A STORY ABOUT LENIN: Negotiations concerning the hand-over of the generators for Mår power station proceeded slowly until Jens Hjort noticed a portrait of Lenin on the wall on which Lenin lacked a wart which should have been on his chin. Hjort pointed out the missing wart and mentioned that he had been a fellow student of Lenin's in Switzerland. This created amazement amongst the Russians, who learned from an official source that Lenin did indeed have a wart on his chin and that they really were standing next to one of Lenin's fellow students. The negotiations were quickly concluded and the generators handed over. The first two machines were commissioned in 1948, with the next two following suit in 1949 and the fifth and final generator being commissioned in 1954.

HISTORY

1918

The Mår dam was completed and, together with the old dam at Kalhovd, was used in connection with flood control and timber rafting.

1920

The fall rights for the Mår watercourse were acquired by the government for NOK 960,000. Mår power station was planned before the Second World War.

1922–1936

Hakavik power station commissioned. 4 Pelton turbines which give an annual production of 25 GWh. This power station produces electricity for the railways (16 2/3 Hz single-phase). The power station delivers its electricity via three "railway power lines" to Asker, Skollenborg and Sande. There were plans for an additional two turbines and a third pipe. Due to the discontinuation of "railway electricity", the plans were never put into action.

1941

Construction of Mår power station started. It was the Germans who began the work. However, the work was soon stopped as a result of the fighting in the Rjukan area. When the work resumed immediately after the war, the machinery, turbines and generators which had been ordered in Germany had to be tracked down. Engineer Jens Hjort travelled to Germany and found the turbines in Heidenheim in the Allied Zone and the generators in the Russian Zone.

1948

The first two turbines at Mår power station were commissioned. The next two were commissioned in 1949. The fifth and final turbine was commissioned in 1954 (180 MW).

2002

Stegaros power station was commissioned. This power station utilises the fall between Mårvatn and Kalhovdfjorden (2.6 MW). Statkraft and Tinn Energi each have a 50% holding in the power station.

SOME TECHNICAL INFORMATION

Area of operation	Location	Power station/ Pumping station	Number of aggregates	Effect (MW)	Average production (GWh / year)	Share of ownership by Statkraft (%)	Entered into operation
Mår	Mår	Mår	5	180,0	995	100	1948
		Stegaros	1	2,6	ca 12	50	2002
	Hakavik	Hakavik	1	14,0	21	100	
Total Mår			7	196,6	1016		

CREATING VALUE

Statkraft is Norway's largest land-based taxpayer. Our production activities generate significant wealth, which is returned to society through dividends, taxes and other public liens and charges. Statkraft also contributes actively to Norwegian society, providing financial support to sports & athletics, culture and other activities and good causes. Our social engagement is organised under the auspices of local clubs and associations and in close cooperation with the local authorities who host Statkraft's activities.

THE SOURCE

Hydroelectric power is clean and renewable – and is actually a form of solar power. Water that evaporates due to solar energy returns in the form of precipitation. Rivers and waterfalls are used for the production of power, and large dams store the water for later use.

Thanks to hydroelectric power, we need not base our supply of electricity on fossil fuels or nuclear power, as many other countries do. Norway is like an island of clean and renewable hydroelectric power in Northern-Europe.

Our country is built, literally speaking, by hydroelectric power. Our economic growth and progress corresponded closely with the building of power stations. Electricity was the most important production factor in the industrialization of Norway, which freed our country from being a poor and underdeveloped place on the outskirts of Europe. The great change took place after 1850, and gathered speed after the dissolution of the union in 1905 when Norway once again became an independent nation. Electricity was an important part of the foundation for the enormous economic growth which occurred, and at the same time, in the course of a half century, it would completely transform Norwegian homes. The wood-fired stoves with cooking plates in the kitchen and oil lamps were thrown out for good and replaced with electric stoves, panel heaters, lamps, electrical appliances and computers.

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Statkraft

MÅR

REGULATION

Mår power station utilises water from watercourses in the municipality of Tinn and has a total catchment area of 770 km², with an average annual infiltration of 560 million m³.

The regulated area in Mår covers the reservoirs of Mårvann, Kallhovd, Gøyst, Strengen and Grotte. Combined, these reservoirs can hold about 580 million m³ of water. This is sufficient to produce about 1 TWh of electricity. The fall height from the intake to the outlet from the power station is 820 m.

The reservoirs and power stations are linked by 17.3 km of transport tunnels. The water is fed from the reservoir to a distribution basin. From this basin, the water is transported through two pipes down to the power station. These pipes are 1250 metres long and have a gradient of 40°. Between the pipes in the shaft is the world's longest wooden staircase, with over 3875 steps.

The Mår dam is one of the country's few dams constructed from natural stone.

Stegaros power station was commissioned in the autumn of 2002. This power station utilises the fall between Mårvatn and Kalhovdfjorden.

The power station has an output of 2.6 MW and a potential average annual production of about 12 GWh. The power station uses the existing 2.4 km long intake tunnel from Mårvatn.

Hakavik power station, which is situated in Buskerud, has a catchment area of 38.5 km² and an average annual infiltration of 29.7 Mm³. This is a common utilisation of the catchment areas for Øksne and Hajeren. Hajeren is transferred by tunnel to Øksnevatnet and the two areas have the same upper regulated limit. The dam in Øksnevannet is a concrete gravity dam. The maximum gross fall height is 389 metres. The power station consists of four turbines, but only two are in daily use today.

The road up to Øksnevatnet is open to all traffic.

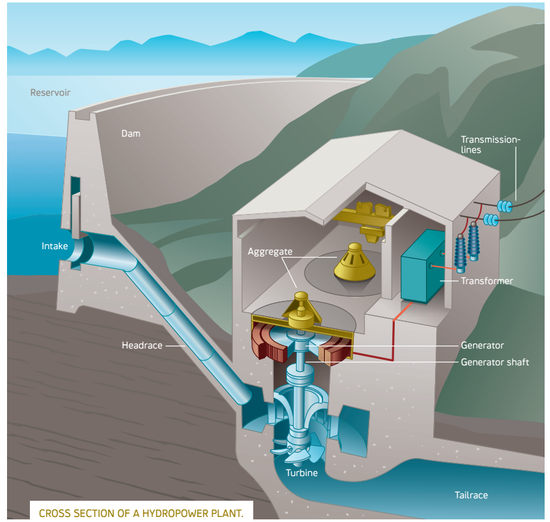
Power production at Mår and Hakavik is remotely controlled from the control centre at Dalen. In the future, Stegaros will also be remotely controlled from the control centre at Dalen.

THIS IS HOW ELECTRICITY IS PRODUCED:

The water is collected in dams up in the mountains. It is then released through tunnels and shafts heading down towards the power station and the turbines. The water drives the turbine which spins the generator mounted on the same shaft.

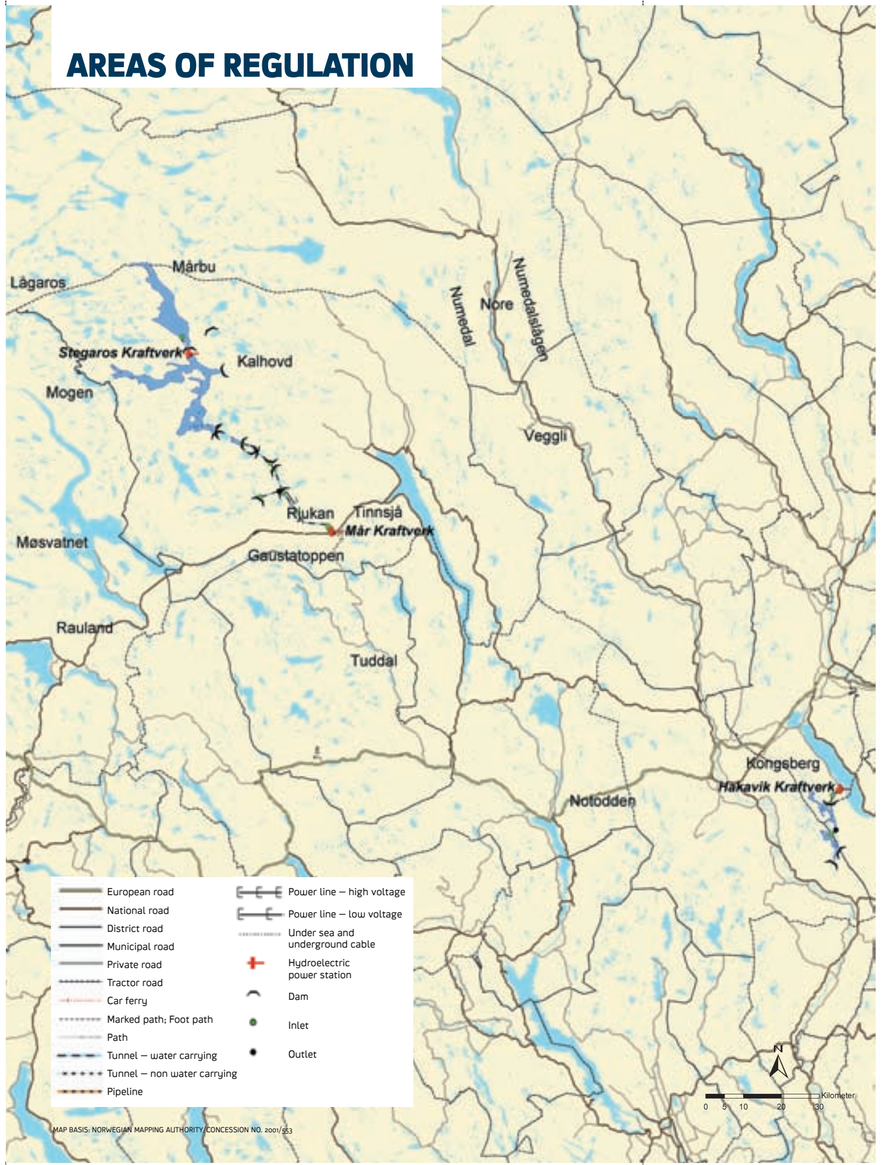
In the generator the mechanical energy is converted to electrical energy. The voltage in the generators in Mår power station are 6.3 and 14 kV (kilovolt).

To reduce losses during transport from the power station to the consumer centres, the voltage is transformed up to 132 and 300 kV. Then the power is carried out to the national grid. Before the electricity arrives at your socket, the voltage is once again reduced to a level which suits the stove, washing machine and freezer.

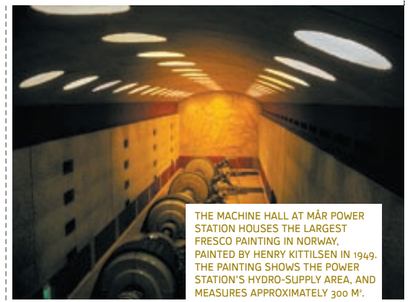


CROSS SECTION OF A HYDROPOWER PLANT.

AREAS OF REGULATION



MAP BASIS: NORWEGIAN MAPPING AUTHORITY CONCESSION NO. 2001/953



THE MACHINE HALL AT MÅR POWER STATION HOUSES THE LARGEST FRESCO PAINTING IN NORWAY, PAINTED BY HENRY KITTILSEN IN 1949. THE PAINTING SHOWS THE POWER STATION'S HYDRO-SUPPLY AREA, AND MEASURES APPROXIMATELY 300 M².

NATURE AND THE ENVIRONMENT

Recent power development schemes take into account environmental and landscaping requirements at a much earlier stage in planning than was the case for developments in previous years. Through a considerable effort in research and development, we also continuously implement measures during and after development to ensure that nature and the environment will be disturbed and affected to the least possible degree.

In order to improve conditions for fish in regulated watercourses, we try various measures. In some cases these are combined with the setting out of fry and juvenile fish.

The construction of thresholds, planting and seeding are also done on a large scale. Wherever there is a need, tidying up after previous developments is done.

THE CONSTRUCTION OF SILLS IN THE RIVER PROVIDES A WATER SURFACE WHICH IS OF VALUE TO BOTH PEOPLE AND LIFE IN THE WATER.