common feature of being market based instruments, based on an interaction between the supply and demand of certificates. One variant of the system is that electricity producers are required to produce a certain proportion (quota) of electricity from renewable energy sources, for which they receive certificates that they then sell on. Another variant, which is used in Sweden, imposes a requirement on electricity users to purchase certificates corresponding to a certain proportion of their electricity use. Both these variants mean that the producers receive additional revenue from certificates, in addition to that from the sale of electricity.

- **Tenders** means that the state calls for offers from companies wanting to supply renewable electricity on a contract basis at a particular price. The company submitting the most competitive tender receives the contract. Consumers who then purchase the electricity have to pay a fee element covering the additional costs arising in connection with production of the renewable electricity. Within the EU today, it is only France that applies this method, for certain production technologies. Historically, it is Ireland that has employed this type of policy measure.

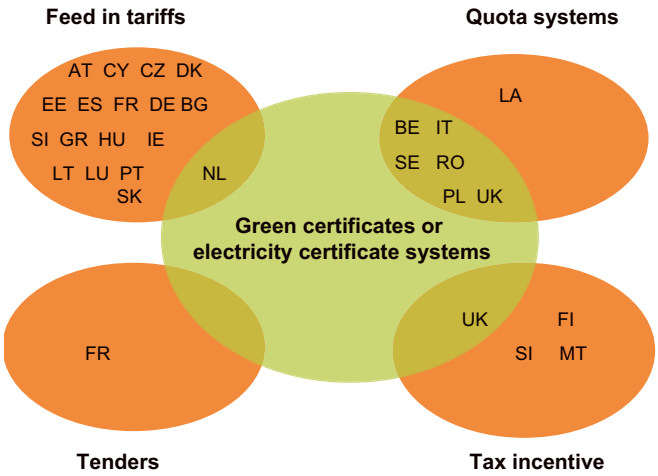
- **Tax incentives** form a group of policy measures, of which tax reliefs or exemptions from energy tax are a couple of

examples. Grants and investments are other examples of policy measures in this group. Malta and Finland are the countries relying entirely on this type of policy measure, while it is very common for such measures to be found in other countries, complementing other types of measures. In the Nordic countries, where energy taxes are higher, tax relief and exemptions from energy tax can be sufficient within this group of policy measures in order to encourage the use of renewable energy. In countries with lower rates of energy taxation, it may be necessary to complement these measures with others, such as grants or investment support.

- **A quota system (without certificates)** is employed in Latvia, which is the only country within the EU using a quota based support system without certificates. It is based on setting quotas for each year, determining the amount of installed capacity from renewable electricity that may be produced within the country.

Figure 1 shows the support systems mainly used by each country within the EU.

Figure 1. Different groups of support systems used by countries in the EU in order to increase production of renewable electricity.



Source: OPTRES Final report – Assessment and optimisation of renewable energy support schemes in the European electricity market

Advantages and disadvantages of the various support systems

Green certificates or electricity certificate systems encourage expansion of the most cost efficient forms of renewable electricity production. The greatest rate of growth occurs first in those technologies that can be developed for the lowest cost, and which are the most mature, after which more expensive technologies follow in due course. For investors, there is a higher risk in investing in renewable electricity production, as the price of the electricity certificates – i.e. part of the producers' revenue – is more difficult to forecast over a longer period.

There are not many countries that use a tendering procedure. This is a technology specific system, and is not applied to all the possible technologies within a country. A weakness of this system lies in market uncertainty, and in the fact that there is a risk that some tenders could be at a level that does not always cover the cost of producing the electricity.

Tax incentives are used primarily as complements to the other policy measures, and are employed when a country is deciding on its policy in respect of renewable energy. It is difficult to measure the results of the various policy measures belonging to this group, as they mostly operate in conjunction with the other groups of policy measures.

In exactly the same way as for green certificates or electricity certificate systems, the certificate less quota system involves an uncertainty for investors considering investing in renewable electricity production, as the quotas are set only for one year ahead, and also because they have hitherto been low.

Harmonisation and parallel use of the various systems

As mentioned above, the support systems for renewable energy within the EU vary from one country to another, due to various factors. Most countries have attempted to optimise their renewable energy support systems to suit their particular conditions. For the time being, the EU Commission has decided that it would be best not to attempt to introduce a common support system for all countries. One reason for this is that it is not possible to say whether a price based system or a quota based system would be best suited for use within the EU in an economically efficient manner. In addition, national support systems are often designed in order specifically to suit the terms and

conditions within the country. A common support system might in fact hinder regional development potentials within specific technologies. Today, several countries have well established support systems that are operating without problems, while changing them could create considerable uncertainty for the production of renewable energy.

However, the Commission recommends that member states should attempt to cooperate across national borders. The cooperation on feed in tariffs that has been introduced between Spain, Germany and Slovenia is an excellent example of such cooperation, as are the Norwegian/Swedish discussions on a common electricity certificate system that were restarted in 2008. Reduction of the number of different support systems at present in existence through cooperation between countries could produce large scale economic benefits, transparency for investors and a more cost effective way of achieving the aim of increasing renewable energy production.

Main barriers in the way of development of renewable energy

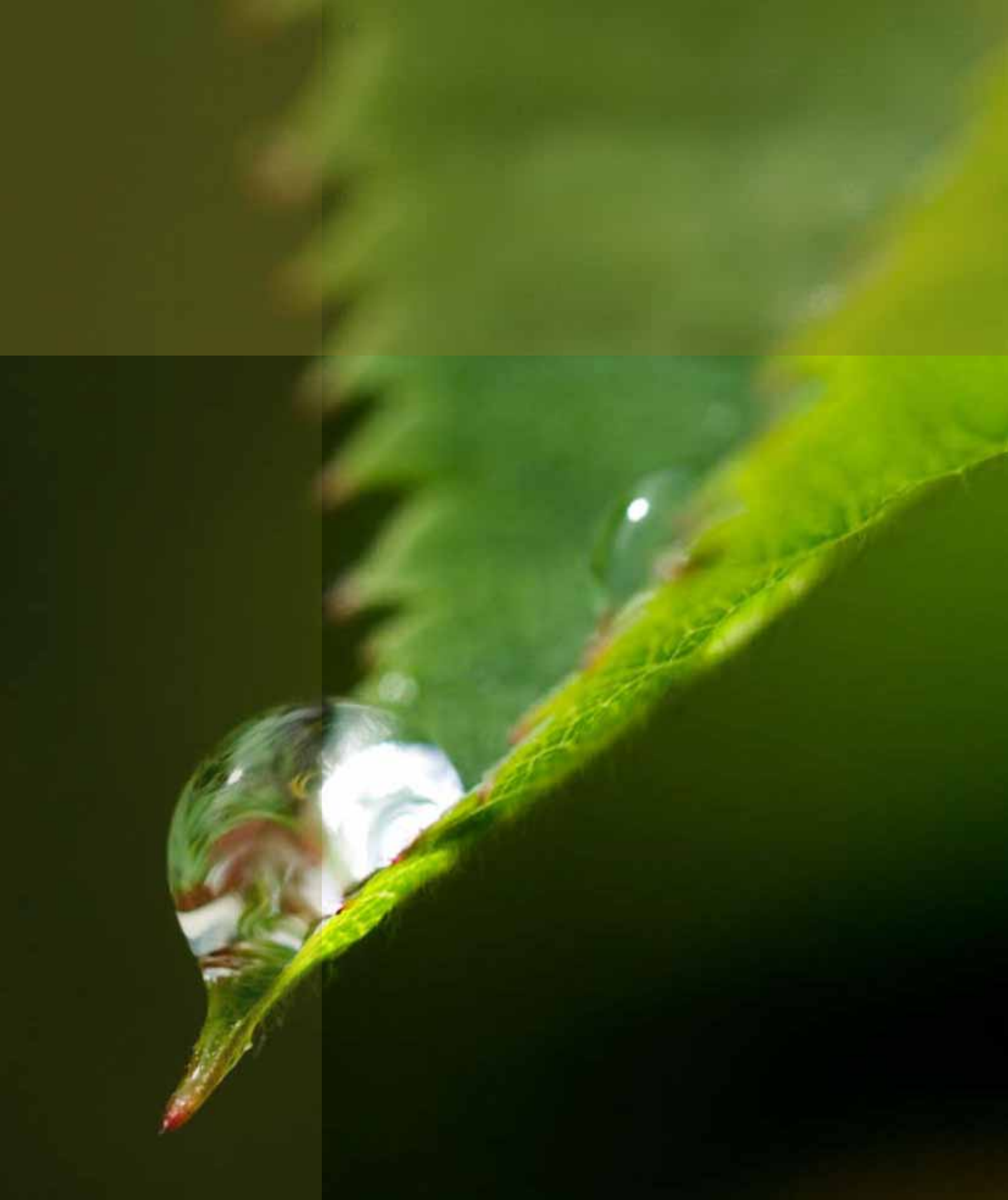
Although several countries have succeeded well with their support systems for renewable energy, there are barriers in the way of increasing the amount of renewable energy production, although it must be emphasised that these barriers vary from country to country. The commonest barriers are:

- **Administrative barriers,** such as the involvement of too many public authorities or other bodies, with poor cooperation between them. It is also common for the planning process for permission to construct new facilities to take far too long. Awareness of the benefits of renewable energy is sometimes poor among regional and local authorities, with the result that overall circumstances are not optimised. The administrative barriers can be reduced by cutting the number of parties involved and by simplifying the planning process, and by improving cooperation with regional authorities.

- **Grid related barriers,** such as insufficient grid transmission capacity, high costs for connection to the grid or long lead times for planning are various examples. There is also a need for improving the objectivity of connection, as it sometimes seems to be more difficult for certain private parties to obtain grid connections as a result of the problems presented by the monopoly situation concerning ownership of national grids.

- **Social barriers,** such as opposition from local interests or the public in connection with, for example, the construction of wind power plants or biofuel plants in their vicinity, are common. Then in the same way, awareness of the benefits of renewable energy by end users is not always particularly good. In addition, when comparing the costs of production from non renewable energy sources, account is not always taken of the total costs, thus failing to make proper comparisons. An example of this is presented by the fact that the costs of handling nuclear waste are not always included, which skews the cost comparison picture.

- **Financial barriers** occur in the various support systems to different extents. One important factor is the lack of confidence of banks and investors, which is especially marked in those countries where renewable energy support systems have not been established for a particularly long period. Uncertainty concerning payment levels, cash flows and higher risk premiums from banks implies that there is a risk that investments will not be made.



Background to the electricity certificate system

The electricity certificate system is a market based system to support the expansion of electricity production in Sweden from renewable energy sources and peat. Its objective is to increase, by 2016, the production of electricity from such sources by 17 TWh relative to the production level in 2002. It is part of the country's overall objective of moving Sweden towards a more ecologically sustainable energy system.

In 2002, Sweden produced 70,3 TWh of electricity from renewable energy sources, of which about 90 % were in the form of large scale hydro power. The EU and Sweden's Parliament have ambitious targets for the production of electricity from renewable energy sources and, in order to meet them, Sweden introduced its electricity certificate scheme in May 2003, with the objective of increasing the production of electricity from renewable energy sources by 10 TWh by 2010, relative to the corresponding production in 2002. In 2004, the objective of the legislation was expanded, so that it now also includes encouragement of the production of electricity from peat as a fuel in combined heat and power plants.

A decision by Parliament on 14th June 2006 modified the legislation concerning electricity certificates and further raised the targets for production of electricity from renewable sources. With effect from 1st January 2007, the objective is now to increase its production by 17 TWh in 2016, relative to production in 2002.

Electricity producers whose electricity production meets the requirements in the Electricity Certificates Act receive one electricity certificate unit for each megawatt hour (MWh) of electricity that they produce. Demand for certificates is created by the fact that all electricity suppliers, and also certain electricity users, are required to purchase certificates corresponding to a certain proportion (quota) of their electricity sales or electricity use. The quantity of certificates to be purchased is adjusted from year to year in step with progressive increases of the quota proportion, thus generating a corresponding increase in demand for the certificates. In turn, this increases the incentive to produce more electricity from energy sources approved for production of certificate entitled electricity. Through the sales of their certificates, producers of electricity from renewable energy sources receive additional revenue from their production of electricity. In this way, the system encourages the expansion of electricity production from renewable sources, and new technologies.

Producer's entitlements to electricity certificates

One electricity certificate unit is issued to each approved producer (i.e. electricity producer operating an approved plant) for each produced and metered megawatt hour of electricity from renewable energy sources, or from peat. Electricity from the following energy sources entitles its producers to certificates:

- Wind power
- Solar energy
- Wave energy
- Geothermal energy
- Biofuels, as defined in the Ordinance (2003:120) Concerning Electricity Certificates
- Peat, when burnt in CHP plants
- Hydro power
  - small scale hydro power which, at the end of April 2003,had a maximum installed capacity of 1500 kW per production unit,
  - new plants,
  - resumed operation from plants that had been closed,
  - increased production capacity from existing plants,
  - plants that can no longer operate in an economically viable manner due to decisions by the authorities, or to extensive rebuilding.

Restrictions on entitlements to certificates

The electricity certificate system is intended to support the construction of new plants for the production of electricity from renewable energy sources or from peat. However, in order to limit the cost to consumers of electricity from sources

such as older, commercially viable plants, there is a time limit on the right of producers to receive certificates. Plants commissioned after the start of the electricity certificate system are entitled to receive electricity certificates for 15 years, or until the end of 2030, whichever is the earlier. Plants that were commissioned before the certificate system was introduced are entitled to certificates until the end of 2012. Plants that, at the time of their construction or conversion, received a public investment grant after 15th February 1998 (in accordance with a grants programme for certain investments within the energy sector), are entitled to certificates until the end of 2014.

Quota obligation

Electricity suppliers (i.e. network companies distributing electricity to end users) are required to purchase electricity certificates corresponding to a certain proportion of the electricity that they sell, known as their quota obligation. In order to fulfil their obligations, the suppliers are required to submit an annual return to the Swedish Energy Agency with details of the amount of electricity that they have invoiced to their customers during the previous year, together with certificates corresponding to a certain proportion (quota) of their sales. These returns are required by not later than 1st March each year. In addition to electricity supply companies, the quota obligation applies also to electricity intensive companies and to electricity users who have used electricity that they have themselves produced, imported or purchased on the Nordic power exchange.

Who does what?

The Swedish Energy Agency and Svenska Kraftnät share responsibility for the electricity certificate system, with the Agency being the compliance authority and Svenska Kraftnät being the accounting authority. Their duties are as follows.

The Swedish Energy Agency:

- Approves certificate entitled plants
- Registers/deregisters parties having quota obligations, and checks their annual returns declaring their amount of quota liable electricity
- Decides on late delivery penalties for those required to submit annual returns but who have not done so by 1st March
- Decides on a quota obligation penalty charge if the quota obligation is not fulfilled
- Redeems electricity producers' unsold certificates at a guaranteed price
- Is the compliance authority in respect of compliance with the Act, Ordinance and regulations concerning electricity certificates
- Publishes information on the electricity certificate system
- Monitors and analyses developments on the electricity certificate market.

Svenska Kraftnät:

- Issues electricity certificates based on metered values from certificate entitled electricity production
- Prepares and maintains the certificate register, with details of certificate holdings
- Cancels certificates on 1st April each year, in accordance with information in the returns received and checked by the Swedish Energy Agency
- Publishes regular information on the number of certificates issued, traded and cancelled, and on their average price.

Important dates in the electricity certificate system

1st March: Latest date for those having quota obligations to submit their returns of electricity sales and electricity use, on which the previous year's quota obligation was based.

31st March: Latest date for those having quota obligations to ensure that a sufficient number of certificates is held in their certificate accounts in order to meet their obligation and, if so wished, to indicate which certificates in their account they wish to be cancelled.

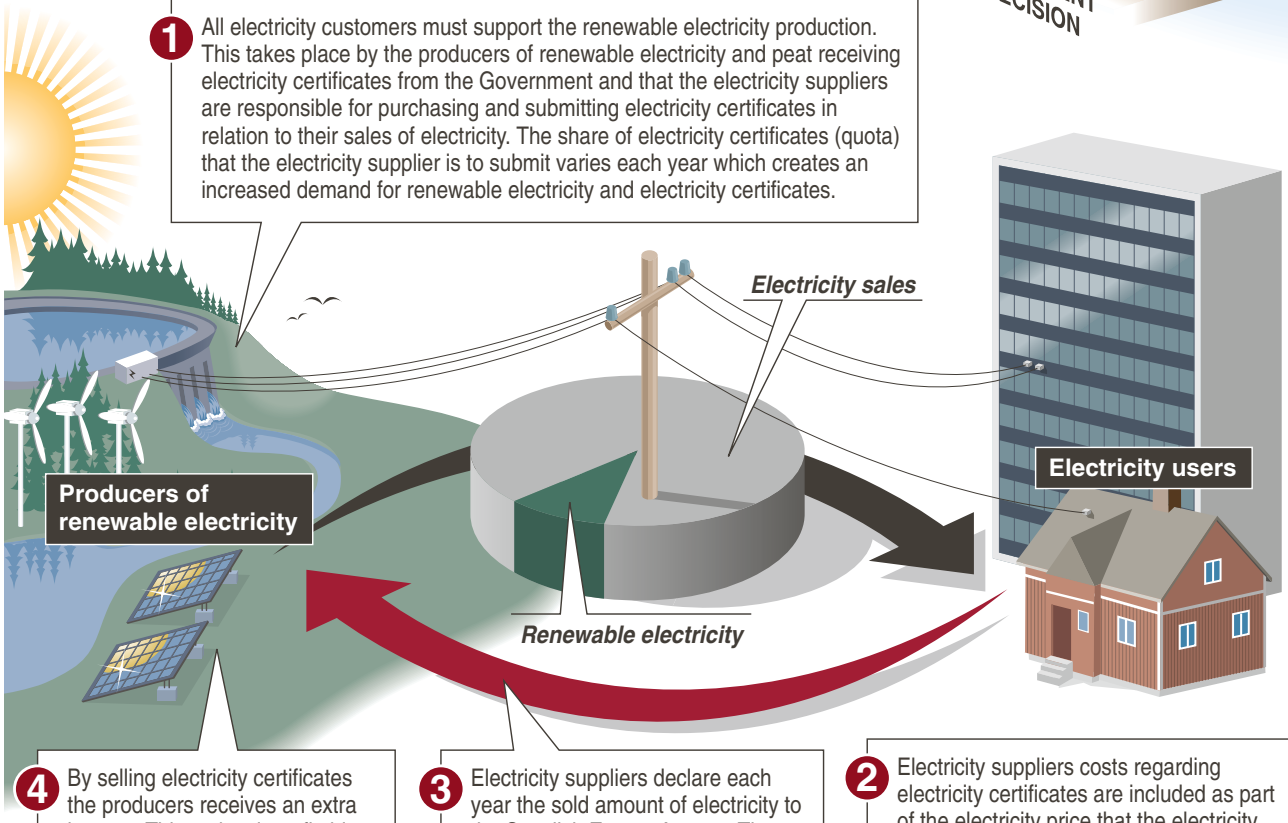
1st April: Cancellation of the requested number of certificates, or of that number of certificates as needed to fulfil the quota obligation. If the account holds an insufficient number of certificates, the Swedish Energy Agency will decide on an appropriate quota obligation penalty fee.

The electricity certificate system

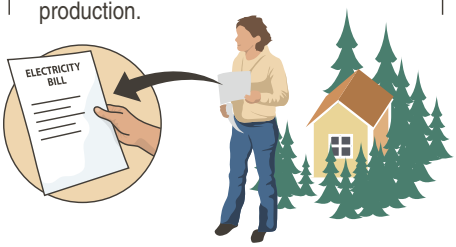
The Swedish Parliament has decided that the support concerning electricity production using renewable energy sources (solar energy, wind power, hydro power and biofuel) and peat is to be based on the electricity certificate system. The electricity certificate system started on the 1st of May 2003 and runs to the end of year 2030.

The system works in the following way:

1 All electricity customers must support the renewable electricity production. This takes place by the producers of renewable electricity and peat receiving electricity certificates from the Government and that the electricity suppliers are responsible for purchasing and submitting electricity certificates in relation to their sales of electricity. The share of electricity certificates (quota) that the electricity supplier is to submit varies each year which creates an increased demand for renewable electricity and electricity certificates.



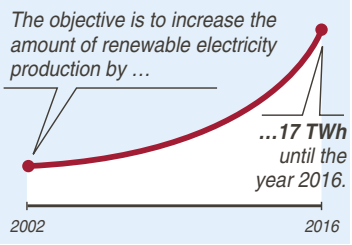
2 Electricity suppliers costs regarding electricity certificates are included as part of the electricity price that the electricity suppliers charges the customers. The electricity certificate system thus leads to an increased cost for the customer but in return the system reduces the environmental impact from the electricity production.



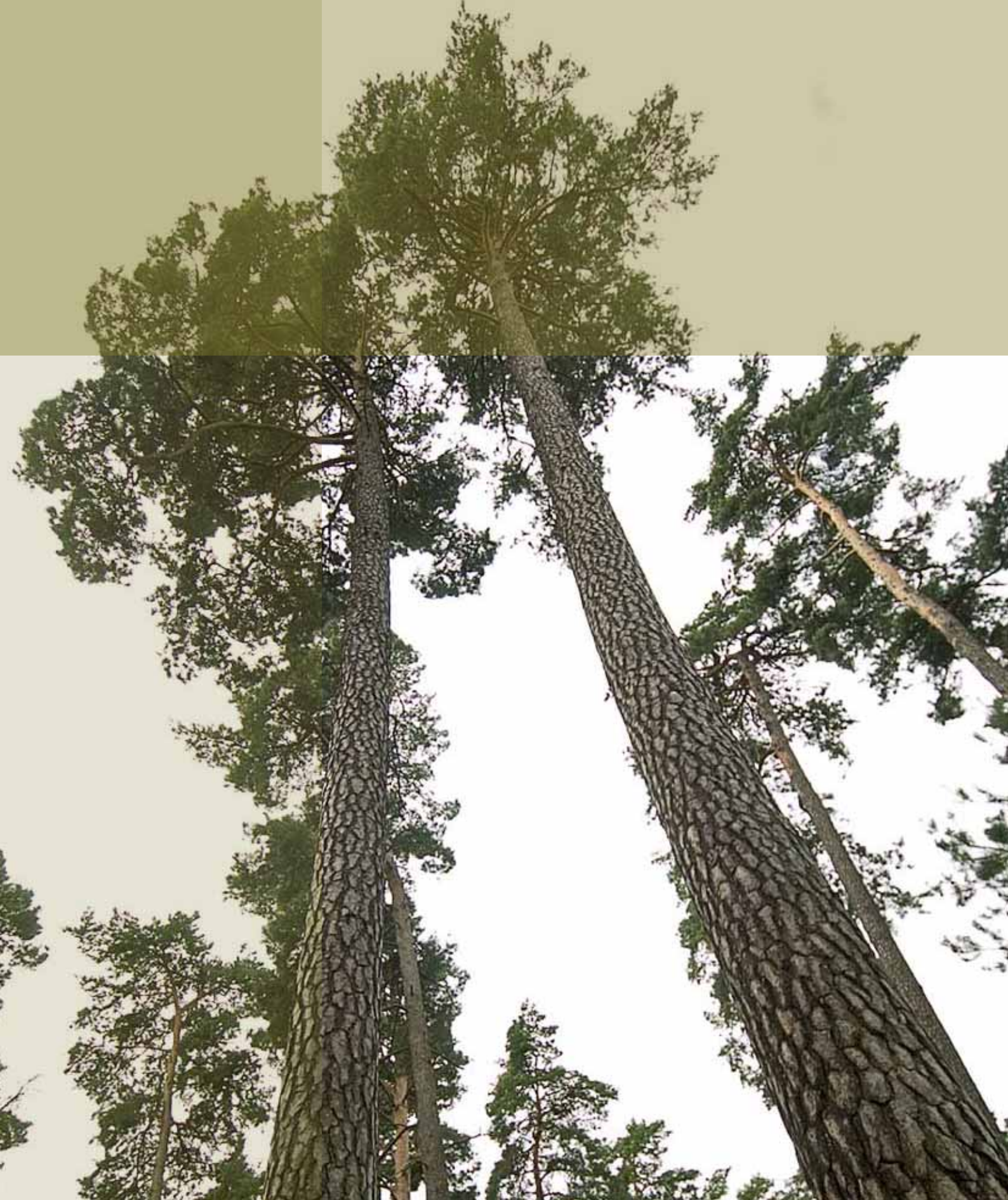
3 Electricity suppliers declare each year the sold amount of electricity to the Swedish Energy Agency. The electricity suppliers quota obligation is calculated based on the sold amount of electricity and the quota for the previous year. On the 1st of April, each year, the electricity supplier is to submit the calculated number of electricity certificates to the Government and a cancellation is performed. Since the electricity certificate is cancelled, the electricity supplier must purchase new electricity certificates in order to meet the quota obligations for the coming year.

4 By selling electricity certificates the producers receives an extra income. This makes it profitable to invest in new renewable electricity production.

Objective until the year 2016



GRAPHICS BY TOMAS ÖHRLING.SE

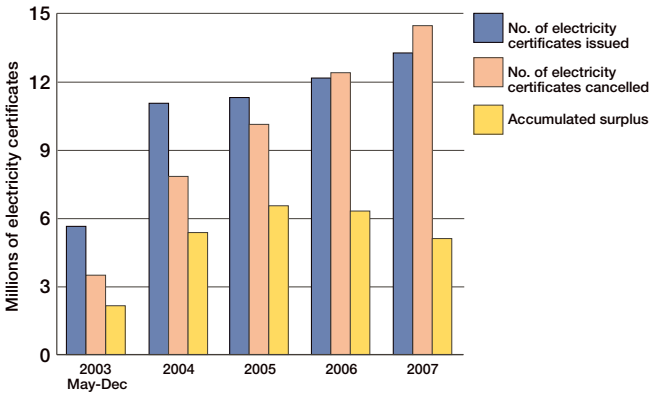


Number of certificates available

Power plants producing electricity from renewable energy sources or from peat, and which have been approved by the Swedish Energy Agency, receive a number of electricity certificates, depending on the amount of renewable electricity produced by the plant. This means that the number of certificates issued is determined by the number of approved plants, by the amount of electricity that they produce and by the proportion of renewable fuel that they use. Electricity production is also affected by external factors such as temperature, precipitation, wind and the country's overall electricity balance.

During the certificate system's first three years, the number of certificates issued exceeded the demand for them, which resulted in a surplus of tradable certificates on the market. The accumulated surplus increased each year, as certificates have open-ended validity, and can therefore be carried forward. A change occurred in 2006, when the number of certificates cancelled was slightly higher than the number of certificates issued. The accumulated surplus continued to contract during 2007, with about 1,2 million more certificates being cancelled than were issued during the year. However, there is still a surplus of certificates on the market, although it has been reduced, as can be seen in Figure 2.

Figure 2. Number of certificates issued and cancelled, together with accumulated surplus over the period 2003-2007.



Source: Svenska Kraftnät's Cesar accounting system

Of the electricity production that received certificates in 2007, 68,2 % was from biofuel fired plants, and 4,4 % from CHP plants burning peat. Wind power plants received 10,8 %, and hydro power plants received 16,6 %, thus making significant contributions to electricity production within the system. A small number of solar energy plants were approved for reception of certificates, but they produced only a few MWh during the year. No wave energy or geothermal energy plants have so far been submitted for approval and inclusion in the system.

The producers on the market are a very mixed group, in terms of the number of plants that they own and the size of their electricity production. In 2007, certificates were issued to 1149 companies and private persons, which was an increase of 45 over the previous year. Of them, 855 own only one plant. Although there are numerically much fewer plants in the bio-energy sector than in the wind and hydro power sectors, they often produce a greater total electricity production from renewable energy sources.

The producers of certificate entitled electricity can be described as a group in which a small number of companies accounts for most of the production, while a large number of producers each contribute only a relatively small production quantity. The structure of the group tends to remain much the same from year to year. In 2007, 96 % of the producers received certificates for a production of 50 000 MWh or less, making up 19 % of the total number of certificates issued during the year. The three largest producers accounted for 21 % of certificate entitled production, which was more or less unchanged from the previous year. These three producers in fact produce 77 % of all electricity in Sweden.

Demand

The demand for electricity certificates is created by the obligation for electricity suppliers and certain electricity users to purchase certificates corresponding to a particular proportion of their electricity sales and/or electricity use. This proportion, or quota, has been decided for each calendar year, and set at such a value that the system will play its part in achieving the objective of increasing the production of electricity from renewable energy sources by 17 TWh in 2016, relative to production in 2002.

The quota is determined by the Act (2003:113) Concerning Electricity Certificates, and is intended to create an increasing demand for certificates. Table 1 and Figure 3 show the value of the quota and its growth between 2003 and 2030. The structure of the quota means that demand is relatively price inelastic, due to the fact that parties having quota obligations have an incentive to purchase certificates up to a price that is 50 % higher than the average price for the year. This is because, for each certificate that they do not cancel, they are required to pay a quota obligation penalty fee of 150 % of the average price of certificates, calculated over a period of one year leading up to the date of cancellation.

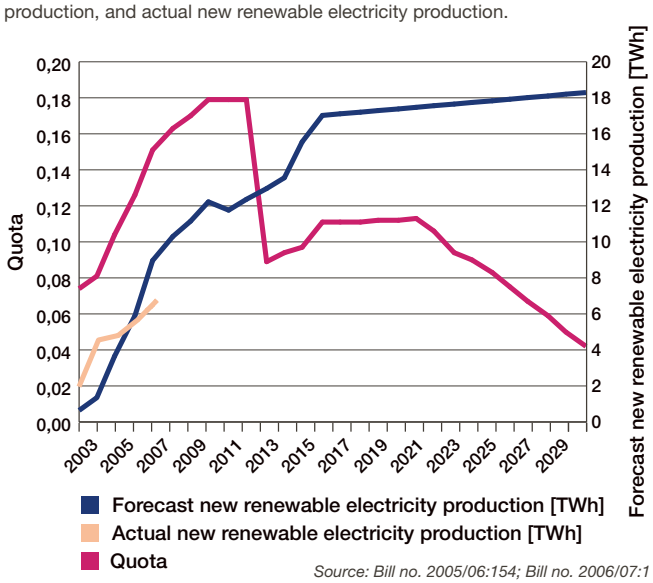
The purpose of the electricity certificate system is to increase the production of electricity from renewable energy sources. Competition and technical development have both been important long term starting points for reducing the costs of electricity production from renewable energy sources, and thus for achieving the established target. If the target is to be achieved, the quota obligation must be increased as time passes. At the same time, such an increase must be based on a reasonable estimate of a likely increase in production of electricity from renewable energy sources. The value of the quota is therefore set also with consideration of expectations of future electricity production from renewable sources and from peat, as well as with forecast values of electricity use in Sweden for each year. Table 1 shows that the actual accumulated result in 2007 amounted to 6,76 TWh, as against a forecast of 8,96 TWh for the year, which

Table 1. Quotas for the period 2003–2030, forecast new renewable electricity production capacity and actual renewable electricity production.

Year	Quota	Forecast of new renewable electricity [TWh]	Actual result (accumulated increase) [TWh]
2003	0,074	0,64	1,96
2004	0,081	1,35	4,55
2005	0,104	3,65	4,80
2006	0,126	5,89	5,66
2007	0,151	8,96	6,76
2008	0,163	10,30	
2009	0,170	11,15	
2010	0,179	12,22	
2011	0,179	11,76	
2012	0,179	12,36	
2013	0,089	12,96	
2014	0,094	13,56	
2015	0,097	15,55	
2016	0,111	17,02	
2017	0,111	17,11	
2018	0,111	17,20	
2019	0,112	17,29	
2020	0,112	17,38	
2021	0,113	17,47	
2022	0,106	17,56	
2023	0,094	17,65	
2024	0,090	17,74	
2025	0,083	17,83	
2026	0,075	17,92	
2027	0,067	18,01	
2028	0,059	18,10	
2029	0,050	18,20	
2030	0,042	18,29	

Source: Bill no. 2005/06:154; Bill no. 2006/07:1; Svenska Kraftnät's Cesar accounting system

Figure 3. Quota obligations 2003–2030, forecast new renewable electricity production, and actual new renewable electricity production.



Source: Bill no. 2005/06:154; Bill no. 2006/07:1

means that the difference between the actual result and the target result has increased relative to the previous years. One reason for the actual result failing to reach the level expected of it in the Bill at this part-way stage is that production from CHP plants in 2007 was lower than in 2006, due to the mild autumn and winter. Another reason is that it is difficult to say exactly when planned projects will be commissioned, and therefore correspondingly difficult to say when the expected increase in production will occur. However, the price of electricity certificates has risen during 2007 and 2008, which means that there should be a greater readiness to invest in new facilities. Against the background of the fact that the forecast for 2007 in the Bill can be regarded only as indicative, it can be regarded that the growth in renewable electricity production capacity is sufficiently in step with the expected development between now and 2016.

At the end of 2012, certain production plants will be phased out of the certificate system. This will have the effect of reducing electricity production from renewable energy sources and from peat in the system, thus also reducing the number of certificates available. In order to adjust the demand for certificates, the quota will therefore be reduced in 2013, as can be seen in Table 1 and Figure 3. A smaller number of plants will be phased out at the end of 2014, and so the increase in the quota will be correspondingly slightly flattened out. However, the production plants that leave the certificate system in this way are expected to continue to produce electricity from renewable sources, as they will be commercially viable by then, even without the additional revenue provided by the certificates. In total, renewable electricity production will increase, as certificates will have to be purchased from new plants.

Different levels of quota obligation

Companies having quota obligations are electricity suppliers, electricity intensive manufacturing companies and electricity users to the extent that they have used electricity that they have themselves produced, imported or purchased on the Nordic power exchange. Up until the end of 2006, it was also possible for other electricity users to manage their quota obligations, but this facility has now been withdrawn. The amount of electricity sold or used varies widely among the companies having quota obligations, which creates substantial differences in the sizes of the obligations. 86 % of those having a quota obligation had an obligation of 10 000 certificate units or less during 2007, equivalent to annual sales or use of electricity of somewhat over 5,8 GWh to each quota-liable party during the year. The quota obligations for these companies and individuals amount to only about 4 % of the total quota obligation. The three largest companies in the system have an obligation amounting to about 36 % of the total obligation, which is about the same as for the previous year.

Not subject to the obligation

Free power, and electricity used as ancillary power for electricity production, are exempted from the quota obligation, as are losses arising in connection with operation of the transmission or distribution networks. Electricity intensive companies are wholly or partly exempted from having a quota obligation for electricity used in manufacturing processes, although other electricity used in the company is quota liable. However, they must still notify themselves to, and be registered with, the Swedish Energy Agency, and must also submit annual returns of their electricity use in the same way as other companies having quota obligations. The reason for exempting these companies from having quota obligations is to ensure that the competitiveness of Swedish electricity intensive industries is not affected by the higher costs of electricity that would result from having a quota obligation.

With effect from the beginning of 2007, companies are defined as electricity intensive if their use of electricity in their manufacturing processes amounts to 40 MWh per million SEK of the company's total sales value of goods and products. Electricity used in the manufacturing process is exempted from the quota obligation to the following extent:

- 50 %, when electricity use amounts to at least 40 MWh/SEK million, but less than 50 MWh/SEK million, of the company's sales value

- 75 %, when electricity use amounts to at least 50 MWh/SEK million, but less than 60 MWh/SEK million, of the company's sales value
- 100 %, when electricity use amounts to at least 60 MWh/SEK million of the company's sales value.

In 2006, 262 companies were registered as electricity intensive in accordance with the old exception rules (SNI code), with an exempted electricity use amounting to 40.5 TWh. For 2007, 472 companies were registered in accordance with the new exemption rules, together exempting 42,8 TWh of electricity use from a quota liability.

Investigation of a new definition of energy intensive and electricity intensive

In December 2007, the Swedish Energy Agency presented the results of a study that it had performed on behalf of the Government to examine, and to propose changes to, the conditions for quota obligation exemption of electricity intensive companies from the electricity certificate system. The objective of the study was to investigate the feasibility of harmonising the definitions, and to consider whether the new exemption rules could result in distortion of competition between different companies having similar activities. The work also included putting forward proposals for changes. The summarised conclusions of the report are that the Agency recommends a new structure for exemption of electricity intensive industries from having a quota obligation, with such industries being defined as those where:

- electricity is used in the manufacturing process to an extent corresponding to at least 190 MWh per million SEK of the company's added value,

or

- electricity is used for purposes that qualify for complete deduction of energy tax on electricity, in accordance with Section 11 9 § 2, 3 or 5 of the Act (1994: 1776) Concerning Taxation of Energy.

This proposed definition is intended to result in as little change as possible in the total quantity of exempted electricity, in comparison with the qualifying amount under the previous regulations. In addition to this, it is proposed that exemptions from the quota obligation should be introduced so that, under certain circumstances, a part of a company can be regarded as a separate or individual company for the purposes of application of the Electricity Certificates Act. Exemptions from quota liability should be issued for a period of three years at a time, while the quota obligation for electricity intensive companies having a quota liable electricity use of less than 60 MWh per year should be transferred to the electricity supplier.

The Agency is of the opinion that the proposed changes would result in a more level playing field for companies, and also for the electricity certificate market in general. In addition, they should also allow simplification of regulations, a reduced amount of administrative work and, to some extent, harmonisation of legislation in the energy sector.

Cancellation of certificates and the quota obligation penalty fee

The electricity certificate system requires those having quota obligations to purchase certificates to a quantity as needed to fulfil their quota obligations. If they have purchased too few certificates, they are required to pay a quota obligation penalty fee for each certificate by which they are short of the required number. By not later than 1st March each year, companies submit an annual declaration of the amount of electricity sold or used during the previous year, which provides the basis for calculation of companies' quota obligations. Certificates are cancelled on 1st April on the basis of the information in the returns. If a company holds insufficient certificate units in its account, it is required to pay a quota obligation penalty fee to the state, based on the number of units shortfall. This penalty fee amounts to 150 % of the volume weighted average price of certificates during the period from the previous 1st April until 31st March of the following year. During 2003 and 2004, this charge was limited to SEK 175 and SEK 240 respectively for each certificate unit, in order to protect consumers against runaway electricity certificate prices. In practice, this was found to have the effect of setting price levels and operating as a price ceiling for certificates, thus undermining the effectiveness of the system. With effect from 2005, there has been no price ceiling to the quota obligation charge. Apart from the first year of the system, the proportion of cancelled certificates in relation to the overall quota obligation has been over 99 %, as shown in Table 2.

Table 2. Cancellation of electricity certificates, 2003–2007.

	Cancellations for respective years				
	2003	**2004**	**2005**	**2006**	**2007**
Quota-liable electricity [TWh]	63,3	97,4	97,6	97,1	96,0
Exempted electricity (electricity-intensive companies) [TWh]	37,8	40,6	40,9	40,5	42,8
Quota	0,074	0,081	0,104	0,126	0,151
No. of cancelled certificates (million)	3,5	7,8	10,1	12,4	14,5
Quota obligation fulfilment	77,0%	99,2%	99,9%	99,9%	99,8%
Quota obligation penalty fee [SEK each]	175	240	306	278	318
Total quota obligation fee [million SEK]	182,8	14,4	3,1	2,3	6,3

Source: The Act (2003:113) Concerning Electricity Certificates; Svenska Kraftnät's Cesar accounting system; Swedish Energy Agency.


VÄRME SEKUNDÄR
RETUR
VÄRME SEKUNDÄR
TILLOPP

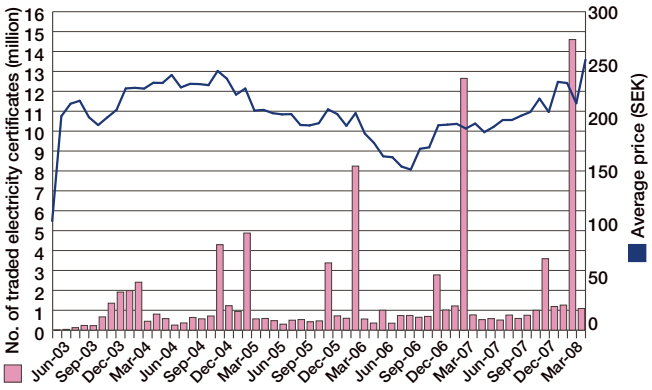
Trading in electricity certificates

Electricity certificates exist only in electronic form, which cannot be converted to a paper format. Producers and those having quota obligations have accounts in Svenska Kraftnät's electronic register, Cesar. Trading involves transfer of certificates from a seller's account to a purchaser's account in Cesar.

Trading on the electricity certificate market occurs through bilateral agreements, directly between producers and those having quota obligations, and through contract purchases involving the services of a broker. The use of brokers has shown itself to be a suitable method, as the parties on the market have different requirements and circumstances. Certificates are traded not only by electricity companies having their own trading departments, but also by industrial companies and district heating utilities as well as by smaller electricity network companies and producers who trade only a few times per year. The diversity and variation between sellers and purchasers has meant that there is a considerable demand for information on aspects such as price trends, traded volumes, forms of contract, price levels etc. In 2007, NordPool (the Nordic power exchange) stopped publishing its market information on certificates, which means that it is now only Svensk Kraftmäkling (SKM) that publishes prices of electricity certificates.

Trading in electricity certificates can be carried out in the form of spot contracts, which involve immediate delivery of, and payment for, certificates, or as forward contracts, which means that a price is settled at the time of trading, but that the certificates will be delivered at some point in the future. The most liquid trading is in forward contracts for the following March, i.e. during 2008, it is likely that contracts for delivery of certificates in March 2009 will dominate the market. About 35 % of trades will be for delivery in March 2009, with spot contracts and contracts for March 2010 each making up a further 20 %. It is also common for certificates to be traded in December contracts, which is partly due to end of year accounting considerations. SKM estimates that the proportion of certificates traded in the exchange market is about 50 % for 2007, with an estimated 50 % being traded internally or directly between parties. Figure 4 shows the turnover of certificates since the start of the system.

Figure 4. Average price for transactions of electricity certificates between Cesar accounts, and monthly turnover in certificates from May 2003 until April 2008.



Source: Svenska Kraftnät's Cesar accounting system.

The price of a certificate is registered when the certificate is transferred between accounts in Svenska Kraftnät's Cesar register, even though the trade and the price may have been decided long before. The price statistics in Figure 4 show the volume weighted average price of all transactions during each month, and cannot therefore be seen as a market price of certificates for the relevant months. However, it does happen that the Cesar price is used as a reference price for certain trades on the electricity certificate market.

Producers of certificate entitled electricity operate under, or experience, different conditions when selling their allocated certificates. The main differences are to be found between large and small producers, with the small producers being more dependent on a continuous sale of their certificates in order to assure revenue flows and thus maintain production. Among the larger producers, it is common for there to be less

need directly to link revenue from the sales of certificates to continued production, which means that these producers can afford to wait for a better price for their certificates before they sell them. However, it is mainly the particular conditions of each company that determine when and how certificates are sold, with fluctuations in the general economy or liquidity requirements being decisive factors in determining when certificates are traded.

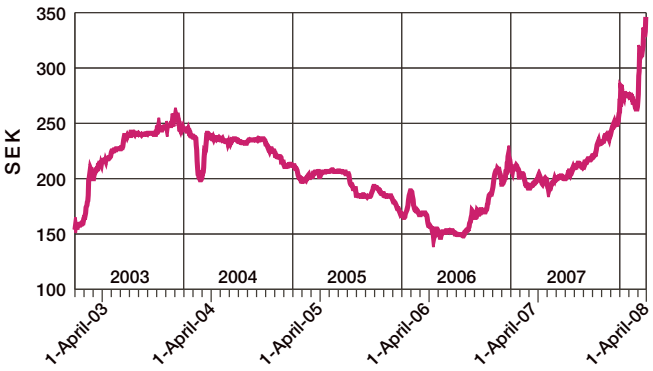
The price of electricity certificates

On a competitive market, the price of certificates is determined by the relationship between supply and demand. Liquidity is important if the price structure is to be regarded as reliable, and it is here that the parties on the market have a joint responsibility for participating in trading, as a market based policy measure requires a market price to be reached by negotiation, and for information on contract times and prices to be published. Market liquidity has progressively improved, partly as the market has grown in parallel with increasing quota obligations, and partly because of a greater need for a price reference for electricity contracts and investments, together with a general increase in trading in electricity certificates. There are also other factors that affect the price. During 2003 and 2004, the quota obligation penalty fee had some effect on the price of certificates, in that its value was determined and announced in advance. The price is also affected by the costs of various risks and future expectations of price and market developments. Figure 5 shows the spot traded price of certificates since the system started on 1st May 2003.

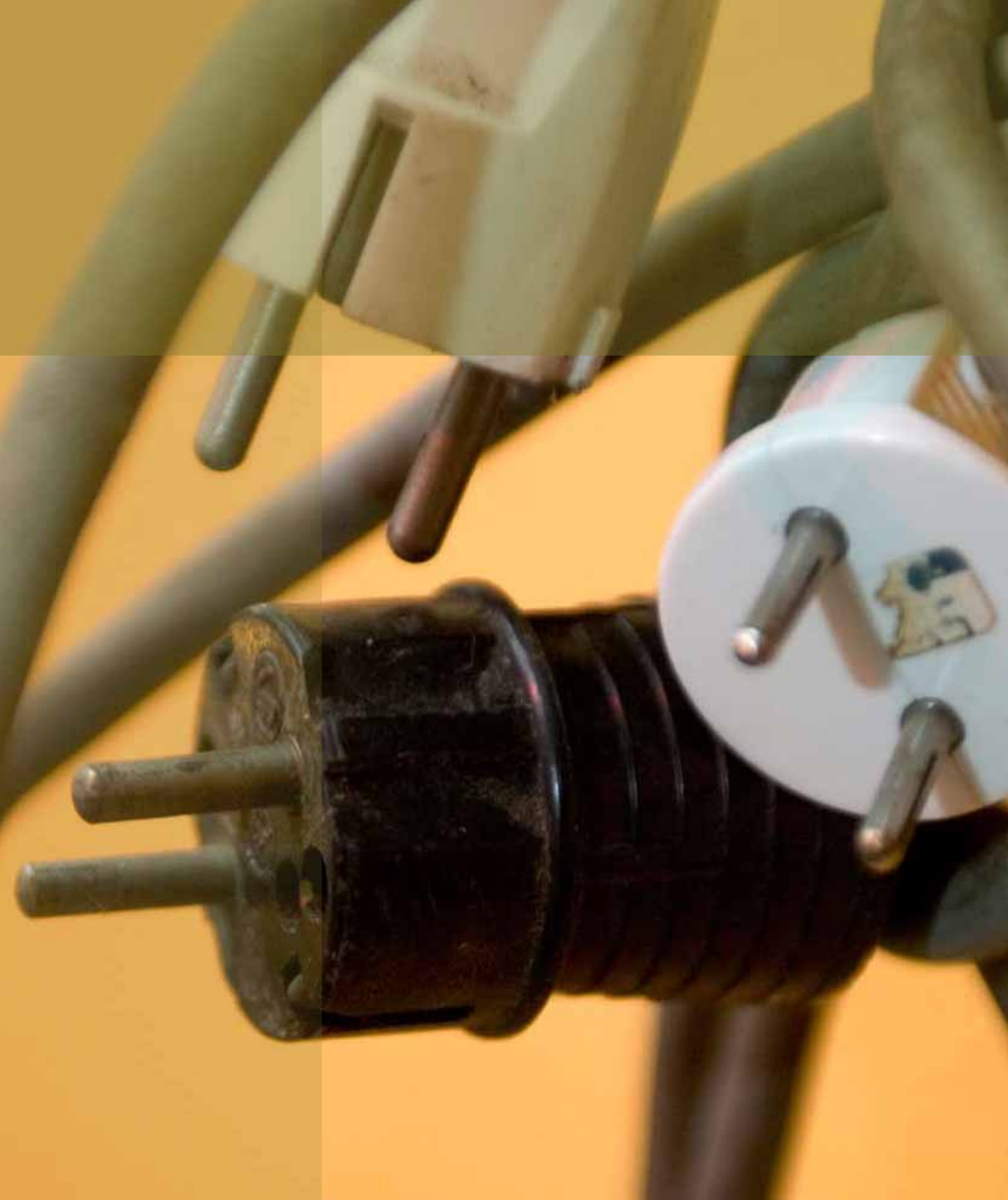
It can be seen from the figure that there was a relatively substantial rise in the price of certificates at the end of 2007, which is probably largely due to the fact that the market has realised that the accumulated surplus of certificates is falling.

However, there is at present still a relatively large surplus of electricity certificates on the market, as can be seen in Figure 2. During the three first years of the electricity certificate system, the accumulated surplus of certificates increased, and it was not until the end of 2006 that this trend reversed and the surplus declined somewhat. After the cancellations on 1st April 2008, it was noted that the reduction in the surplus continued to decline, which means that fewer certificates were issued in 2007 than were in demand. By the end of 2007, the surplus had declined by about 1,2 million certificates, to little more than one third of the number of certificates that was needed to meet the 2007 quota obligation. The future price development of certificates is largely dependent on the extent to which larger production expansion plans are realised.

Figure 5. Average price of spot traded electricity certificates.



Source: SKM



Electricity consumers contribute to renewable electricity

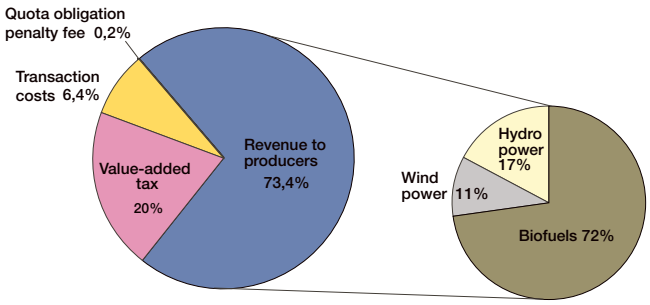
Producers of electricity from renewable energy sources receive economic support for doing so through the electricity certificates. The money for the certificates comes from consumers' electricity bills, and helps the electricity producers increasingly to invest in the production of electricity from renewable energy sources. The cost efficiency of the certificate system has increased since the system started: in 2007, producers received over 73 % of the money.

The objective of the electricity certificate system is to increase electricity production from renewable energy sources by 17 TWh by 2016, in comparison with corresponding production in 2002. This is a very ambitious target, when seen in comparison with the period from 1997 to 2002, for which the target was to increase electricity production from renewable energy sources by 1.5 TWh. Since 2002, Sweden's electricity production from renewable energy sources has increased by 6,2 TWh/year. The fact that the producers choose renewable energy sources is largely due to the extra revenue received via the certificates.

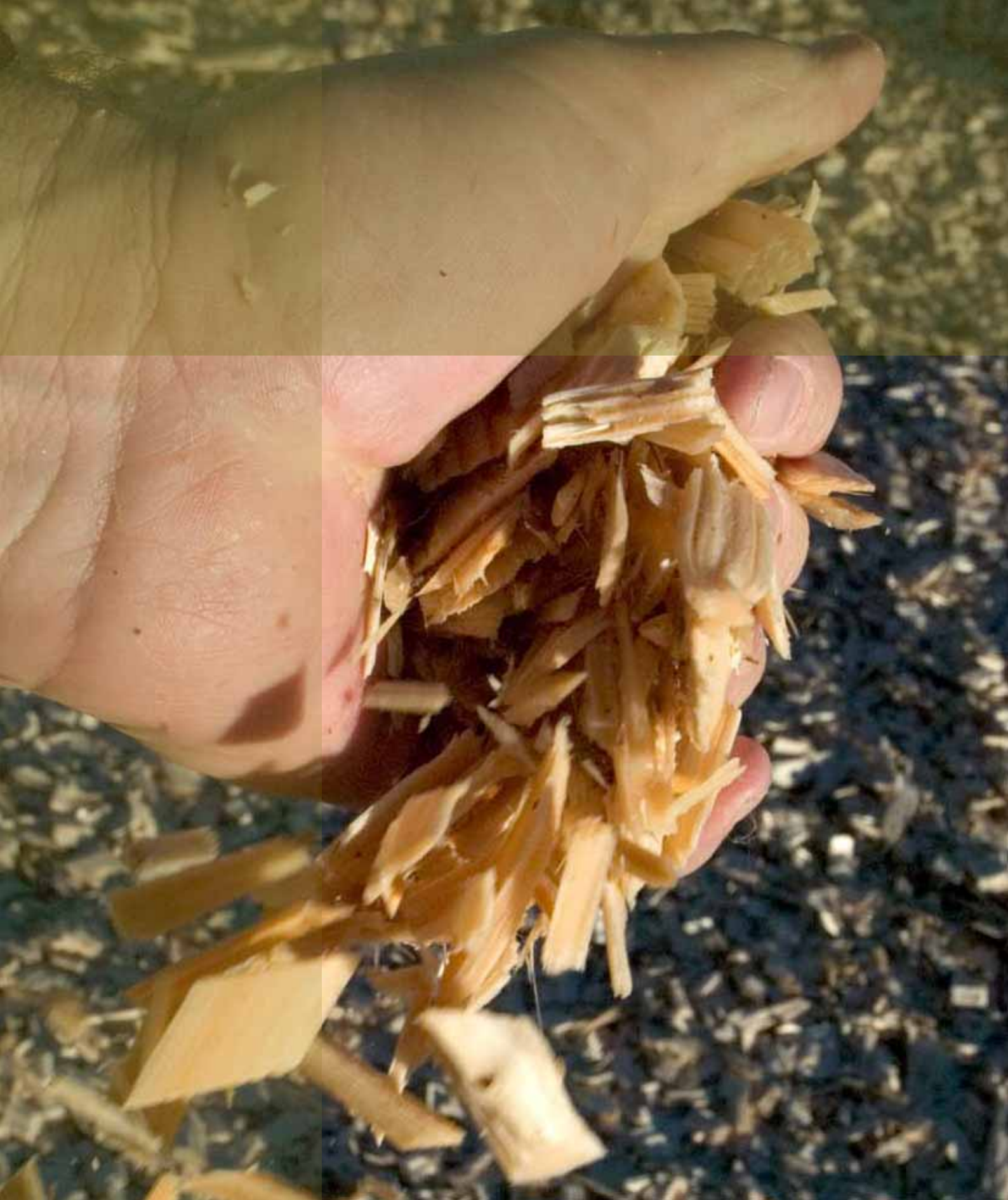
Since 1st January 2007, electricity suppliers' costs for certificates is included as part of the price of the electricity that they sell. This change was introduced in order to improve cost efficiency and to make it easier for consumers to compare electricity prices between suppliers. However, what is unaltered is that the certificate system represents a cost for consumers, in that the producers' extra revenue comes from consumers and is paid by them via the suppliers' electricity bills. Nevertheless, not all the money paid by the consumers reaches the producers: some of it is used to pay value added tax, transaction costs by the electricity suppliers and quota obligation penalty fees. Nonetheless, a rough calculation enables us to see where the money goes.

During 2007, electricity consumers paid an average price of 4 öre/kWh (including value added tax) for electricity certificates: this price is based on price information from about a dozen larger electricity suppliers. During the year, the total quota obligated use of electricity amounted to 96 TWh of electricity, giving a total cost for electricity certificates to consumers of approximately SEK 3800 million, of which SEK 800 million were for value added tax. Of this, the total contribution from domestic consumers amounts to about SEK 1400 million, based on an assumed electricity use of 36 TWh, with the remaining SEK 2400 million coming from other electricity users in society. The average price of certificates was SEK 195 each during the year, and 14,5 million were cancelled for electricity use in 2007. From this, the producers' total revenue can be calculated as SEK 2800 million. The remainder of the consumers' costs, SEK 250 million, is accounted for by the electricity suppliers' transaction costs for items such as administration, wages, trading brokers' fees, other fees and risk costs. Figure 6 shows the percentage breakdown of the costs, and also the fact that over 73 % of the input revenue reached the electricity producers. A rough calculation based on the figures in Table 3 from 2003 until 2007 clearly shows that the proportion of the payments reaching the producers has increased each year.

Figure 6. Estimated breakdown of electricity consumers' costs (SEK 3800 million) for electricity certificates in 2007.



Source: Swedish Energy Agency



Production of renewable electricity

Electricity certificates are issued to those who produce electricity from various renewable energy sources, and from peat, and who have had their production plants approved by the Swedish Energy Agency. To date, certificates have been issued to producers of electricity from biofuels and peat, wind power, hydro power and solar electricity. Production from the renewable sources amounted to 12,7 TWh in 2007, which is 6,2 TWh more than corresponding production in 2002.

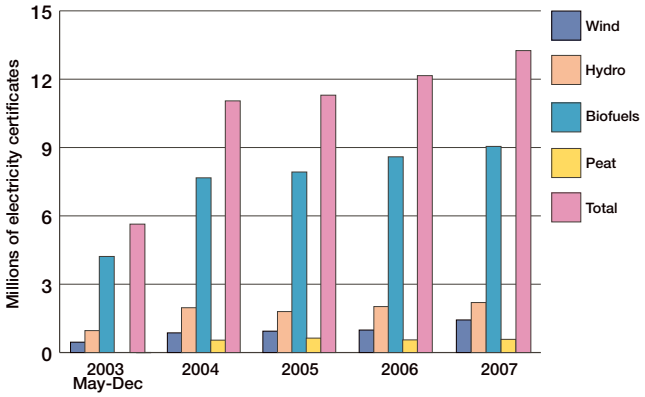
Certificate entitling electricity production has increased since the start of the certificate system, mainly in the form of increased production of electricity from biofuels as a result of using a greater proportion of renewable fuels, or of an increase in capacity of existing biofuel plants. Table 4 provides further information on electricity production from certificate entitling sources, from 2003 to 2007. Note that a plant can consist of one or more production units, e.g. a wind power farm with several turbines is regarded as one plant.

Certificate entitling electricity production in 2007 amounted to 13,3 TWh. Directive 2001/77/EC does not classify peat as a renewable fuel, and so the quantity of electricity produced from it (0,6 TWh) must be subtracted from the total amount of electricity from renewable sources. Electricity production from renewable energy sources within the electricity certificate system therefore amounted to 12,7 TWh in 2007, having increased from 6,5 TWh in 2002. This represents an increase of 6,2 TWh since 2002.

Figure 7 shows the breakdown of allocation of certificates among different energy sources from 2003 until 2007. (As the system started on 1st May 2003, information for 2003 covers a period of only eight months.)

Electricity production from renewable energy sources can be increased through the construction of new plants or through increases in production from existing plants. Since the certificate system started on 1st May 2003, a total of 469 new plants had been started up by the end of December 2007, of which 365 are wind power plants, 28 are biofuel power plants, 73 are hydro power plants and three are solar electricity plants. In 2007, these new plants produced 1,6 TWh of electricity: further information on new plants is shown in Table 5 (see the tables section at the end of this report). During 2007, plants that had been taken into use since 2002 produced about 2,3 TWh of electricity, which means that the increase in plants that were in operation prior to 2002 is about 3,9 TWh, excluding the contribution from the use of peat.

Figure 7. Number of certificates issued, by types of production plants, for 2003–2007.



Source: Svenska Kraftnät's Cesar accounting system

Wind power

Although wind power today supplies less than 1 % of Sweden's total electricity production, it has the potential to supply a considerably greater proportion, making it an area of political priority. In Bill No. 2001/02:143, Cooperation for Reliable, Effective and Environmentally Friendly Electricity Production, the Swedish Parliament has set a national planning target of 10 TWh of electricity from wind power by 2015. Setting a planning target for wind power production is one way of creating the necessary planning conditions for an annual production of a certain number of TWh from wind power. It gives signals of the amount of wind power to be included in local authorities'

regional planning activities. Instructed by the Government, the Swedish Energy Agency has proposed a new planning target of 30 TWh of wind power production in 2020. Of this, 20 TWh should be onshore, and 10 TWh offshore. This will necessitate an increase in the number of wind power plants from less than 1000 to 3000–6000, depending on their output ratings. However, the potential for wind power production in Sweden exceeds the planning target.

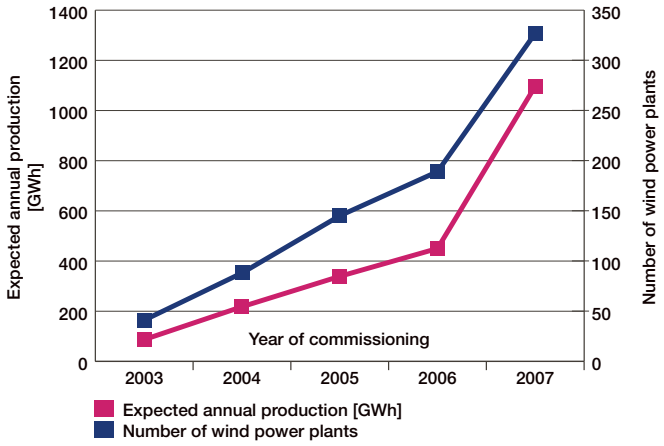
In its report *'A new planning target for wind power in 2020'*, the Agency proposes several ways in which a substantial expansion of wind power production could be achieved. First and foremost, there is a need for cutting down the time taken by the planning application and approval process. Wind power production should also be removed from the Ordinance Concerning Environmentally Hazardous Activities, as it is a 'clean' energy source. In addition, the Agency proposes that contacts with public authorities should be channelled through a single entry point, that the quotas in the electricity certificate system should be reviewed by not later than the next review of the system as a whole, and that greater support should be provided for offshore wind power production through new policy measures. All these factors can affect the electricity certificate system.

Technical development in the wind power sector has been explosive. Twenty years ago, wind turbines had an output of a few hundred kilowatts, while today turbines with outputs of 5 MW are being built. Most expansion to date has been inland or near coasts, but offshore plants are now increasingly being planned. 2007 saw start-up of the Lillgrund offshore wind power farm in Öresund. However, at present, offshore wind power production is more expensive than onshore production, and requires higher levels of revenue. Nevertheless, applied research and experience from a growing number of projects should enable cost reductions to be made in the future. Offshore wind power production facilities are already in operation in the UK, Ireland, Denmark, The Netherlands and Germany. In these and other countries, such as Spain, the USA and China, offshore expansion is expected to take off over the next few years. The Swedish Lillgrund wind power farm was built with financial assistance from the state fund (known as the Pilot Fund) for market introduction of wind power. A new tranche of this support has been decided for the 2008–2012 period, and can result in more offshore construction projects.

Wind power plants

859 wind power plants, of which 61 are offshore, were granted certificates in 2007. Several production units, close to each other and having a common connection point to the grid, are counted as one plant: in total, the 859 plants consisted of 1003 individual turbines. Total installed capacity in 2007 amounted to 831 MW, as can be seen in Table 6. A number of new plants have entered the system since its start. Figure 8 shows the total number of new wind power plants in the certificate system, and their expected annual energy production.

Figure 8. Number of new wind power plants and their expected annual production.



Source: Svenska Kraftnät's Cesar accounting system; Swedish Energy Agency

The average installed capacity of wind turbines commissioned in 2003 was 0,8 MW. In 2006 it was 1,1 MW, rising to 1,7 MW in 2007. This shows that the per unit installed capacity for wind turbines has increased.

Electricity production

Wind power production varies with the wind conditions, and therefore changes with time, depending on climate conditions. 2003, 2005 and 2006 were relatively calm years, while winds in 2004 came up to the statistically average climate conditions. 2007 was a windy year, with the relative wind energy content amounting (as indicated by the actual production figures from the wind plants) to 110 % of the energy content to be expected of a statistically average year, based on data from the last twelve years. Total electricity production from wind power plants in

2007 amounted to 1,4 TWh, which was an increase of 45 % over the previous year.

Together with the Swedish Association of Electrical Utilities, the Swedish Energy Agency is responsible for monitoring production from wind power plants, with the aim of collecting production data from all the wind power plants in the country. The introduction of the electricity certificate system has created a second, parallel channel, with information on electricity production from the annual returns submitted as part of the electricity certificate system. As most wind power plants are covered by this certificate system, production figures from this source are more comprehensive. As a result, the figures for electricity production from wind power as given in this report are somewhat higher than the corresponding figures in the operational monitoring scheme.

Biofuels and peat

With its substantial areas of forest and arable land, Sweden is in a favourable position to produce biofuels. The energy in the fuel can be utilised efficiently and with little environmental effect by burning it in CHP plants, producing both electricity and heat. The heat can be supplied to a public district heating system, or be used in industrial processes. If used in industry, this process is referred to as industrial back pressure production. As it is the heat demand in such plants that generally determines the amount of electricity that can be produced, the amount of electricity produced is more constant, more reliable and more forecastable than from many other forms of renewable production, such as wind power, which assists the overall power balance on the grid. Electricity demand in Sweden is also greatest during the winter, which coincides with the greatest electricity production in CHP plants. Since the beginning of the 1980s, the proportion of biofuels used in CHP plants has steadily increased, and the electricity certificate system has provided a further incentive for changeover to the use of renewable fuels.

Peat

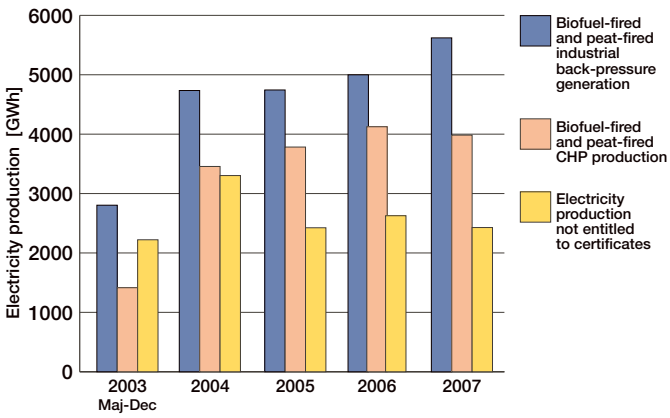
Peat is an indigenous energy asset which, in a strict meaning, is not classified as a renewable fuel. Nevertheless, on 1st April 2004, the scope of the electricity certificate system was expanded to include the use of peat as a fuel in CHP plants. The reason for this was based on environmental considerations: by making electricity production from the combustion of peat eligible for the receipt of certificates, it would prevent the use of peat as a fuel in CHP plants from being displaced by the use of coal.

With this change, electricity production from the combustion of peat in CHP plants became entitled to certificates. In 2007, there were 16 such plants burning peat, producing about 580 GWh of electricity, or about 24 GWh more than were produced in 2006.

The plants

For the purposes of the electricity certificate system, biofuelled plants are divided up into CHP, industrial back pressure and biogas. All approved biofuel plants in the certificate system make monthly returns of their total electricity production, and of the proportions of biofuels, peat and other fuels used. Certificates are then allocated to the plant owner for that part of the electricity production based on biofuels and peat. Figure 9 shows electricity production from approved biofuelled plants from 2003 to 2007.

Figure 9. Electricity production in approved biofuelled plants, 2003–2007.

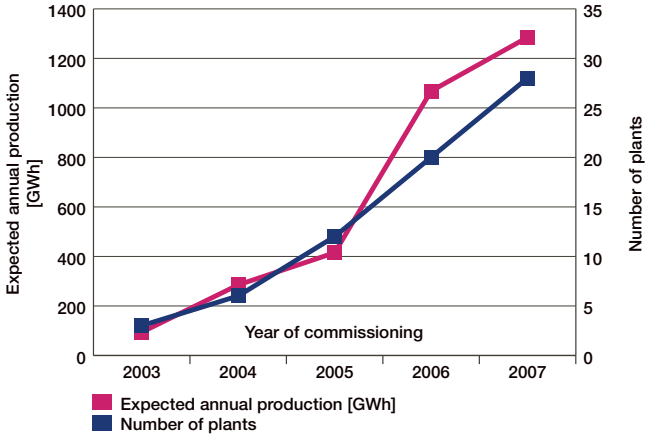


Source: Svenska Kraftnät's Cesar accounting system

The proportion of renewable fuels and peat used for electricity production differs between biogas and CHP plants, and also between them and industrial back pressure plants, as shown in Table 7. It can be seen that total electricity production from biofuelled plants amounted to 11,8 TWh in 2007, which was essentially the same as in 2006. At the same time,

the proportion of non-entitled electricity production has fallen by over 20 %, the main reason for which lying not in conversions from fossil fuels to biofuels, but in an increase in production from industrial back-pressure power based on a high proportion of renewable fuels, while production in CHP plants with a lower proportion of renewable fuels fell due to the mild autumn and winter in 2007.

Figure 10. Total number of new plants in the electricity certificate system and their expected annual production.



Source: Svenska Kraftnät's Cesar accounting system; Swedish Energy Agency.

In 2007, biofuel fired plants produced 9,1 TWh of renewable electricity. Compared with a total 12,7 TWh of renewable electricity produced by all plants covered by the certificate system, it can be seen that bioenergy is by far the largest energy source in the system. Of these 9,1 TWh, about 8 TWh were produced in plants that were commissioned before the electricity certificate system was started. With the introduction of the certificate system, annual production of renewable electricity in these plants increased by about 3,5 TWh as a result of such factors as increases in the proportion of biofuels and increases in power outputs. This trend continues, although now at a slower rate, with production from 2004 to 2007 having risen by about 10 %. However, it is not just the older plants that contribute to overall production, but also new plants that are being registered each year for the system. Figure 10 shows the growth in the total number of new plants, together with their total annual electricity production, from 2003 up and until 2007.

The Igelsta power station

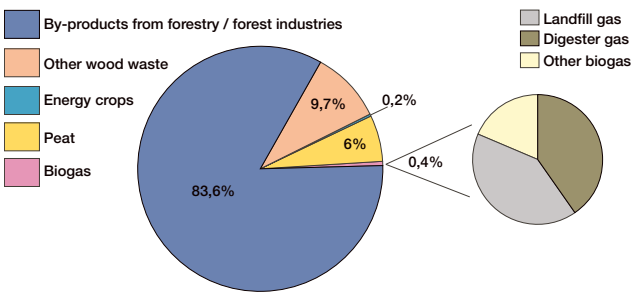
There are many projects in progress for new plants that will be covered by the electricity certificate system. Of them, the largest is construction of the new Igelsta combined heat and power plant in Södertälje, which is due to start commercial operation at the beginning of 2010, with an annual production of about 500 GWh of electricity and 1250 GWh of district heating. Production will be based on several types of fuels, in order to create flexibility to be able to deal with any future changes in the types or amounts of fuels available. However, the main fuels will be various biofuels, which means that the plant will qualify for certificates.

Electricity production

Electricity from plants that partly or wholly produce electricity from biofuels or peat is entitled to certificates. The biofuels that are included in the certificate system are defined in the Ordinance (2003:120) Concerning Electricity Certificates. Bill No. 2005/06:154, Renewable Electricity with Green Certificates, expressly excludes biomass in mixed domestic refuse from the electricity certificate system.

Waste and by products from forestry and the forest products industry, such as black liquors, chips and felling residues, form the single most common type of biofuel that is eligible for the receipt of certificates.

Figure 11. Biofuels used in approved biofuelled plants in 2007.



Source: Svenska Kraftnät's Cesar accounting system

Figure 11 and Table 8 show that other wood industry waste and peat are also used to a considerable extent. Table 8 also shows that the relative proportions of the various renewable fuels has not significantly changed over the duration of the

certificate system. The information in the table is based on the biofuel returns submitted by the plant owners. The returns in 2003 were less detailed, which means that production in that year cannot be exactly assigned to all categories.

Hydro power

Historically, hydro power is a very important energy source in Sweden, and nowadays supplies - on average - almost half of Sweden's total electricity production. Generally, construction of new hydro power plants, or modifications to increase the output from existing plants, involve very substantial investments. However, with the aim of increasing hydro power based output, hydro power plants can receive certificates for the following measures:

- continued operation of small scale hydro power that was in operation at the end of April 2003 and had an installed capacity not exceeding 1500 kW per production unit
- new plants
- resumption of operation in plants that had been taken out of operation before 1st July 2001, and which were then started up again after the end of 2002
- increased production capacity from existing plants
- plants that can no longer be viably operated in the long term due to decisions by public authorities or to extensive rebuilding.

Plants

Hydro power plants from which production qualifies for electricity certificates vary in size. Small scale plants, with a maximum installed capacity of 1500 kW per production unit, dominate, as shown in Table 9. During 2007, 559 companies were issued with certificates for 1098 hydro power plants. Several production units, grouped closely together and having a common connection point to the transmission/distribution network, are counted as one plant

Avestaforsen

2007 saw commissioning of the new Avestaforsen hydro power station on the Dal river. A complete new build, it replaced the old Månsbo power station that was in acute need of renovation and rebuilding. This has provided greater production of renewable power from the same site by using the water more efficiently. With an installed capacity of 24 MW, the power station should produce an annual energy output of about 170 GWh under statistically average conditions.

Production

Electricity production from hydro power varies from one year to another, depending on such factors as precipitation. 2003, 2004 and 2006 were dry years, while 2005 and 2007 were wet years with good water availability. In 2007, production from approved hydro power plants was 2,2 TWh. Since 2003, measures to increase production have been carried out at about a score of large-scale hydro power plants, with replacement or renovation of turbines and generators being the most common improvement. In this way, plant outputs have been increased by about 0,5 TWh.

Solar electricity

Solar electricity is produced by solar cells, which are the only technology available at present that can convert solar energy directly to electricity. Today, solar cells have an efficiency of about 15 %. Although there are thousands of small solar cell installations, e.g. for private homes, they are on sites where it would be expensive to connect the production units to the electricity network.

Solar cell installations are generally relatively small in comparison with, for example, wind power plants or CHP plants. To be approved for inclusion in the electricity certificate system, production plants must meet the requirement for hourly metering and reporting of electricity production. For small plants, this becomes very expensive per MWh of production: in such cases, the cost of metering can exceed the revenue from the electricity certificates, which is one reason why very few solar electricity installations are registered in the certificate system.

Plants and production

Four approved solar electricity installations were covered by the system in 2007, having an installed capacity of 43 kW and producing 19 MWh/year. It can therefore be seen that, at present, solar electricity contributes only a marginal quantity of energy within the certificate system.

Limited allocation

The purpose of the electricity certificate system is to encourage production of electricity from renewable energy sources and from peat. However, in order to prevent commercially viable older plants from abusing the certificate system and creating unjustifiably higher costs for electricity consumers, there is a time limit on the right to receive certificates. Limitation of this qualifying period reduces consumers' costs for the electricity certificate, which is important when the overall target objective of increased production is raised.

Plants taken into operation after 1st May 2003 are entitled to receive certificates for up to 15 years, but in no case after the end of 2030. These plants will be steadily phased out of the electricity system during the year concerned, depending on their date of starting up.

Production plants that were started up before the start of the certificate system on 1st May 2003 are entitled to certificates until the end of 2012. Plants started before 1st May 2003, and which received some form of public grant for investment or conversion of the plant, are entitled to certificates until the end of 2014. However, any such grant must have been issued after 15th February 1998, as part of a programme of investments in the energy sector.

The installed capacities of plants due for phase out at the end of 2012 and 2014, as well as those due for phase out over the period 2018–2022, are shown in Table 10.

Table 11 shows the corresponding phase out of production over the years concerned, based on annual average values of the plants' certificate entitling production during 2005, 2006 and 2007, which means that the values may change, depending on operating conditions. The relatively short history of the electricity certificate scheme means that annual average values are at present based on only a few years' production, which can create some uncertainty of forecasting. The longer the periods for which annual average values can be calculated, the less the significance of structural and systematic changes. An example of this is the increasing proportion of certificate entitled fuels in bio-energy plants. Other factors that can affect the expected production values are external conditions such as precipitation, temperature and wind. As the forecast is based only on operating statistics, it will be adjusted with time.


Kilafors

Planned expansion of renewable electricity production up and until 2012

Forecasts of future renewable electricity production often vary very widely, with calculations and scenarios based on different planned measures or different potentials of energy sources. This investigation will therefore concentrate on certificate entitled electricity production, as well as being more short term and concentrating primarily on planned projects. Its time perspective extends only to the end of 2012, which is when the first production plants are due to be phased out of the certificate system and when a second review of the system is due to be carried out.

The most likely scenario is that the increase in electricity production from renewable sources will be effected mainly by biofuel fired plants, wind power plants and hydro power plants, as only a few dozen certificates are allocated to other forms of power generation each year. The Swedish Energy Agency has therefore based its forecast of expansion of electricity production on these forms of power production alone, with the emphasis on those projects that have a high likelihood of being carried out. For the purposes of this report, this means those projects for which all planning permissions etc. have been granted, and where the company concerned has decided on dates for starting and completion of construction.

The Swedish Energy Agency monitors reports of new CHP projects, of which a number have planned production starts before 2012. In most cases, these projects relate to conversion of district heating only plants to combined heat and power plants, although there are also a number of completely new plants. Total planned annual production from these plants is 2,74 TWh of renewable electricity. There are also a number of other CHP plants, either planned or on which work has already started, that will mainly produce electricity from waste or natural gas, and which will deliver a significant quantity of electricity to the grid. Potentially, they could replace all or parts of their fuels by renewable energy sources, and could therefore be included in this study. However, as there is considerable uncertainty as to whether such replacement would actually occur, these plants are not included in the forecast calculations for this report. The forest industry is another sector that also makes considerable use of combined heat and power production, or industrial back pressure generation as it is more correctly known. According to the report Combined Heat and Power Production Expansion 2007–2015 from Svebio, the Swedish Forest Industries Association, the Swedish District Heating Association and Swedenergy, electricity production from this source is expected to increase by about 1 TWh by 2012, which would mean that the total increase in all forms of combined heat and power production would amount to about 3,74 TWh by 2012.

Electricity production capacity from Swedish hydro power sources is owned almost entirely by Vattenfall, Fortum, E.ON and Skellefteå Kraft, and so it was these companies that were contacted for information on hydro power projects. The results showed that there are about 50 projects in the pipeline, with most being various forms of increases of output from existing plants, representing a potential annual increase of about 1 TWh of electricity if all projects are carried out. Applying the criteria for this investigation indicates that electricity production from hydro power will probably be 0,42 TWh higher in 2012.

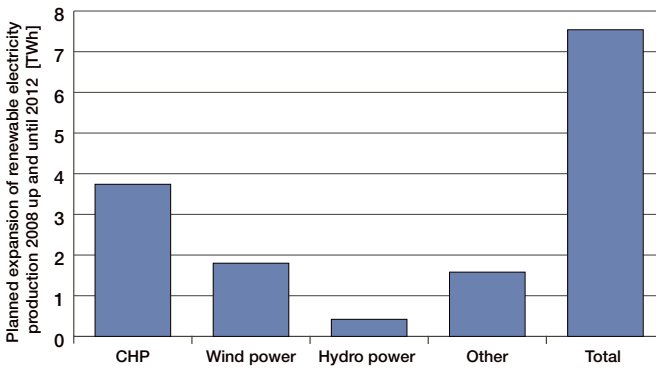
Estimates of wind power production are subject to greater uncertainty than those applying to the two other forms of power production. The Agency's investigation of wind power projects shows that there are plans for both onshore and offshore wind farms throughout the country, with a potential energy production of 41 TWh of renewable electricity if all projects were implemented. The planned production capacities from the wind farms range from as little as 0,055 TWh to 12 TWh of electricity, being the result either of single projects or of development in stages. A closer analysis shows that, together, all projects having a planned start up date before 2012, would produce 7 TWh of electricity. Of this, 1,8 TWh are regarded as being delivered from projects that have a high probability of being constructed. Although this represents a substantial reduction in comparison with the original potential, it does mean that, with the terms of reference of this investigation, 1,8 TWh are regarded as likely to be realised by 2012.

A drawback of looking only at individual projects is that smaller production plants, regardless of whether planned as new developments or increases of output from existing plants, can easily be overlooked. This is due partly to the fact that larger companies do not issue as much information about such projects, and partly because many small plants are owned by private persons or small companies. In the case of CHP plants, it is also so that an increase in the proportion of renewable fuels results in an increase in production of renewable electricity, but such increase can easily be overlooked if such a fuel conversion is carried out in stages. In addition, such measures do not result in an increase in the respective

plants' production capacities, as is generally the case with larger projects having a higher profile. The same applies also to other restructuring of production in a plant which, when completed, results in increased production of renewable electricity. Examining the number of allocated certificates more closely shows that there has been a total increase of 3,9 TWh in the production of electricity that cannot actually be linked to any specific new plant. Most of this increase occurred when the certificate system was started in 2003, but there is still an ongoing increase of about 0,5 TWh per year in the existing CHP plants. Small scale wind power and hydro power are delivering a total annual increase of about 0,07 TWh of renewable electricity production. A simple assumption is that this upward trend will continue in the future. If so, a further 1,6 TWh of renewable electricity will be produced each year from new small scale power and a greater proportion of biofuels in CHP plants by 2012.

Summarising, power production in 2012 is very likely to be at least 5,0 TWh higher than in 2007, based on current projects. If we add in production from small scale power production, industrial back pressure production and other increases, the overall increase can be expected to be 7,6 TWh. The target for the electricity certificate system is to increase the production of electricity from renewable energy sources by 17 TWh between 2002 and 2016. Production up and until 2007 had reached 6,2 TWh which, together with the results from this investigation, indicates 13,8 TWh of more renewable electricity in 2012, which is therefore only 3,2 TWh short of the final target to be achieved by four years later.

Figure 12. Increase in renewable electricity production between 2007 and 2012, by different energy sources.



Source: Swedish Energy Agency, Vattenfall, Forum, E.On, Skellefteå Kraft and the report Combined Heat and Power Production Expansion 2007–2015 from Svebio, the Swedish Forest Industries Association, the Swedish District Heating Association and Swedenergy

Important events in the electricity certificate system during 2007

- Changes in the law on the electricity certificate system came into force on 1st January 2007.The target was changed, to increase production from renewable energy sources by 17 TWh in 2016, relative to production in 2002. A new definition of electricity intensive companies was introduced. Production of renewable electricity in new plants will be entitled to receive certificates for 15 consecutive years, but in no case beyond the end of 2030.
- October 2007: Production of first electricity from the Lillgrund wind farm, the largest offshore wind farm in Sweden.
- November 2007: The Swedish Energy Agency notified a change to application of 4 § Ordinance 2003:120 Concerning Electricity Certificates. The effect of the change is that no biofuels other than those expressly defined in the Ordinance would qualify for the receipt of certificates. This new, more restrictive, application started to be applied with effect from 1st January 2008.
- 3rd December 2007: The Agency presented its report 'To investigate the use of the concepts of energy intensity and electricity intensity, and to propose changes in the electricity certificate system with regard to exceptions from quota obligations for electricity intensive companies' in its report Exemptions of electricity intensive companies from quota obligations in the electricity certificate system.

Important future events that might affect the electricity certificate system

- The Ministry of Industry and Commerce is at present working on a definition of what constitutes 'new plant'. The Swedish Energy Agency hopes that it will, within the near future, be able to provide clear information on new allocation periods in connection with extensive renovations or modernisations of old plants.
- The Government has instructed all public authorities to investigate opportunities for simplifying regulations. The aim of this work is that the costs to companies of dealing with all public regulations should be reduced by at least 25 % by the autumn of 2010. An additional purpose is that simplification of regulations should result in a noticeable change in the day-to-day work of companies.
- A draft directive setting out new targets for the use of renewable energy in the EU was published by the EU Commission in January 2008. Under it, 20 % of energy use in the EU should be from renewable sources by 2020: for Sweden, the target is 49 % of energy from renewable sources by that date. The draft directive also includes proposals for a trading system with guarantees of origin of the renewables content.

Glossary / Explanation of Terms

Auxiliary power is electricity used in connection with the production of electricity (e.g. fans, pumps etc.).

Calculated normal annual production is the calculated annual amount of production of renewable electricity under normal operating conditions.

Cancellation of electricity certificates means that the certificates are returned to the state from the account in Cesar of the party having a quota obligation. When a certificate is cancelled, it can no longer be sold or used for fulfilment of the party's quota obligation. Cancellation of certificates occurs on 1st April, covering the previous year's quota obligation.

Certificate entitled electricity production is electricity production from renewable energy sources or from peat, and meeting requirements in the Act (2003:113) Concerning Electricity Certificates.

Cesar is Svenska Kraftnät's electronic accounting system for certificates. Parties eligible for receiving certificates, or wishing to purchase or sell them, must hold a certificate account in Cesar.

Combined heat and power is the use of a thermal process, e.g. a steam boiler, for the combined production of electricity and heat.

Electrical losses are losses that occur in operating the electrical transmission or distribution networks.

Electricity certificates are issued by the state, and provide electronic proof of production of 1 MWh of renewable electricity in accordance with the Act (2003:113) Concerning Electricity Certificates.

Electricity certificate entitled producer is the owner or operator of a plant that produces electricity from renewable energy sources or from peat, and who has had the plant approved by the Swedish Energy Agency for receipt of electricity certificates. Approval for inclusion in the electricity certificate system means that each producer is allocated one certificate unit per produced and metered MWh of electricity.

Electricity intensive companies are manufacturing companies, using a manufacturing process which, during a calendar year, uses at least 40 MWh of electricity for each SEK million of sales value of the company's production.

Electricity suppliers are suppliers of electricity that has been produced by themselves or by some other producer. In addition to companies whose main business activity is the supply of electricity, this means that other suppliers, such as property-owners who supply electricity to their tenants, are included in this category.

Forward contracts are agreements to purchase at a particular time in the future, and at a price determined at the date of entering into the contract.

Free power is electricity supplied to a user without charge, in accordance with an agreement for compensation for loss of potential benefit or commodity.

Industrial back pressure power production is the simultaneous production of heat (normally in the form of process steam) and electricity in an industrial production plant.

Parties having quota obligations are:
- electricity suppliers, supplying electricity to end users
- electricity users, to the extent that they have used electricity that they themselves have produced, imported or purchased on the Nordic electricity exchange
- electricity intensive companies.

Quota obligation is a requirement each year to cancel (on 1st April) electricity certificates representing the sale or use of electricity during the previous year.

Quota obligation penalty fee must be paid by any party having a quota obligation who does not cancel the necessary number of certificates corresponding to the obligation. During 2003 and 2004, there were ceilings on this fee, of SEK 175 and SEK 240 respectively, for each 'missing' certificate, in order to protect consumers against runaway certificate prices. With effect from 2005, the quota obligation penalty fee has been set at 150 % of the volume weighted average price of electricity certificates over the period from the preceding 1st April until the following 31st March.

Renewable energy sources are those that do not consume the earth's resources, and thus have little effect on the environment. Examples of renewable energy sources include wind power, solar energy, wave energy, geothermal energy, biofuels and hydro power.

Returns for electricity production from bio-energy and from peat must be received by Svenska Kraftnät by not later than the 15th of the month following the production month. The return must state what proportion the respective fuels constitute of the total quantity of energy input.

Returns from those having quota obligations must be submitted for each calendar year by not later than the following 1st March. Returns give details of the quantity of electricity sold, the quantity used and any deductions for such qualifying purposes as electricity use in electricity intensive manufacturing processes, auxiliary power, free power and electrical losses.

Sales value in electricity intensive companies is defined as the sales value of the company's total production over the calendar year, i.e. including the sales value of other activities than that of the electricity-intensive production. The sales value of any unsold products produced during the year is calculated on the basis of the sales price of corresponding goods that were sold during the year.

Small scale hydro power includes plants with an installed capacity up to 1500 kW.

Spot contracts are contracts that have been entered into at the current market price, and under which electricity certificates are transferred from seller to purchaser within one week.

Svenska Kraftnät (SvK) operates the Swedish high voltage distribution grid (the country's 'backbone' grid), and maintains the electronic accounts of certificates in the electricity certificate system, with responsibility for its Cesar accounting system.

Links

On its web site, **the Swedish Energy Agency** publishes market statistics such as the number of approved production plants and of registered entities having quota obligations, information on which electricity producers from whom electricity certificates can be purchased, and also other general information on the electricity certificate system. This report is also available on the site in electronic form.
http://www.energimyndigheten.se/elcertifikat

On its web site, **Svenska Kraftnät** provides constantly updated information on such statistics as the number of issued, traded and cancelled certificates, as well as on the certificates' average price.
https://elcertifikat.svk.se/

The Energy Markets Inspectorate's web site has information on the certificate-inclusive price of electricity from suppliers, thus enabling consumers to compare prices on the market.
http://www.energimarknadsinspektionen.se/elpriskollen

Sources, references

- The Fiscal Policy Bill 2006/07:1
- Energy in Sweden 2006, ET 2006:43
- The Energy Market 2007, the Energy Markets Inspectorate
- The Swedish Energy Agency's IT support, the Electricity Certificate System
- E.ON Vattenkraft Sverige AB
- COD 2008/0016 Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the promotion of the use of energy from renewable sources
- Fortum Generation AB
- Ordinance (2003:120) Concerning Electricity Certificates
- Act (2003:113) Concerning Electricity Certificates
- New planning targets for wind power, 2020
- OPTRES Final Report - Assessment and optimisation of renewable energy support schemes in the European electricity market
- Bill no. 2003/04:42, Peat and Electricity Certificates
- Bill no. 2002/03:40, Electricity Certificates to Assist the Use of Renewable Energy Sources
- Bill no. 2005/06:154, Renewable Electricity with Green Certificates
- Svebio, Swedish Forest Industries' Federation, Swedish District Heating Association and Swedish Energy - Report on expansion of combined heat and power production facilities, 2007-2015 [in Swedish]
- Statistics Sweden, Energy statistics for detached houses, apartment buildings and other premises, 2005
- STEMFS (2006:07) on Electricity Certificates
- Svenska Kraftnät's Cesar IT support system
- Svensk Kraftmäkling, (SKM)
- Vattenfall AB

Tables

Table 3. Consumers' estimated costs for electricity certificates, 2003–2007.

	2003	2004	2005	2006	2007
Consumers' average costs, including value-added tax [öre/kWh] [1)]	2,4	3	3,3	3,4	4[2)]
Quota-obligated electricity [TWh]	63,3	97,4	97,6	97	96
No. of cancelled certificates [millions]	3,5	7,8	10,1	12,4	14,5
Average price per certificate [SEK]	201	231	216	191	195
Producers' revenue from certificates [MSEK]	701	1 809	2 186	2 367	2 820
Value-added tax, 25% [MSEK]	304	584	644	660	768
Quota obligations fees [MSEK]	183	14	3	2	6
Electricity suppliers' transaction costs [MSEK]	331	514	388	270	245
Consumers' costs for certificates [MSEK]	1 519	2 922	3 221	3 298	3 840

1) The price for 2004-2006 is based on data supplied by the electricity suppliers to the Swedish Energy Agency, and is valid for customers using less than 50 MWh per year. The price may be different for other electricity customers.
2) The price for 2007 is based on information called for by the Agency from about a dozen larger electricity suppliers.
Source: Swedish Energy Agency

Table 4. Production and installed capacity, by type of production, 2003–2007.

	2003 Maj-Dec	2004	2005	2006	2007
Number of plants1 [1)]	1 597	1 759	1 848	1 909	2 088
Hydro	966	1 040	1 060	1 075	1 094
Wind	543	613	668	706	859[3)]
Biofuels, peat	87	105	118	125	131
Solar	1	1	2	3	4
Installed capacity (elec.) [MW][2)]	4 049	4 161	4 471	4 765	5 066
Hydro	491	504	517	540	558
Wind	401	472	530	583	831
Biofuels, peat	3 157	3 185	3 424	3 643	3 676
Solar	0,008	0,008	0,011	0,036	0,043
Electricity production - renewables and peat [MWh]	5 637 559	11 048 438	11 298 378	12 156 855	13 255 913
Hydro	963 637	1 968 325	1 799 446	2 018 577	2 195 320
Wind	455 642	864 546	939 125	988 340	1 431 644
Biofuels	4 218 276	7 670 770	7 925 790	8 593 538	9 049 308
Peat	-	544 791	634 012	556 380	579 622
Solar	4	6	5	20	19

[1)] Number of plants allocated one or more certificates during the respective year.
[2)] For plants allocated one or more certificates.
[3)] 859 wind power plants, consisting of a total of 1003 individual turbines.
Source: Svenska Kraftnät's Cesar accounting system

Table 5.1. Production during 2007 in plants started up before 1st May 2003, and between 1st May 2003 and 31st December 2007.

Production during 2007 in plants commissioned in the following years [GWh]	Bio	Hydro	Wind	Solar	Peat	Total
Before 1st May 2003	8 353	1 919	767	0,006	575	11 614
May 2003–2007	696	276	665	0,013	5	1 642
Total	9 049	2 195	1 432	0	580	13 256

Table 5.2. Number of plants commissioned before 1st May 2003 and between 1st May 2003 and 31st December 2007.

No. of plants commissioned during the years shown	Bio	Hydro	Wind[1)]	Solar	Total
Before 1st May 2003	103	1 025	638	1	1 767
May 2003–2007	28	73	365	3	469
Total	131	1 098	1 003	4	2 236

1) For Wind is the number of turbines presented. Under 2007, 859 plants consisted of 1003 turbines.

Table 5.3. Installed capacity of plants commissioned before 1st May 2003 and between 1st May 2003 and 31st December 2007.

Production capacity commissioned during the years shown [MW]	Bio	Hydro	Wind	Solar	Total
Before 1st May 2003	3 410	492	372	0,008	4 254
May 2003–2007	267	86	460	0,035	812
Total	3 676	578	831	0,043	5 066

Source: Swedish Energy Agency, Svenska Kraftnät's Cesar accounting system

Table 6. Number of wind power plants, installed capacity and production in 2007, by year of commissioning.

Commissioned:	Number of wind power plants	Installed capacity [MW]	Production in 2007 [GWh]
2001 or earlier	558	304	613
2002–2003 (Jan–April)	80	68	154
2003 (May–Dec)	57	48	91
2004	52	58	124
2005	61	57	126
2006	51	58	138
2007	144	240	185
Total	**1 003**	**831**	**1 432**

Source: Svenska Kraftnät's Cesar accounting system; Swedish Energy Agency

Table 7. Electricity production from renewables and peat, total electricity production and proportion of total fuels made up of renewable fuels in approved biofuel plants, 2003–2007.

	2003 Maj-Dec	2004	2005	2006	2007
Renewable electricity production, including peat [GWh]	*4 218*	*8 216*	*8 560*	*9 150*	*9 629*
Industrial back-pressure	2 804	4 735	4 744	4 999	5 622
CHP	1 415	3 456	3 783	4 125	3 984
Biogas	0	25	32	26	23
Total electricity production [GWh]	*6 285*	*11 519*	*10 984*	*11 777*	*12 057*
Industrial back-pressure	3 238	5 215	5 146	5 411	5 976
CHP	3 047	6 278	5 785	6 310	6 023
Biogas	-	25	53	56	*58*
Proportion of renewable fuels and peat [%]	*67,1*	*71,8*	*77,9*	*77,7*	*80*
Industrial back-pressure	86,6	90,8	92,2	92,4	94
CHP	46,4	55,0	65,4	65,4	66
Biogas	-	99,8	61,6	46,5	40,4

Source: Svenska Kraftnät's Cesar accounting system

Table 8. Production in approved biofuel plants, 2003–2007, by types of fuels.

	Fuels entitled to certificates [GWh]								Non certificate-entitled fuels [GWh][1)]
Year	Energy crops	By-products from forestry/ forest industries	Landfill gas	Digester gas	Other biogas	Other wood waste	Peat	Total renewables and peat	
2003 Maj-Dec	–	–	–	–	–	–	–	4 218,3	2 066,5
2004	59,1	6 542,8	16,2	16,2	2,0	1 034,3	544,8	8 215,6	3 303,0
2005	50,7	6 743,3	15,2	24,1	4,9	1 087,6	634,0	8 559,8	2 424,2
2006	52,3	7 357,8	17,1	20,4	5,8	1 140,1	556,4	9 149,9	2 627,4
2007	23,9	8 051,2	16,6	16,9	7,5	933,2	579,6	9 628,9	2 427,7

1) Fuels that are not entitled to certificates are fossil fuels and fuels that qualify for guarantees of origin fro renewable electricity, such as the biological fraction in waste and byproducts from agricultural, domestic and industrial waste.
Source: Svenska Kraftnät's Cesar accounting system

Table 9. Recipients of electricity certificates for hydro power production in 2007, by types of entitlement.

Type of production	Number of plants	Allocated certificates	
		[no.]	[%]
Small-scale hydro	1 025	1 919 004	87,4
Resumed operation	16	4 494	0,2
New hydro power	36	89 817	4,1
Production increase	19	151 655	6,9
Concession[1)]	2	30 350	1,4
Total	**1 098**	**2 195 320**	**100**

[1)] Concession for plants that can no longer operate commercially viably due to a decision by a public authority or to extensive rebuilding work.
Source: Svenska Kraftnät's Cesar accounting system; Swedish Energy Agency

Table 10. Production capacity due for phase-out, 2012–2022.

	2012	2014	2018	2019	2020	2021	2022	Total
Wind [MW]	131	240	40	62	58	63	58	652
Hydro [MW]	491	3	2	12	18	9	21	555
Bio [MW]	3 227	209	-	23	64	135	46	3 703
Solar [MW]	0,008	-	-	-	-	0,028	0,007	0,043
Total [MW]	**3 849**	**453**	**42**	**96**	**139**	**206**	**125**	**4 910**

Source: Svenska Kraftnät's Cesar accounting system; Swedish Energy Agency

Table 11. Production phase-out, 2012–2022.

	2012	2014	2018	2019	2020	2021	2022	Total
Wind [GWh]	230	478	70	126	121	144	137	1 305
Hydro [GWh]	1 874	12	9	49	104	35	25	2 109
Bio [GWh]	7 964	834	-	30	171	423	65	9 487
Solar [GWh]	0,005	-	-	-	-	0,003	0,010	0,030
Total [GWh]	**10 068**	**1 324**	**78**	**204**	**396**	**603**	**227**	**12 901**

Source: Svenska Kraftnät's Cesar accounting system; Swedish Energy Agency

www.swedishenergyagency.se

Our objectives – smarter energy use
The Swedish Energy Agency is a state authority working to achieve a secure, environmentally-friendly and efficient energy system. We can help achieve the climate objectives through international cooperation and involvement. The Agency finances the research and development of new energy technology. We actively support business concepts and innovations that can lead to the establishment of new companies. We also show Swedish households and companies the way to accomplishing smarter energy use.

This report, the Electricity Certificate System, 2008, is intended to make statistics on the electricity certificate system more easily accessible, and to increase understanding of the system. It brings together, and comments on, statistics from the Swedish Energy Agency and from Svenska Kraftnät's IT-system.

Swedish Energy Agency
Swedish Energy Agency
Box 310, SE-631 04 Eskilstuna Visiting address: Kungsgatan 43
Telephone: +46 16-544 20 00 Fax: +46 16-544 20 99
registrator@energimyndigheten.se www.swedishenergyagency.se