

SVENSKA KRAFTNÄT
INFORMATION

IN THE SERVICE
OF SOCIETY



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Today's society is dependent on electricity. One of Svenska Kraftnät's important tasks is to transmit electricity from the major power stations to regional electricity networks, via the national electrical grid. In our control room, we monitor the national electrical and gas grids and ensure that there is always a balance between consumption and production in Sweden. Although the provision of electricity is extremely important to the society, the general public do not know much about the role of Svenska Kraftnät. We want to change that!



»The Swedish electricity supply system can be compared to the road network, where there are motorways, main roads and side roads. Electricity is transmitted from the major power stations to the regional networks via the national grid, which is owned by the Swedish state and managed by Svenska Kraftnät. In other words, the national grid constitutes the »motorways« of the electricity supply system.«

01. THIS IS SVENSKA KRAFTNÄT

Svenska Kraftnät has many different areas of work. Our primary function is to operate and manage the national grid and monitor Sweden's electricity supply system. We are responsible for maintaining Sweden's electricity balance, which means we ensure that there is always a balance between production and consumption of electricity. Our work contributes to ensuring an electricity market where the players can purchase electricity in free competition. We are the government authority responsible for electricity preparedness and we work to reinforce the country's electricity supply system to ensure it is able to withstand critical situations. We are also responsible for the natural gas system in Sweden, and we coordinate the country's dam safety.

CHARGED BY THE STATE

Svenska Kraftnät was established in 1992 and is a state-owned public utility. Our work is financed by the fees that regional networks and major electricity producers, such as operators of nuclear power stations, pay to Svenska Kraftnät for use of the national grid. The Swedish government has stipulated our guiding principles, and every year the government specifies special tasks for Svenska Kraftnät for the coming year. Parliament sets up the framework for Svenska Kraftnät's investment and financing activities.

Svenska Kraftnät's mission is to:

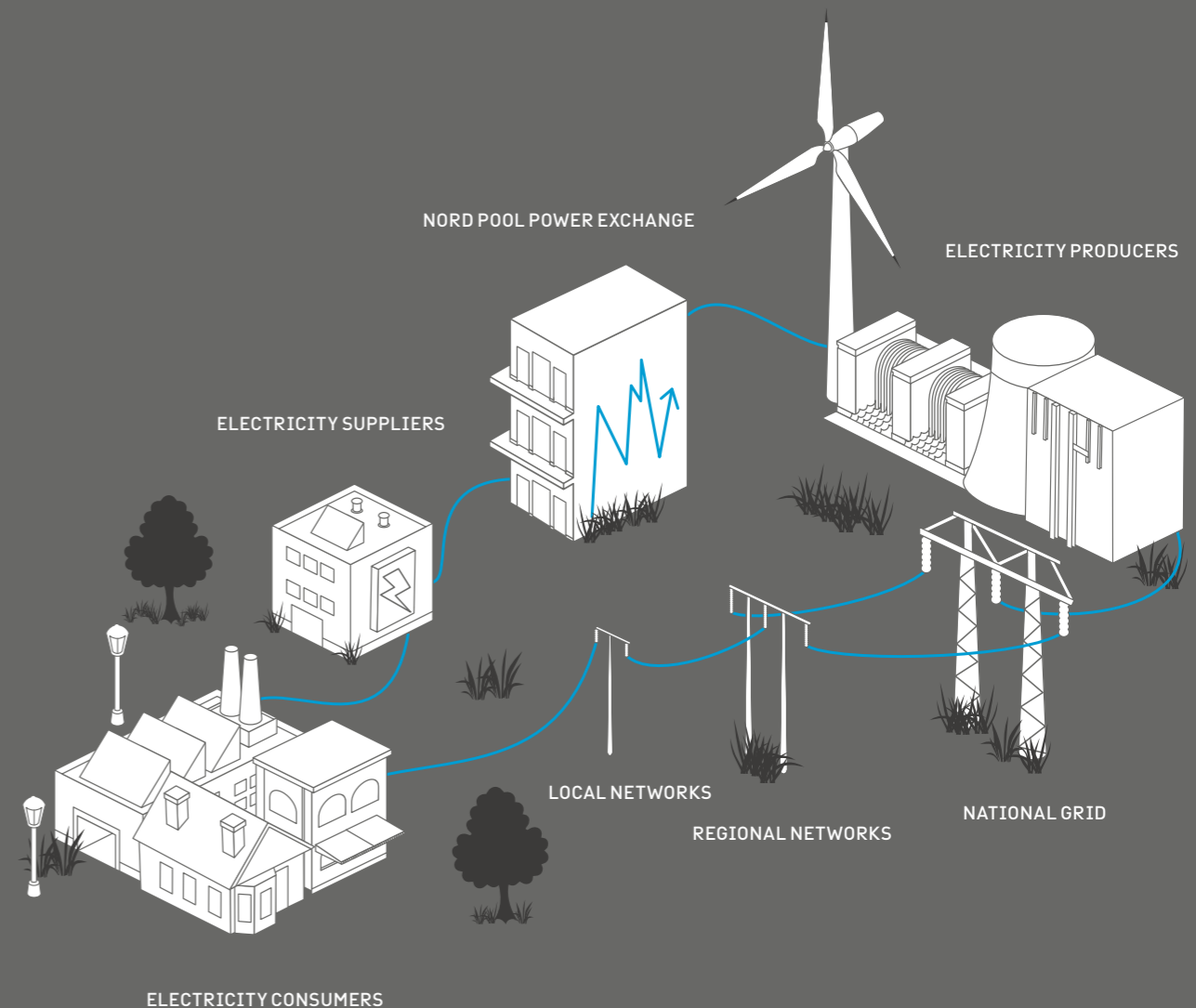
- > provide transmission of power on the national grid well in compliance with security, efficiency and environmental requirements
- > perform the system operator function for electricity and natural gas cost-efficiently
- > promote an open Swedish, Nordic and European market for electricity and natural gas
- > ensure a robust nationwide supply of electricity.

THE NATIONAL GRID AND OTHER NETWORKS

Electricity is transported from the major power stations to the regional electricity networks (40-130 kV) via the national grid (220 kV and 400 kV), which is owned by the Swedish state and managed by Svenska Kraftnät. From the regional networks, electricity is transported via local networks (40 kV or less) to electricity consumers.

ELECTRICITY'S ROUTE

Here is a diagram showing the route of electricity from the producer (power station) via the national grid, regional network, local network and finally to the electricity consumer. The producers sell their electricity on the Nord Pool power exchange or to electricity suppliers. Suppliers sell the electricity on to the consumer. The network owner uses the local network to distribute the electricity in the mains to the consumer. Electricity suppliers and network owners are different kinds of companies. If you have changed your supplier then you get two bills, one from the supplier detailing the cost of the electrical energy, and one from the network owner for transmission of the electricity on the supply system.





»Our work is important for society; almost everyone is dependent on electricity. In the coming years, investment in the national grids in the Nordic region will be doubled.«

02. NATIONAL GRID TO BE EXTENDED

Our modern society has an ever-increasing demand for a safe and uninterrupted supply of electricity. That's why it's important that we have a robust and dependable national electrical grid. In a dependable national grid, the electricity reaches its destination and any interruptions can be dealt with quickly.

The national grid needs to be strengthened and renovated in order to be able to deal with today's high electricity consumption and demands for safe electricity distribution. The same challenges face our neighbouring countries. In the coming years, investment in the Nordic national grids will be doubled. In order to manage an electricity supply system, you need a concession (permission), and over the next few years, Svenska Kraftnät will have to apply for new concessions for many of the existing power lines of Sweden's national grid.

SAFE DISTRIBUTION WITH AN EXTENSIVE ELECTRICITY SUPPLY SYSTEM

Sweden is a long and narrow country. Most electricity production takes place in the north, while most consumption takes place in the south, where most of the major cities and industries are located. That means that the electricity has to be transmitted over long distances from production to consumption. The national grid cannot transmit an unlimited amount of electricity at the same time, but an extensive supply system increases distribution security and the ability to transmit large amounts of electricity to high consumption areas.

European cooperation is stimulating increased demands for import and export of electricity across national borders. That way, our shared production resources can be put to better use, bringing economic and environmental benefits. We can export when we have an electricity surplus and import when we have a shortage, for example, on cold winter days. By increasing capacity and facilitating transmission from areas with a lot of hydroelectric energy, we can also reduce our dependency on fossil fuels for electricity production.

RENEWABLE ENERGY SOURCES REQUIRE EXPANSION OF THE NATIONAL GRID

Both in Sweden and in the EU, politicians want to prioritise development of renewable energy sources. Our task is to give the Swedish government and parliament the maximum possible freedom to implement this kind of energy policy. In order to develop windpower and other renewables, the country's electricity supply system must be fortified accordingly. For example, when major new wind farms are set up, they have to be connected to the national grid.

OVERHEAD LINES ARE THE MAIN METHOD

The Swedish national grid is an AC (alternating current) network. AC is a tried and tested, fail-safe technology. Often landowners, for example, express a desire for power lines to be buried underground. In the context of the national grid, this option can only be used in exceptional cases. For technical reasons, it is not possible to bury AC connections over a long distance. Underground cables are more complicated and considerably more expensive to install. Interruptions last longer, since it takes time to find and repair any faults. However, underground cables may be an advantageous option in urban areas where there is competition for land usage.

EXAMPLES OF CURRENT EXPANSION PROJECTS

In order to be able to support the expansion of renewable electricity production and improve distribution security, a number of new national grid connections are currently being constructed in the Nordic region. Three of these involve Swedish territory. These are a new 400 kV AC connection between Järpströmmen in Sweden and Nea in Norway, an AC/DC connection called SydVästlänken (the South West link) and another DC connection between Sweden and Finland called Fenno-Skan 2.

Svenska Kraftnät also plans to build a national grid connection between Gotland and the Swedish mainland. A DC connection between Sweden and the Baltic States is also part of the plan.

Society's demand for electricity is growing as the major cities expand. The electricity supply system in the Stockholm region has been expanded gradually throughout the 20th century. Along with network owners Vattenfall and Fortum, Svenska Kraftnät has planned an entirely new structure for the Stockholm electricity supply system, in a project called Stockholms Ström. The most important part of this project will be the 400 kV 'CityLink', a cable under central Stockholm, which will give another connection between the north and south of the Greater Stockholm area.

The 'Uppsala Ström' project is a collaboration between Svenska Kraftnät, Vattenfall AB and Uppsala Local Authority. Uppsala will gain a more secure and dependable electricity supply as a result of renovation of the electricity supply system with more intake points.

In order to reduce the risks of interruptions to supply in Gothenburg, Svenska Kraftnät, along with other network owners in the area, has decided to construct a 400 kV AC line between Stenkullen and Lindome. Most of the power line will follow an existing power line route.

There is more information on these projects at www.svk.se.



»In our control room we make sure that every minute, around the clock, there is a balance between production and consumption of electricity in the country as a whole.«

03. WE MONITOR THE NATIONAL GRID AROUND THE CLOCK

Svenska Kraftnät's responsibilities include preventing faults and, in the event of a fault, restoring the system to normal operation. At worst, faults in the national grid can cause breakdowns resulting in blackouts for large parts of the country. That's why we monitor the national grid around the clock, from our operations centre in Sundbyberg just outside Stockholm. From here, we also coordinate the work to restore the country's electricity supply in the event of major breakdowns. We also have an operations centre in Sollefteå for the national grid in Norrland. Communication between the operations centres and our various electricity facilities all over the country goes via a nationwide optical fibre network.

BLACKOUTS ON THE NATIONAL GRID ARE RARE

One of Svenska Kraftnät's goals is to ensure that the electricity in the national grid is never interrupted. The most recent major blackout on the national grid happened in 2003, when southern Sweden was hit. Before that, the most recent similar powercut was 20 years earlier, and we are constantly working to reduce the risks of such major blackouts. Most faults in the national grid do not lead to interruptions to supply for consumers. Just like a car on the road network, the electricity can often travel by a different route if there is a breakdown somewhere.

On average, there is a fault on the national grid once every two or three days. During the summer, faults are more frequent due to lightning strikes. When the supply for an electricity consumer is interrupted, the problem is usually a breakdown in the regional or local electricity supply systems. In the event of stormy or snowy weather, trees can fall on regional and local electricity supply lines, since the power line corridors for these networks are narrow, and there are often trees near the lines. That's why local electricity supply lines are often buried underground now. The national grid is not affected by the same risks, as its power line corridors are very broad, its pylons are high and all trees that could fall on the power lines have been removed.

WE ENSURE BALANCE IN THE SUPPLY SYSTEM

In our control room we make sure that every minute, around the clock, there is a balance between production and consumption of electricity in the country as a whole. A good measure of the balance is a relatively stable frequency. For technical reasons we aim to maintain a stable frequency of about 50 Hz. In order to maintain this balance, we can regulate electricity production in Sweden or in neighbouring countries when necessary. To make this possible we have agreements with electricity producers and our Nordic counterparts Statnett, Fingrid and Energinet.dk.

There is also an economic aspect to maintaining this balance. Electricity suppliers must ensure that the amount of electricity fed into the grid is equivalent to the amount their customers are expected to use. They do this by making a prognosis, but the result in reality is seldom exactly the same as the prognosis. There is often a disparity between the prognosis and the actual consumption. For example, major disparities can be caused by a particularly cold winter day, when consumption suddenly increases. In order to compensate for disparities between production and consumption, and to maintain the frequency as close to 50 Hz as possible, Svenska Kraftnät has to trade electricity with producers. Afterwards, we do a balance settlement to ensure that the players who caused the imbalance pay for it. This settlement is based on figures including the readings that regional and local network owners send to Svenska Kraftnät, which come originally from the electricity meters of the consumers.

ELECTRICITY GENERATED BY WINDPOWER HAS PARTICULAR REQUIREMENTS

In the future, an increasing proportion of our electricity will come from renewable energy sources such as windpower. If the weather is not windy when electricity consumption is at its peak, then the electricity balance may be difficult to maintain if there is no other form of production to resort to. That's why hydroelectric power is an important condition for the expansion of windpower, since water can be stored and electricity can be made available even when the weather is not windy.

WE ARE RESPONSIBLE FOR THE NATURAL GAS GRID SYSTEM

On 1 July 2005, an important step was taken for natural gas consumers in Sweden. A new gas law entered into force, giving major natural gas consumers the option of choosing their supplier freely. An important aspect of the new law is the fact that the responsibility for the natural gas grid system was to be managed by an independent and neutral organisation. Svenska Kraftnät was given this responsibility, partly because our experience of being responsible for the electrical grid could be put to good use for natural gas. In 2007, the natural gas market was opened completely, so even domestic consumers were able to change supplier. Sweden now has a free natural gas market that is similar to the electricity market.



»One of Svenska Kraftnät's objectives is to promote a competitive electricity market at all levels – Swedish, Nordic and European. We participate in the Nordic and European work to create common markets for electricity and natural gas.«

04. AN OPEN AND COMPETITIVE ELECTRICITY MARKET

One of Svenska Kraftnät's objectives is to promote a competitive electricity market at all levels – Swedish, Nordic and European. We do this by creating rules and drawing up contracts and procedures that make it as straightforward as possible to buy and sell electricity in Sweden, between the Nordic countries and with the continent. We participate actively in efforts to create a common electricity market at Nordic and European levels.

Svenska Kraftnät owns the Nordic power exchange Nord Pool Spot, along with the other Nordic transmission system operators. The players on the electricity market can buy and sell electricity there, subject to competitive forces. There is a map at www.svk.se that shows the flow of electricity that is transmitted between the Nordic countries and the continent. You can also look at the latest prognosis for the country's electricity consumption for the next few days.

The Swedish electricity market was reformed in 1996. That's when it became possible for electricity consumers to choose their own supplier. We take part in the work to develop this market to ensure it is as fair as possible for all players, large and small. This benefits the electricity consumer, since more trade in electricity gives the consumer more choice.

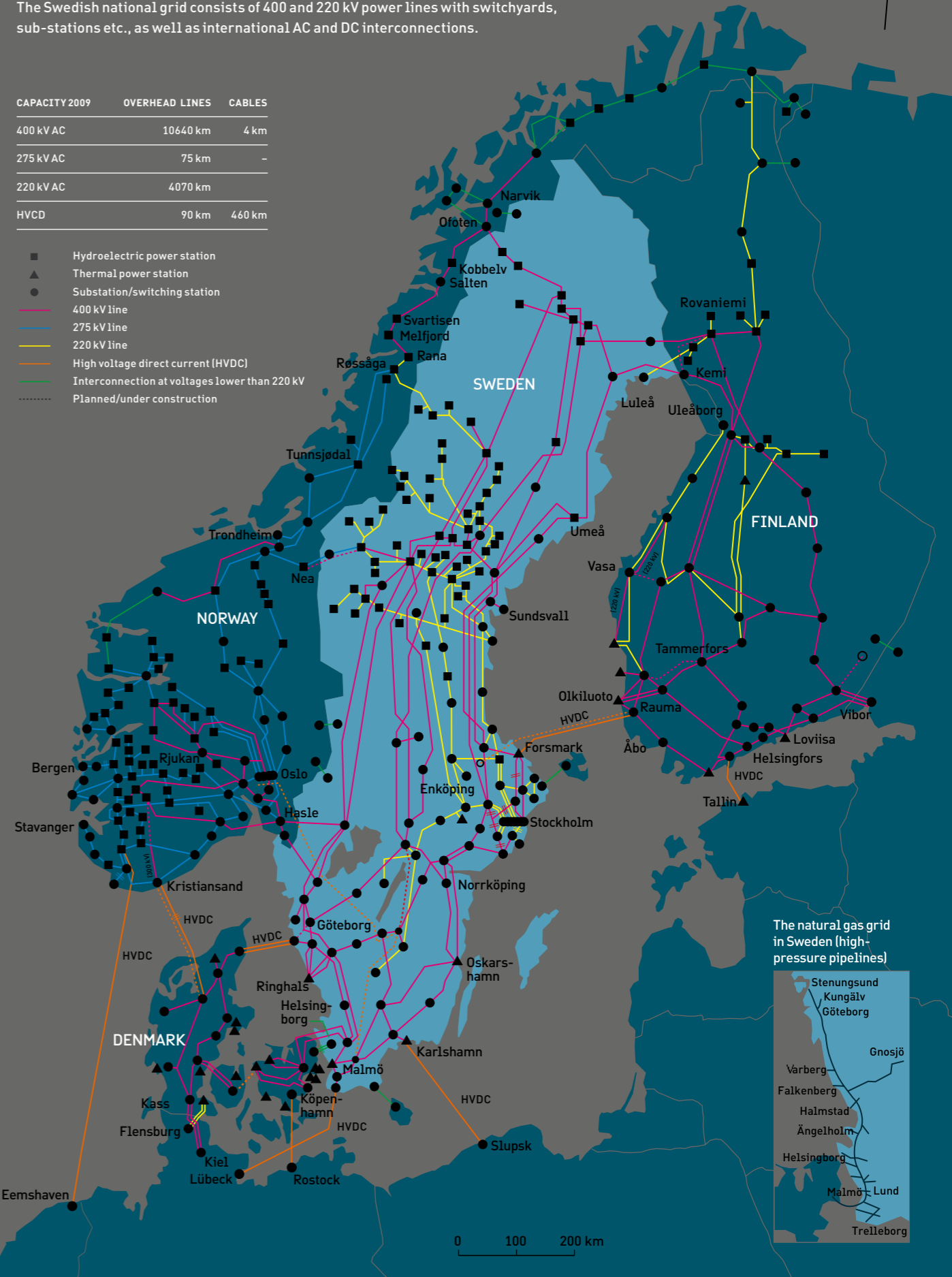
Within the EU, many rules and procedures are developed that affect the energy markets in member states. In 2008, the transmission system operators within the EU founded the organisation ENTSO-E (European Network of Transmission System Operators for Electricity). Its purpose is to ensure a competitive electricity market with a secure national grid network to meet future challenges. The work that was previously carried out by Nordel and other regional groups in Europe is now run by the new organisation. Progress towards a common European electricity market continues.

THE POWER GRID IN THE NORDIC REGION IN 2009

The Swedish national grid consists of 400 and 220 kV power lines with switchyards, sub-stations etc., as well as international AC and DC interconnections.

CAPACITY 2009	OVERHEAD LINES	CABLES
400 kV AC	10640 km	4 km
275 kV AC	75 km	-
220 kV AC	4070 km	-
HVDC	90 km	460 km

- Hydroelectric power station
- ▲ Thermal power station
- Substation/switching station
- 400 kV line
- 275 kV line
- 220 kV line
- High voltage direct current (HVDC)
- Interconnection at voltages lower than 220 kV
- ⋯ Planned/under construction





»It is difficult to build infrastructure without making a mark on our natural surroundings. In order to reduce our environmental impact, we apply stringent environmental criteria to the way we build networks and run our stations.«

05. ELECTRICITY PREPAREDNESS AND DAM SAFETY

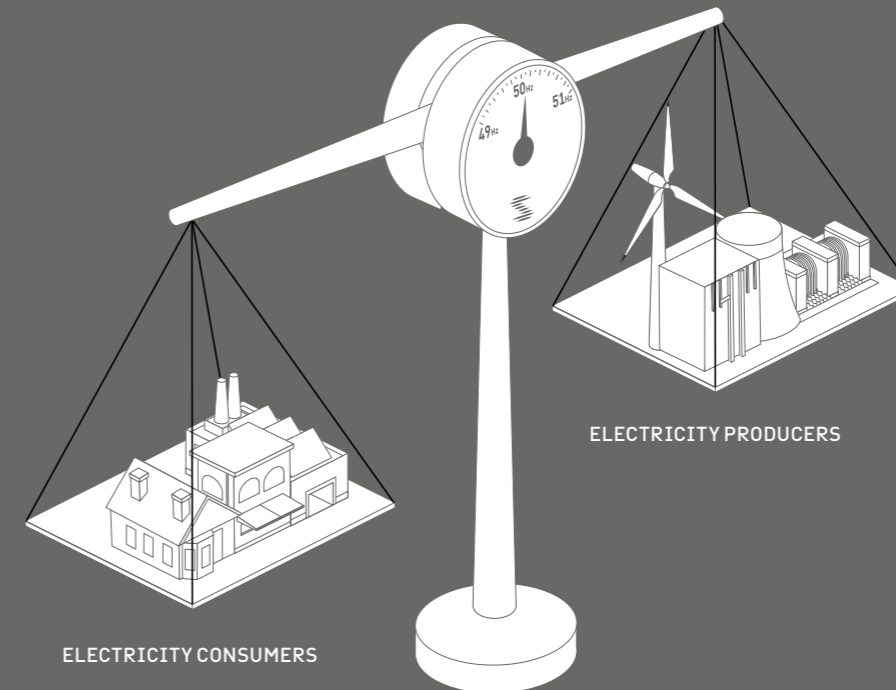
Svenska Kraftnät is the authority in charge of electricity preparedness in Sweden. This means that we work to ensure that the country's electricity supply can withstand critical situations in war, or major disturbances in times of peace. When facilities that form part of the country's electricity system are damaged, the owner is responsible for restoring their own facilities. If the damage is major, Svenska Kraftnät can offer maintenance personnel, spare parts, communication equipment and more. These resources can also be used for international aid operations.

The network owners in Sweden have founded an organisation for collaboration in such situations, and Svenska Kraftnät is part of this initiative. The organisation exists to create an overview in the event of major damage, and to coordinate repair work to ensure it focuses on wherever the need is greatest. The Swedish Armed Forces' resources for fast transportation can also be utilised in the electricity supply system, and that support is coordinated by Svenska Kraftnät. During the repair work in the aftermath of the storms Gudrun in 2005 and Per in 2007, cooperation in the electricity sector made it possible for resources to be put to effective use. International support operations were also used.

Svenska Kraftnät is also the coordinating authority for dam safety in Sweden. Our task here includes monitoring and helping to develop safer dams and reduce damage caused by flooding. The owners of the dams carry the primary responsibility for ensuring that they are safe. The county administrative boards have a supervisory role, ensuring that the owners fulfil their responsibilities, while Svenska Kraftnät advises the county administrative boards in this work. We also support research and development in this area.

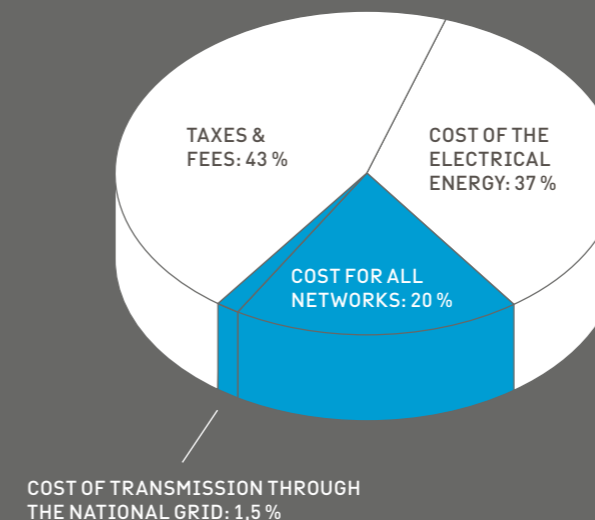
THE ELECTRICITY BALANCE

Svenska Kraftnät maintains the balance between electricity production and consumption in Sweden. The Swedish system is designed for a relatively steady frequency of 50 Hz.



WHAT DO YOU PAY FOR?

The cost of your electricity consumption can be divided into three parts. The national grid in Sweden is among the most cost-effective in the world, according to several studies.





»Svenska Kraftnät has the important task of giving the state – government and parliament – the maximum possible freedom in climate and energy policy.«

06. HIGH-PRIORITY AND LONG-TERM ENVIRONMENTAL WORK

It is difficult to build infrastructure without making a mark on our natural surroundings. In order to reduce our environmental impact, we apply stringent environmental criteria to the way we build networks and run our stations. For many years now, we have had a long-term approach where goals, procedures and follow-up lead to ongoing environmental improvements. We place environmental criteria on all procurement of construction and maintenance contracts and follow these up to ensure they are followed, using environmental audits. In the Swedish Environmental Protection Agency's annual evaluations of the environmental work of government authorities, Svenska Kraftnät has scored highly, and in spring 2009 Svenska Kraftnät received the Swedish Environmental Management Council's annual award for Excellent Green Procurement. This shows clearly that our long-term environmental work has yielded results.

The local environment is affected by where our lines and stations are placed and how they are designed. Sometimes we need to use land that is part of agricultural, forest or recreation areas. In urban areas, the local environment can be affected when lines or stations have an impact on the visual landscape, and people are exposed to electromagnetic fields and noise from our facilities. We put a great deal of effort into developing Environmental Impact Assessments (EIAs) for our projects and consulting with those who are affected. Our facilities contain many different materials and substances – some of them harmful to the environment. We work actively to reduce emissions of the harmful substances used in our facilities.

Svenska Kraftnät's environmental responsibility does not just cover our direct impact on the environment. Our responsibility also includes taking the global environment into consideration as we design the Swedish national grid, for example, by facilitating the expansion of renewable energy production and minimising energy loss on the grid.

POWER LINE CORRIDORS CAN PROVIDE A HABITAT FOR RARE SPECIES

Power lines and the corridors they take through the natural surroundings are sometimes perceived as a disruption, but it has become clear that clearing the way for power line corridors can have a positive effect. These corridors can replace land that was kept open by grazing animals. Endangered plant and animal species that depend on open spaces thrive in power line corridors. That's why in recent years, Svenska Kraftnät has adapted its methods for clearing power line corridors to ensure that these species are preserved and favoured. On our website, www.svk.se, under Environment, you can read more about our environmental work.

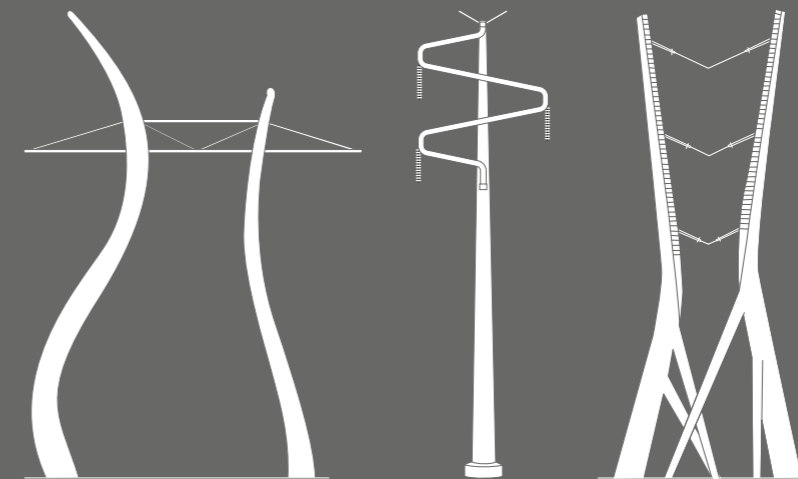
PYLONS IN THE NATIONAL GRID

In Sweden, as in the rest of the world, the dominant method for transmission of electricity in the grid at high voltages and across long distances is AC networks with overhead lines. This is because this method is simple, reliable and economical. The national grid also includes cables, but these are almost exclusively deep sea cables. Regardless of whether we choose AC or DC, overhead lines are still the main method of transmission when we carry out expansion or renovation work on the grid.

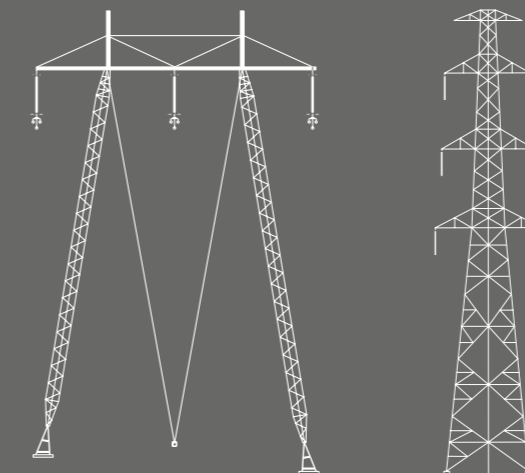
An overhead line consists of lines that hang from pylons or poles. The lines are divided into three phases. In each phase there are one to three lines, depending on the voltage and transmission capacity. A 400 kV line costs SEK 3-4 million per kilometre.

Svenska Kraftnät invests in specially designed pylons and stations that are located at selected locations in the Swedish national grid. We hope that the pylons will be perceived as typical landmarks and attractive elements of the landscape. They should also have some sort of connection to or relationship with their particular location. This is one way to create a positive interest in expansion projects that impact the environment in which we live. Power lines are a part of our modern cultural landscape, in the same way that roads and railways are.

DESIGNED PYLONS:



OUR MOST USED PYLONS:





»The national grid needs to be strengthened and renovated in order to be able to deal with today's high electricity consumption and demands for safe electricity distribution. The same challenge faces our neighbouring countries.«

07. BROAD AND KNOWLEDGE-INTENSIVE OPERATIONS

Our work is important for society; almost everyone is dependent on electricity. Employees of Svenska Kraftnät have a central place in the Swedish electricity system and on the Swedish electricity market.

Svenska Kraftnät has over 330 employees, the majority of whom are based at our head office in Sundbyberg. We also have offices in Sundsvall, Halmstad and an operations centre in Sollefteå. We give work to a few hundred more people on a contract basis, for operation and maintenance of the national grid all over the country. Svenska Kraftnät has three subsidiaries and six associated companies.

Our work is expanding and we need more personnel, while the simultaneous retirement of many of those born in the 1940s constitutes a particular challenge for a knowledge-intensive organisation such as ours. A majority of our employees have completed higher education, and most of them are educated to degree level. Svenska Kraftnät must be able to cope with this change of generation, alongside expansion, without losing our skills and know-how.

MANY DIFFERENT AREAS OF WORK

Our operations are extremely broad, and cover a number of areas of work. These include (in alphabetical order) agreements and frameworks for the electricity and natural gas markets, communication and PR, dam safety, electricity preparedness, electrical power technology (analysis, estimates, project management etc.), environmental issues, facility maintenance planning, finance, IT (operation, support, development, optic), land and access issues, natural gas, Nordic and European cooperation, operational work, personnel issues, and connection of renewables such as windpower.

COMPETITIVE TRAINEE PROGRAMME

Svenska Kraftnät runs a trainee programme. It lasts for approximately one year at a time and aims to strengthen our organisation by providing young, highly-skilled personnel who can develop Svenska Kraftnät today and in the future. Those who are accepted to the scheme have a permanent employment contract from day one, and combine work with field trips and study. They gain a wide network of contacts and a good insight into the Nordic and European electricity and gas markets.

RESEARCH

Svenska Kraftnät supports research and development in order to improve the reliability, efficiency and environmental adaptation of the national grid. We also support research and development in dam safety and in risk and vulnerability issues for the power system.

READ MORE

You can read more about the work of Svenska Kraftnät at www.svk.se. You can also order printed materials on the website.

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