Norway electricity generation

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In the beginning of 2023, the power supply in Norway had a total installed production capacity of 39 703 MW. In a normal year, the Norwegian power plants produce about 156 TWh. In 2021, Norway set a new production record with a total power production of 157.1 TWh. In 2022, there was low levels of water inflow to the reservoirs, and the total power production was 146.1 TWh.

Hydropower accounts for most of the Norwegian power supply, and the resource base for production depends on the precipitation in a given year. This is a significant difference compared to the rest of Europe where security of supply is mainly secured through thermal power plants, with fuels available in the energy markets.

A special feature of the Norwegian hydropower system is its high storage capacity. Norway has half of Europe"s reservoir storage capacity, and more than 75 % of Norwegian production capacity is flexible. Production can be rapidly increased and decreased as needed, at low cost. This is important because there must be a balance between production and consumption at all times in the power system. The growing share of intermittent production technologies, such as wind and solar, makes it even more vital that there is flexibility available in the rest of the system.

The power market in Norway was deregulated in 1991, when few countries had market-based power systems. The market is now a fundamental element of the Norwegian power supply. Electricity prices provide long-term investment signals and play an important part in short-term balancing of supply, demand and transmission.

Renewable power plants are generally located where there is access to resources. Production capacity is therefore unequally distributed between different regions of Norway. A well-developed power grid is vital for transmitting electricity to consumers in all parts of the country.

The Norwegian power system is closely integrated with the other Nordic systems, both in physical terms and through market integration. In turn, the Nordic market is integrated with the rest of Europe through cross-border interconnectors to the Netherlands, Germany, the Baltic states and Poland. Integration with other countries" power systems, the well-developed power grid and the characteristics of hydropower production make Norway"s power supply system very flexible, reducing vulnerability to fluctuations in production between seasons and years.

Hydropower is still the mainstay of the Norwegian electricity system. At the beginning of 2023, there were 1 769 hydropower plants in Norway, with a combined installed capacity of 33 691 MW. In a normal year, the Norwegian hydropower plants produce 136.49 TWh, which is about 88% of Norway"s total power production.

Water inflow and installed capacity determine how much hydropower the Norwegian system can produce.

Inflow varies considerably during the year and from one year to another. The water inflow is highest during the spring, normally declines towards the end of summer but increases again during the autumn. Inflow is generally very low in the winter months.

Norway has more than 1240 hydropower storage reservoirs with a total capacity of 87 TWh. The 30 largest reservoirs provide about half the storage capacity. Total reservoir capacity corresponds to 70% of annual Norwegian electricity consumption. Most of the reservoirs were constructed before 1990. Upgrading and expansion of hydropower plants has made it possible to utilize the reservoirs more fully.

Electricity production capacity is generally split into two categories, flexible and intermittent. If production is flexible, power plants can adjust production to market developments. Many power plants in Norway have storage reservoirs and production can therefore be adjusted within the constraints set by the licence and the watercourse itself.

Wind and solar power are intermittent; electricity can only be generated when the energy is available. The same applies to run-of-river power plants and small-scale hydropower plants. However a number of the large run-of-river power plants in Norway lie downstream of storage hydropower plants in the same river system, and this influences their production patterns. Some small hydropower plants make use of the head of water between reservoirs.

By using storage reservoirs, flexible hydropower plants can produce electricity even in periods when there is little precipitation and inflow is low. The large available reservoir storage capacity makes it possible to even out production over years, seasons, weeks and days, within the constraints set by the licence and the watercourse itself.