

# Hydropower completes greening of Norway

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The Norwegian energy supply can be sustainable by 2030, according to new research. Politicians simply have to keep their promises.

Professor Kjell Bendiksen of Oslo University's Department of Physics has analysed the development potential of the Norwegian [energy system](#) to find out how it could be made more sustainable.

The international discussion is about how we can achieve a binding climate agreement that drastically cuts harmful CO2 emissions. The world needs more energy, and it must be sustainable.

"We're sitting pretty in Norway. Hydropower can give us more than enough renewable energy. In addition, we have renewable resources that we haven't called into play yet. This is a unique situation in an international context," says Professor Kjell Bendiksen of Oslo University's Department of Physics, who also heads the research department at Norway's Institute of Energy Technology

## High consumption

"We also have one of the world's highest per capita energy consumptions, however. For example, we use ten times more energy than the average Indian, points out the scientist." The challenge is to bring about a substantial cut in fossil energy consumption.

He has analysed the development potential of the Norwegian energy system to find out how it could be made more sustainable. What

resources do we have, and how have the [energy supply](#) and energy consumption changed?

Bendiksen outlines three scenarios based on different political measures, the market, and technological development. The result is published in *Det norske energisystemt mot 2030* [the Norwegian energy system towards 2030], the first in UiO Energy's report series.

## **Water rather than wind**

Professor Bendiksen has a clear message to the politicians: Our energy supply can be virtually sustainable, but effort is needed in a number of areas.

"The analysis is based on the current situation and what we can realistically foresee in the near term. We should focus on areas where we have natural advantages and long experience, in other words on hydropower rather than wind, where we have not had many success stories."

UiO Professor Kjell Bendiksen is also head of research at Norway's Institute for Energy Technology.

## **More than enough energy**

Today more than half of Norway's domestic energy consumption is supplied by renewable hydropower. No other country has as large a proportion of renewable energy. By way of comparison, the average for the EU countries is only 13 per cent, according to the EU. Bendiksen stresses that shipping, aviation and offshore energy production are not covered in the report.

The goal of the authorities is that 67.5 per cent of energy consumption should be supplied by [renewable sources](#) by 2020. Bendiksen feels that this is not very ambitious, since we have already passed the 65 per cent mark.

In the report, he describes five concrete measures to boost the production of renewable energy:

Development of micropower plants. A licence is not required to develop them, and together they could provide us with 7–10 TWh annually.

Necessary upgrading of old hydropower plants. This would result in approximately 4–5 TWh more production.

Surprisingly enough, climate change is on the side of Norwegian hydropower. More precipitation results in more water in the reservoirs and hence greater capacity for the power plants. Other studies show that this will amount to a minimum of 5 TWh annually.

Collaboration with Sweden on green certificates. The scheme, which supports the development of all types of renewable energy, is projected to provide Norway with 13 TWh annually by 2020.

Continued development and investment in bioenergy, heat pumps and solar panels. The authorities aim for 14 TWh from bioenergy production by 2020.

Even using conservative estimates, Professor Bendiksen believes that these combined measures will yield at least 40 TWh more renewable energy, in other words about 30 per cent more than we have today. At that rate, we will be producing more sustainable energy than we use by 2030.

## **Improved efficiency**

Thus we can gain access to not just more, but also cleaner energy. But what about our consumption?

In the context of sustainability, more efficient energy consumption is more important than increasing the production of renewable energy, according to Bendiksen.

"Our consumption could be reduced by from 10 to 25 per cent by 2030, depending on the means employed and population growth. The potential is greatest for buildings, given the shift towards passive solar building design, heat pumps and integrated solar panels. In due course, the latter two measures may meet a substantial part of our heating needs."

## **Contingent on action**

The use of fossil energy could also be more than halved by 2030, according to Professor Bendiksen. The potential is greatest in the transport sector, with the move towards more energy-efficient cars, as proposed in the Norwegian National Transport Plan. This applies especially to electric cars.

"Interestingly enough, it is technology and infrastructure that are placing constraints on developments in the transport sector, not the supply of renewable energy. In contrast to most other countries, Norway will have more than enough hydropower and bioenergy to phase out fossil fuel on the roads," he maintains.

## **A sustainable energy system**

The result of more investment in renewable energy and increasing the efficiency of our [energy consumption](#) is that as much as 80–90 per cent of our energy mix may be renewable in 2030.

"One prerequisite for this is that the power market functions smoothly, that political energy initiatives are actually realised and that power and quota prices increase," points out Professor Bendiksen.

He believes that political decisions so far have provided a good foundation for sustainable development, but that ambitious measures actually have to be implemented.

"And that remains to be seen. The report shows the possibilities of achieving a more [sustainable energy](#) system in terms of both production and consumption."

## **Power surplus**

But why go in for more renewable [energy](#) when we are already doing so well in an international context?

"That's a good question.. All the scenarios show that we will have a growing power surplus in the years ahead. I believe that Norway, with its rich [renewable energy resources](#) and strong economy has a special responsibility to lead the way in [renewable energy](#) and technology. It's not just about meeting our own needs," says Bendiksen.

He feels very definitely that whatever we can do something about, we should do something about.

"Particularly when it costs us relatively little and will yield such high returns with time."

Provided by University of Oslo

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