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The electricity certificate system 2012

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Preface

From the start, 2012 was, and will continue to be, an eventful year for the electricity certificate market. A new act, new regulations and new rules relating to electricity certificates came into force at the beginning of the year. The changes affect both plant-owners and those having quota obligations, but their main effect is to give an improved overview of the system and markets. Since 1st January 2012, Sweden and Norway have operated a joint electricity certificate market, which means that certificates can be traded across the two countries' border. Extensive work on reviewing the conditions applicable to electricity-intensive industries has been performed during the year. In addition, 2012 is the final year for allocation of certificates to a significant volume of older production plant capacity.

There is also, of course, a lot that has not changed. The electricity certificate system continues to deliver new renewable electricity production in a cost-effective manner, which is one of the key policy measures supporting Sweden's aims of achieving its objectives for the supply and use of renewable energy, both nationally and at EU level.

The aim of this publication is to provide readers with easily accessible information on the electricity certificate system and its development.

This publication has been produced by Johanna Nilsson, assisted by Roger Östberg, Martin Johansson, Anna M. Johansson and Brita Lundkvist.

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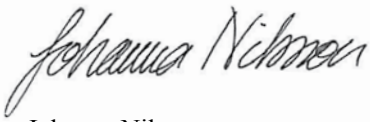

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Sweden's electricity market[1]

Electricity production on the Swedish electricity market is traded competitively. Electricity distribution (over the country's backbone grid, regional distribution networks and local distribution networks), on the other hand, is operated by monopolies that are under the surveillance of the Energy Markets Inspectorate. Trading in electricity means that the producers sell electricity to electricity trading companies on the Nord Pool electricity exchange, with the trading companies in turn selling the electricity to electricity end users. Producers may also sell electricity directly to users. The total cost paid by users for their electricity includes tax, in addition to the cost of the electricity itself. Producers' costs and revenues are affected not only by their sales of electricity but also by the electricity certificate system and the EU emission rights trading system.

Many parties and functions must work efficiently together on the electricity market if the electricity is to be safely delivered and if consumers are to be able to buy their electricity on a freely competitive market. The following are brief descriptions of the roles played by the various parties:

Svenska kraftnät is a public enterprise body, whose main duty is to operate and administer the country's high-voltage backbone grid and cross-border connections to other countries. The very largest production plants, together with the regional networks, are connected to the grid. Svenska kraftnät (Swedish national grid) is also responsible for overall operation of the Swedish electricity system, which includes monitoring the country's electricity system and ensuring that production and import of electricity are in balance with use and export.

The electricity producers produce electricity in their power stations and feed it into the grid and networks. They are free to choose whether they want to sell their electricity directly to larger electricity end users, to electricity trading companies or on the electricity exchange. Most of electricity production is sold on the exchange's spot market.

Electricity trading companies purchase electricity from the producers or on the electricity exchange and resell it to electricity end users. The role of electricity resellers (electricity suppliers) means that they have commercial contacts with electricity end users.

Grid operators own the regional and local electricity networks, and are responsible for electricity reaching its users. The regional networks operate at 40 kV– 130 kV, while the local networks operate at 40 kV and below. The regional networks transport electricity from the grid to the local networks and, in certain cases, also to very large users, such as larger industries. The local networks distribute electricity to other electricity end users, such as domestic users, offices, small industries etc.

Electricity end users, such as households and industries, are those who use the electricity. Generally, users have an agreement (contract) with an electricity trading company for supply of the electricity, and an agreement with a network company for connection to the latter's network. The users pay a network fee (fixed charge) to the network company for the supply connection and for transmission of the electricity.

The market place for electricity trading – the Nordic Nord Pool Spot electricity exchange – provides standard agreements that make it easier for the parties on the market to do business with each other. Nord Pool Spot provides a means of spot market trading (physical trading) for electricity on an hour by hour basis up to the day before delivery. OMX/Nasdaq has a forward market (financial trading) for long term trading by which the parties can set a fixed price. Most of the hourly trading occurs on the spot market, with a smaller amount being traded bilaterally between electricity producers and trading companies. Long term trading may also be agreed bilaterally.

[1] *Source: Svenska kraftnät, the Electricity market in Sweden and Svenska kraftnät's role [in Swedish], ISBN 978-91-976721-0-8, May 2011*

The electricity certificate system

The electricity certificate system is a market-based support system for cost-effective expansion of electricity production from renewable sources. The objective is to increase, by 2020, the production in Sweden of electricity from such sources by 25 TWh relative to production in 2002. Together with Norway, annual production from renewable sources in 2020 shall have increased by a further 13,2 TWh relative to production in 2012. The certificate system, which will run until the end of 2035, is intended to help Sweden to achieve a more ecologically sustainable energy system and also to meet the EU target for the country's proportion of renewable energy production.

In 2002, Sweden produced 70,3 TWh of electricity from renewable energy sources, of which about 90 percent were in cale 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. Its objective is to increase, by 2020, the production of electricity from such sources by 25 TWh relative to the production level in 2002. Since 1st January 2012, Sweden and Norway have operated a shared electricity certificate market. Together with Norway, it is the intention that a further annual production capacity of 13,2 TWh of renewable electricity production will be brought on line between 2012 and 2020.

Electricity producers whose electricity production meets the requirements of the Electricity Certificates Act receive one electricity certificate unit for each MWh of electricity that they produce. Demand for certificates is created by the fact that all electricity suppliers, and also certainelectricity end users, are required to purchase certificates corresponding to a certain proportion (quota) of their electricity sales or electricity use. The number of certificates to be purchased is adjusted from year to year in step with progressive changes of the quota (table 2, see the tables section) thus generating an increasing demand for certificates. In turn, this increases the incentive to produce more electricity from energy sources approved for production of certificate-entitled electricity. By selling their certificates, the producers of electricity from renewable sources can receive additional revenue to complement their sale of electricity. The certificate system thus encourages the expansion of production from renewable energy sources.

Producers' entitlements to electricity certificates

Producers of electricity in approved plants are allocated one certificate unit for each MWh of electricity that they produce and meter from renewable energy sources or from peat. Electricity from the following energy sources entitles its producers to certificates in Sweden:

- wind power
- solar energy
- wave energy
- geothermal energy
- biofuels, as defined in the Ordinance (2011:1480) Concerning Electricity Certificates
- peat, when burnt in combined heat and power (CHP) plants
- hydro power:
  - small-scale hydro power which, at the end of April 2003, had a maximum installed capacity of 1 500 kW per production unit,
  - new plants,
  - resumed operation from plants that had been closed, if they have been so extensively rebuilt or received such investments that the plants are to be regarded as new plants,
  - 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 to the right of producers to receive certificates. Plants commissioned after the start of the electricity certificate system are entitled to receive electricity certificates for fifteen years, or until the end of 2035, 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 the Ordinance (1998:22) Concerning Public Subsidies for Certain Investments in 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 must 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 specified proportion (quota) of their sales. These returns must be submitted by not later than 1st March each year. In addition to electricity supply companies, the quota obligation applies also to electricity-intensive companies and toelectricity end users who have used electricity that they have themselves produced, imported or purchased on the Nordic power exchange. In addition, those who use electricity that they have themselves produced, if the quantity of such energy amounts to more than 60 MWh per accounting year, and has been produced in a plant having an installed capacity exceeding 50 kW, also have a quota obligation.

Who does what?

The Swedish Energy Agency and Svenska kraftnät share responsibility for the electricity certificate system and are the surveillance authority and the accounting registrar respectively. Their duties are as follows.

The Swedish Energy Agency:

- approves plants for receipt of certificates,
- provides advance decisions on whether approval will be granted for receipt of certificates,
- registers/deregisters parties having quota obligations, and processes their annual returns declaring their amount of quota-liable electricity bought or used,
- 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 charge if the quota obligation is not fulfilled,
- 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 the Swedish Energy Agency's decisions,
- regularly publishes information on the number of certificates issued, traded and cancelled, including those traded with Norway, together with their average price.

Important dates in the electricity certificate system

1st March: The 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: The 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.

1st April: Cancellation of the 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 charge.

New regulatory framework for electricity certificates

A new Act, a new ordinance and new regulations concerning electricity certificates came into force on 1st January 2012, changing the Swedish Energy Agency's regulations and general guidelines for certificates (STEMFS 2011:4). The changes that have occurred in the regulations bring them into line with the concepts in the Act and the Ordinance. The forms in STEMFS 2011:4 have been changed in order to reflect the changes in the Act and the Ordinance, and also to simplify them for the parties concerned. The text describing the deductions for auxiliary power generation have also been clarified (see 2 Section 6 §). The general guidance to 5 Section 1 §, concerning extensive rebuilding, has also been rewritten.

Briefly, the new regulatory structure governing electricity certificates involves the following changes:

Changes that affect plant-owners

- **Allocation period length decided at the time of approval**
  The Swedish Energy Agency now decides on the length of the allocation period for the receipt of certificates as part of the approval process for the plant. This means that, right from the start, the plant-owner knows when allocation of certificates will cease. Generally, the allocation period starts to run from the time of approval, and will in no case exceed 15 years. If the approval relates to a new allocation period after extensive rebuilding, it starts from the date when the plant can be regarded as new. In the case of plants receiving approval for an increase in their output, the allocation period is regarded as starting from the date when the production of renewable electricity increased.

- **Stricter rules for hydro power**
  The rules applying to plants that were taken out of operation before 1st July 2001, and which were then restarted after the end of 2002, have been tightened up. Such plants can be approved for the receipt of certificates only if the conversion or extension works, or other investments in the plant, are such that the plant can be regarded as a new one. In addition, the requirements for hydro power plants that have been started up for the first time, and have an installed capacity of 1 500 kW or more, have been tightened up.

• A change in the definition of biofuels

The definition of biofuels has been changed by means of the requirements set out in 2 § of the Regulations (2011:1480) Concerning Electricity Certificates. The old Regulations (2003:120) Concerning Electricity Certificates specified which biofuels that were approved for the receipt of certificates. Under the terms of the new regulations, biofuels are defined as materials of biological origin that are used as fuel. This is followed by a definition of what is not regarded as a biofuel:

1. fossil materials or peat,
2. unsorted waste, regardless of its contents, or
3. objects or substances as defined in 2 above, but which have ceased to be waste after a recovery process.

The new definition of biofuels means that there can be more materials of biological origin that can be entitled to receipt of certificates. In addition, it is clear that no forms of unsorted waste can qualify for receipt of certificates.

• Power to reduce electricity certificate allocation

A new type of decision that can be reached by the Swedish Energy Agency concerns a reduction in the quantity of allocated certificates. Such a reduction means that certificates will not be allocated in accordance with the fuel report submitted by the plant-owner. Each month, before certificates are issued, the Swedish Energy Agency checks the fuel reports that have been submitted to Svenska kraftnät. Depending on what the plant-owner has stated as additional information in the report, the issue of certificates can be stopped and further investigated if a decision concerning a reduction in the number of certificates is to be made. Such decisions can be appealed against.

Changes that affect those having quota obligations

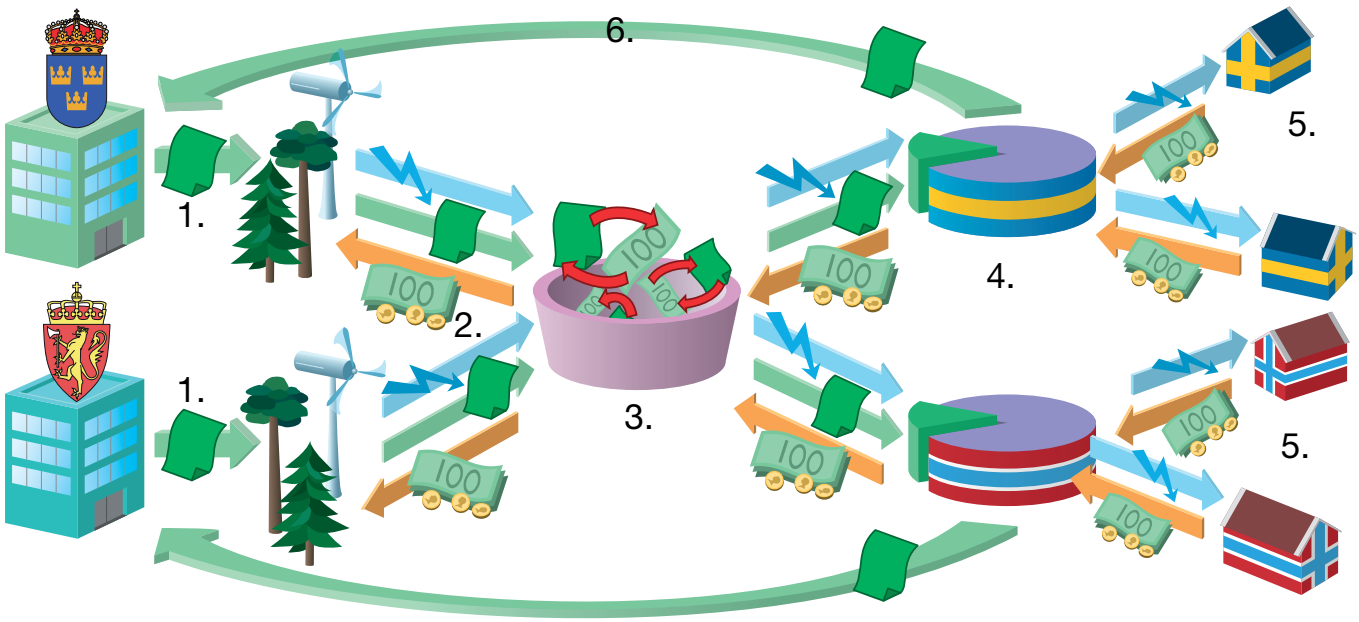
• Quota obligation removed for certain users of electricity

The quota obligation on thoseelectricity end users who use electricity that they themselves have produced has been removed if the quantity of such electricity does not exceed 60 MWh per accounting year, or if the electricity has been produced in a plant having an installed capacity not exceeding 50 kW.

• Cancellation decisions transferred to the Swedish Energy Agency

With effect from the 2012 cancellation year, it is the Swedish Energy Agency that makes the cancellation decisions for certificates. This decision has previously been made by Svenska kraftnät. The Swedish Energy Agency can decide that more certificates must be cancelled than the number given by the party having a quota obligation in its return. In those cases where such a decision has been made, the number of certificates representing the difference between the quota obligation declared in the return and the quota obligation regarded by the Swedish Energy Agency as being correct will be frozen in the party's Cesar account. The decision can be appealed, which means that the certificates will either be cancelled or that the frozen certificates will be unfrozen in accordance with a court decision.

Figure 1. The electricity certificate system and a joint Swedish/Norwegian electricity certificate market



1. Electricity producers receive one electronic electricity certificate from the Swedish state for each MWh of electricity that they have produced from renewable energy sources or from peat. Norway also has an electricity certificate system, with the Norwegian State issuing electricity certificates to producers of renewable electricity in the same way as in Sweden.

2. The electricity producers can then sell their certificates, thus receiving additional revenue for their electricity production.

3. Certificates are traded on an open market, with the price being determined by supply and demand. Both Swedish and Norwegian certificates are traded. The price of certificates is determined by the buyer and seller.

4. Purchasers are Swedish or Norwegian parties having quota obligations: they are required to purchase certificates corresponding to a certain proportion (quota) of their electricity sales or use. The size of the quota obligation is set by the requirements of the relevant legislation, and helps to create a demand for certificates.

5. If the purchaser is an electricity supplier, the cost for the acquired certificates forms part of the price that the supplier charges his customers. In this way, electricity customers in Sweden and Norway contribute to expansion of production facilities for renewable electricity.

6. On 1st April each year, those having quota obligations are required to hold the necessary number of certificates to meet their quota obligations in the two countries in their certificate accounts. The appropriate number of certificates will then be cancelled by the registrars. Between that date and 1st April of the following year, the parties must purchase new certificates as needed in order to meet the next year's quota obligation. This means that a constant demand for certificates is created.

A joint Swedish/Norwegian electricity certificate market

Sweden and Norway have operated a joint electricity certificate market since 1st January 2012, which means that certificates can be traded across the countries' border. In addition to the Swedish target of an increase of 25 TWh in the production of renewable electricity between 2002 and 2020, the intention of the joint electricity certificate market is that it should effect the production of a further 13,2 TWh of renewable electricity between 2012 and 2020. Both countries have an equally high aim over the period.

The effect of a joint electricity certificate market is that renewable resources will be better utilised than if each country was working independently on increasing its renewable electricity production. As the producers of renewable electricity can receive electricity certificates regardless of whether the electricity is produced in Norway or in Sweden, they will invest in production wherever the conditions are most favourable and/or the highest profitability can be obtained. Figure 1 shows how the joint market operates with the two electricity certificate systems. The joint Swedish/Norwegian electricity certificate market is larger than the individual markets, with more trading parties, which is expected to result in greater competition due to such effects as greater liquidity. The target of greater renewable electricity production can be achieved more cost-effectively, as investments will be made where conditions are most favourable, helping to keep down the cost of electricity for customers.

The shared market permits trading in both Swedish and Norwegian electricity certificates, as needed in order to fulfil quota obligations in the two countries. Although the market is a joint market, each country still has its national legislation governing the certificate system in its respective country. This means that Norway, too, has quota obligations that create a demand for certificates. For 2012, the Norwegian quota is 0,03, with the demand increasing by almost 1.5 million certificate units per year, giving a quota of 0,183 in 2020. Table 2 (see the tables section) shows the Swedish and Norwegian quota obligations. Although the basic principles of the two electricity certificate systems are the same, there are some differences, of which the following are examples:

- In Sweden, peat also qualifies for entitlement to certificates.
- The proportion of biomass in mixed waste qualifies for certificates in Norway.
- Plants taken into operation after 2020 will qualify for certificates in Sweden, but not in Norway.
- Certain minor differences in the exemption rules for electricity-intensive industries.
- Receipt of certificates possible after extensive rebuilding in Sweden, but not in Norway.

In Sweden, it is the Swedish Energy Agency that operates and develops the electricity certificate system: in Norway, it is the responsibility of the Norwegian Water Resources and Energy Directorate (NVE). The two authorities also receive and approve applications for certificates, as well as registering and de-registering parties having quota obligations. Each authority also exercises surveillance of its respective country's regulations concerning certificates, and provides up-to-date information on the state of the certificate market in its home market and in the wider joint market. In Sweden, it is Svenska kraftnät that maintains the register and operates the Cesar accounting system: in Norway, it is Statnett (the Norwegian grid operator), operating the NECS accounting system, that has the corresponding role.

Svenska kraftnät and Statnett issue electricity certificates and maintain the holders' accounts in their respective registers. They also cancel the certificates as instructed by the Swedish Energy Agency and NVE on the due dates for when quota obligations are required to be fulfilled. Both Statnett and Svenska kraftnät publish market and price information on certificate trading, both within and between their respective countries.

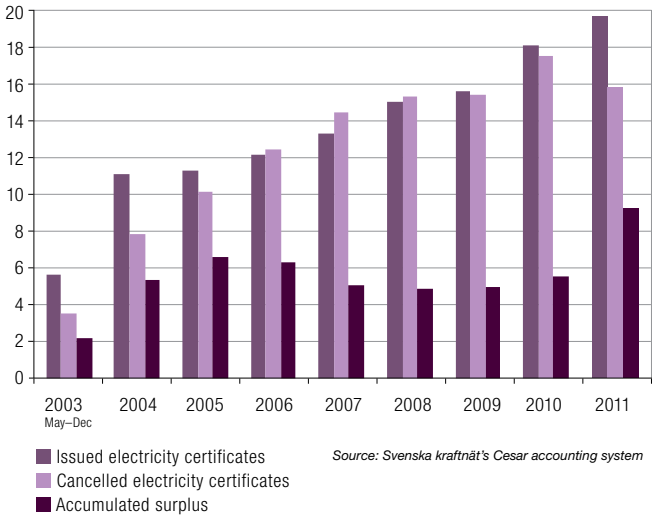
Supply

Power plants producing electricity from renewable energy sources, and which have been approved by the Swedish Energy Agency or by NVE, receive a number of electricity certificates, depending on the amount of renewable electricity produced by the plant. In 2011, there was still a surplus of certificates, amounting to about 8,8 million units.

The number of certificates issued is determined by the amount of electricity produced by approved plants and, in the case of CHP, also the proportion of renewable fuel used. Electricity production is also affected by external factors such as temperature, precipitation, the availability of wind power and the country's overall electricity balance.

In 2011, the difference between the demand for electricity certificates and the number issued was about 3 300 000 certificate units, resulting in a change of the surplus from its value for the last four years of about five million certificates to almost nine million certificates.

Figure 2. Numbers of Issued and cancelled certificates, 2003–2011, and accumulated surplus over the period



Source: Svenska kraftnät's Cesar accounting system

Importance of the surplus for the electricity certificate market

The effect of the accumulated surplus of electricity certificates on the market has increasingly been discussed over the last few years. Some general aspects of the surplus must be borne in mind. A certain amount of surplus is needed in order to ensure market liquidity, and thus a quantity interval for trading. The surplus also acts as a buffer to absorb variations in the electricity market between one year and the next. Cold, wet and windy years generate a surplus, while mild, dry and calm years generate a deficit in comparison with conditions in a statistically normal year, around which the quota curve is designed. It is also so that bringing forward the start-up of a production plant creates a surplus during part of the production period, with a deficit arising fifteen years later when that production is phased out of the certificate system. A surplus can also arise if quota-obligated electricity use differs from the forecasting data used when the quotas were set. This particular deviation can be compensated for at the next review of the certificate system (known as a checkpoint), which is performed about every fourth year. The next checkpoint review is due by not later than 2015. The magnitude of the surplus affects the price of certificates, but the long-term price trend is also affected by the market's view of changes in the surplus in the future.

During the certificate system's first three years, a surplus arose as a result of rapid expansion of existing biofuel-fired production capacity. This was followed by a period of diminishing surplus as construction of new production capacity failed to keep pace with the rises in quota obligations. The market responded by worrying that a deficit of certificates would arise in a few years. Between 2007 and 2010, the surplus remained essentially unchanged at about 5 TWh. In 2011, the proportion of renewable electricity production was high, while electricity demand was low, leading to an increase of the surplus to nearly 9 TWh. This is expected to increase further over the next year as a result of continued substantial expansion of renewable electricity production capacity, and because the quota obligations covering the period up to 2012 do not provide sufficient demand to take up all the certificates available.

Quota-obligated electricity use has been considerably less than the forecasts on which the new quota obligations were based in 2006 in order to meet the target (at that time) of 17 TWh additional production by 2016.

New quota obligations with effect from 2013 have been approved by the Swedish Parliament, intended to reduce the surplus and to achieve the production target by 2020. Entitlement of a significant number of older plants to receive certificates will cease with effect from 2013 as their allocation entitlement periods come to an end. The surplus of certificates is expected to decline over the period 2013/2014. However, it will continue to vary in the future, depending on the amount of quota-obligated electricity actually used and on increases in production capacity.

Since 1st January 2012, Sweden and Norway have operated a joint electricity certificate market, which has increased the demand for certificates and also means that the percentage proportion of the total demand for certificates represented by the surplus will be reduced. Norway's quota obligations are based on a linear growth of demand, amounting to almost 1,5 TWh per year. The rate of production expansion in Norway during the start-up years will affect the size of the surplus, so that Sweden's present surplus will be needed if Norwegian demand exceeds Norwegian issue of certificates.

Most renewable energy production in biofuel-fired plants

Of the electricity production that received certificates in 2011, 52,2 percent was from biofuel-fired plants and 3,3 percent from CHP plants burning peat. Wind power plants produced 30,8 percent, and hydro power plants produced 13,7 percent, thus making significant contributions to electricity production within the certificate system. About 30 solar energy plants were approved for receipt of certificates in 2011, but they produced only a few hundred MWh during the year. No wave energy or geothermal energy plants have so far been submitted for approval and inclusion in the electricity certificate system.

In 2011, a total of 3 034 plants have been approved for the allocation of certificates, made up as follows: solar 31, biofuels 170, hydro power 1 200, and wind power 1 633. 53 plants have been approved for receipt of certificates based on an increase in output from large-scale hydro power. All told, a total of 323 plants were approved for receipt of certificates during 2011.

Two groups of producers in the electricity certificate system

The producers of certificate-entitled electricity can be classified into essentially two groups: one consisting of a few large companies, which in fact produce most of the electricity, and the other consisting of a large number of producers who individually produce relatively small quantities of electricity. In 2011, 96 percent of the producers received certificates for a total electricity vproduction of 50 GWh (50 000 MWh) or less, making up 27 percent of the total number of certificates issued during the year. The three largest producers accounted for 21 percent of certificate entitled production, which was more or less unchanged from earlier years.

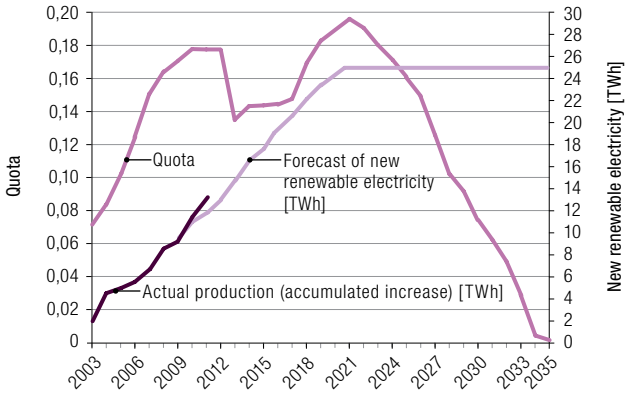
Demand

The Swedish Parliament set adjusted and new quotas for certificates on 1st July 2010. The purpose of this update was to ensure that the certificate system will help to achieve the new target of increasing the production of electricity from renewable energy sources by 25 TWh in 2020, relative to production in 2002.

The demand for electricity certificates is created by the requirement for electricity suppliers and certainelectricity end users to purchase certificates corresponding to a certain proportion of their electricity sales and/or electricity use. This proportion, or quota, has been decided for each calendar year, and is set at such a value as to create an increasing demand for certificates. The purpose of the system is to increase 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 set target. If the target is to be achieved, the quota obligation must be increased as time passes. In the spring of 2010, Parliament set increased quotas for 2013–2030 and new quotas for 2031–2035.

Table 2 (see the tables section) and figure 3 show quota sizes and developments over the period 2003–2035. 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 percent 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 charge of 150 percent of the average price of certificates, calculated over the period of one year leading up to the date of cancellation.

Figure 3. Quota for 2003–2035 and the forecast of new renewable electricity production, together with the actual quantity of renewable electricity production



Source: Bill no. 2009/10:133; Svenska kraftnät's Cesar accounting system

Different sizes of quota obligations

The companies having quota obligations are electricity suppliers, electricity-intensive manufacturing companies andelectricity end users, to the extent that they have used electricity that they have imported or purchased on the Nordic power exchange. In addition, those who use electricity that they have themselves produced, if such production exceeds 60 MWh per accounting year, and has been produced in a plant with an installed capacity exceeding 50 kW, also have a quota obligation. 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. 81 percent of those having a quota obligation had an obligation of 10 000 certificate units or less in 2011, equivalent to annual sales or use of electricity of somewhat over 7 GWh on average.

The quota obligations for these companies and individuals amount to only about 4 percent of the total quota obligation. The three largest companies in the system have an obligation amounting to about 33 percent of the total obligation, which is essentially un-changed from earlier years.

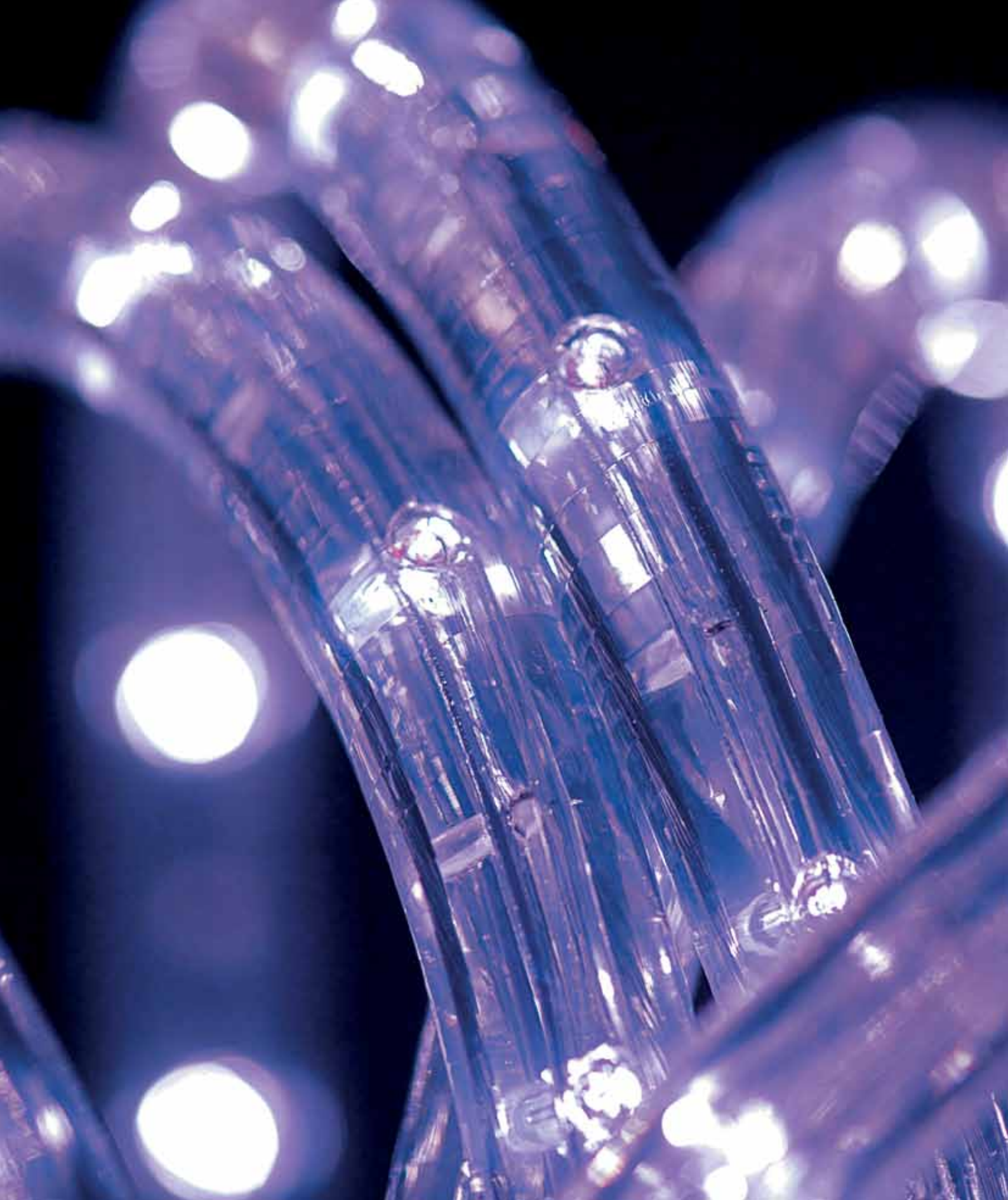
Electrically-intensive industry exempted from quota obligations

Free power, and electricity used as auxiliary power for electricity production, are exempted from the quota obligation, as are losses arising in connection with operation of transmission or distribution networks. Electricity-intensive companies registered by the Swedish Energy Agency are exempted from having a quota obligation for electricity used in their manufacturing processes, although other electricity use by the companies attracts a quota obligation. For such companies to be registered for exemption, they must 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 companies having quota obligations. The reason for exempting these companies from having quota obligations is to ensure that the international competitiveness of Swedish electricity-intensive industries is not affected by the higher costs of electricity that would result from having a quota obligation.

It is also possible to register only part of a company, if that part is operating as an independent business or activity. In 2011, about 450 companies were registered as electricity-intensive, exempting a total of 40,3–41,3 MWh from a quota obligation.

Proportion of cancelled electricity certificates close to 100 percent

The electricity certificate system requires those having a quota obligation to purchase the number of certificates as needed to fulfil their quota obligation. By not later than 1st March each year, those having an obligation submit a return with details of their sales and/or purchases of electricity during the previous year, and these details are then used for calculation of the parties' quota obligations. The requisite number of certificates as needed to fulfil the quota obligations, as given in the party's return, is then cancelled on 1st April. If the party holds insufficient certificate units in its account, it is required to pay a quota obligation charge to the State. This charge amounts to 150 percent of the volume-weighted average price of certificates during the period from the previous 1st April until 31st March of the following year. Apart from the first year of the system, the proportion of cancelled certificates in relation to the overall quota obligation has been over 99 percent, as shown in table 1 (see the tables section).

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Certificate trading

Each electricity certificate certifies that one MWh of electricity has been produced from renewable energy sources. Producers and those having quota obligations both have accounts in Svenska kraftnät's electronic register, Cesar. Trading involves transfer of certificates from the seller's account to the 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 brokered transactions. The use of brokers has shown itself to be a practical method, as the parties on the market have different requirements and circumstances. Certificates are traded not only by electricity companies that have 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 of, and variation between, sellers and purchasers has meant that there is a demand for different levels of information on aspects such as price trends, traded volumes, forms of contract, price levels etc. Current prices of electricity certificates are published regularly by Svensk Kraftmäkling (SKM), on its web site, www.skm.se. SKM also lists historical weekly and monthly average prices for electricity certificates.

Half of all trading through brokers

Electricity certificates are traded 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 and paid for at some point in the future. The most liquid trading is in forward contracts for the following March, and in spot contracts, each of which account for about a third of total traded volumes. Contracts for March 2012 are expected to make up about one fifth of traded quantities. SKM estimates that the proportion of certificates traded via brokers was about 50 percent in 2009, with the other 50 percent estimated as traded either internally or directly between parties. Certificates are traded fairly steadily throughout the year.

The price of a certificate is registered when the certificate is transferred between accounts in Svenska kraftnät's Cesar register. The average price that is recorded in and shown by Cesar is the weighted average price of all transactions during the time period concerned, and cannot therefore be seen as a market price for certificates. However, it does happen that the Cesar price is used as a reference price for certain trades on the electricity certificate market.

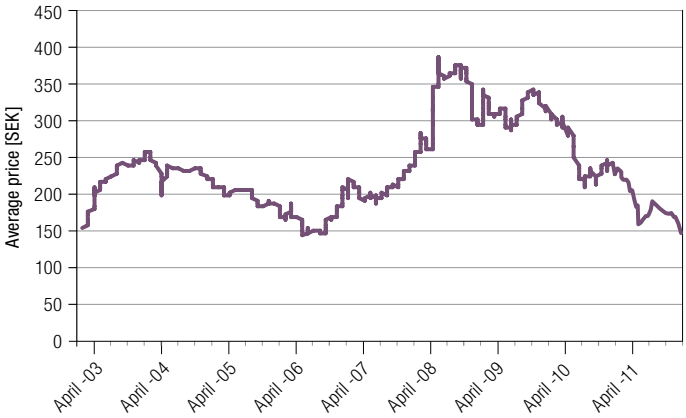
Producers of certificate-entitled electricity have different priorities, or reasons for selling, when selling their allocated certificates. The main differences are to be found between large and small producers, with the small producers being more dependent on a steady sale of their certificates in order to assure revenue flows and thus maintain production. It is common that the larger producers, on the other hand, are less dependent on the sale of certificates in order to keep their plants running, and so they can wait for a better price for their certificates before they sell them. However, it is mainly the particular circumstances 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 market determines the price of certificates

On a competitive market, the price of certificates is determined by the interaction 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 shared responsibility for participating in public 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.

Several factors affect the setting of prices, such as the expected demand for electricity and expected introduction of new production capacity, as well as changes in the certificate system as a result of political decisions. All these factors are considered by the parties on the market when trading, with the result that the traded price becomes an indicator of expected availability of, and demand for, electricity certificates. If the market expects a shortage of certificates, their price will rise, while a surplus causes the price to fall. Figure 4 shows the spot traded price of certificates since the system started on 1st May 2003.

Figure 4. Average spot market price of electricity certificates, 2003–2011



Source: SKM Svensk Kraftmäkling AB

How the electricity customer supports renewable electricity production

The producers of electricity from renewable energy sources bolster their revenue through the sale of electricity certificates. Although most of the revenue comes from the producers' nearest party in the chain - electricity suppliers - when the suppliers buy electricity certificates, it ultimately and indirectly comes from the end purchasers, the consumers, when they pay their electricity bills. In 2011, the average cost to consumers of this element of the total cost of electricity was 4,4 öre per kWh. In addition, VAT and transaction costs further increase the price for many of them .

Since 2002, Sweden's electricity production from renewable energy sources (including peat) has increased by 13,3 TWh. The fact that the producers choose renewable energy sources is largely due to the extra revenue received via the certificates.

End users pay for the electricity certificate system…

Although it is the electricity supplier who buys the certificates, it is the end-user electricity customer who ultimately pays for the certificate system, via the supplier's bills. However, not all the money paid by the consumers reaches the producers: some of it is used to pay value-added tax, quota obligation charges and transaction costs for the suppliers, such as administration, wages, brokers' fees and risk costs. Since 1st January 2007, electricity suppliers' costs for certificates are included as part of the price of electricity in fixed-rate tariffs, which makes it more difficult to work out the cost of the certificates to the user today. This change was introduced in order to improve cost efficiency and to make it easier for consumers to compare electricity prices between suppliers.

… with domestic users paying for about half of the cost

In 2011, the cost of renewable electricity production toelectricity end users amounted to about SEK 4100 million. To this, for certain customers, must be added VAT and administration costs. There are several different types of customers who pay for the certificates. The largest group is that of domestic consumers, who account for about 45 percent of quota-obligated electricity use. The service sector uses about 29 percent of the electricity, with quota-obligated industry using 17 percent. The remaining 9 percent of renewable electricity is used by transport, agriculture, district heating suppliers etc.

Cost estimation for electricity customers

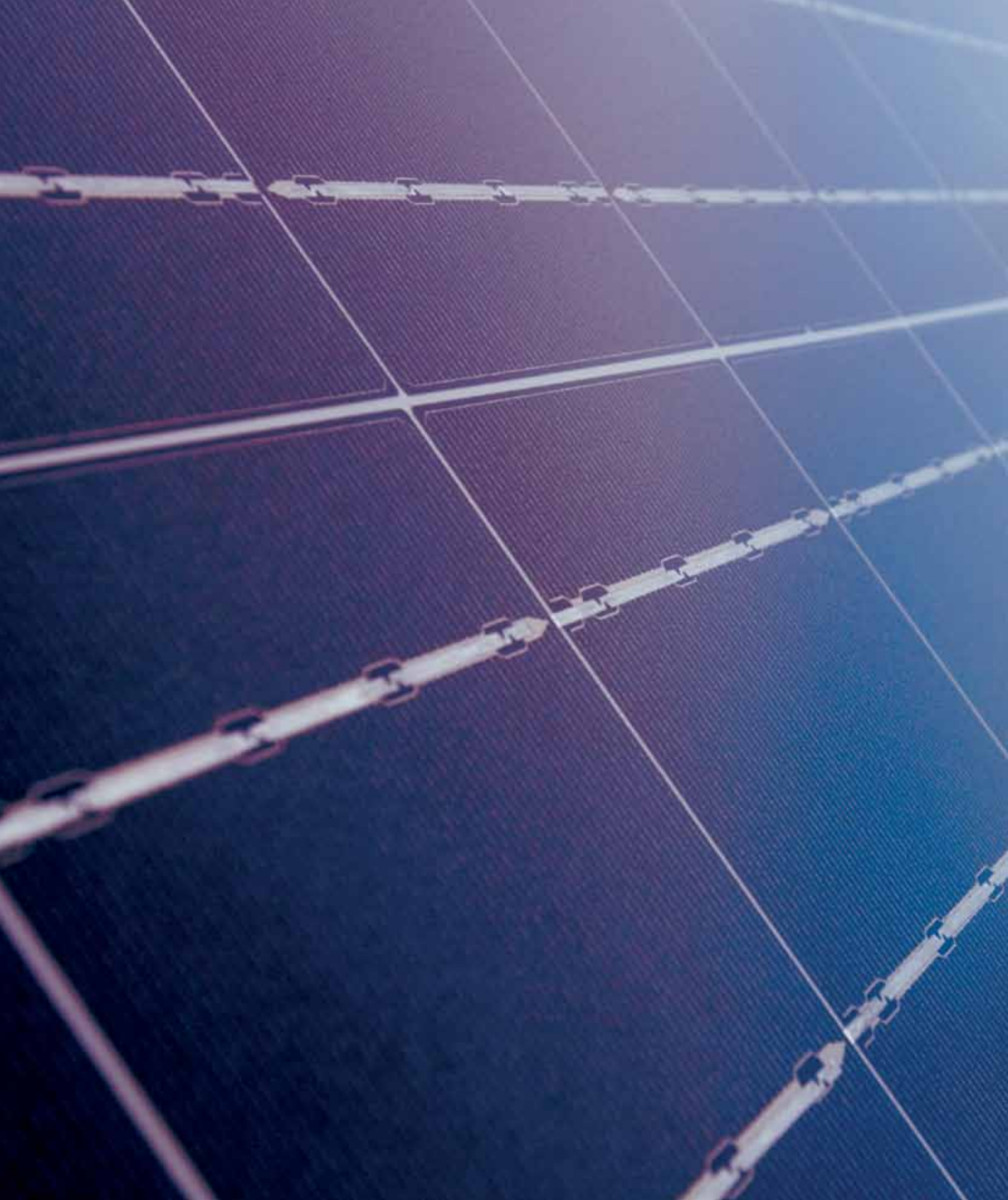
The following formula can be used by electricity customers wishing to estimate what proportion of the electricity certificate price is represented by the actual cost of the electricity in öre/kWh:

$$\frac{\text{(Electricity certificate price [SEK/MWh])} \bullet \text{(quota for the year)}}{10} = \text{cost to the electricity customer [öre/kWh]}$$

The cost as shown in figure 5 has been estimated from the spot price of certificates since 2003. However, it should be noted that the final cost to an end-user customer can vary widely, as certificates are not only purchased on the spot market, and because many electricity customers have fixed-price, rather than variable, tariffs. Many customers must also pay VAT and transaction costs. Table 3 shows the total cost for certificates on an annual basis, converted to an average cost (see table 3 in the table section).

Figure 5. Electricity customer's cost for electricity certificates, öre/kWh, 2003–2011

Source: Swedish Energy Agency, price of certificates from SKM Svensk Kraftmäkling AB



Electricity production in the electricity certificate system

Electricity certificates are issued to those who produce electricity from one or more renewable energy sources, or 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. In 2011, electricity production from renewable sources and peat amounted to 19,8 TWh, which is an increase of 13,3 TWh compared with corresponding production in 2002.

Certificate-entitled electricity production has increased since the start of the certificate system, 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 (see the tables section) provides further information on electricity production from certificate-entitled sources, from 2003 to 2011. 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.

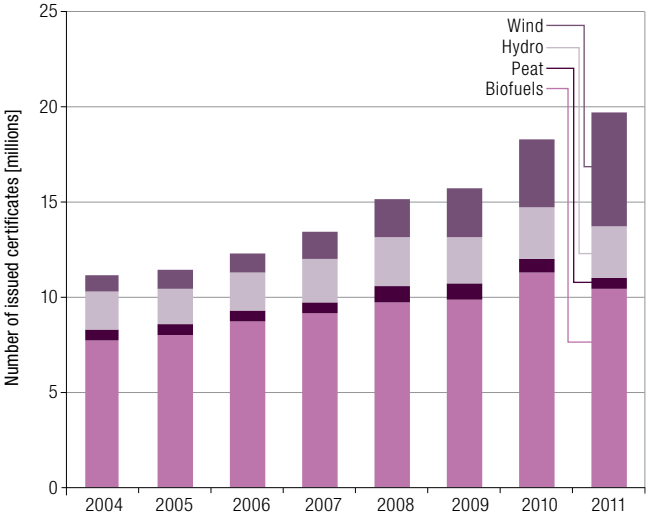
19,8 TWh of certificate-entitled electricity production in 2011

Certificate-entitled electricity production in 2011 amounted to 19,8 TWh, having increased from 6,5 TWh in 2002. This represents an increase of 13,3 TWh since 2002. Figure 6 shows the breakdown of allocation of certificates among different energy sources from 2004 until 2011.

1 613 new plants started up

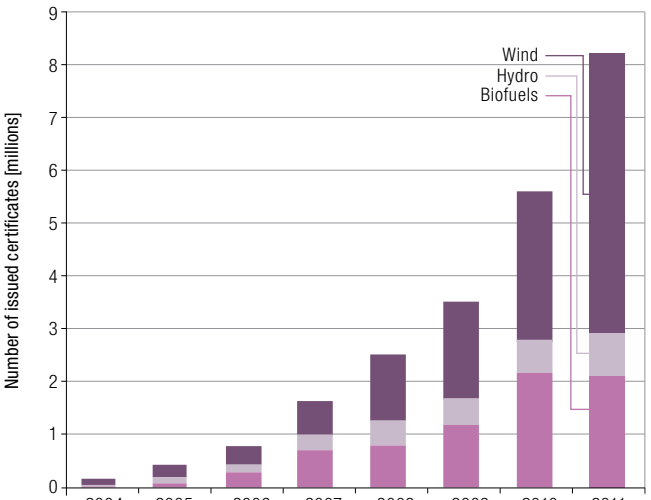
Electricity production from renewable energy sources can be increased through the construction of new plants or through increases in production from existing plants. Since the certificate system started on 1st May 2003, a total of 1 613 new plants had been started up by the end of December 2011. Figure 7 shows that these new plants produced a total of 8,2 TWh in 2011. Table 5 (see the tables section) contains more information on new plants.

Figure 6. Number of certificates issued, by energy source, 2004–2011



Source: Svenska kraftnät's Cesar accounting system

Figure 7. Number of electricity certificates issued for new plants, by energy source, 2004–2011



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

Wind power

Wind power today supplies over 4 percent of Sweden's total electricity production. Potentially, it could supply considerably more than this, which means that it is a politically high-profile area. Parliament has set a planning framework that requires establishment of conditions for an expansion of 30 TWh of wind power production by 2020, with 20 TWh of this from onshore plant and 10 TWh from offshore plant.

Technical development in the wind power sector has been explosive. Twenty years ago, wind turbines had outputs of a few hundred kilowatts: today, some turbines with outputs of over 7 MW are being built, although units installed in Sweden are generally in the 2–3 MW range. Most expansion to date has been inland or near coasts, but a few offshore installations are in operation: 2007, for example, saw start-up of the Lillgrund offshore wind power farm in Öresund. However, offshore wind power production is at present more expensive than onshore production, and requires high levels of support revenue. Applied research and experience from a growing number of projects should enable cost reductions to be made in the future.

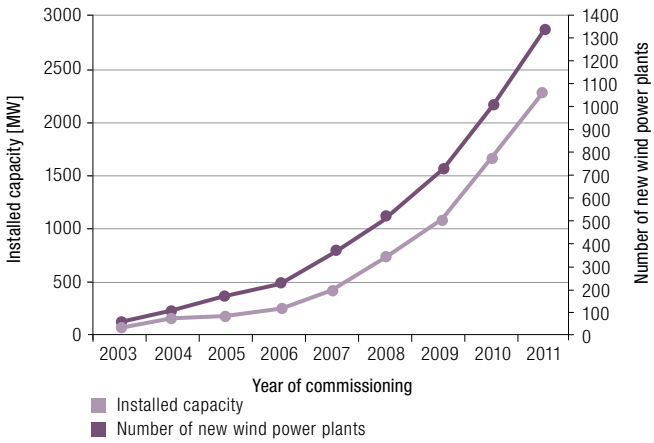
1 633 wind power plants have received certificates

1 633 wind power plants were granted certificates in 2011. Several production units, close to each other and having a common feed-in point to the grid, are regarded as one plant. In total, the plants consisted of 1 947 individual turbines, of which 67 were offshore. Total installed capacity in 2011 amounted to 2 688 MW, as can be seen in table 6 (see the tables section). Figure 8 shows the total number of new wind power plants in the certificate system, and their installed capacity.

75 percent increase in wind power production

Wind power production varies with wind conditions, and therefore changes with time, depending on weather conditions. 2010 was a relatively calm year in terms of wind, while 2011 was a windy year. Total electricity production from wind power plants in 2011 amounted to about 6,1 TWh, which was an increase of 75 percent over the previous year.

Figure 8. Total number of new wind power plants registered in the electricity certificate system and their installed capacity, 2003–2011



Source: Svenska kraftnät's Cesar accounting system; Swedish Energy

Biofuels and peat

With its substantial areas of forest and arable land, conditions in Sweden are favourable for the production of biofuels. From a systems perspective, the Swedish Energy Agency regards CHP production as a very efficient way of using biofuels, as much of the energy in the fuel is converted to both electricity and heat. The heat can either 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 steam or 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 highest 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 included in the electricity certificate system

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 extended to include its use 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 hindered by competition from coal. In 2011, there were 22 such plants burning peat, producing about 657 GWh of electricity, which is about 135 GWh less than were produced in 2010.

Bioenergy is the major energy source in the certificate system

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 submit monthly returns of their total electricity production, and of the energy proportions provided by biofuels, peat and other fuels. 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 2011. 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 (see the tables section).

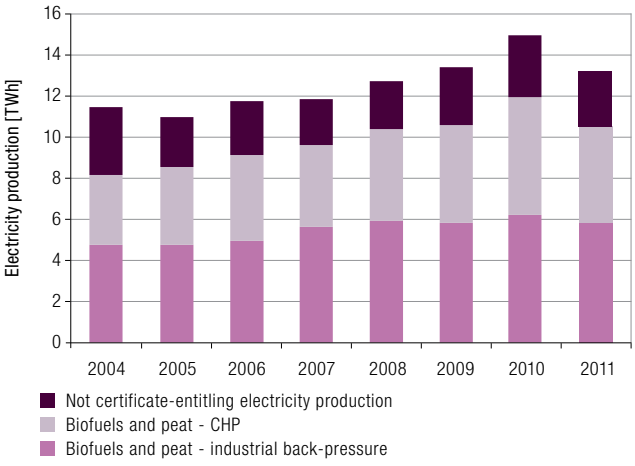
In 2011, biofuel-fired plants produced 10,3 TWh of renewable electricity (excluding that from peat). Compared with a total 19,8 TWh of renewable electricity produced by all plants covered by the certificate system, it can be seen that bioenergy is by far the largest energy source in the system. Including the contribution from peat brings the total quantity of renewable energy up to 11,0 TWh. Of this, about 9–10 TWh was produced in plants that were commissioned before the electricity certificate system was started. With the admission of peat to the certificate system, annual production of renewable electricity in these plants increased by about 3,5 TWh as a result of factors such as increases in the proportion of biofuels and increases in power outputs. This trend continues, although now at a slower rate, so that production from 2004 to 2010 in these plants increased by about 20 percent. 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 from 2003 until 2011, together with their installed capacity.

The most common fuel is forest industry by-products

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 (2011:1480) Concerning Electricity Certificates.

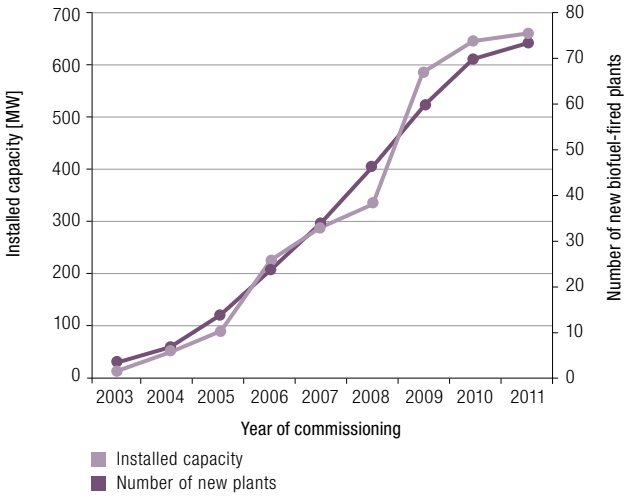
By-products from the forest products industry, such as black liquor, form the single most common type of biofuel that is eligible for the receipt of certificates, closely followed by by-products from forestry, such as felling residues. Other wood industry waste and peat are also used to a considerable extent, as is shown in figure 11 and table 8 (see the tables section). Table 8 also shows that the relative proportions of the various renewable fuels have 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. In 2009, by-products from the joint forestry/forest industry category were divided up into the two constituent categories of forestry by-products and forest industry by-products.

Figure 9. Electricity production in approved biofuel-fired power plants, 2004–2011



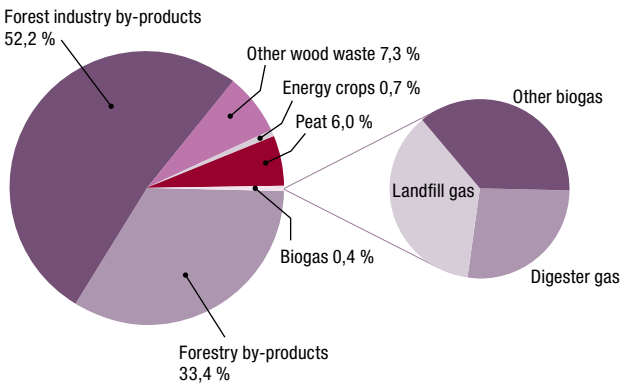
Source: Svenska kraftnät's Cesar accounting system

Figure 10. Total number of new biofuel-fired plants registered in the electricity certificate system and their installed capacity, 2003–2011



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

Figure 11. Biofuels used in approved biofuel-fired power plants, 2011



Source: Svenska kraftnät's Cesar accounting system

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, involves very substantial investments. With the aim of increasing hydro power-based output, hydro power plants can therefore receive certificates for the following measures:

- small-scale hydro power that was in operation at the end of April 2003 and which had an installed capacity not exceeding 1 500 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, if they have been so extensively rebuilt or the object of other Investments that the plant can be regarded as a new plant,
- 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.

A new Act, a new Ordinance and new Regulations concerning electricity certificates came into force on 1st January 2012. The rules have been tightened up for hydro power plants that were decommissioned before 1st July 2001 and then recommissioned after the end of 2002. Plants in this category can be approved for the receipt of certificates only if they have been so extensively rebuilt, or have been the object of such investments, that they can be regarded as new plants. The rules have also been tightened up for hydro power plants that were first taken into use after the end of 2002, and which have an installed capacity of more that 1 500 kW.

1 200 hydro power plants qualified for certificates

Hydro power plants within the electricity certificates system vary in size. Small-scale plants, with a maximum installed capacity of 1 500 kW per production unit, dominate, as shown in table 9 (see the tables section). In 2011, 606 companies were issued with certificates for 1200 hydro power plants. (Several production units, grouped closely together and having a common connection point to the transmission/distribution network, are regarded as one plant.)

2,7 TWh of electricity production

Electricity production from hydro power varies from one year to another, depending on precipitation and other factors: in 2011, production in approved hydro power plants amounted to 2,7 TWh.

Since 2003, measures to increase production have been carried out at about 50 large-scale hydro power plants, with replacement or renovation of turbines and generators being the most common upgrades. In this way, plant outputs have been increased by about 0,3 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. Present-day solar cells have an efficiency of about 15 percent. Although there are thousands of small solar cell installations in Sweden today, e.g. for private homes, they are on sites where it would be expensive to connect the production units to the public electricity network.

Solar cell installations are generally relatively small in comparison with, for example, wind power plants or CHP plants. If a plant is to be approved for inclusion in the electricity certificate system, it must meet the requirements 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.

529 MWh of electricity production

In 2011, there were 31 approved solar electricity installations covered by the certificate system, having an installed capacity of 1,0 MW and producing 529 MWh/year. It can therefore be seen that solar electricity contributed only a marginal quantity of energy within the certificate system.

Limited allocation

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

Plants started up after 1st May 2003 are entitled to receive certificates for up to fifteen years, but in no case after the end of 2035. These plants will be progressively phased out of the electricity system at the end of their qualification period, 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 public grant assistance for investment or conversion of the plant, are entitled to certificates until the end of 2014. However, any such grant must have been paid 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 2018–2026, are shown in table 10 (see the tables section). Table 11 shows the corresponding phase-out of production over the years concerned. However, as this calculation is based on annual average values of the plants' qualifying production during 2009 and 2010, the quantity of production actually phased out can vary if operating conditions vary. But as yearly average values come to be calculated from a longer basis of operating experience, the significance of structural changes alters: an example of this is that of the increasing proportion of certificate-qualifying fuels used in bioenergy 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 change with time.

In some cases, it is possible to receive an allocation of certificates greater than that set out in the regulations. This occurs in cases when the production of renewable electricity increases, or when the plant has been extensively rebuilt.

The past year and coming events

2011 in brief

- Number of cancelled electricity certificates: 16 524 816
- Number of issued electricity certificates: 19 754 905
- Average spot price per certificate: SEK 187
- Volume-weighted average price of certificates from Cesar: SEK 247
- New renewable electricity: 13,3 TWh
- Number of approved plants: 3 034
- Number of quota-obligated parties: 790
  (of which 182 electricity suppliers)

Important events in 2012

- A new Act and Ordinance concerning electricity certificates came into force on 1st January 2012. The Swedish Energy Agency has also published new regulations and general guidelines for electricity certificates , which came into force on the same date.
- Since the beginning of the year, Sweden and Norway have had a joint electricity certificate market.
- A new IT support system (Eugen) for parties in the electricity certificate system and those involved with issuing certificates of origin will be brought into use during the year.
- During the year, the Swedish Energy Agency will carry out a larger review of electricity-intensive industries registered as having a quota obligation.
- The first larger implementation of the conclusion of time-limited periods for the receipt of certificates will be carried out at the end of 2012. Plants that were taken into operation before the electricity certificate system started are entitled to receive certificates until the end of 2012. However, some plants will continue to be covered by the system and will not be phased out until 2014 (see *Important future events*).
- In May 2012, the Swedish Energy Agency published a report that it had prepared on behalf of the Government concerning itemisation of the cost of electricity certificates on electricity customers' bills.
- During 2012, EU member states have for the first time reported their performance under the Renewables Directive. The forecast in Sweden's report shows that the country is in line to achieve its target by a slight margin.

Important future events

- Together with the Norwegian Water Resources and Energy Directorate (NVE) the Swedish Energy Agency will perform energy strategy checkpoint analyses by not later than 2015 and 2019. One of the purposes of these analyses is to check whether the quota levels need to be adjusted as a result of progress in the development of quota-fulfilling electricity use,- the rate of expansion of production or the size and expected development of the certificate surplus.
- The second larger implementation of the conclusion of time-limited periods for the receipt of certificates will be carried out at the end of 2014. This applies to plants that were taken into operation before the introduction of the electricity certificate system and which received public investment support for their construction or rebuilding after 15th February 1998, in accordance with the Ordinance (1998:22) Concerning Public Support for Certain Investments In the Energy Sector, thus being entitled to the receipt of certificates until the end of 2014.


0.007
492.04
0.236
0.285
0.030
5.10
0.270
0.015
0.214
0.017

Tables

Table 1. Cancellation of electricity certificates, 2003–2011

	Cancellation per quota obligation year								
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Quota-obligated electricity [TWh]	63,3	97,4	97,6	97,1	96,0	94,0	90,6	98,0	92,5[2]
Exempted electricity in electricity-intensive companies[1] [TWh]	37,8	40,6	40,9	40,5	42,8	41,6	36,5 - 37,4	39,7 - 40,6	40,3 - 41,3
Quota	0,074	0,081	0,104	0,126	0,151	0,163	0,170	0,179	0,179
Number of cancelled electricity certificates [million]	3,5	7,8	10,1	12,4	14,5	15,3	15,4	17,5	16,5[2]
Quota obligation fulfilment [%]	77	99,2	99,9	99,9	99,8	100	100	100	99,8
Quota non-fulfilment charge [SEK per certificate]	175	240	306	278	318	431	470	402	310
Total quota non-fulfilment charge [SEK million]	182,8	14,4	3,1	2,3	8,3	2,3	0,7	0,8	9,5

[1] New regulations for electricity-intensive industries were introduced on 1st January 2009.
[2] These figures may be amended somewhat, as the Swedish Energy Agency was empowered, from 1st January 2012, to be able to require a quota-obligated party to submit more certificates for cancellation than as given in the party's annual return. The additional certificates are registered in Cesar as locked, and will either be cancelled or returned to the party after a court has confirmed or rejected the action.

Source: The Act 2011:1200 Concerning Electricity Certificates, Svenska kraftnät's Cesar accounting system and the Swedish Energy Agency

Table 2. Quotas (Sweden and Norway), 2003–2035

Year	Quota Sweden	Quota Norway
2003	0,074	-
2004	0,081	-
2005	0,104	-
2006	0,126	-
2007	0,151	-
2008	0,163	-
2009	0,170	-
2010	0,179	-
2011	0,179	-
2012	0,179	0,030
2013	0,135	0,049
2014	0,142	0,069
2015	0,143	0,088
2016	0,144	0,108
2017	0,152	0,127
2018	0,168	0,146
2019	0,181	0,165
2020	0,195	0,183
2021	0,190	0,182
2022	0,180	0,181
2023	0,170	0,180
2024	0,161	0,179
2025	0,149	0,176
2026	0,137	0,164
2027	0,124	0,151
2028	0,107	0,132
2029	0,092	0,113
2030	0,076	0,094
2031	0,061	0,075
2032	0,045	0,056
2033	0,028	0,037
2034	0,012	0,018
2035	0,008	0,009

Source: The Act (2011:1200) Concerning Electricity Certificates [Sweden]; The Act (2011-06-24, no. 39) Concerning Electricity Certificates [Norway]

Table 3. Estimated cost of certificates to electricity customers, per kWh of electricity, 2003–2011

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Volume-weighted average price per certificate (in Cesar) [SEK]	201	231	216	167	195	247	293	295	247
Quota	0,074	0,081	0,104	0,126	0,151	0,163	0,17	0,179	0,179
Electricity customers' average cost for certificates [öre/kWh][1]	1,49	1,87	2,25	2,10	2,95	4,03	4,98	5,27	4,42

[1] VAT and transaction costs may apply.

Source: Svenska kraftnät's Cesar system and the Swedish Energy Agency

Table 4. Number of plants, installed capacity and electricity production, by type of energy source, 2003–2011

	2003 May-Dec	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Number of plants[1]									
Hydro	966	1 040	1 060	1 075	1 094	1 120	1 144	1 164	1 200
Wind	543	613	668	706	846	948	1 108	1 371	1 633[3]
Biofuels, peat	87	105	118	125	131	142	156	163	170
Solar	1	1	2	3	4	9	11	13	31
Total	1 597	1 759	1 848	1 909	2 075	2 219	2 419	2 711	3 034
Installed capacity [MW][2]									
Hydro	491	504	517	540	558	598	602	620	657
Wind	401	472	530	583	831	1 074	1 440	1 998	2 688
Biofuels, peat	3 157	3 185	3 424	3 643	3 676	3 451	3 892	4 056	3 924
Solar	0,008	0,008	0,011	0,036	0,043	0,309	0,369	0,557	1,001
Total	4 049	4 161	4 471	4 765	5 066	5 123	5 935	6 674	7 271
Electricity production – renewables and peat [MWh]									
Hydro	963 637	1 968 325	1 799 446	2 018 577	2 195 320	2 607 348	2 441 624	2 611 044	2 698 130
Wind	455 642	864 546	939 125	988 340	1 431 644	1 995 846	2 490 409	3 485 933	6 093 169
Biofuels	4 218 276	7 670 770	7 925 790	8 593 538	9 049 308	9 599 311	9 765 983	11 162 850	10 305 639
Peat	-	544 791	634 012	556 380	579 622	834 194	871 437	792 434	657 438
Solar	4	6	5	20	19	129	212	275	529
Total	5 637 559	11 048 438	11 298 378	12 156 855	13 255 913	15 036 828	15 569 665	18 052 536	19 754 905

[1] Number of plants allocated at least one certificate during the year.

[2] For plants allocated at least one certificate.

[3] 1 633 wind power plants, consisting of 1 947 individual turbines.

Source: Svenska kraftnät's Cesar accounting system and the Swedish Energy Agency

Table 5.1 Electricity production in 2011 in plants commissioned before 1st May 2003 and during the period 1st May 2003 to 31st December 2011

Electricity production [GWh] in 2011 in plants commissioned during the periods shown below	Biofuels	Hydro	Wind	Solar	Peat	Total
Before 1st May 2003	8 245	1 986	732	0,005	564	11 526
May 2003–December 2011	2 061	712	5 362	0,524	94	8 229
Total	10 306	2 698	6 093	0,529	657	19 755

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

Table 5.2 Number of plants commissioned before 1st May 2003 and during the period 1st May 2003 to 31st December 2011

Number of plants[1] commissioned during years below	Biofuels, peat	Hydro	Wind	Solar[2]	Total
Before 1st May 2003	97	1 034	603	1	1 735
May 2003–December 2011	73	166	1 344	30	1 613
Total	170	1 200	1 947	31	3 348

[1] For wind power, this is the number of plants. In 2011, there were 1 633 plants with o total of 1 947 turbines.

[2] A further twelve solar energy facilities were registered in the electricity certificate system in 2011, but are not included in these statistics as they were not allocated any certificates during the year.

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

Table 5.3 Installed capacity in plants commissioned before 1st May 2003 and during the period 1st May 2003 to 31st December 2011

Installed capacity [MW] in plants commissioned during years below	Biofuels, peat	Hydro	Wind	Solar	Total
Before 1st May 2003	3 263	487	365	0,008	4 114
May 2003–December 2011	662	170	2 323	0,993	3 157
Total	3 924	657	2 688	1,001	7 271

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

Table 6. Number of wind power plants, installed capacity and production in 2011, by year of commissioning

Year of commissioning	Number of wind power plants	Installed capacity [MW]	Production in 2011 [GWh]
2001 or earlier	522	293	572
2002–2003 (Jan–April)	81	71	159
2003 (May–Dec)	57	48	90
2004	52	56	124
2005	63	61	139
2006	51	60	143
2007	145	242	686
2008	150	258	693
2009	204	376	1 008
2010	284	533	1 544
2011	338	690	934
Total	1 947	2 688	6 093

Source: Svenska kraftnät's Cesar accounting system and the Swedish Energy Agency

Table 7. Electricity production from certificate-entitled fuels, total electricity production and proportion of certificate-entitled fuels in relation to total fuel supply to biofuel-fired plants, 2003–2011

	2003 May–Dec	2004	2005	2006	2007	2008	2009	2010	2011
Renewable electricity production, including peat [GWh]									
Industrial back-pressure	2 804	4 735	4 744	4 999	5 622	5 924	5 885	6 249	5 869
CHP	1 415	3 456	3 783	4 125	3 984	4 484	4 725	5 682	5 069
Biogas, other	0	25	32	26	23	25	27	24	25
Total	4 218	8 216	8 560	9 150	9 629	10 434	10 637	11 955	10 963
Total electricity production [GWh]									
Industrial back-pressure	3 238	5 215	5 146	5 411	5 976	6 331	6 324	6 734	6 281
CHP	3 047	6 278	5 785	6 298	5 827	6 424	7 038	8 190	7 108
Biogas, other	-	25	53	56	57	54	61	57	57
Total	6 285	11 519	10 984	11 766	11 861	12 810	13 423	14 981	13 446
Proportion of renewable fuels and peat [%]									
Industrial back-pressure	86,6	90,8	92,2	92,4	94,1	93,6	93,1	92,8	93,4
CHP	46,4	55,0	65,4	65,5	68,4	69,8	67,1	69,4	71,3
Biogas, other	-	99,8	61,6	46,6	40,6	46,1	44,4	42,9	43,8
Total	67,1	71,8	77,9	77,8	81,2	81,4	79,3	79,8	81,5

Source: Svenska kraftnät's Cesar accounting system and Swedish Energy Agency

Table 8. Electricity production in approved biofuel-fired, by type of fuel, 2003–2011[1]

	Certificate-entitled fuels [GWh]										
Year	**Energy crops**	**Forestry/forest industries by-products[2]**	**Forestry by-products**	**Forest industries by-products**	**Landfill gas**	**Digester gas**	**Other biogas**	**Other wood waste**	**Peat**	**Total renewables plus peat**	**Non-certificate-entitled fuels [GWh][3]**
2003 May–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	2 615,7
2007	23,9	8 051,2	-	-	16,6	16,9	7,5	933,2	579,6	9 628,9	2 232,0
2008	11,7	-	3 348,2	5 621,1	36,1	15,8	8,3	558,2	834,2	10 433,5	2 376,5
2009	18,0	-	3 369,4	5 816,8	29,4	15,6	10,4	506,5	871,4	10 637,5	2 785,5
2010	16,9	-	4 664,4	5 830,2	25,0	13,8	13,3	599,3	792,4	11 955,5	3 025,1
2011	75,2	-	3 671,1	5 735,4	18,0	13,0	17,6	807,4	657,4	10 995,1	2 483,3

Source: Svenska kraftnät's Cesar accounting system

[1] *Based on months for which certificates were allocated.*
[2] *Forestry and forest industries by-products were divided up into two categories in 2008.*
[3] *Non-certificate-entitled fuels are fossil fuels and fuels that give entitlement to guarantees of origin for renewable electricity, such as the biological fraction in waste and by-products from agriculture and domestic and industrial waste.*

Table 9. Certificate-allocated hydro power producers, 2011, by entitlement basis

Type of production	Number of plants	Allocated certificates	
		Number	[%]
Small-scale hydro	1 034	1 985 868	73,6
Restarted operation	34	17 508	0,6
New hydro power	75	327 742	12,1
Production increase	53	293 904	10,9
Concessionary dispensation[1]	4	73 108	2,7
Total	1 200	2 698 130	100

[1] *Concessionary dispensations for plants that can no longer operate profitably in the long term due to a public authority decision or extensive rebuilding.*

Source: Svenska kraftnät's Cesar accounting system and the Swedish Energy Agency

Table 10. Phase-out of installed capacity, 2012–2026

	2012	2014	2018	2019	2020	2021	2022	2023	2024	2025	2026	Total
Wind [MW]	128	246	42	62	62	60	242	236	359	548	408	2 392
Hydro [MW]	489	3	2	11	20	17	47	10	23	17	16	655
Biofuels [MW]	3 273	209	-	23	63	135	40	56	234	64	28	4 125
Solar [MW]	0,008	-	-	-	-	0,028	-	0,153	0,120	0,248	0,444	0,557
Total [MW]	3 889	458	44	96	146	212	329	302	616	629	453	7 172

Source: Svenska kraftnät's Cesar accounting system and the Swedish Energy Agency

Table 11. Phase-out of electricity production capacity, 2012–2026

	2012	2014	2018	2019	2020	2021	2022	2023	2024	2025	2026	Total
Wind [GWh]	203	481	72	124	125	128	628	580	875	1 574	1 084	5 876
Hydro [GWh]	1 981	11	8	48	100	66	236	44	94	40	83	2 711
Biofuels [GWh]	8 122	977	-	39	155	525	75	82	937	236	165	11 315
Solar [GWh]	0,005	-	-	-	-	0,011	-	0,091	0,090	0,225	0,130	0,551
Total [GWh]	10 306	1 469	80	212	381	719	939	706	1 907	1 851	1 333	19 902

Source: Svenska kraftnät's Cesar accounting system and the Swedish Energy Agency

Glossary/Explanation of terms

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

Calculated normal year 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 Cesar account 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.

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 production (CHP) is the use of a thermal process, e.g. a steam boiler, for the combined production of electricity and heat.

Conversion value or **added value** is defined as the difference between the total turnover of an electricity-intensive industry and its total purchasing expenditure, as these concepts are defined in Section 1 8 § of the Act Concerning Taxation of Energy. 'Total turnover' refers to income from sales of goods and services, including the company's own use of such goods and/or services, as produced or provided in accordance with the company's normal business activities (net turnover), changes in stock levels, and work performed for the company's own uses, together with other income due to operating activities and interest income. 'Total purchasing expenditure' refers to all costs of operating the business, including depreciation and write-down of assets and interest charges. Personnel costs, including statutory employer social security charges etc., and the costs of hired temporary staff, shall not be included in the business operating costs.

Electrical losses are losses that occur for the necessary operation of the electrical transmission or distribution networks.

Electricity certificates are issued by the State, and provide electronic proof that 1 MWh of renewable elec-tricity has been produced in accordance with the Act (2011:1200) Concerning Electricity Certificates.

Electricity certificate-entitled electricity production is electricity production from renewable energy sources and from peat that meets the requirements in the Act (2011:1200) Concerning Electricity Certificates.

An Electricity certificate-entitled producer is the owner 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 the producer is allocated one certificate unit per produced and metered MWh of electricity.

Electricity-intensive industries are companies that, either in their entirety or as a particular part of a company that constitutes an independent business or performs an independent activity, and which:

- have performed for the last three years an industrial manufacturing process using an average of at least 190 MWh per million SEK of the added value of the industry's production, or
- use electricity in a new industrial manufacturing process at a historic or expected average rate of at least 190 MWh per million SEK of the added value of the industry's production, or
- which use electricity for purposes that qualify for exemption from energy tax on electricity, in accordance with Section 11 9 § 2, 3 or 5 of the Act (1994: 1776) Concerning Taxation of Energy.

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 companies, 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 agreed 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.

NECS is the Norwegian Statnett's electronic accounting system for electricity certificates.

Parties having quota obligations are:

- electricity suppliers who supply electricity to end users, or
- electricity end users who use electricity that they have themselves produced, if such quantity of electricity exceeds 60 MWh per accounting year and has been produced in a plant having an installed capacity exceeding 50 kW, or
- electricity users, to the extent that they have used electricity that they themselves have produced, imported or purchased on the Nordic electricity exchange, or
- electricity intensive companies, registered as such by the Swedish Energy Agency.

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

Quota obligation charge must be paid by any party having a quota obligation who does not cancel the necessary number of certificates corresponding to his obligation. The charge per certificate is set at 150 percent 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 are perpetually replaced or replenished by the effect of the sun on the earth and nature, and are therefore referred to as renewables. Hydro power, wind power and wave energy are in this category, as is tidal energy. Biomass is classified as a solar-based energy source, and is therefore renewable, as is of course solar energy. In addition to these energy sources, there are also geothermal energy sources that have their origins in the interior of the Earth.

Returns for electricity production from bio-energy and 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 source input.

Returns for those having quota obligations must be submitted to the Swedish Energy Agency by not later than 1st March each year for the preceding calendar year. The return gives details of the quantity of sold electricity, of used electricity and of any permissible deductions, such as for electricity used in electricity-intensive process industries, auxiliary power, free power and electrical losses.

Small-scale hydro power plants are those having an installed capacity up to 1 500 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 (Swedish national grid) operates the Swedish high-voltage distribution grid (the country's backbone grid), and has overall system responsibility for Swedish electricity supply. It also maintains the electronic accounts of certificates in the electricity certificate system, with responsibility for its Cesar accounting system.

Links

The Swedish Energy Agency publishes on its web site market statistics such as the number of approved production plants and registered entities having quota obligations, information on electricity producers from whom electricity certificates can be purchased, and also other general information on the electricity certificate system. This publication is also available for download from the web site.

www.energimyndigheten.se/elcertifikat

Svenska kraftnät provides on its web site, 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 suppliers' electricity prices, including the price of electricity certificates, thus enabling consumers to compare prices on the market. The web site also displays the results of analyses and business intelligence on the electricity market.

www.energimarknadsinspektionen.se

The Norwegian Water Resources and Energy Directorate (NVE) is the Norwegian public authority that is the surveillance authority for the Norwegian Electricity Certificate Act. Its duties in this respect on a joint electricity certificate market are similar to those of the Swedish Energy Agency.

www.nve.no/elsertifikater

Statnett SF is the Norwegian authority that operates the accounting system for the Norwegian Electricity Certificate Act. Its duties in this respect on a joint electricity certificate market are similar to those of Svenska kraftnät.

www.statnett.no/no/Kraftsystemet/Elsertifikater/

References and further reading

(Note that not all of the following documents etc. are in English.)

- Energy in Sweden 2011, Swedish Energy Agency
- Wind power statistics 2011, Swedish Energy Agency
- Ordinance (1998:22) Concerning Public Grants for Certain Investments in the Energy Sector
- Bill no. 2002/03:40: Electricity Certificates to Support the Use of Renewable Energy Sources
- Bill no. 2003/04:42: Peat and Electricity Certificates
- Bill no. 2005/06:154: Renewable Electricity with Green Certificates
- Bill no. 2008/09:9: Amendment of the Act (2003:113) Concerning Electricity Certificates
- Bill no. 2008/09:92: Amendments of the Act (2003:113) Concerning Electricity Certificate Allocation Principles and Indicative Notification of Quantities
- Bill no. 2008/09:163: A Coordinated Climate and Energy Policy – Energy
- Bill no. 2009/10:133: A Higher Target and Further Development of the Electricity Certificate System
- Bill no. 2010/11:155: A New Electricity Certificate Act - Simpler Rules and a Joint Electricity Certificate Market
- The Act (2011:1200) Concerning Electricity Certificates
- Ordinance (2011:1480) Concerning Electricity Certificates
- Swedish Energy Agency Code of Statutes STEMFS (2011:4) Concerning Electricity Certificates

Norwegian legislation:

- LOV 2011-06-24 no. 39: The Act Concerning Electricity Certificates
- FOR 2011-12-16 no. 1398: Regulations Concerning Electricity Certificates

A sustainable energy system benefits society
The Swedish Energy Agency works for a sustainable energy system, combining ecological sustainability, competitiveness and security of supply.

For a more efficient energy use, the Swedish Energy Agency supports the development and dissemination of knowledge targeted at households, industry, and the public sector.

The Swedish Energy Agency finances research for new and renewable energy technologies, smart grids, and vehicles and transport fuels of the future. The Swedish Energy Agency supports commercialisation and growth of energy related cleantech.

With the aim of attaining energy and climate objectives, the Swedish Energy Agency participates in international collaboration and manages instruments such as the EU Emission Trading System and the Electricity Certificate System. The Swedish Energy Agency also provides energy system analysis, energy forecasts and official energy statistics.

Swedish Energy Agency

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