



**Bioenergy.
A sustainable energy source.**

The natural energy cycle

Skellefteå Kraft strongly believes that bioenergy will play an important role in future Swedish energy production. Its raw material consists mainly of by-products from the logging and sawmilling industries. Making use of local energy resources helps ensure a sustainable energy supply that is part of the natural energy cycle.



Strong, goal-oriented player

For many years, Skellefteå Kraft has been a Swedish leader in the development of environmentally friendly electricity production as a long-term solution to the problem of climate change. As Sweden's fourth largest energy producer, Skellefteå Kraft is both an established and important player within the industry. The combination of owning our own energy resources and our financial stability make possible large-scale investments in research and the in-house development of market-leading technology. Our technological expertise is at the forefront of the industry, including specialisation on the technical design of biocombines.

Sustainable energy sources

Promoting environmentally friendly energy production and giving our customers the opportunity to choose a green alternative to heating using oil or electricity is a part of Skellefteå Kraft's corporate philosophy. Together with wind and hydroelectric power, bioenergy plays an important role in our aim of offering our customers a broad range of environmentally friendly energy. This shift towards more eco-



The by-products of logging and sawmilling are an important energy resource which Skellefteå Kraft uses to improve its ability to offer its customers eco-friendly heating and power.

friendly power generation is in line with the national energy objectives which apply within the EU. According to these objectives, 49 per cent of Sweden's energy is to be produced using renewable energy sources by 2020, which translates to an increase of around 17 per cent over the current level.

Good for both the environment and the economy

Bioenergy is a sustainable energy alternative in both the long and short term, as its production is a natural part of the energy cycle. Making use of energy resources in this way generates economic value from the raw materials from local forestry and sawmilling industries. Bioenergy is mainly produced using renewable biofuels. Forest which is replanted after felling captures the same amount of carbon dioxide as is released during the consumption of the raw material. The increased use of bioenergy also reduces the use of forms of energy which are more damaging to the environment, such as oil and other fossil fuels.



The production of bioenergy is a natural part of the unending energy cycle. By driving the development of bioenergy technology forward, Skellefteå Kraft is contributing to energy production that is sustainable in the long-term.

Skellefteå Kraft's bioenergy production

Skellefteå Kraft's bioenergy production takes place partly in combined power and heating plants, which produce heat for district heating and renewable electricity, and partly in biocombine plants in which heating plants are complemented with biopellet production facilities. The main fuel used is biofuel in the form of by-products from sawmills and logging, as well as peat and waste heat. Biopellets are used as fuel in small-scale district heating and plants for heat deliveries to individual customers such as schools and industries.

The principal components of a combined heating and power plant are a boiler, a steam turbine with a generator and a heat exchanger for district heating. Steam is produced in the boiler at a high pressure and temperature. First it is led to a turbine that drives a generator, which in turn generates electricity. The steam is then led away to a heat condenser, where it warms the water used for district heating.

District heating

District heating is a reliable and flexible heat source because it uses a number of different kinds of fuel. The water is heated by burning the fuel, and the heat is then transferred over to the water in the district heating network via a heat exchanger. Skellefteå Kraft's district heating is produced in its heating plants and bioenergy combines, which mainly use raw materials sourced from the surrounding area.

Skellefteå Kraft uses primarily biofuel in the form of forestry products, harvested peat from our own lands and waste heat for its district heating. Effective production results in an efficient use of the raw material and shorter transportation distances mean that production has a minimal impact on the environment. When the raw material is found close by, biofuel-produced district heating is considered to be a viable long-term, environmentally friendly energy source. It creates no additional release of carbon dioxide into the atmosphere and, as such, does not affect the climate. During those times of the year when the demand for district heating is greatest, a small amount of oil may also be used as fuel.

Skellefteå Kraft uses efficient technology for the cleaning of fumes, which means that the smoke from the chimneys at its plants consists mainly of water vapour.



District heating that is based on biofuel sourced from near-by areas is an eco-friendly energy source which does not generate any extra emission of carbon dioxide into the atmosphere.



Heating using biopellets can effectively replace electricity generated using traditional fuels and the burning of oil, which means that the method has a significant positive effect on the environment.

District cooling

District cooling is six-degree-warm water which is sent via a distribution system to properties and facilities. Skellefteå Kraft's district cooling is produced with the aid of refrigerating machines and free cooling, in which water from the Skellefteälven River cools central heat exchangers, which in turn lower the water temperature in the district cooling network. The system cools the air in the building's ventilation system. Both environmental impact and energy use are minimal in comparison with what they would be if the building had its own, local cooling installation.

Biopellets

Skellefteå Kraft produces biopellets in its bioenergy combines in Storuman and Hedensbyn, Skellefteå. Only the highest quality raw materials sourced from the by-products of logging, sawmilling and wood working industries are used in their production. The raw material is dried and pressed into small, cylindrical pellets. The result is a compressed biofuel with a high energy content which is also kind to the environment. Skellefteå Kraft's biopellets are produced using raw



The highest quality raw material sourced from forestry industry by-products is used in the production of biopellets.

materials sourced exclusively from the northern Swedish countryside. When the forest grows, biomass is accumulated in the trees from carbon dioxide in the atmosphere, among other things. In other words, the process is a wholly natural part of the energy cycle. Also, because heating using biopellets often replaces the burning of oil and the use of electricity, it has a significant positive effect on the environment.

Renewable electric power

The production of renewable electric power joins wind power and hydroelectric power as part of Skellefteå Kraft's large-scale investment in the future development of electric power. Skellefteå Kraft's renewable electricity is produced in its combined power and heating plant and bioenergy combines. The steam which is created during the production of district heating is collected and led to a turbine which generates electricity. Skellefteå Kraft also produces electric power through the utilization of waste heat from larger industries, including Rönnskär smelter outside of Skellefteå.



In Storuman, Skellefteå Kraft has developed a one-of-a-kind, next-generation bioenergy combine with an energy efficiency of 98 per cent.

Skellefteå Kraft's plants

Skellefteå Kraft currently operates bioenergy combines in Storuman and Hedensbyn as well as combined power and heating plants in Lycksele and Malå. It also runs an additional 17 small-scale district heating plants and 48 plants for heat deliveries to individual customers.

Storuman

The bioenergy combine in Storuman went online in 2008 and represented an investment of SEK 470 million in the production of district heating, biopellets and renewable electric power, which allowed the company to increase the percentage of eco-friendly energy it produces. The plant is the result of far-sighted research and development within Skellefteå Kraft and is considered to be the next generation in bioenergy combines. With an energy yield of 98 per cent, the bioenergy combine is unique in its efficiency and comprises a further step in Skellefteå Kraft's development of modern technology within bioenergy production.

One of the reasons why the company chose to establish a new energy combine in Storuman is the easy access to raw biomaterial. The plant's large need for the local raw material, which through effective handling can be re-used as green energy, is positive for the region's forest owners. The environment is benefitted by exploiting the plant's close proximity to the raw material, sourced from the region's forests and saw mills, as it means transportation distances are reduced and overall environmental impact is kept to a minimum.

Online 2008

Bioenergy combine

32 MW boiler

8 MW steam turbine

16 tonne/hr biopellets

Annual production

40 GWh heat

48 GWh electricity

105,000 tonnes biopellets



Skogsbacka Lycksele

The combined power and heating plant Skogsbacka in Lycksele is powered exclusively by biofuel and uses both damp and dry materials to achieve the best possible combustion. The plant's boiler works at high pressure and is equipped with fluid bed technology. The turbine is fitted with a number of steam outputs which give both flexibility and also make it possible to provide both the Lycksele sawmill and the community in Lycksele with heat. The two district heating networks have different requirements in terms of temperature levels. The temperature can be adjusted and the difference accommodated thanks to the combined power and heating plant's dual accumulator tank. The operation's environmental impact is minimised as a result of an electrofilter which cleans the plant's flue gases.

Online 2000

Combined power and heating plant

50 MW boiler
16 MW steam turbine

Annual production

135 GWh heat
55 GWh electricity



Hedensbyn Skellefteå

Skellefteå Kraft's bioenergy combine Hedensbyn in Skellefteå consists of a combined power and heating plant, which is powered by damp biofuel and modern fluid bed technology, as well as a biopellet factory. Thanks to the use of an electrofilter which exhaust gases from the boiler pass through on the way to the chimney stack, 99.98 per cent of the matter can be separated, which means that it is largely just water vapour which is emitted from the chimneys. The operation of the combined power and heating plant is completely automated and it has two turbines which are driven at different speeds of rotation to achieve an optimal operation. The plant also incorporates a 15,000m³ accumulator tank for hot water in order to facilitate long-term planning for maximum energy production.

Some of the steam from the combined power and heating plant's high-pressure turbine is transported over to the pellet factory, where it is used to dry the raw material. The pellet factory has a low-pressure turbine which makes it possible to utilise the waste heat from the drying process to generate electricity. A facility for the efficient packaging of the finished product also exists in connection with the pellet factory.

Online 1996

Bioenergy combine

98 MW boiler
34 MW steam turbine
24 tonne/hr biopellets

Annual production

260 GWh heat
170 GWh electricity
130,000 tonnes biopellets





Power, Reliability, Environmental Responsibility and Development

Skellefteå Kraft is one of Sweden's largest producers of electric power with its own hydroelectric energy resources. With our own expertise and continual development, we create quality, confidence and competence within bioenergy technology and processes, as well as wind power and other areas. This means we are able to offer our customers value-for-money, long-term, eco-friendly energy solutions as well

as safe and secure energy delivery. Skellefteå Kraft AB is wholly owned by the municipality and has five business areas: Electric power, Electric networks, Heating, Real estate properties and Communication and it has the staff to support these business areas. Skellefteå Kraft consists of 485 employees. The turnover during the year of 2007 was SEK 3,076 million.



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