



National report on the Norwegian Energy regime

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by

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Knowledge for business

Introduction

- Short history of the energy system in Norway
- Policies – overall targets and policies

Energy for heating

- Production
- Consumption
- Policies to curb consumption/Increase production

Electricity

- Production
- Consumption
- Policies to curb consumption/Increase production

Transportation fuels

- Production
- Consumption (also share of alternative fuels ((biofuels, electricity) and hybrid, others)
- Policies to curb consumption/Increase production

References

Introduction

Norway is a large hydropower producer, a significant exporter of oil and gas and how these two matters have influenced the domestic debate and policies.

The development of hydropower in Norway started in the 1880-ties with the development of small scale power plants for small industries and lighting in the private houses close to the plants. The expansion of energy-intensive industries after the second World War, combined with an increasing private demand resulted in an escalation in the building of new of hydropower plants in the years between the 1950-ties up to the 1990-ties (NVE, 2006).

The largest hydropower developments projects took place in the years between 1970 and 1985 (OED, 2008). After that one smaller hydropower plans, and refurbishing and upgrading of old power plants have taken place. This is a recurring debate wheter more of the hydropower potential in Norwegian rivers should be realised. As of 2006, 44,2 TWh of the total hydropower potential is found in preserved water ways (of a total potential of 205 TWh).

Nuclear energy has also appeared on the Norwegian energy political agenda. A Committee was established in february 2007, to “arrive at a solid knowledge base concerning opportunities and risks related to the use of thorium for long-term energy production” (OED, 2008c). The interest for thorium had its background in that Norway has quite significant resources of this element, and that it may have some advantages over uranium for energy production (OED, 2008b). Their report was handed over to the Minister in February 2008. The reports conclusion where not strong enough to either conclude or exclude the use of thorium as fuel, so there are no new plans for nuclear plants in Norway at the moment (OED, 2008c)

6 of the 7 political parties in the Norwegian Parliament (Stortinget) came in January 2008 to an agreement on climate policies, commonly known as “the Climate Settlement”. In this agreement it is stated that Norway should become carbon neutral by the latest in 2050. As a part of a global and ambitious agreement, where even other significant developed countries commit themselves to large obligations, will Norway commit to a goal of carbon neutrality in 2030 at the latest. Carbon neutrality is in these documents understood as Norway should see to emission reductions corresponding to Norwegian emissions (Stortinget, 2008).

Norway have ratified the Kyoto-protocol, and according to this Norway’s emissions should not oncrease more than 1 percent above the 1990-level. Compared to emissions in 2006, it implies reductions of around 8 percent.

Electricity

Hydro power production of electricity accounts for about 99% of the total domestic electricity production. That said, the production capacity is naturally dependent on precipitation levels which varies. This is rather striking if we look at production numbers: In 2000 the hydropower production was 143 TWh, whereas just 4 years earlier, in 1996, it was 27% lower, or 105 TWh. The yearly production of electricity in Norway is shown in Figure 1.

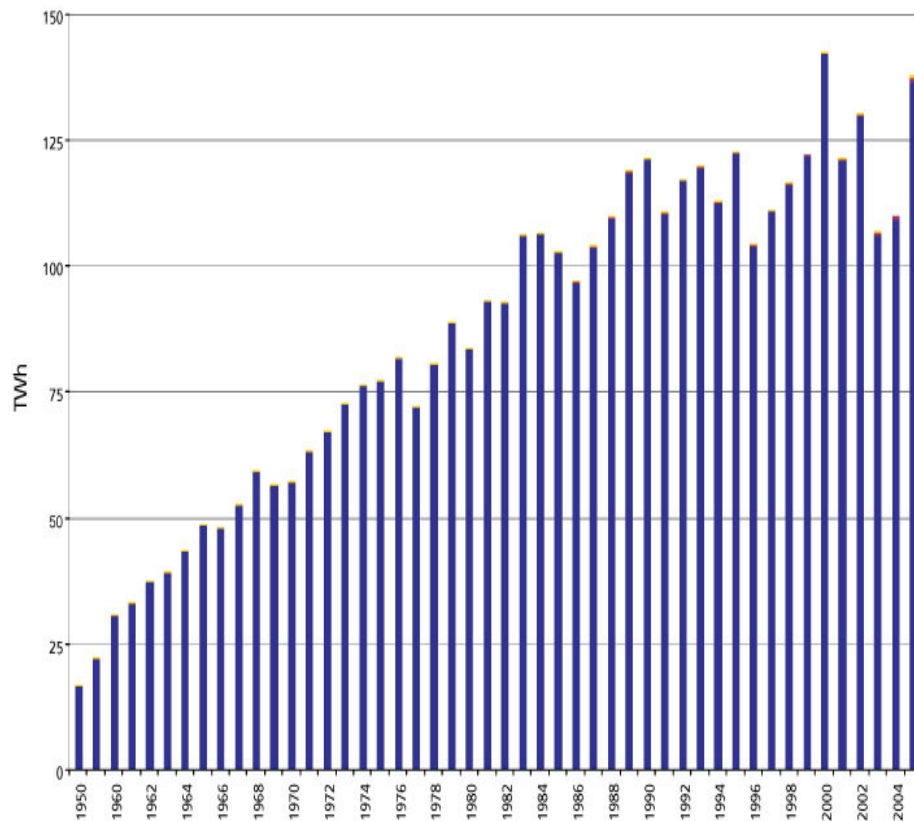


Figure 1: The yearly production of electricity in Norway. (Blue: Hydropower, red: thermal, yellow: wind). Source: www.nve.no (Norwegian Water Resource and Energy Directorate)

The Norwegian Parliament approved a new energy law in June 1990, which was implemented in January 1991. This came to represent a radical change, where the features that used to describe the Norwegian electricity sector "... as a technically intergrated natural monopoly, a public sector not-for-profit infrastructure system for the supply of basic low priced welfare good to the population, to businesses, and especially the supply of cheap input to large scale energy intensive industries. All of a sudden, it became something different" (Olsen, 2000:10-11). Some have called the resulting system a hybrid system: that a competitive market takes place within a hierachically and politically controlled system. The stability of this hybrid system may come under severe tests in the future (ibid:317).

When Finland and Sweden also deregulated their electricity markets in 1995/1996, following much of the Norwegian model, and joining the Norwegian Power Pool system, we talk of a Nordic, rather than Norwegian, model for market deregulation. This became the world's first transnational open competitive market for electricity trade (ibid). It has become rather popular, and have attracted attention from other countries, and continents, even though it is not without flaws (ibid:14).

Production, consumption and export surplus of electric energy per month. GWh

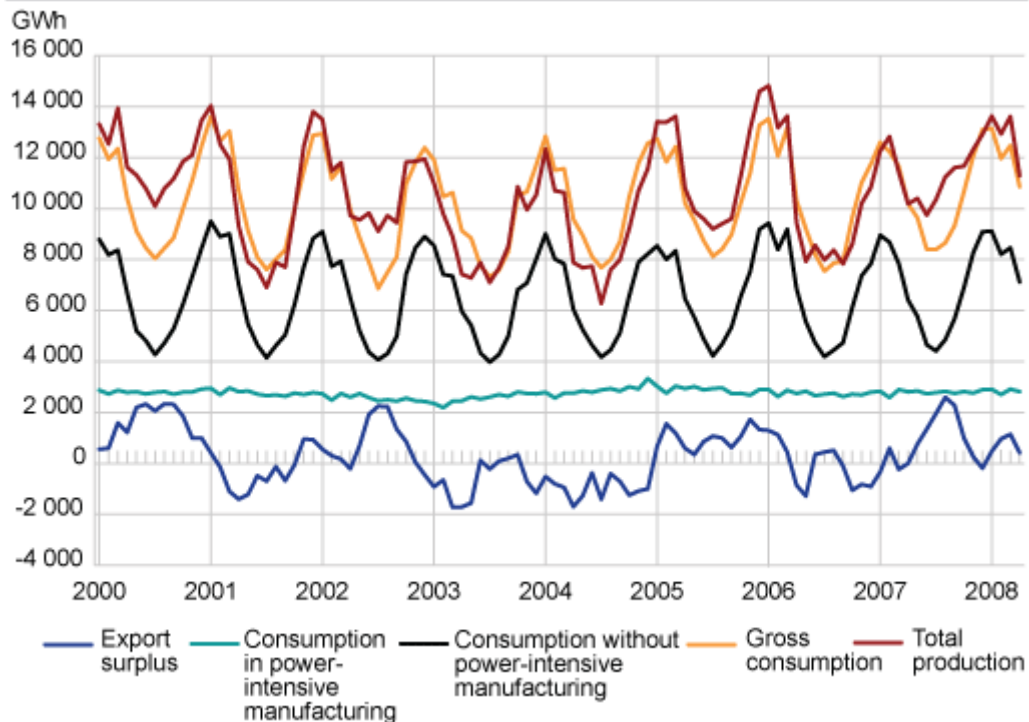


Figure 2: Production, consumption and export surplus of electric energy per month

As Norway is connected to a Nordic/European grid for imports/exports there is a discussion on whether Norwegian electricity really is clean, as some of the electricity we use is imported from other more polluted or problematic sources like coal-fired power plants in Denmark, or nuclear power from Sweden. SIFO is currently taking part in an effort to make a “National Climate emission calculator. The agreement among those who takes part in this, is that the correct emission factor for electricity in Norway is a so-called Nordic mix: 0.21 kg CO₂-equivalents per kWh (including transmission losses).

Policies to curb consumption/Increase production

One of the important policy tools regarding more effective energy use, was the establishment of Enova SF. It was officially created on June 22, 2001 and became operational on January 1, 2002. Enova SF is a public enterprise owned by the Royal Norwegian Ministry of Petroleum and Energy. The main mission of this enterprise is to contribute to environmentally sound and rational use and production of energy, through financial instruments and incentives to stimulate market actors and mechanisms to achieve national energy policy goals. Enova SF enjoys substantial freedom regarding the choices and composition of its strategic foci and policy measures. Enova SF advises the Ministry in questions relating to energy efficiency and new renewable energy.

Their activities are financed through an “Energy fund”, which mainly is financed through an add-on on the electricity distribution tariff. The Norwegian Parliament initially set up this Energy Fund and indicated grants within a framework of up to NOK 5 billion (app. 650 million Euro) over a ten-year period (Enova, 2008).

Enova’s objectives are:

- to limit energy use considerably more than if developments were allowed to continue unchecked
- to increase annual use of water-based central heating based on new renewable energy sources, heat pumps and waste heat of 4 TWh by the year 2010
- to install wind power capacity of 3 TWh by the year 2010
- increase environmentally friendly land-based use of natural gas

The enterprise is also responsible for a national information and guidance on environmental energy use and production (OED, 2006). Enova focuses its efforts on both the energy supply and the energy demand side.

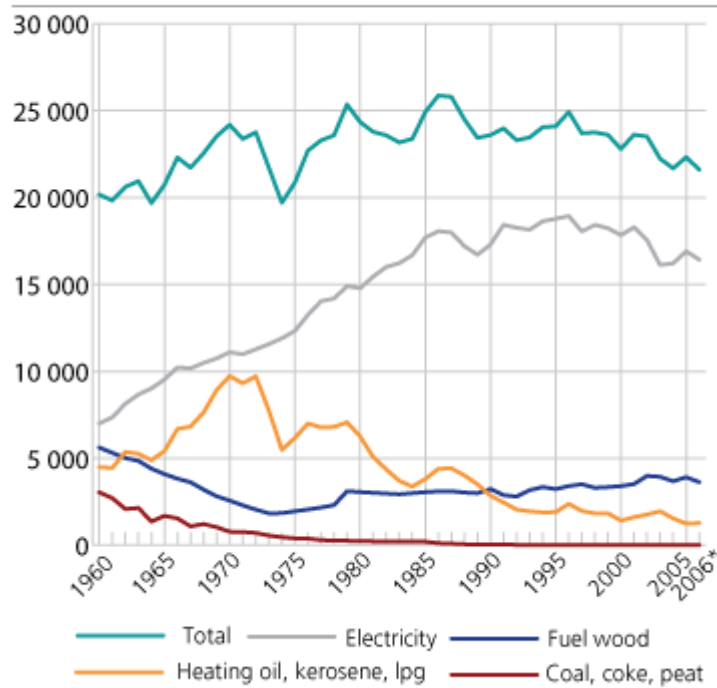
In 2007 it contributed in saving and production of renewable energies to approx. 2,4 TWh, summing up to 10,1 TWh since its establishment. Improved energy efficiency in buildings and industry accounts for approx. 50% of this (Enova 2008b).

To increase the production of electricity there is also a certain focus on so-called micro-(hydro) power stations, which are thought to amount to rather restricted environmental consequences and at the same time assures local usage of resources (OED, 1998).

Energy for heating

Electricity is widely used in Norway, even for heating. In figure 3 we can see that the electricity consumption in Norwegian households apparently are flattening out, and that the total energy consumption actually is decreasing. The reasons for this is probably more effective conversions into the desired services (heating, lighting), better insulation and an increasing awareness of energy prices.

Energy consumption on average, total and by energy bearer. 1960-2006*. kWh supply of energy per household



Source: Energy balance.

Figure 3: The yearly consumption of energy for heating in Norwegian households, kWh. Source: www.ssb.no (Statistics Norway).

Policies to curb consumption/Increase production

The schemes described for Enova SF will also apply here.

The Norwegian Government have recently adopted a strategy to achieve 14 TWh of new energy production from bio fuels within 2020 (OED 2008d).

The Norwegian government have decided to grant an extra 100 million NOK in grants to households who buy environmental friendly heating solutions like biofuel based heating and air-to-air heating pumps.

There has also been a heated debate on the possibilities to increase the production capacity. Some would claim that we rather should save energy than produce more, and this has especially been the case on the disputed decision to build gas powered power plants in Norway. Arguments for have been the reflections over that Norway have large gas reserves in the North sea, but only 1% of our energy is related to this resource. Two are under construction one at Kårstø and one connected to the LNG facilities in Hammerfest (Snøhvit). At Kårstø the Norwegian government will build a full scale Carbon capture and storage (CCS) facility. This is to catch 1 million tons of CO₂ to be transported by pipeline to safe storage in geological formations under the sea bed. Gassnova SF will have the responsibility for this work.

Transportation fuels

Diesel with up to 5 % biodiesel is available from around 200 gasoline stations in Norway. The Biodiesel is considered to be CO₂-neutral, and the authorities have therefor granted tax exemptions for this component (NP, 2008).

The average CO₂-emissions of new private cars for the full year 2007, was 159 g/km. This is a clear reduction compared to 2006, when the average was 177 g/km. For dieselpowered cars, the average was 158 g/km, down from 173 g/km in 2006. For gasoline cars the average landed on 161 g/km, down from 181 g/km in the preceding year (OFV, 2008).

In Table 1 we can see the composition of the total Norwegian car pool with regard to type of fuel (OFV, 2008b)

Table 1: Total car pool of Norway as of 31.03.2008

Gasoline	1634047
- E85	~1500
- hybrids	~3000
Diesel	534400
Gas	23
Electricity	1472
Hydrogen	15

Table 2: Sales of petroleum products for Norway, 2007. In million litre.
From www.ssb.no

	Volume	Change from previous year
Total sales	9 753	0,9
Gasoline for cars	1 950	-5,2
Autodiesel	2 955	11,5
Heating kerosene	103	-21
Light heating oils	488	-14,8
Heavy heating oils	570	-11,6

Policies to curb consumption/Increase production

The first hydrogen filling station in Norway was opened in Stavanger in August 2006. That marked the opening of the national project of making a Hydrogen Highway, also called HyNor between Stavanger and Oslo. The aim of the project is that it should be possible to drive a hydrogen powered car from Stavanger to Oslo by the end of 2009. An agreement is made with the Swedish and Danish counterparts to prolong this through Sweden and Denmark, "Scandinavian Hydrogen Highway Partnership, SHHP". (HyNor, 2008)

Fuels are heavily taxed in Norway. Currently around 60% of the prices on gasoline (50% of diesel) paid by consumers, are taxes to the authorities (30% are product price, and the remaining ~10% covers transport etc for the oil companies) (NP, 2008b).

Norway was one of the first countries to impose a tax on CO₂-emissions (for instance on domestic air travel), in 1991. For 2008, this amounts to 0,82 NOK/litre gasoline (~0,1 €/litre). This amounts to a tax with approximately 345 NOK per tonne, whereas other mineral products like diesel, jet kerosene and heating oil is taxed 200 NOK per tonne.

There is a political will from the current Government to adjust the car taxes to reward environmentally friendly cars. From the 1st of July 2007, cars that run on E85 fuel, get a tax ease of 10 000 NOK in the Vehicle Import Duty (MD, 2006)

Electrical cars and cars that run on hydrogen is exempted from this duty. They are also exempted from the annual Excise duty on motor vehicles. Electrical cars can park for free, they have free passage through tollbooths and can use the public-transport lane. There is no fuel tax on hydrogen (MD, 2006).

The Climate Road ("Klimaveien") is a campaign by organisations relating to traffic and environmental organisations initiated to reach an ambitious goal of reducing the emissions from road traffic with 10% by the end of 2009 (Klimaveien 2008). It will focus on what is achievable within the current framework. The campaign will look for effective measures to reduce emissions of CO₂ while ensuring the possibility for mobility "that our society is dependent on". All participating organisations are obliged to develop plan of actions that can contribute to reduced emissions.

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