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ANNUAL REPORT 1999

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Rapporteur:
Director Monica Ulfhielm, Swedish Power Association

- **Political decision closes first nuclear reactor**
- **Power reserve falls**
- **Energy taxes rise**
- **Competition becomes stiffer on the electricity market**

The closure of Barsebäck 1

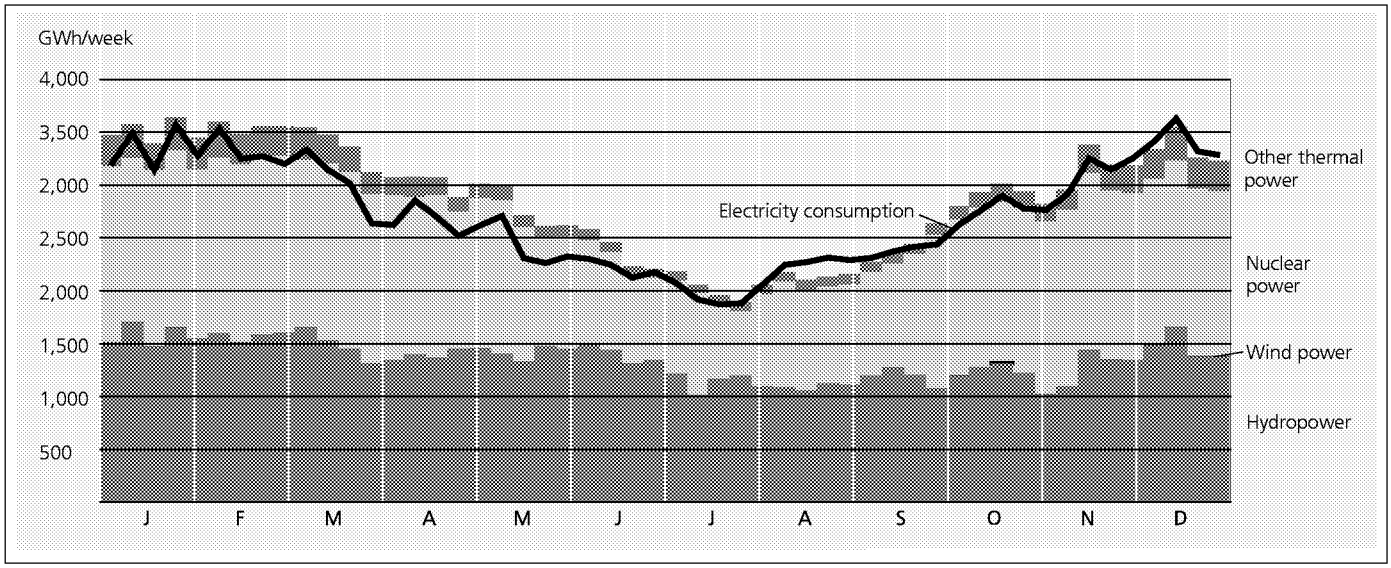
In compliance with the "Decommissioning of Nuclear Power Act", the operating licence for Barsebäck 1 should have expired on 1 July 1998. However, this decision was prevented some months previously when Sweden's Supreme Administrative Court ruled in favour of suspension. The legal review of the government's decision continued in the Supreme Administrative Court and the European Commission, to which Sydkraft had reported the matter for contravening EU competition laws. Neither were Sydkraft and the government able to reach a voluntary agreement during 1998.

On 16 June 1999, the verdict of the Supreme Administrative Court was announced, enabling the government to close a reactor at Barsebäck at the end of November that year. In the autumn, negotiations to achieve a voluntary solution were resumed, with the participation of the state, Sydkraft and Vattenfall.

On 30 November 1999, a settlement was reached – the framework agreement – in respect of Barsebäck. The settlement applies to both reactors at Barsebäck and entails Sydkraft receiving compensation of an equivalent volume of power generated by the Ringhals nuclear power plant, at the same cost and environmental impact, as well as Vattenfall being financially compensated by the state for the power generation it relinquishes. Barsebäck 1 was closed on 30 November 1999.

DIAGRAM 1

Overall electricity generation and consumption during 1999, GWh/week*.



* When the electricity consumption curve lies above the bars, Sweden imports electricity. When it is below, we export electricity.

The closure of this nuclear power plant will have a substantial impact on the environment. Barsebäck's output of approximately 4 TWh per year will primarily be replaced by imports from coal-fired plants in Denmark and Germany. In doing so, emissions of carbon dioxide in our surroundings will increase, corresponding to more than a doubling of the Swedish electricity sector's emissions of carbon dioxide. Besides sharply increased carbon dioxide emissions, the fallout in Southern Sweden of acidifying substances, such as sulphur and nitrogen, will also increase.

The power balance

During the year, the closure of Swedish fossil-fired condensing power stations continued with Hässelby (150 MW) and Bråvalla (240 MW). Additionally, gas turbines at Stallbacka and Arendal were closed, totalling 150 MW. With that, over 3,000 MW of peak-load power has been shut down, Barsebäck included, during recent years.

One consequence of the closure is that Sweden risks hitting the "output power ceiling" in extreme situations, e.g. severe cold. Consequently, situations entailing shortages of power can arise. In January, the Swedish National Energy Administration and Svenska Kraftnät pointed out in a report that Sweden's existing system has an installed capacity of 26,000 MW and that demand during cold winter days could be as high as 28,000 MW. According to the report, adequate reserves must exist within the Nordic area, which Sweden can import when necessary. Svenska Kraftnät has made the assessment that available transmission capacity exists and that generating capacity should be able to be freed up.

The Swedish Power Association pointed out that the inquiry had only analyzed the transmission capacity, not whether generating capacity really exists in the neighbour-countries or how, if this is the case, it would be able to be activated during a tight power situation. One problem is that when it is cold in Sweden, it is also cold in the countries assumed to be able to sell electricity to Sweden.

The situation is most troublesome in Central and Southern Sweden. The shortage of power could be as high as 800 MW, if it becomes extremely cold. Svenska Kraftnät decided during the autumn to allocate contingency funds enabling, as and when required, the utilization of the third unit, 330 MW, at Karlshamn oil-fired power station up until 2002. Both the other units, totalling 660 MW, were closed at the turn of the year 98/99.

Svenska Kraftnät introduced, effective November, a special price into its balance service for an assessed risk of a power shortage, or alternatively if a power shortage leads to the rapid disruption reserve having to be used, or if the disconnection of consumption is ordered. The price is at least SEK 3/kWh or SEK 9/kWh, as the case may be. This means that balance centre companies, i.e. electricity traders or others with financial responsibility for extra electrical energy being supplied to the network if their own electricity customer consumes more than had been calculated, will have to pay this price if they have a deficit on critical occasions. The objective is to make the balance centres more protective of "their" power balances.

Svenska Kraftnät, as system operator, is ultimately responsible for ensuring that a balance is maintained between the production and consumption of electricity in Sweden. This responsibility also includes ensuring that the necessary disruption reserve is always available. On the deregulated electricity market, it is only the system operators that have a satisfactory overview of the overall electricity balance. The Swedish Power Association has thus lobbied the government as regards the need to elucidate Svenska Kraftnät's responsibility.

In a governmental decision from December, Svenska Kraftnät was given the task of, among other things, monitoring the available capacity during peak loads and developing market instruments that can contribute to safeguarding the availability of power during peak loads. Svenska Kraftnät has acquired gas turbines with a combined output power of 400 MW from Vattenfall. In order to cover the remaining requirement for rapid disruption reserves, Svenska Kraftnät also has agreements with several power producers regarding a further 800 MW of gas turbine capacity.

One further possibility lies in agreements with industry regarding the disconnection of consumption during times of peak loading. Svenska Kraftnät signed such an agreement with Vargön Alloys at the end of the year

Unsettled prices on 24 January

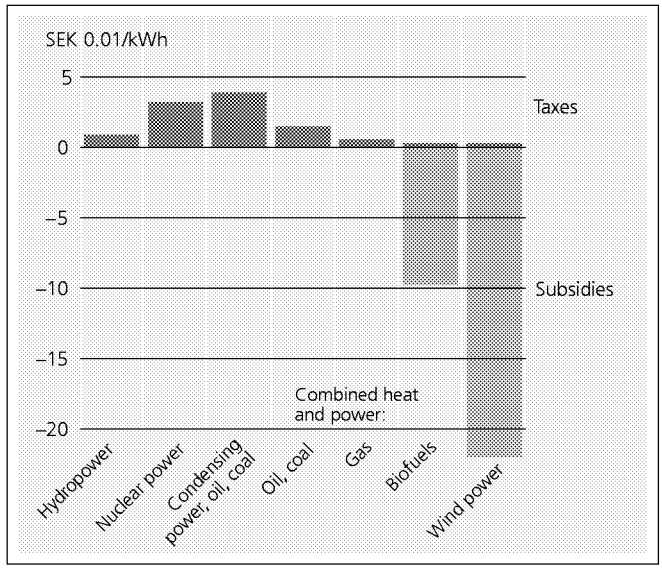
The Swedish power system was put to the test on 24 January 2000, when the power requirement rose to just under 25,000 MW. The remaining unit at the Karlshamn power station was started up at the request of Svenska Kraftnät. Svenska Kraftnät had also procured 100 MW from Germany.

On the morning of 23 January, before the power exchange closed, the market was informed that Statnett had reserved 600 MW during certain hours on 24 January and that the export capacity of the Hasle transmission link would be severely reduced during certain hours of the day. Shortly afterwards, Svenska Kraftnät informed the market of the risk of a power shortage in the Swedish system.

Based on the assigned capacity for the electricity spot market on the Hasle transmission link, Nord Pool's price calculations entailed the market being partitioned into two price sectors. The average price for the Oslo Sector was approximately SEK 0.15/kWh, and approximately SEK 1.00/kWh for the Stockholm Sector. The average system price was set at approximately SEK 0.41/kWh. Players in Sweden who had hedged their purchases using the system price as a reference were badly hit.

DIAGRAM 2

Swedish taxes and Government subsidies in supply of electricity 2000, SEK 0.01/kWh.



Energy taxes
On 1 January 1999, the property tax on the land value of hydropower plants was cut by 1.71 percentage points to 0.5. The remaining tax corresponds to the tax payable on all industrial properties.

On 1 January 2000, the nuclear power tax was increased by SEK 0.005 per kWh to SEK 0.027 per kWh. This means that the nuclear power companies pay approximately SEK 1,800 m per year in fiscal taxation on their nuclear power generation. The tax on electrical energy, paid by the consumer, was raised by SEK 0.011 to SEK 0.162 per kWh. The tax on diesel fuel was increased at the same time by SEK 0.25 per litre. In addition, a special network fee of SEK 0.002 per kWh came into existence in order to finance small-scale electricity generation, following removal of the obligation-to-receive system. Diagram 2 shows a table of taxes and subsidies, broken down by different types of energy used in the supply of electricity.

The Swedish Power Association is of the opinion that the increase in production taxes on nuclear power is completely misdirected. The short-term result will be increased electricity prices for certain power-intensive industries and the long-term result will be increased electricity prices for everyone and imported coal-fired power from Denmark and Germany. Sweden is the only EU country to have production taxes on electricity. This discriminates against the Swedish power industry, which now operates on an international electricity market that is exposed to competition. Uncertainty and the lack of stability in the present taxation system will entail considerable difficulties both for electricity-intensive industry and for the power companies vis-à-vis long-term investment in Sweden.

A generating year with a good supply of water and decreased consumption
In 1999, no records were broken with regard to consumption and generation in Sweden. Overall consumption in the country fell by 0.3 TWh to 142.9 TWh, compared with last year. The decrease is explained by the fact that the autumn was very warm. Corrected to the normal temperature, consumption would have been slightly higher than the year before.

Nineteen ninety-nine was a good year for water. Inflow into the major rivers was somewhat higher than normal (see Diagram 3) enabling 70.4 TWh to be generated by the hydropower plants. This is 6 TWh more than during a normal year. Nuclear power accounted for 70.2 TWh, equal to the previous year. Additionally, combined heat and power and condensing plants accounted for 9.5 TWh, almost half of which using biofuels. Wind power continues to increase. At year-end, there were about 480 wind power plants, and the annual production was 0.4 TWh.

Overall electricity production in the country was 150.5 TWh, a decrease of 3.4 TWh, or just under three percent. Exports amounted to 16.1 TWh and imports to 8.5 TWh. Consequently, net exports were 7.6 TWh, the bulk of which went to Finland. Most electricity was imported from Norway.

The average price for the year on the Nordic power exchange's spot market (Sector Sweden) was SEK 0.119 per kWh. The low price is explained by the mild weather and a plentiful supply of water in the Nordic reservoirs.

A more open electricity market using profile settlement
On 1 November, the electricity market was changed in such a way that small consumers, with a fuse rating of up to 200 amps, were also able to take part. Parliament's decision to remove the requirement for continually registering hourly meters was of crucial importance. With this measure, the electricity market was also opened up to household

customers. Hourly metering was replaced by profile settlement. Svenska Kraftnät was given the task of drawing up the system of rules for the new profile model.

Even before 1 November, electricity producers and trading companies presented many new types of bids. Customers were offered fixed prices that could be considerably lower than previously. Flexible prices were on offer, e.g. linked to the power exchange's spot price, with or without a ceiling price, as well as mixtures of fixed and flexible prices. Campaigns and electricity agreements combined with other services were also common.

The "Electricity from new plants" study

On the instructions of the Swedish Power Association and the Swedish National Energy Administration, Elforsk implemented the "Electricity from new plants" study during the year. The aim was to compare available commercial technology in respect of performance, environmental characteristics, availability and costs, as well as assessing how competitive technology will look in ten years' time. A calculation model was produced in order to be able to calculate the costs of electricity generation for most types of plants.

The following conclusions may be drawn from the investigation:

The electricity price is expected to be low throughout the 10-year period. This means that no appreciable expansion is expected in terms of new electricity production plants.

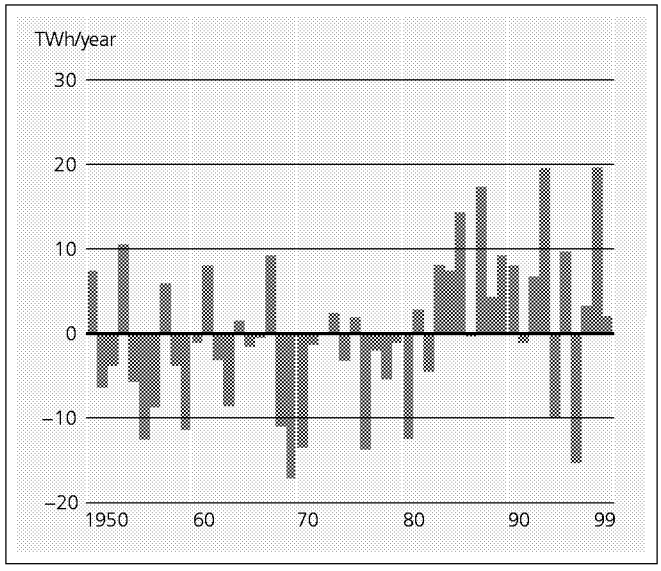
Deregulation has entailed stiffening competition in the energy industry. This can reduce the opportunities for endeavours in new technology, especially if this involves great investment and risks.

Natural gas-based cogeneration plants yield low generating costs, compared to other alternatives. This presupposes, however, that natural gas is available at a competitive price.

Landfill taxes and other environmental fees, as well as a future ban on dumping combustible refuse, will probably cause the combustion of refuse to increase. Refuse-based electricity may thus become more important as a development sector.

DIAGRAM 3

Variation in inflow relative to the average inflow between 1950 and 1999 (66 TWh, not corrected for spillage)



ELECTRICITY GENERATION, (TWH)

	1997	1998	**1999**
Hydropower	68.2	73.5	**70.4**
Wind power	0.2	0.3	**0.4**
Nuclear power	66.9	70.5	**70.2**
Conventional thermal power	9.9	9.6	**9.5**
of which CHP, industrial	4.2	3.7	**4.5**
CHP, district heating	5.3	5.7	**4.7**
condensing + gas turbine	0.4	0.2	**0.3**
TOTAL GENERATED OUTPUT	145.2	153.9	**150.5**

New hydropower can, given the most beneficial prerequisites, provide relatively low generating costs.

Renewable electricity based on biofuels and wind power needs support in order to be able to compete with fossil fuels. Wind power costs are expected to fall considerably due to continued technical development and rationalisation.

Flexible mechanisms and the Climate Committee

In April 1999, the government appointed the Director General of Customs and Excise, Kjell Jansson, as a one-man commission of inquiry into the possibilities of using the flexible mechanisms of the Kyoto protocol. Ten or so experts are attached to the inquiry, which goes under the name of the Flexmex Inquiry, among them Peter Åsell of the Swedish Power Association.

The brief of the inquiry is to sketch out a system for how the three flexible mechanisms: Trading in Emission Rights, Joint Implementation and the Mechanism for Clean Development could be used to enable Sweden, in a cost-effective way, to achieve the emission goals of the Kyoto protocol. During the autumn of 1999, the inquiry presented an interim report, "Seeking Cost-effective Solutions within the Climate Sector" (Official Government Report 1999:111). In this, general principles were presented regarding how the mechanisms could conceivably be used.

The inquiry is working in parallel with the parliamentary Climate Committee under the leadership of former minister Olof Johansson. At the end of March, the Climate Committee will make proposals regarding Swedish measures to comply with the climate goals. At the same time, the Flexmex Inquiry will make its proposal regarding how the flexible mechanisms can be used in this context. The inquiry is working in close contact with the Climate Committee in order that the completed proposals may be able to work together.

The Poland Cable

Work on the 250 km long DC link between Blekinge (S.E. Sweden) and Poland encountered problems during the year. The Supreme Environmental Court ruled in June to set aside the water ruling for the Poland Link that the Water Court at Växjö had made in the middle of December 1998. At the same time, the case was handed over to the new Environmental Court at Växjö. The reason for this was a "formal error" made by the Water Court at Växjö.

Without a water ruling, the SwePol Link could not complete cable-laying work within Swedish territorial waters. At this point, the main cable had already been laid within Swedish waters, but not the return conductors.

The main negotiations in the Environmental Court at Växjö took place in October. The legal review primarily applied to the Water Act, especially the assessment of benefit, i.e. whether the advantages, from the public and private point of view, outweigh the costs, damage and inconvenience.

In November, the Environmental Court at Växjö granted Svenska Kraftnät permission to complete the cable. Shortly afterwards, the Municipality of Karlshamn decided to lodge an appeal against this ruling with the Supreme Environmental Court. The municipality was of the opinion that Svenska Kraftnät's application to construct the Poland Cable was flawed and that the Environmental Court had not carried out a full legal review.

The Swedish Power Association turns 90 — Swedenergy is formed

The Swedish Power Association has turned 90. The Association was formed in 1909 under the name the Swedish Water Power Association, with the aim of "promoting the expedient utilization of the country's hydropower". Electricity has existed in Sweden since 1876, but it was not until the beginning of the 20th century that expansion started in earnest.

During the year, work intensified on a joint trade organisation, by the name of Svensk Energi — Swedenergy — AB, for the Swedish Power Association, Swedish Electricity Distributors and the Swedish District Heating Association. According to the timetable, the merger between the Swedish Power Association and Swedish Electricity Distributors is to be completed by 1 January 2001.

European contacts

Via the partly-owned company Swedelec AB, the Swedish Power Association and representatives of the member companies take an active part in European electricity industry collaboration. The organisations Eurelectric and UNIPEDE, with a joint office in Brussels, constitute the industry's joint forum. In December 1999, it was decided to merge the two organisations into a new organisation called the Union of the Electricity Industry – EURELECTRIC. The merger will be fully implemented in June 2000 and entails adapting the organisation to focus on strategic and policy issues.

During 1999, the most important task of operations in Eurelectric and UNIPEDE has been making contributions to ensure that the opening up of the European electricity market can continue according to plan. Questions arising from the interpretation of different systems of rules and from harmonisation efforts, in order to achieve a level playing field for competition, have been given plenty of resources. In talks between the companies of the industry in the EU countries, and with representatives of the European Commission, Eurelectric has been able to contribute towards facilitating a transition from the traditional market solutions to the kind of open electricity market that the EU Electricity Market Directive is aiming towards. A good many problems remain to be solved, however, before a smoothly functioning European electricity market is established.

Two examples of issues being dealt with are the harmonisation of subsidy measures to renewable energy and a review of the international transmission tariffs. Within the environmental sector, emissions from large combustion plants have been dealt with as have issues concerning how the electricity industry can deal with the new demands being made by international climate politics.

Another important issue has been talks with the electricity industry companies in countries applying for membership of the EU. The objective is to make it easier, through fraternal exchanges of experience, for applicant-countries to adapt themselves to the requirements laid down for membership.

Nordel is an organisation for collaboration between the system-operating network companies of the Nordic area. The primary objective is to develop an efficient Nordic electricity market. The organisation is also the forum for technical collaboration, focusing on the operation and development of the electricity system.

Baltrel is an organisation with the task of creating the prerequisites for an open electricity market around the Baltic Sea. Seventeen companies from eleven countries take part in this collaboration. Sweden's power industry is represented by the Swedish Power Association. The EU has approved funding for studies to, among other things, look into the possibilities of joint implementation.

Sweden's energy requirement is partly covered by imported energy, primarily oil, coal, natural gas and nuclear fuel, and partly by domestic energy in the form of hydropower, wood and peat plus waste products from the forestry industry (bark and liquors), see Table 1. Originally, all our energy was domestic, primarily wood and hydropower. During the 19th century, however, we began to import coal. Coal came to play an important role up until WW2, after which oil and hydropower became the base of our energy supply. The first oil crisis in 1973 demonstrated the risks of being dependent upon oil.

As far back as the 60s, a decision had been made to invest in nuclear power. Nuclear power and domestic fuels would then play a large part in the replacement of oil, together with the more efficient utilization of energy, primarily in the heating sector. The trend for the energy supply after 1973 is shown in Diagram 4. The greatest changes occurring between 1973 and 1999 were the proportion of oil used in the energy supply falling from 71 to 29 percent, and nuclear power rising from 1 to 37 percent.

When studying the trend for the energy supply, it is customary to add the various primary energy products without regard to their respective "quality". Certain energy

TABLE 1

SUPPLY OF ENERGY
(excl. bunker oil and deposits for non-energy purposes)

	1995 TWh	1996 TWh	1997 TWh	1998 TWh	**1999 prel.** TWh	%
Crude oil and oil products	167	182	166	166	**168**	**29**
Coal and coke	27	30	26	26	**25**	**4**
Natural gas	9	9	8	8	**9**	**2**
Peat	4	4	3	3	**3**	**1**
Biofuels	41	45	46	48	**48**	**8**
Recovery liquors in forestry	34	33	36	36	**36**	**6**
Refuse	5	5	5	5	**5**	**1**
Waste heat, etc	7	7	7	7	**7**	**1**
Hydropower, gross*	68	52	69	74	**72**	**12**
Nuclear power, fuel*	204	222	204	215	**217**	**37**
Electricity imports, net	–2	6	–3	–11	**–8**	**–1**
TOTAL	564	595	567	577	**582**	**100**
of which bio and fossil fuel for electricity generation	12	22	13	13	**13**	**2**

* Nuclear power and hydropower are reported in accordance with international praxis. Hydropower shows the gross generation and nuclear power shows the supplied fuel. Approx. 32 % of nuclear fuel becomes electrical energy.

DIAGRAM 4

The overall energy supply in Sweden. Nuclear power is shown both as produced electrical energy and total supplied energy in the form of nuclear fuel, in accordance with international praxis. Hydropower corresponds to the gross electrical energy generated.

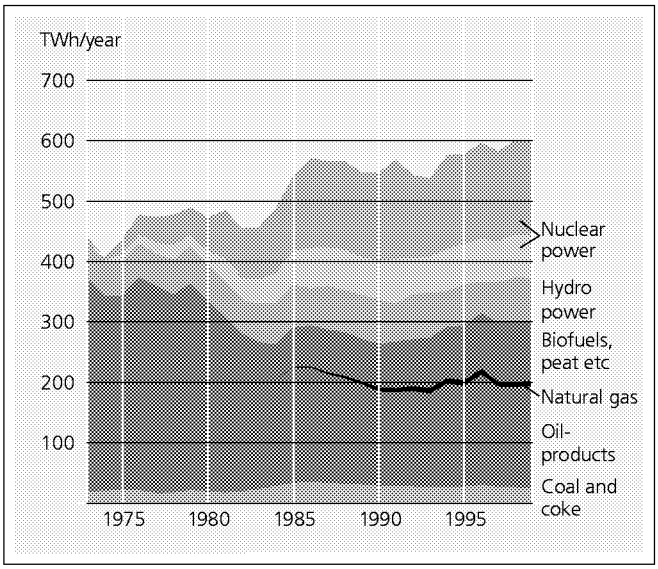
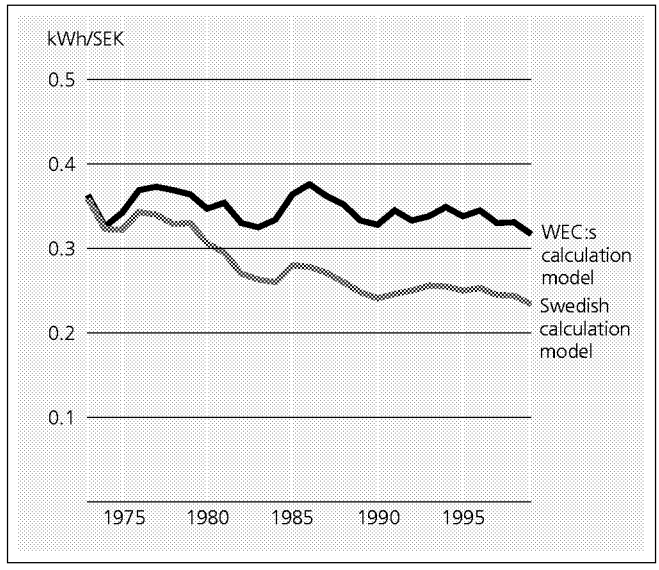


DIAGRAM 5

Energy supply in relation to GNP. In monetary value of 1995.



products, primarily nuclear power and hydropower, cannot be utilized by the end-user, instead having first to be converted into a more manageable energy carrier, e.g. electricity or district heating. Conversion losses in nuclear power and hydropower plants have often been ignored. Sweden is now increasingly using the internationally-prevalent method of calculating, in the case of hydropower, the gross production as the supplied energy and, in the case of nuclear power, the energy content of the fuel. In Swedish hydropower stations, losses are about 1 percent and in the nuclear power plants about 68 percent, using this method of calculation. If we just take into account the net generation of electricity in the hydropower and nuclear power stations, Sweden's supply of energy in 1999 was, preliminarily, 439 TWh, compared with 587 TWh in accordance with the new, international method of calculation.

THE CONSUMPTION OF ENERGY

The consumption of energy is strongly linked to economic growth in society. Diagram 5 shows energy consumption in relation to GNP (kWh/SEK of GNP). It can be established that the consumption of energy, calculated in accordance with the older method, has been falling since 1973, while it has mainly been constant in accordance with the international method.

TABLE 2

FINAL CONSUMPTION OF ENERGY ACCORDING TO STATISTICS SWEDEN
(user level)

	1995	1996	1997	1998	1999 prel.	
	TWh	TWh	TWh	TWh	TWh	%
Industry	146	147	149	149	**149**	**38**
Transportation	87	86	87	89	**90**	**23**
Homes, services, etc	158	167	156	156	**154**	**39**
TOTAL	391	400	392	394	**393**	**100**

The consumption of energy by end-users has been falling since 1973. This is due to consumption having been rationalised, while consumption of the refined forms of energy, electricity and district heating, has risen. The proportion of oil in the consumption of energy has fallen markedly within industry and homes, services etc. However, in the transportation sector, there has been no substitution for oil, see Diagram 6.

The consumption of domestic fuels has risen sharply since the oil crises. In industry, it is primarily the paper and pulp industry that has increased its consumption of waste fuels, e.g. spent liquors. The district-heating sector, too, has increased its consumption steeply. On the other hand, consumption in the housing and service sector is relatively static, see Diagram 7.

The consumption of energy by end-users during 1999 rose slightly on the year before, see Table 2. Nineteen ninety-nine was considerably warmer than 1998, which in turn was also slightly warmer than usual. If we take this into account, the consumption of energy should have been approximately 6 TWh higher than the result, i.e. 404 TWh instead of 398 TWh. Taking this into account, the increase between 1998 and 1999 is approximately 9 TWh or 2 percent.

DIAGRAM 6

The proportion of petroleum products in the overall consumption of energy.

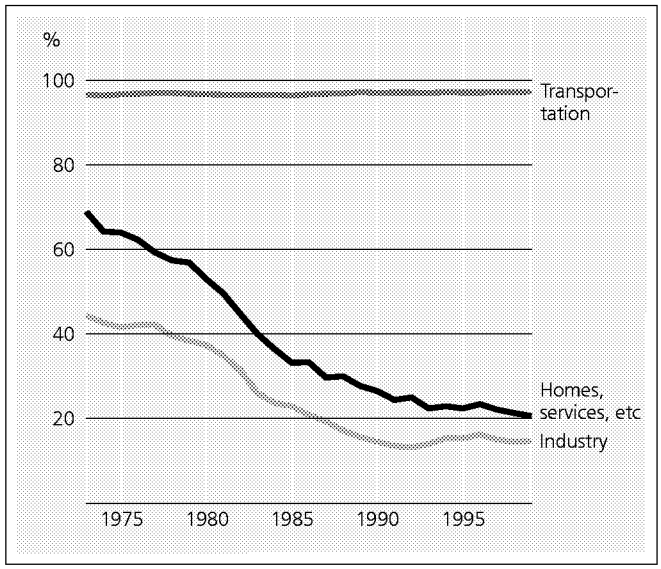
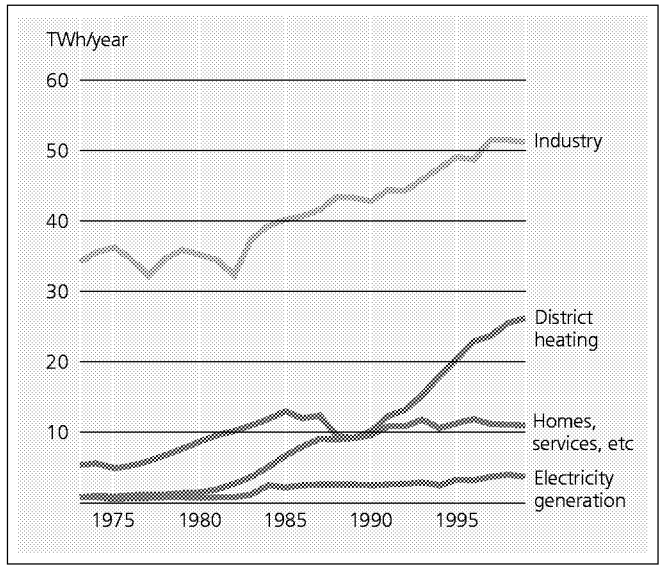


DIAGRAM 7

Consumption of biofuels, peat, etc.



The overall consumption of electricity, including transmission losses and large electrical boilers in industry and heating plants, fell from 143.2 TWh in 1998 to, preliminarily, 142.9 TWh in 1999.

Sweden has a relatively high level of electrical heating, approximately 31 TWh in total, of which two thirds is dependent upon the outside temperature (the rest being used, among other things, for hot tap water). When comparing two years, we must therefore take into account whether it has been warmer or colder than "usual". Nineteen ninety-nine was warmer, cutting electricity consumption by approximately 2.4 TWh. Nineteen ninety-eight was warmer, too, cutting electricity consumption that year by approximately 0.7 TWh.

At certain times of the year, there is a surplus of "inexpensive" generated output. This electricity is then sold at relatively low prices to large electric boilers in district heating plants and industrial facilities, then replacing other types of thermal production, normally based on oil. Previously, statistics were kept with regard to these deliveries of electricity, but following the reform of the electricity market at the turn of the year 1995/96, this is no longer possible. Only electrical boilers in heating plants are now recorded in official statistics. Preliminarily, 1.7 TWh was used here in 1999, compared with 1.9 TWh in 1998.

TABLE 3

ELECTRICITY CONSUMPTION BY CONSUMER GROUP

	1995	1996	1997	1998	**1999 prel.**
Industry, incl. large elec. boilers	52.0	52.2	53.5	54.4	**55.0**
Services, excl. large elec. htg. plant boilers	33.3	33.9	33.7	33.8	**33.8**
Elec. deliveries to htg. plant boilers	3.4	1.7	2.2	1.9	**1.7**
Homes	43.6	44.5	42.7	42.5	**41.9**
Losses	10.1	10.3	10.4	10.6	**10.6**
Total actual domestic consumption	142.4	142.6	142.5	143.2	**142.9**
Temperature adjustment	0.2	-2.7	0.9	0.7	**2.4**
Temperature adjusted consumption	142.6	139.9	143.4	143.9	**145.3**

During the closing months of 1999, the price of electricity on the power exchange was low, while the price of oil was rising sharply. Thus, there is good reason to assume that industry, first and foremost, was using its electric boilers more than usual, which can explain part of the large increase in the consumption of electricity.

Following temperature adjustment, and excluding the electrical boilers in the heating plants, the consumption of electricity thus increased from 142.0 TWh in 1998 to 143.6 TWh in 1998, i.e. by 1.6 TWh or 1.1 percent. This is the highest level of electricity consumption ever noted in Sweden.

The trend for electricity consumption, by consumer group over the last five years, can be seen in Table 3, where temperature adjustment is also shown. Largely speaking, the entire temperature adjustment is down to homes and services. It should be borne in mind that 1996 was a leap year, which normally entails an increase in electricity consumption of approximately 0.4 TWh. Consequently, consumption fell slightly between 1995 and 1996, due to the recession in 1996. The trend for electricity consumption since 1970 can be seen in Diagram 8.

DIAGRAM 8

Electricity consumption by consumer group, TWh/year.

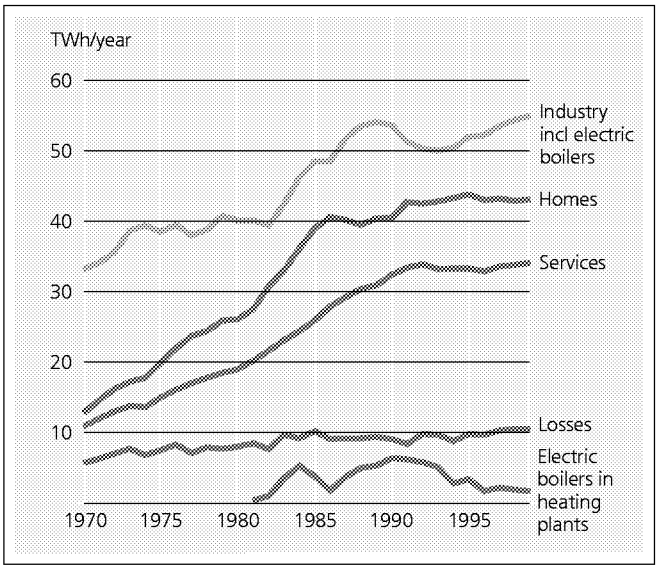
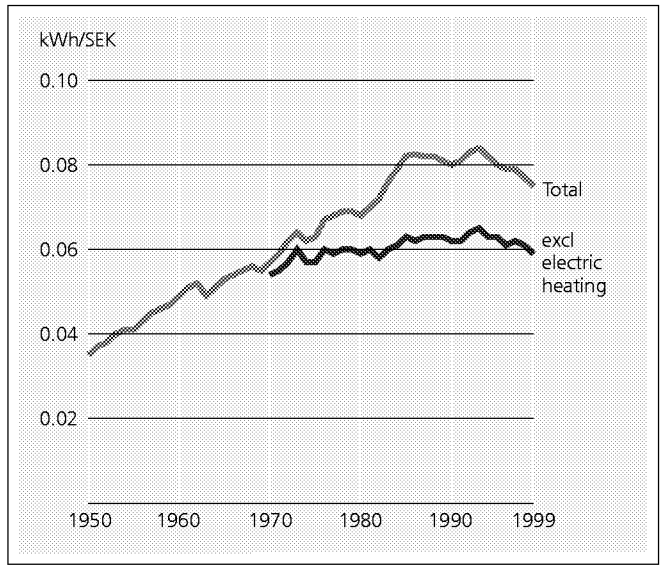


DIAGRAM 9

Electricity consumption as a function of GNP, in monetary value for 1995, kWh/SEK.



The trend for electricity consumption is greatly dependent on economic growth in society. Diagram 9 shows the trend from 1950 onwards. Up until 1986, electricity consumption increased more rapidly than GNP. Between 1974 and 1986, this was largely due to the increased use of electrical heating. In 1993, the trend was clearly broken: electricity consumption is now increasing more slowly than GNP.

THE CONSUMPTION OF ELECTRICITY IN INDUSTRY

Diagram 8 shows that electricity consumption in industry increased sharply between 1982 and 1989, thanks to the long-lived economic boom. Devaluation of the krona in 1982 provided the power-intensive base industries, primarily pulp and paper, with good prerequisites for expansion. During the recession and structural realignment of the early 90s, the consumption of electricity fell once again. At mid-year 1993, there was an upswing in the consumption of electricity and the trend has not yet been broken. In 1999, the consumption of electricity was 55 TWh, which is a record. To a certain extent, the increase during 1999 can be explained by an increased level of consumption in large electrical boilers, due to low electricity prices and high oil prices.

The fact that electricity consumption rose so sharply between 1997 and 1999 is mainly due to electricity consumption in the pulp and paper industry having risen by a total of 12 percent to 22 TWh during this three-year period. The trend for the various sectors of industry, between 1995 and 1999, is shown in Table 4.

TABLE 4

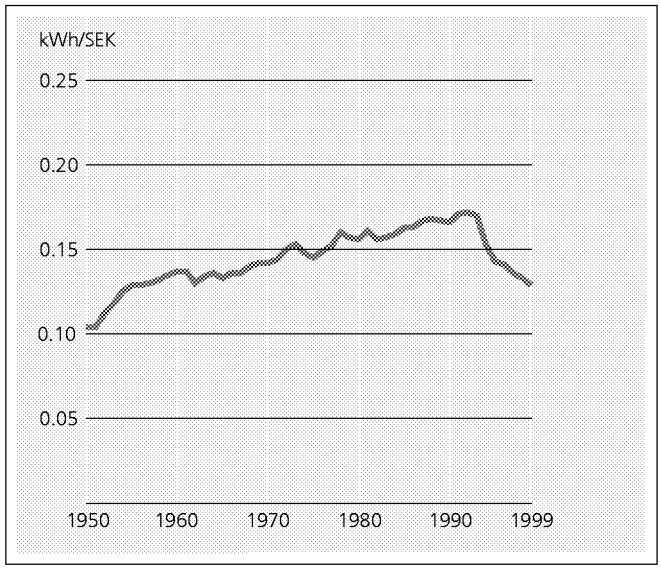
ELECTRICITY CONSUMPTION OF INDUSTRY BY SECTOR

	1995	1996	1997	1998	**1999 prel.**
Mining	2.4	2.5	2.6	2.5	**2.5**
Food	2.6	2.6	2.4	2.4	**2.5**
Textiles and upholstery	0.3	0.3	0.3	0.3	**0.3**
Wood processing	2.0	2.1	2.1	2.1	**2.0**
Pulp and paper, graphics	19.7	19.6	20.7	21.6	**22.0**
Chemicals	6.2	6.4	6.8	7.0	**7.2**
Soil and quarrying	1.3	1.2	1.1	1.1	**1.1**
Iron, steel and metal-works	7.9	7.6	7.9	7.6	**7.6**
Engineering	6.9	7.2	7.3	7.1	**7.0**
Small industries, handicrafts, misc.	2.7	2.7	2.3	2.7	**2.8**
TOTAL incl. large electric boilers	52.0	52.2	53.5	54.4	**55.0**

Diagram 10 shows how industrial electricity consumption has developed in relation to value added. Since 1993, the trend for specific electricity consumption has been falling. This can be explained by the structure of industry having changed due to rationalisation, as well as by certain electricity-intensive industries within, for instance, base chemicals and iron and steel closing down. At the same time, growth has been greatest in the pharmaceutical and engineering industries, where electricity consumption is low in relation to value added. The power-intensive base industries (mining, pulp and paper, base chemicals, as well as steel and metal works) account for a quarter of Sweden's export revenues and use 70 percent of all the electricity consumed within industry.

DIAGRAM 10

Industrial electricity consumption relative to the value added. In monetary value for 1995, kWh/SEK.



ELECTRICITY CONSUMPTION IN SERVICES, HEATING PLANTS, TRANSPORTATION, ETC

Electricity consumption in the service industries (among others, offices, schools, shops, hospitals) rose sharply during the 80s. It was primarily lighting, ventilation, office equipment etc, as well as extra electrical background heating, which increased. This increase was due to a considerable increase in standards following the renovation, building and rebuilding of service industry premises, as well as a powerful increase in the number of electrical appliances, e.g. computers. At the end of the 80s, there was a considerable increase in the number of new buildings. In conjunction with the recession during the first half of the 90s, few new houses have been built. This, in combination with more efficient appliances, has entailed that electricity consumption, excluding large electrical boilers, has stagnated on the level of 33 to 34 TWh per year.

The bulk of the buildings in the premises sector are heated using district heating. Electrical heating as the principal source of heating is used for approximately 9 percent of floor space, but accounts for approximately 20 percent of all heating energy due to the large proportion of supplementary electrical heating.

The Services category also includes technical services, e.g. district heating plants, waterworks, street lighting and railways. For these, too, growth was considerable during the 80s. It was then that the large heating pumps, for example, came into existence in the district heating plants, which today use 2.3 TWh per year. During the 90s, the electricity consumption of the technical services has stagnated on an overall level of approximately 11.5 TWh.

ELECTRICITY CONSUMPTION IN THE HOME

The housing sector encompasses small houses, farms, apartment blocks and second homes. Electricity for agriculture comes under services. The consumption of electricity, excluding electrical heating, has experienced a rather even rate of growth since the 60s, with the exception of the oil crisis in 1973/74 and a temporary energy saving campaign in 1980/81, when the increase was temporarily halted.

The consumption of household and operating power in apartment blocks has increased steadily. This is partly due to the number of homes increasing, but it is also due to improved standards regarding appliances. The rate of growth has, however, fallen during recent years and it is today mainly in connection with the renovation of older apartment blocks and the fact that households are obtaining more appliances, e.g. dishwashers, freezers or home computers, that electricity consumption is on the increase. However, for all types of homes, the replacement of older equipment, e.g. fridges and washing machines, is counteracting this increase.

In the housing sector, electrical heating is responsible for 30 percent of the heating energy consumed. It is primarily in small houses that electrical heating is used. Between 1965 and 1980, a large number of small houses were built with directly-acting electrical heating. Since 1980, the bulk of newly-built small houses have been equipped with electrical heating systems that use circulating water. In order to reduce the dependency on oil following the second oil crisis at the beginning of the 80s, a large number of small houses had their oil-fired boilers converted to electrical ones between 1982 and 1986.

In apartment blocks, the natural choice for new houses and conversions has been district heating, whenever this is available. Outside areas with district heating, however, electrical heating has been installed, primarily when building new houses. Electrical heating as a supplement to other forms of heating is also very common. Approximately 4 percent of the floor space in apartment blocks is primarily heated using electricity.

Electricity consumption in this sector in 1999 is estimated, following temperature adjustment, to be approximately 43 TWh. Of this, approximately 22.5 TWh is electrical heating.

DIAGRAM 11

Trend for electricity consumption in 1999, rolling 52-week values.

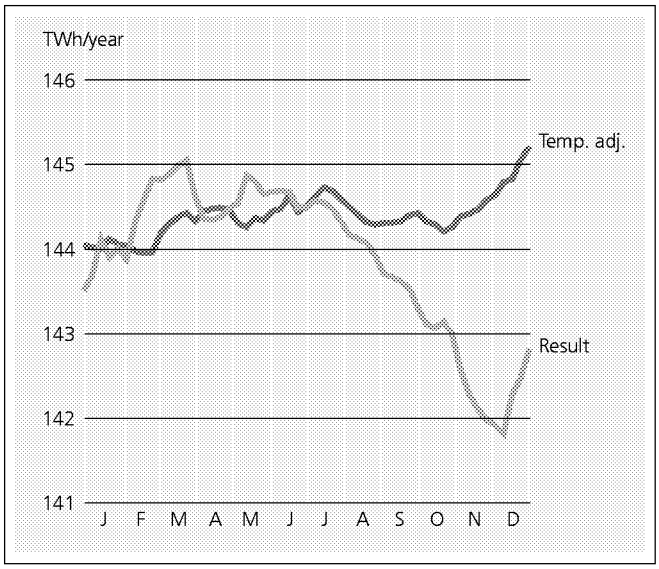


DIAGRAM 12

Total domestic electricity consumption, adjusted to "normal" temperature, incl. losses, TWh/year. Prognosis by Swedish National Energy Administration.

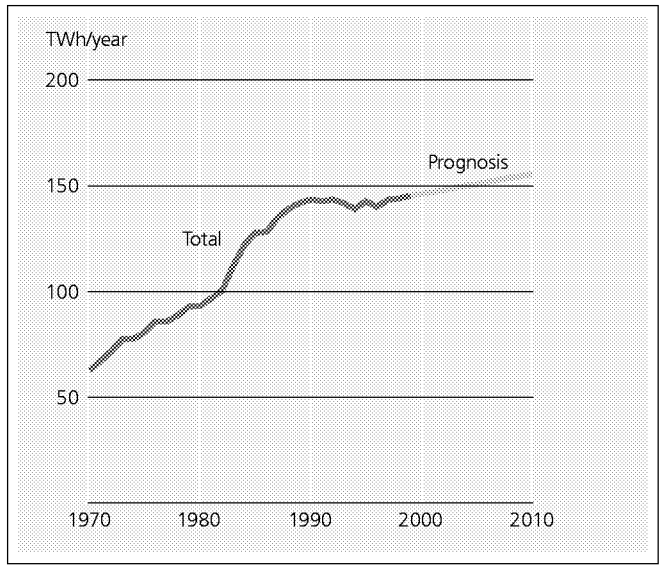


Table 5 shows the temperature-adjusted consumption of electricity during 1998 for different customer groups broken down by operating power and electrical heating, respectively. Diagram 11 shows the trend for electricity consumption in the form of the most recent 52-week values. Both the actual result and the temperature-adjusted values are shown.

THE TREND FOR ELECTRICITY CONSUMPTION UNTIL 2010

In 1999, the Swedish National Energy Administration carried out a scenario study of the trend for the energy system until 2010. In this, electricity consumption is forecast, in a reference alternative in 2010, to amount to 154.4 TWh, excluding electric boilers in heating plants. This corresponds to an increase of 0.7 percent per year. The prognosis is shown, together with the temperature-adjusted electricity consumption, excluding heating plant electrical boilers between 1970 and 1997, in Diagram 12.

TABLE 5

ELECTRICITY CONSUMPTION BROKEN DOWN BY ELECTRICAL HEATING AND OPERATING POWER, 1998

Temperature-adjusted, excl. large electrical boilers in heating plants

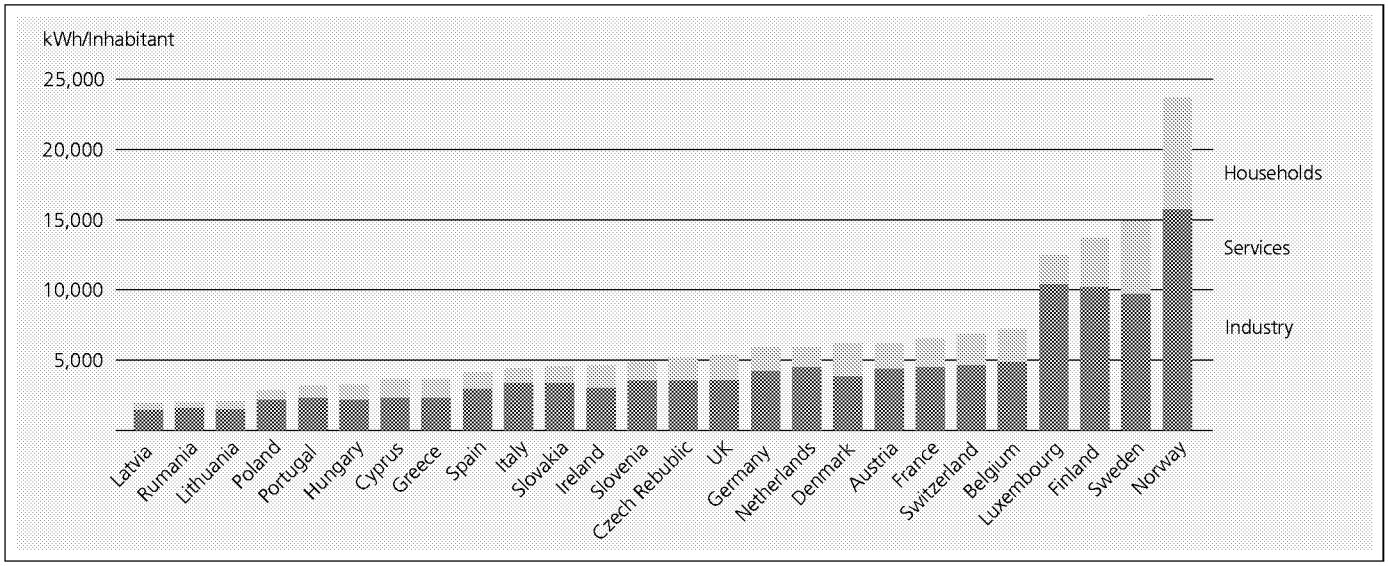
TWh	Operating power	Elec. heating	Total
Industry	53.1	1.4	54.5
Heating plants incl. large heating pumps	1.4	2.3	3.7
Premises	18.0	4.5	22.5
Technical services incl. transportation and agriculture	7.9		7.9
Small houses, incl. farms	10.0	18.4	28.4
Apartments, incl. building supply	9.2	2.8	12.0
Second homes	1.1	1.4	2.5
Losses	10.6		10.6
Total	111.2	30.8	142.0

INTERNATIONAL COMPARISON

A country's trade and industry structure is largely determined by its natural resources. In Sweden's case, the forests, the ore and hydropower have played a crucial role in establishing the power-intensive industry that we have today. Diagram 13 shows the electricity consumption per capita in a number of countries. Countries with high values have one or more of the above factors in common with Sweden.

DIAGRAM 13

Net consumption of electricity per capita during 1996 relatively by user.



Sweden's electricity supply is based upon hydropower, wind power, nuclear power, fossil/biofuel-fired thermal power and exchanges of power with neighbour-countries.

The overall generation of electricity in the country in 1999 was 150.5 TWh, a decrease of 2.4 percent on the previous year.

HYDROPOWER

The weather is of great significance to Sweden's electricity supply. The temperature affects the consumption of electricity, primarily the heating of homes and other premises. Levels of precipitation and, accordingly, inflows into the water reservoirs and hydropower stations are crucial to hydropower generation.

Inflow and reservoirs

The annual variation in inflow in relation to the average inflow is shown in Diagram 3. The inflow for 1999 was slightly higher than usual, but 20 percent down on last year.

The variation in inflow during the year is shown in Diagram 14. The white area indicates the inflow with a degree of probability of between 10 and 90 percent. There is a 90 percent probability that the inflow will be higher than the lower limit and a 10 percent probability that it will be above the upper limit of the white area. The thin black curve indicates the inflow for a normal year (50 percent probability) and the blue curve indicates the actual inflow for the year week-by-week.

The year started with inflows that were slightly higher than usual. At the beginning of April, the inflow increased sharply due to a thaw, to several hundred percent above normal values. Following a setback for two weeks at the beginning of May, with reduced inflows, the spring flood gained momentum and culminated at the end of May. During June, inflows were in excess of normal values, while in July, they were around normal. August saw the start of a long period of low inflows. It was not until October that normal inflows were achieved once again. During November, inflows were above normal, while in December, they were close to normal values.

The rate of filling of the reservoirs at the beginning of the year was 71 percent, which is 4 percentage points above the median value for the comparison period 1950–1999.

The rate of filling was above the median value right up until the end of August, beginning of September, and was then below the median value for the rest of the year. At the turn of the year 1999/2000, the rate of filling was 62 percent, which is 5 percentage points below the median value.

TABLE 6

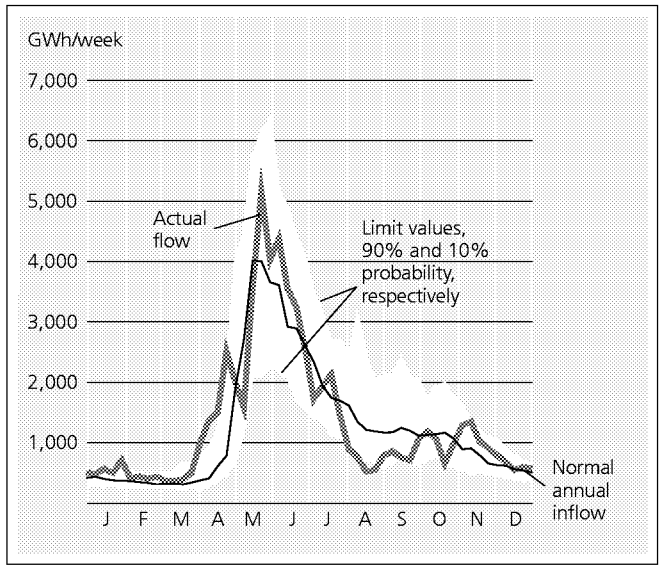
HYDROPOWER GENERATION

By river during 1999, TWh

River	Net generation
Lule älv	15.8
Skellefte älv	5.2
Ume älv	8.2
Ångermanälven	7.7
Faxälven	3.8
Indalsälven	10.0
Ljungan	2.4
Ljusnan	3.8
Dalälven	4.7
Klarälven	1.7
Göta älv	2.2
Other rivers	4.9
Total generation	**70.4**

DIAGRAM 14

Annual variation in inflow into the harnessed rivers.



The rate of filling of the reservoirs is shown in Diagram 15.

Sweden's hydropower generation during the year amounted to 70.4 TWh, which is almost 10 percent above the normal annual generated output, but 4 percent down on 1998. During the year, hydropower accounted for 47 percent of Sweden's electricity generation.

Variations in generation during the year are shown in Diagram 1. The trend from 1975 onwards is shown in Diagram 16.

Sweden's hydropower generation by principal river is shown in Table 6. The four largest rivers - Lule älv, Ume älv, Ångermanälven and Indalsälven - jointly accounted for 65 percent of Sweden's hydropower.

The volume of water that can be stored, if the annual reservoirs are utilized to the full, was the equivalent of 33.7 TWh of energy at the end of 1999, 0.2 TWh higher than that recorded in 1998. The increase is explained by a revision of the volumes and equivalents used in calculations.

At year-end, the installed capacity in the country's hydropower stations was approximately 16,200 MW. During the year, only minor changes were made in the output power of existing stations.

The energy production capability during normal years, with regard to supplies of water, remains unchanged at approximately 64.0 TWh.

NUCLEAR POWER

Nineteen ninety-nine will go into history as the year when Barsebäck 1, one of Sweden's 12 reactors, became the first to be definitively shut down. Nuclear power generation in Sweden during 1999 was 70.2 TWh, about the same as during 1998 and 3.3 TWh less than the record year of 1991.

Table 7 shows the energy availability of the nuclear power units between 1996 and 1999, the net output of the units, the year of going into service and the total generated output since going into service.

The annual output of the three Oskarshamn units was 15.0 TWh, the second highest ever. The result corresponds to 10 percent of Sweden's overall electricity generation. The operating results of the first and third units were very good, while the availability of Oskarshamn 2 was lower than usual due to a long overhaul period during the summer.

The two units at Barsebäck generated 6.1 TWh. The availability of both units was lower than usual due to extended overhaul periods.

The four units at Ringhals generated 25.3 TWh, which was slightly higher than in 1998 (24.9 TWh). This corresponds to almost 17 percent of Sweden's overall electricity generation. The availability of Ringhals 1 was lower than usual due to an extended overhaul period, but very high for the other three units, more than 90 percent for each unit.

At Forsmark, too, the operating result was very good. For all three units, the availability was over 91 percent. Forsmark 1 was best, with an availability close to 97 percent, a new Swedish record. The total generated output was 23.7 TWh, corresponding to almost 16 percent of the country's overall electricity generation.

The long overhaul shutdowns at Oskarshamn 2, Barsebäck 1 and 2 and Ringhals 1 were due to similar problems with the moderator tank caps of the reactors.

The mean value of the energy availability of the twelve Swedish units was approximately 83 percent, which can be compared with 75 percent, which is an average figure for the world's nuclear power units of equivalent type.

DIAGRAM 15

Rate of filling of reservoirs.
Limit values, last 15 years

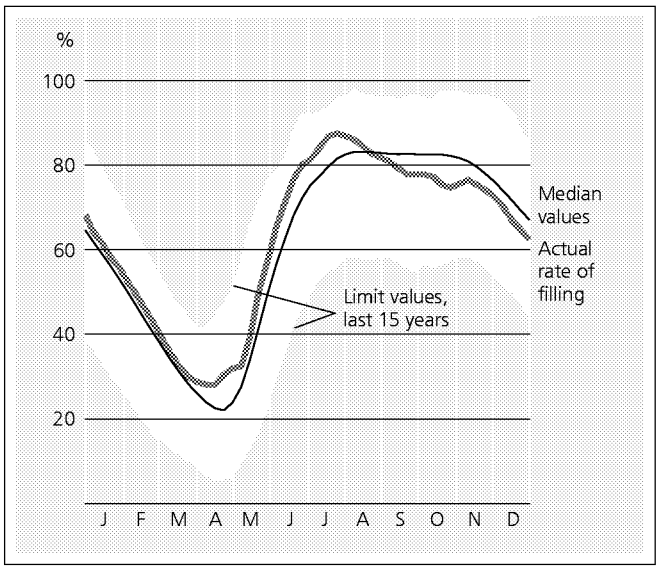
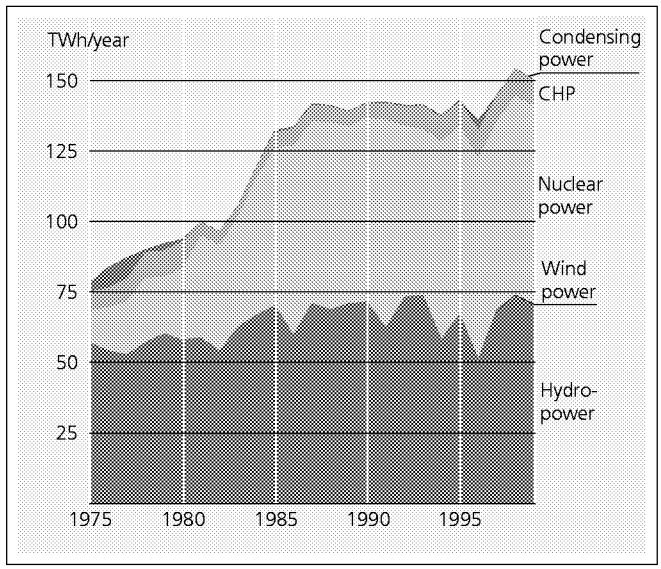


DIAGRAM 16

Electricity generation by type of power 1975–99, TWh/year.



TABELL 7

ENERGY AVAILABILITY AND GENERATION OF NUCLEAR PLANTS

			Energy availability, %				General output, TWh				Total generated output in service
Unit	Net output MW	In service	1996	1997	1998	**1999**	1996	1997	1998	**1999**	TWh
Barsebäck 1*	600	1975	82.0	72.6	86.0	**52.9**	4.1	3.7	4.3	**2.6**	92.7
Barsebäck 2	600	1977	73.2	76.1	82.0	**70.0**	3.8	3.9	4.0	**3.5**	87.6
Forsmark 1	970	1980	94.8	70.1	93.8	**96.8**	7.3	5.4	7.3	**7.6**	126.7
Forsmark 2	970	1981	91.4	87.8	92.1	**92.8**	7.3	7.3	7.2	**7.3**	122.6
Forsmark 3	1,155	1985	89.1	90.1	93.9	**91.1**	8.8	9.0	9.0	**8.8**	121.0
Oskarshamn 1	445	1972	61.4	75.9	32.7	**87.6**	2.4	2.9	1.3	**3.3**	65.9
Oskarshamn 2	605	1974	72.9	86.3	90.2	**64.7**	3.8	4.4	4.4	**3.2**	97.0
Oskarshamn 3	1,160	1985	85.1	90.9	89.4	**89.9**	8.5	9.0	8.0	**8.5**	119.0
Ringhals 1	835	1976	90.2	33.0	84.7	**73.5**	6.5	2.2	5.6	**4.9**	108.2
Ringhals 2	875	1975	85.4	90.0	90.4	**92.2**	5.7	6.2	6.1	**6.4**	116.5
Ringhals 3	920	1981	92.8	86.0	90.1	**90.1**	6.8	6.6	6.4	**7.0**	105.9
Ringhals 4	920	1983	91.0	87.0	92.4	**91.6**	6.3	6.4	6.8	**7.0**	103.4
Total	10,055		84.1	78.8	84.8	**82.8**	71.4	67.0	70.5	**70.2**	1,266.5

* Closed 30th Nov. 99.

For reasons of production economy, nuclear power undergoes downward regulation, normally during the period from March to October, when consumption is low and the water reservoirs are well-filled. As a consequence of the abundant supply of water, there was downward regulation of nuclear power during 1999 by approximately 3 TWh (5 TWh during 1998).

For the bulk of the nuclear units, generation was also restricted due to coast-down operation. This is a deliberate restriction carried out some months prior to planned refuelling, in order to utilize the fuel more efficiently and thereby reduce generating overheads. In total, the generated output during 1999 was reduced as a result of coast-down by 0.3 TWh (0.5 TWh in 1998).

At the beginning of the year, the total installed nuclear capacity was 10,055 MW. At year-end, it had been reduced by 600 MW to 9,455 MW due to the closure of Barsebäck 1.

ELECTRICITY GENERATION BASED UPON FOSSIL AND BIOFUELS

The fossil fuels consist of oil, coal and natural gas. Peat is usually also included. The biofuels include forest fuels, energy forest, annual crops, felling waste and recovery liquors from the cellulose industry.

The use of biofuels has the environmental advantage that plants bind just as much carbon dioxide when they are alive and growing as they subsequently emit during combustion.

In 1999, electricity generation based on fossil and biofuels amounted to 9.5 TWh, just over 6 percent of Sweden's overall electricity generation. Of the fossil and biofuel-based generation, 4.5 TWh was generated in industrial combined heat and power plants (chiefly biofuel-fired) and 4.7 TWh in combined heat and power plants in district heating systems (coal-fired to about 40 percent). Condensing plants generated 0.3 TWh.

The installed capacity at the end of 1999 is shown in Table 8. Auxiliary diesels at end-users such as hospitals, waterworks, etc are not recorded.

The closure of Swedish condensing plants continued during the year. These plants have become unprofitable compared with the coal-based electricity generation of neighbour-countries that lack environmental charges. The Swedish plants have invested in expensive filtration equipment, which has reduced their economic potential for competing on the open electricity market.

The following condensing plants were taken out of service during the year:

Bråvalla	240 MW
Hässelby G4	154 MW
Total	394 MW

The gas turbines at Arendal (60 MW) and Stallbacka G3 (86 MW) have also been taken out of service.

WIND POWER

The contribution of the wind power plants to the generation of electricity during 1999 was approximately 370 GWh, which is just over 0.2 percent of Sweden's overall electricity generation and 16 percent up on last year.

By year-end, 60 new wind power plants had come into existence, bringing the number of Swedish wind power plants, with an output power greater than 50 kW, to 480. The installed capacity rose during the year by 40 MW bringing, at the end of 1999, the installed wind power capacity to approximately 215 MW.

TABLE 8

INSTALLED CAPACITY IN SWEDEN'S POWER STATIONS, MW

	98-12-31	Change in 1999	99-12-31	Generation 1999, TWh
Hydropower	16,204	–12	16,192	70.4
Wind power	174	41	215	0.4
Nuclear power	10,052	–600	9,452	70.2
Other thermal power	5,564	–538	5,026	9.5
CHP, industrial	841	0	841	4.5
CHP, district heating	2,246	2	2,248	4.7
Condensing	846	–394	452	0.3
Gas turbine, etc	1,631	–146	1,485	0.0
Total	31,994	–1,109	30,885	150.5

The electricity balance week-by-week during 1999 is shown in Diagram 1. The supply side is divided up into hydropower, wind power, nuclear power, and other thermal power. The trend since 1995 is shown in Table 9.

The diagram 1 shows how electricity generation is distributed across the year in order to meet domestic demand, as well as how Sweden's net exchanges of electricity with neighbour-countries have varied during the year.

Hydropower is used relatively evenly during the year due to the reservoirs being topped up during the spring and summer and the energy stored in the reservoirs being utilized throughout the winter, right up until next year's spring flood. Overhauls of nuclear units are scheduled for the warm part of the year, when consumption is low. Other thermal power is made up almost entirely of combined heat and power, with the major part of the generated output occurring during the cold part of the year, when the demand for district heating is great.

In total during the year, hydropower accounted for almost 47 percent of the generated output, with nuclear power

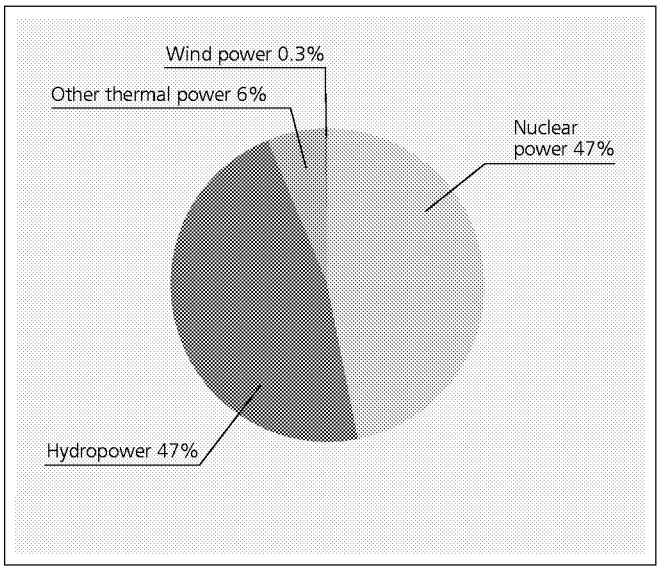
TABLE 9

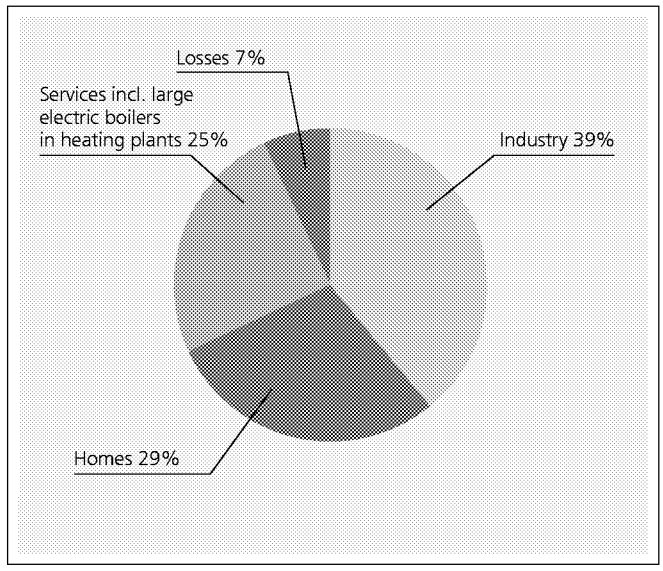
ELECTRICAL ENERGY BALANCE 1995-1999, TWH

	1995	1996	1997	1998	**1999**
Domestic generation	144.1	136.5	145.2	153.9	**150.5**
Hydropower	67.2	51.1	68.2	73.5	**70.4**
Wind power	0.1	0.1	0.2	0.3	**0.4**
Nuclear power	67.0	71.4	66.9	70.5	**70.2**
Other thermal power	9.8	13.9	9.9	9.6	**9.5**
CHP, industry	3.8	4.0	4.2	3.7	**4.5**
CHP, district heating	5.5	6.3	5.3	5.7	**4.7**
Condensing	0.4	3.6	0.4	0.2	**0.3**
Gas turbine, diesel etc	0.1	0.0	0.0	0.0	**0.0**
Domestic consumption	142.4	142.6	142.5	143.4	**142.9**
Grid losses (accdg. to Statistics Sweden)	10.1	10.3	10.4	10.6	**10.6**
Power from neighbour-countries	7.7	15.9	10.3	6.1	**8.5**
Power to neighbour-countries (–)	–9.4	–9.7	–13.0	–16.8	**–16.1**
Net exchanges with neighbour-countries	-1.7	6.2	–2.7	–10.7	**–7.6**

DIAGRAM 17

Generation and consumption of electricity by percent, 1999.





accounting for 47 percent and fossil and biofuel-fired power for 6 percent. Wind power contributed to the Swedish electricity balance to the tune of just under 0.3 percent of the generated output (Diagram 17).

During 1999, Sweden exported more electricity than it imported (Table 9). Exchanges of power are reported in more detail in a separate section on the next page.

The highest hourly level of electricity consumption during 1999 occurred on 29 January between 08.00 and 09.00, and amounted to approximately 25,800 MWh/h. Sweden's average weighted diurnal temperature on this day was approximately –7°C, which is about 2 degrees lower than usual.

Weekday electricity consumption generally has two peaks; one at about 8 in the morning and one at about 4 in the afternoon. The large impact of temperature on consumption is reflected in the fact that the amount of energy consumed on a winter's day in Sweden is double that consumed on a Saturday or a Sunday during summer.

The increase in consumption entailed by a warm summer through the increased use of fans and cooling equipment, together with increased watering, etc, is thus far insignificant compared to what a cold winter month entails in terms of the increased consumption of power for heating.

At year-end, the installed capacity in all of Sweden's power plants was 30,885 MW (see Table 8), of which hydropower accounted for 52 percent, nuclear power for 31 percent, other thermal power for 16 percent and wind power for 1 percent.

Due to hydrological limitations, among other things, not all of the installed capacity can be utilized simultaneously. Network transmission from the North to the South of Sweden has limitations, too. Additionally, a certain capacity must be reserved for normal frequency regulation and for disruptions.

In order to be able to meet the demand for power at all times and avoid power shortages on cold winter days, for instance, there must always be a reserve capacity which, at the very least, corresponds to the capacity of one of our largest units. Exchanges of power with our neighbour-countries also contribute, to some extent, to the possibility of evening out sudden fluctuations in the consumption of power.

EXCHANGES OF POWER

In 1996, the Swedish electricity market was deregulated and the Norwegian-Swedish power exchange, Nord Pool, was established. Following deregulation of the electricity market, Sweden's exchanges with its neighbour-countries are reported as physical values per country. They are thus not comparable with previous years' values, when exchanges of trade were reported. The reporting of physical values entails the sum of the net exchanges per hour and the point of exchange being reported.

The annual values of Sweden's physical exchanges with different countries in 1999 are shown in the following table. (Values for 1998 in brackets).

TWh	To Sweden	From Sweden
Denmark	1.6 (2.2)	2.1 (1.9)
Finland	0.9 (0.8)	6.8 (5.3)
Norway	5.9 (3.0)	5.9 (7.3)
Germany	0.1 (0.1)	1.3 (2.3)
Total	8.5 (6.1)	16.1 (16.8)

In 1999, Sweden's imports of electricity from neighbour-countries amounted to 8.5 TWh, an increase of just under 40 percent compared with last year. Exports fell slightly to 16.0 TWh. Net exports were 7.6 TWh, down 30 percent on last year's all time high.

TAXES AND CHARGES IN THE SUPPLY OF ELECTRICITY FROM 2000-01-01

A general industrial property tax of 0.5 percent of the rateable value of the property (the land as well as the building value) is charged on all electricity-generating plants.

Electricity generated in nuclear power plants is taxed at SEK 0.027/kWh. For electricity of this type, a charge of SEK 0.0015/kWh is also levied, in accordance with the Studsvik Act, to cover the costs of the Studsvik plant's previous operations. In order to finance the future cost of terminal storage of spent nuclear fuel etc, a charge is levied on each nuclear power plant individually, which in 2000 was SEK 0.014/kWh for Forsmark, SEK 0.006/kWh for Oskarshamn, SEK 0.01/kWh for Ringhals and SEK 0.006/kWh for Barsebäck. The weighted average is approximately SEK 0.01/kWh. In addition to this, the owners of the reactors have to provide securities totalling SEK 6.6 bn.

According to the law on the taxation of energy, no tax is levied (i.e. deductions may be made) on fuel used in generating taxable electricity. In the case of fossil fuel-fired condensing power generation, however, 5 percent of the generated output is classified, in the form of a standardised allowance, as non-taxable internal electricity consumption, which is why 5 percent of the supplied fuel is taxed. In the case of fossil fuel-fired combined heat and power generation, 3 percent of the fuel for electricity generation is correspondingly classified as internal electricity consumption and taxed. Fossil fuel for thermal production in combined heat and power plants is taxed at half-rate with regard to energy tax and at full-rate with regard to carbon dioxide tax.

A sulphur tax is charged at SEK 30/kg of sulphur for sulphur dioxide emitted during the combustion of fossil fuels and peat.

A nitrous oxide charge is levied at SEK 40/kg of nitrous oxides (counted as NO2) when using boilers and gas turbines with a utilized energy production greater than 25 GWh/year. The bulk of the charges paid in are repaid to those who are liable to pay charges, in proportion to their share of the utilized energy production.

When electricity is consumed, energy tax is levied as follows:

a) SEK 0.0/kWh for electricity used in industrial operations classified in accordance with SNI 2 and 3, or in commercial greenhouse cultivation. (also in farms effective 2000–07–01)

b) SEK 0.106/kWh for electricity other than that denoted under a) and which is used in certain municipalities in Northern Sweden.

c) SEK 0.139/kWh for electricity used in the supply of power, gas, heating or water.

d) SEK 0.162/kWh for electricity consumed in all other cases.

For electricity used in electric boiler plants larger than 2 MW, the energy tax during the period November 1 – March 31 is SEK 0.023/kWh higher than it is under b) and c) above.

Additionally, electricity customers pay charges to finance certain authorities. In total, high-tension customers pay SEK 3,068 per year and low-tension customers SEK 45 per year in electrical safety, grid monitoring and contingency fees.

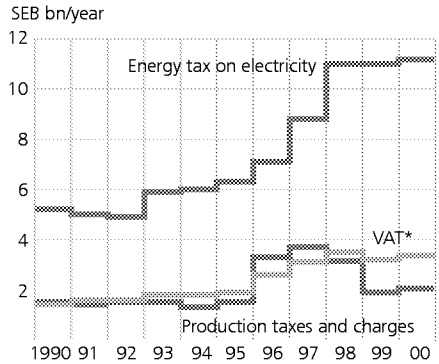
In several ways, the electricity supply is taxed more severely than other sectors of Swedish trade and industry. The following taxes and charges can be regarded as specific to the supply of electricity in 2000:

	SEK m
Nuclear power tax and Studsvik charge	1,900
Certain charges for financing authorities	250
Temporary charge for financing subsidies to small-scale electricity generation	250
Energy tax on electricity	11,200
VAT on taxes and charges specific to the electricity supply	3,400
Total	17,000

The trend for these taxes and charges between 1990 and 2000 is shown in Diagram 18.

DIAGRAM 18

Taxes and charges in the supply of electricity.



* VAT on taxes and charges reported here. Additionally, VAT is to be added to the electricity price and the grid fees.

TAX RATES APPLICABLE TO THE CONSUMPTION OF FOSSIL FUELS:

		ENERGY TAX		CARBON DIOXIDE TAX
Light fuel oil	SEK 0.075/kWh fu	SEK 743/m^3	SEK 0.107/kWh fu	SEK 1,058/m^3
Heavy fuel oil	SEK 0.069/kWh fu	SEK 743/m^3	SEK 0.398/kWh fu	SEK 1,058/m^3
Coal	SEK 0.043/kWh fu	SEK 316/tonne	SEK 0.124/kWh fu	SEK 920/tonne
Natural gas	SEK 0.022/kWh fu	SEK 241/1000m^3	SEK 0.073/kWh fu	SEK 792/1000 m^3

[kWh fu = kWh of fuel]

SULPHUR DIOXIDE AND NITROUS OXIDES

Thanks to the large proportion of hydropower and nuclear power in Sweden's generated output, emissions of carbon dioxide, sulphur dioxide, nitrous oxides etc from electricity generation are very small, normally only about 3 percent of the country's overall emissions of carbon dioxide. In an international perspective, this is a very low figure.

To this, it should be added that electricity, to a significant degree, is used for heating purposes, thereby replacing fossil fuels, primarily oil. If the present consumption of electricity in heating, as well as in heat pumps and large disconnectable boilers, were to be replaced by oil-fired heating, emissions of carbon dioxide would increase by some ten million tonnes annually.

Diagram 19 shows the overall emissions of carbon dioxide in Sweden, as well as emissions from electricity generation during the period 1975–1998.

Sweden's overall carbon dioxide emissions – excluding those from international aviation and marine traffic – have fallen from approximately 90 million tonnes per year at the beginning of the 70s to less than 60 million tonnes at present. Some years, however, emissions can be slightly higher, for instance as a result of winters that are colder than usual or a lower rate of inflow to the hydropower stations. One such year was 1996, when almost 64 million tonnes of carbon dioxide were emitted. Emissions during 1997 and 1998 were more normal, around 57 million tonnes.

The reduced emissions of carbon dioxide can, to a great extent, be attributed to the expansion of nuclear power. If Sweden's nuclear power programme had not been expanded, emissions of carbon dioxide from electricity generation might today have been as high as 30-50 million tonnes per year, i.e. Sweden's total carbon dioxide emissions might have been approaching 100 million tonnes per year, instead of less than 60.

At the beginning of the 70s, before the first nuclear plants had gone into service, the emissions of carbon dioxide from electricity generation were, for several years, on the level of 7 to 8 million tonnes per year. At that time, the generated output was in the order of 70 TWh/year. Today, with the generated output at more than double that, the emissions of carbon dioxide from electricity generation are less than a quarter of what they were during some years in the 70s.

The climate negotiations in Kyoto during the autumn of 1997 led to the industrialized nations undertaking to cut their emissions of carbon dioxide and other climate-impacting gases by, on average, just over 5 percent by 2010, compared with 1990. The EU, for its part, undertook a slightly greater reduction, 8 percent. This reduction is distributed among the member countries in accordance with an internal quota system. In accordance with this, Sweden can increase its emissions by 4 percent.

The costs of limiting carbon dioxide emissions can vary greatly from country to country. In order to facilitate the implementation of the reduction undertakings, the Kyoto Protocol also contains provisions regarding something usually referred to as the three "flexible mechanisms". These are 1) trade in emission rights between states, 2) a state, or a company in a state, pays costs enabling a company in another state to reduce its emissions, 3) the same as the preceding point, but with the difference that the receiving country must be a developing country.

In Sweden, which has considerably reduced its emissions of carbon dioxide, over time, and which has a very small proportion of carbon dioxide-emitting electricity generation, further limitation measures will be comparatively expensive. The flexible mechanisms can thus be of great consequence to Sweden. See Diagram 20.

Swedish emissions of sulphur dioxide display a trend similar to that of carbon dioxide, reinforced by stricter emission requirements. Since the beginning of the 70s, emissions of sulphur dioxide from electricity generation have fallen to approximately one twentieth. Sweden's overall emissions of sulphur dioxide in 1998 (excluding those from international aviation and marine traffic) amounted to 70,000 tonnes, of which less than 2,000 tonnes originated from electricity generation.

Sweden's overall emissions of nitrous oxides in 1998 (excluding those from international aviation and marine traffic) amounted to 280,000 tonnes, of which less than 3,000 tonnes originated from electricity generation.

DIAGRAM 19

Emissions of carbon dioxide in Sweden, overall and from electricity generation.

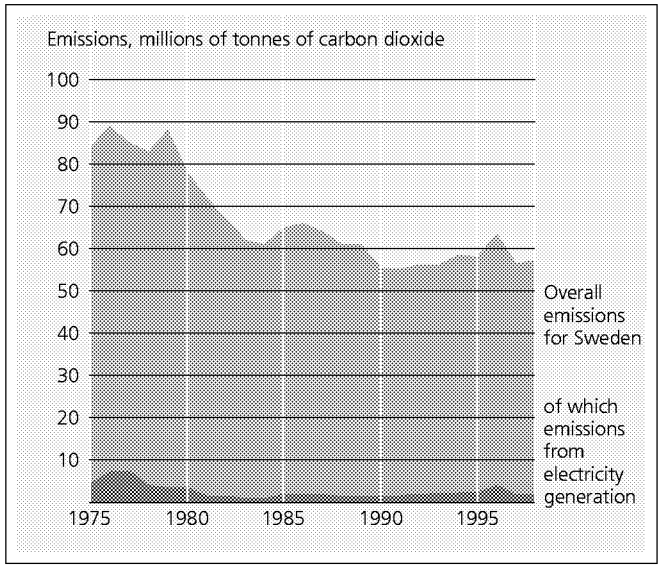
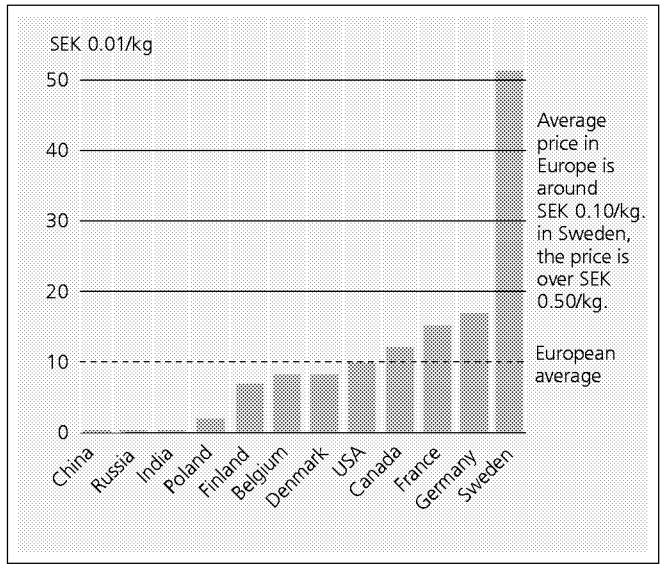


DIAGRAM 20

The "price" of reducing carbon dioxide emissions in some countries, SEK 0.01/kg.



SUPPLY AND THE ELECTRICITY MARKET

The Swedish electricity market was deregulated on January 1st 1996. One characteristic of the new, free electricity market is the fact that the distribution networks are open to all and that electricity network operations are conducted separately, both from a financial and legal point of view, to generation, trading and other operations within the group.

The distribution networks constitute a natural monopoly and the network operation is supervised by the Swedish National Energy Administration. The Swedish National Energy Administration also grants permission for the installation of power lines, as well as issuing line concessions. By paying network fees, a customer gains access to the electricity networks of the entire country and can freely choose an electricity supplier.

The generation of electricity is not regulated by law; anyone wishing to do so is free to generate or trade in electricity. Sweden's electricity producers compete for customers with one another, with overseas electricity producers and with electricity traders and brokers.

The system of supply concessions ceased on 1 November 1999. The requirement for hourly metering equipment when changing supplier now only applies to customers with a main fuse that is rated at more than 200 amps. Other customers are subject to profile settlement when changing supplier. The small-scale electricity producers have been receiving, since 1 November 1999, a government subsidy by way of a new network fee of SEK 0.002/kWh being charged by the regional network owners, calculated to provide approximately SEK 0.09/kWh in subsidies to small-scale producers' electricity generation. The subsidy to small-scale producers will apply until the turn of the year 2000/2001. Exactly how future subsidies to small-scale electricity generation will be formulated is being investigated by the Cabinet Office.

THE ELECTRICITY PRODUCERS

Electricity is generated in plants owned by the state, the municipalities, industries and private companies. Additionally, a small amount of power is generated in small-scale privately owned wind power and hydropower plants. All in all, the state owns approximately 48 percent of the generating capacity, with overseas owners holding approximately 25 percent, the municipalities approximately 20 percent and others approximately 7 percent (Diagram 21).

Mergers and acquisitions have gradually reduced the number of large producers during the last 20 years. Through this structural rationalization, the generation of electricity has become strongly concentrated. The six largest power companies accounted for 139.7 TWh, or 93 percent of Sweden's overall electricity generation, during 1999. In the production statistics shown below, minority shares have been deducted and leased power has only been included at the company making use of the power. At the beginning of 2000, Stora Enso Energy AB was acquired by the Finnish energy group Fortum via its wholly-owned Swedish subsidiary Fortum Energi Sverige AB.

THE LARGEST ELECTRICITY PRODUCERS

Generated output in 1999 (TWh)

Vattenfall	79.6
Sydkraft	27.5
Birka Energi	21.0
Stora Enso Energy	6.0
Skellefteå Kraft	3.0
Graninge	2.6

THE TRANSMISSION OF POWER

The transmission of power from power plants to customers takes place using the interconnected electricity network. The network is normally divided into three levels; the high-voltage grid and the regional and local networks.

DIAGRAM 21

Breakdown of ownership of electricity-generating capacity.

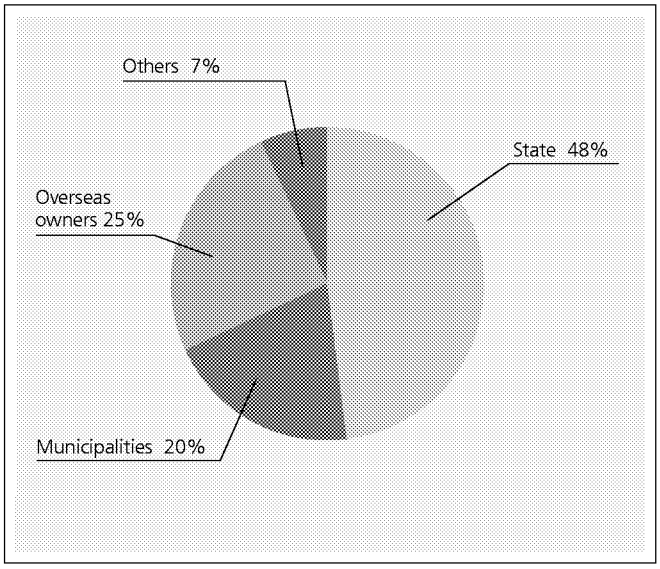
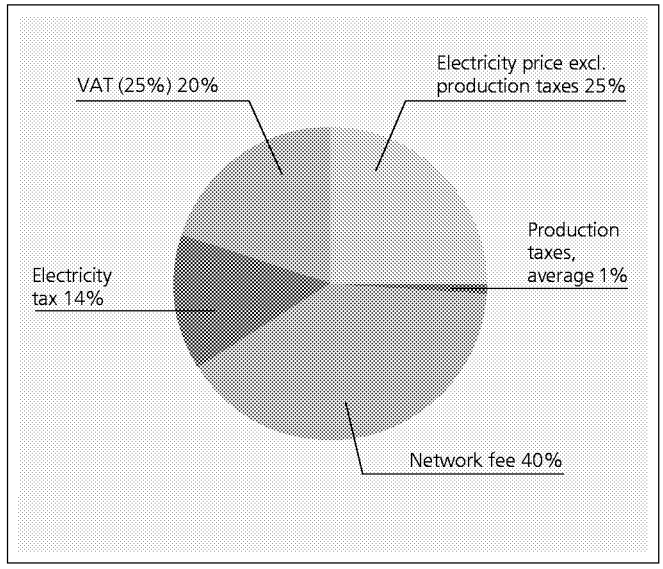


DIAGRAM 22

Breakdown of electricity price as at 1 January 1999 for a customer in an apartment block, consumption of 2,000 kWh/year.



The utility Svenska Kraftnät is responsible for the high-voltage grid, which includes the 220 and 400 kV lines, as well as the bulk of the links with our neighbour-countries.

The regional networks are owned and operated by the large power companies' network companies, and generally include lines of 130-40 kV.

The local networks are owned and operated by about 200 network companies, and normally include lines of a maximum of 20 kV. The number of local network companies is gradually decreasing due to the continuing structural rationalisation of network operations. When network companies become larger, this often entails the local and regional networks being co-ordinated within the same network company.

Svenska Kraftnät's grid tariffs were reduced by a few percent, compared with 1998. Also, other network tariffs were only changed marginally.

THE TREND ON THE ELECTRICITY MARKET

Nineteen ninety-nine was the fourth year of the new electricity market, bringing with it continued downward pressure on prices for the electricity producers.

During the first year of deregulation, the supply of hydropower was low and electricity prices were at times very high on the spot market. Nineteen ninety-seven was a good year for water and the average price for the year on the spot market almost halved. Nineteen ninety-eight was a year of extremely high inflows, yielding even lower spot market prices.

Today, the general assessment is that the formation of prices on the spot market is effective and that this market is gradually growing in significance, with increased trade between more countries.

In spite of inflows being less than last year, electricity prices on the spot market were lower than the year before. Competition for customers put pressure on prices to all customer groups and the margins of the electricity producers are now so small that extensive programmes of cuts have become necessary.

As a consequence of this, almost all condensing plants in the country have been shut down, as well as several gas turbine plants. This has radically reduced the electricity market's reserve of power. Margins for coping with major breakdowns or weeks of real winter temperatures across the country, without having to impose restrictions on consumption, no longer exist in Sweden. In situations like these, we are completely dependent on help from our neighbour-countries.

Svenska Kraftnät is responsible for the power reserve. By warning about power shortages in advance and raising the regulation price of electricity to an extremely high level, Svenska Kraftnät can fend off a certain amount of consumption, for instance electric boilers and heat pumps. Due to the difficulty of assessing consumption in advance, the individual players can be hit very hard financially in such situations. Consequently, there are still some details as regards the functioning of the electricity market that need to be analysed and improved.

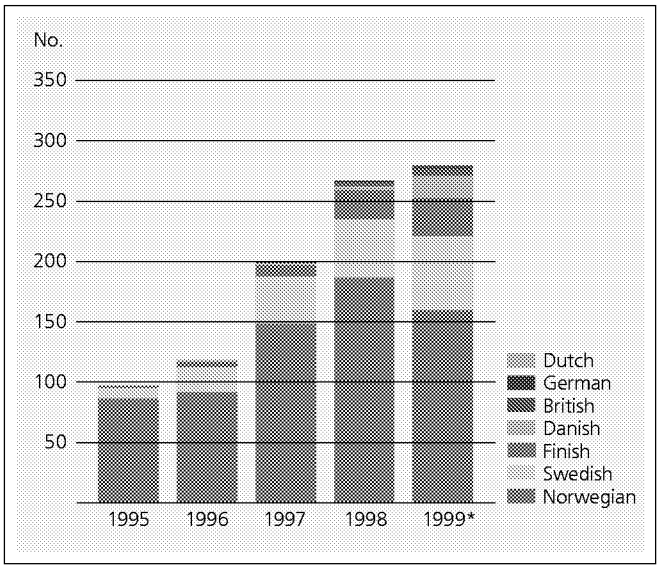
For the large number of smaller customers, 1999 was the year when the free electricity market also became available to them. Previously, equipment for hourly metering was required, entailing an extra investment cost amounting to SEK 2,500. From 1 November 1999, all customers up to and including a fuse rating of 200 amps who change supplier are subject to profile settlement. The electricity market is now just as exposed to competition as, for instance, the telecom market.

THE PRICE OF ELECTRICITY

Diagram 22 shows a breakdown of the price of electricity as at 1 January 1999. The diagram applies to a customer in a flat in an apartment block who consumes 2,000 kWh per year. Statistics from the Swedish National Energy Administration

DIAGRAM 23

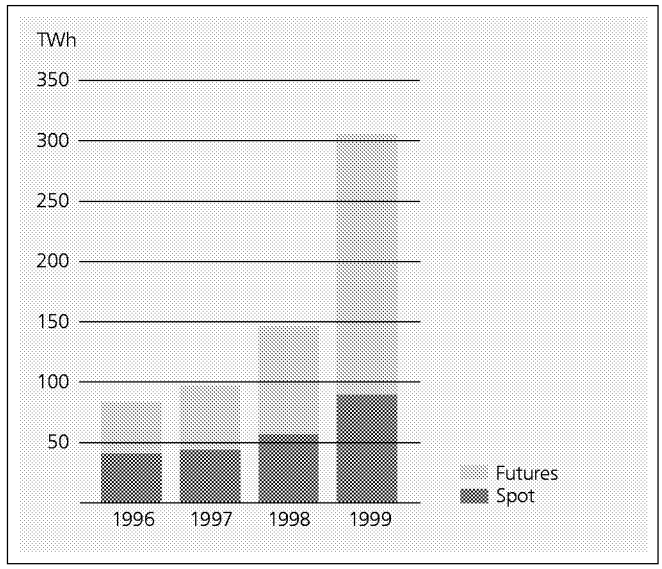
Players on the Nordic power exchange Nord Pool.



* From 1999 and on, players are counted by legal unit.

DIAGRAM 24

Turnover on the Nordic spot and futures markets.



show that the average price has fallen by 3.5 percent, compared with one year previously. The majority of customers living in flats buy their electricity from their local electricity supplier at prices in effect until further notice.

On the free electricity market, customers living in detached houses more frequently receive various offers to replace prices in effect until further notice with another form of pricing and to enter into a more fixed contractual relationship with their electricity supplier. Generally speaking, the electricity supplier provides a choice between a variable price, which changes from month to month, a fixed price for one year, a fixed price for two years or a fixed price for three years. If the customer wishes to break a contract for a fixed electricity price during the period of validity, the supplier will demand financial compensation. Following the price trend for customers living in detached houses is therefore considerably more difficult than for customers living in flats, and entails a greater degree of uncertainty.

THE POWER EXCHANGE

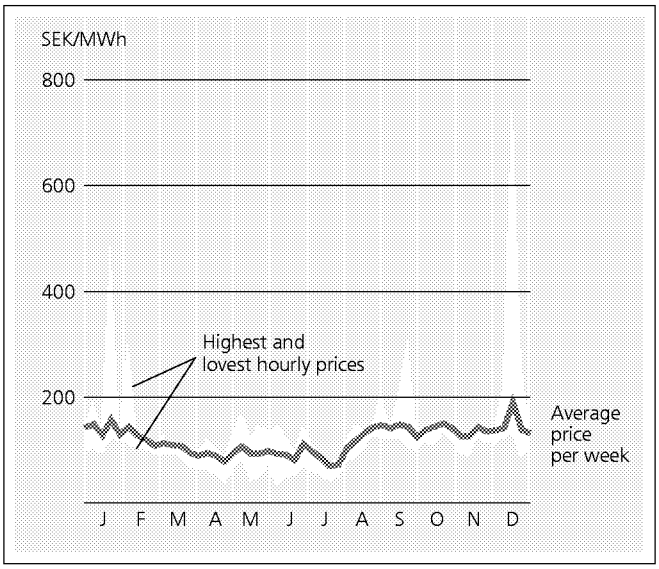
Nord Pool consists of a spot market for physical trading and a financial market for hedging and risk-spreading. The financial market consists of three types of contracts for future supplies of electricity: forwards, futures and options. For the coming three to seven days, day contracts are traded. For the coming three to seven weeks, week contracts are traded, followed by 7-13 four-week block contracts. For longer periods, only forwards are available. Up until two years after the present year, the year is divided into three seasons. Year contracts also exist for a further year.

The Nordic power exchange, Nord Pool, is equally owned by Statnett of Norway and Svenska Kraftnät of Sweden. The power exchange has its headquarters in Oslo, but it also has offices in Stockholm and Odense. Nord Pool Sverige primarily focuses on the Swedish market, with marketplace services for both the spot and futures markets, as well as training and information. About 60 Swedish players participate in trading as legal counterparts.

On the spot market, the players trade in hour contracts for the 24 hours of the following day. The price is set as an equilibrium price at the point where the supply and demand curves cross each other. The electricity spot price is the reference price for the electricity market, as well as for Nord Pool's futures market. Turnover on the spot market has risen from just under 41 TWh in 1996, from approximately 44 TWh in 1997, from just over 56 TWh in 1998 to 89 TWh in 1999.

DIAGRAM 25

Prices on the Nordic electricity spot market for 1999, Price Sector Sweden.



The average price for the year on the spot market (Price Sector Sweden) was SEK 0.119/kWh, slightly down on the 1998 average of SEK 0.121/kWh.

A futures contract is an agreement between the buyer and the seller regarding the delivery of a set volume of power at a set price. On this market, the players have the opportunity to hedge the buying and selling of power three years into the future. Thus, the futures market is an important instrument for, among other things, calculating and budgeting future revenues and overheads when trading in electricity. Turnover on Nord Pool's futures market has increased even more than on the spot market, from just under 43 TWh in 1996, from approximately 53 TWh in 1997, from approximately 89 TWh in 1998 to 215 TWh in 1999.

Diagrams 23 and 24 show the trend on the power exchange during recent years. The price trend on the power exchange's spot market, Price Sector Sweden, during 1999 can be seen in Diagram 25.

SERIOUSLY FLAWED ENERGY TAXATION

Present energy taxes in the electricity sectors of the Nordic countries are leading to serious distortions on the common Nordic electricity market. Swedish environmental taxes and charges are leading to Swedish fossil fuel-fired power stations equipped with highly-efficient emission control being cut out by overseas coal-fired power stations with poorer environmental standards.

Several years ago, an industry-wide proposal for energy taxation in Sweden was put forward by the Swedish Power Association, the Swedish District Heating Association and the Swedish Gas Association. The fundamental principle of the proposal is that environment-managing taxes on fuels and environmental charges must be levied on the production side. On the other hand, fiscal taxation, i.e. taxation intended to generate revenues for the state, must be levied on the end-user side. Furthermore, fiscal taxation should levied equally on electricity and heating, in order not to distort competition.

It is also important that markets which are open for reciprocal trade, like the Nordic electricity market, have taxes that are harmonized, in order that electricity generation in one country is not penalised out of existence by electricity generation in another due to the environmental taxes there being lower.

MEMBER COMPANIES' GENERATING CAPACITIES IN MW, JANUARY 2000

	Hydro-power	Nuclear power	Other thermal power	Wind power	Total
Vattenfall AB	8,393	5,383	529	20	14,324
Sydkraft AB	2,349	2,372	1,148	9	5,878
Birka Energi AB	2,304	1,298	796	1	4,399
Stora Enso Energy AB	929	291	111	0	1,331
Skellefteå Kraft	500	61	37	0	598
Graninge	551	0	0	1	552
Holmen Kraft	247	0	0	0	247
Jämtkraft AB	198	0	0	0	198
Mälarenergi	44	0	148	0	192
Tekniska Verken i Linköping AB	16	0	150	0	166
Umeå Energi AB	150	0	0	0	150
Uppsala Energi AB	3	0	140	0	143
Norrköping Miljö & Energi AB	12	0	104	0	116
Karlstads Energi AB	24	47	38	0	109
Other member companies	67	0	348	5	420
Total	15,787	9,452	3,547	35	28,403

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