

Hydropower in Europe

The role of hydropower in the energy transition phase



Study design

Hydropower is currently Europe's largest renewable energy source with a market share of approx. 35 percent. On behalf of Voith Hydro, the research agency TNS Emnid conducted a survey among energy experts on the significance of hydropower technology for the European energy transition.

The study is based on a qualitative telephone survey of energy experts in Germany, Austria, Switzerland, Sweden and Norway.

Overview

International expert survey on hydropower

Institute	TSN Emnid Political and social research agency			
Method	Telephone interviews (CATI ad hoc)			
Target group	Experts working in		· Representatives of energy policy, regulatory authorities, energy and infrastructure planners	
	· trade associations			
	· environmental associations			
	· journalists			
	· suppliers			
Spot tests	Germany	n = 200	Norway	n = 100
	Austria	n = 100	Sweden	n = 100
	Switzerland	n = 100		
Inquiry period	May, 14 until July 11, 2014			



TNS Emnid

Note: As the proportional values shown have been rounded to whole figures, it can happen that they do not add up to 100%. For the same reason the so-called "Top Two values" (obtained by adding summarized categories such as "very satisfied" + "fairly satisfied") also differ from the sum of the individual categories shown. In case of several possible answer options to a question, the total sum of answers might exceed 100%.

Content: the results of the survey can be summarised as follows

- 01 Without hydropower the European energy transition cannot succeed
- 02 The potential of hydropower is far from exhausted

Editorial



Dear Readers,

Voith has been an energy supplier for almost 150 years and as a leading player on the global market is working to increase the volume of electricity generated from hydropower. As part of the transition from traditional fuels to more renewable forms of energy (known as the Energiewende in Germany), there has been increasing focus in Europe over the last few years on climate-neutral energy production, system adequacy and grid stability as well as energy costs. Hydropower is particularly significant in this context, as it is the only source of renewable energy that provides power efficiently, reliably and with low environmental impact, but that is also able to store this energy on a flexible basis.

Against the background of the current energy policy discussion, our aim was to find out how Europe's opinion leaders view hydropower – how do they see its image, what differences are there between countries, and what role is being assigned to hydropower in the future energy mix. Accordingly, we tasked the opinion research institute Emnid with investigating attitudes to hydropower in selected European countries.

Emnid has questioned 600 European energy experts, who view the energy transition and hydropower from very different perspectives. We have collated the results of the investigation in this brochure. Our conclusion: without hydropower there can be no energy transition in Europe that makes sense environmentally and economically. The prerequisites, however, are a corresponding political will, the support of the people, cross-border cooperation and long-term planning. We will incorporate the findings of the study into our discussions on the future of European energy infrastructure.

Make up your own mind – I hope you enjoy reading this brochure.

Yours,

A handwritten signature in blue ink that reads "Roland Münch". The signature is written in a cursive, flowing style.

Dr. Roland Münch

Member of the Voith Corporate Board of Management, CEO Voith Hydro

01

Without hydropower
the European energy transition
cannot succeed





The dam of the Limberg pumped-storage power station in Austria

The listed Eglisau power station on the German-Swiss border has been extensively modernized over the last few years

Hydropower and energy transition

In Austria, Switzerland and Norway, hydropower plays a key role in the national energy discourse. In Germany, by contrast, experts have accorded little importance to this energy source, despite its widespread popular acceptance.

In contrast to wind and solar power, hydropower is the only renewable energy source that can provide a stable and base load electricity supply. Hydropower also enjoys widespread popular support as an efficient source of energy for consumers and industry.

The results of TNS Emnid's expert survey put hydropower in a new perspective and demonstrate its significance in the context of the energy transition in Europe.

Experts value hydropower as a reliable and stable source of energy

Proportion of participating experts who agree with this statement



Experts also confirm the high energy efficiency, high profitability and high durability of hydropower facilities

Proportion of participating experts who agree with this statement





Despite the varying assessments of hydropower in the respective countries, experts agree that the potential of hydropower is far from exploited – especially in Germany.

In Germany, hydropower accounts for just 3.5 percent of the national energy supply. However, its low carbon dioxide emissions and storage capabilities make hydropower a valuable resource in achieving climate targets. For example: Pumped storage plants can store renewable energy from wind and solar sources.

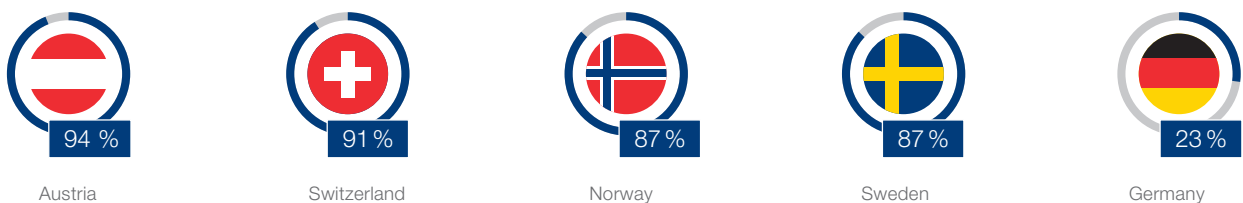
Hydropower has low CO₂-emissions

Proportion of participating experts who agree with this statement



Hydropower makes a “big to very big” contribution to achieving climate targets

Proportion of experts who agree with this statement in



Why does Europe need energy storage?



“To achieve the European energy transition, we need stronger coordination at European level. A European energy union would improve our ability to harness various geographical advantages. Pumped storage plants could turn Germany, Austria and Switzerland into a battery for Europe.”

Heike Bergmann
Board of Management, Voith Hydro Germany

Increasing dependence on intermittent energy sources like wind and sun is causing greater fluctuations in the energy grid. Sometimes too much and sometimes too little power is fed into the grid. To keep the grid stable, Europe needs reliable and flexible energy supplies, as well as powerful storage facilities. The operation of thermal power plants, such as gas-fired power plants, can then be reduced. Capacity overloads from wind and solar power can only be regulated by inefficient curtailment or storage.

Pumped storage plants can balance out power shortages. In case of higher demand, the plants can feed electricity into the grid within seconds. On the other hand surplus energy is stored, enabling wind and photovoltaic plants to continue operation. Renewable capacities can thus be used to full potential. Errors in forecast of wind and solar energy production are easily compensated. Further benefits of pumped storage plants include lower costs per kilowatt hour and a lower impact on the environment.

Hydropower provides excellent storage capabilities

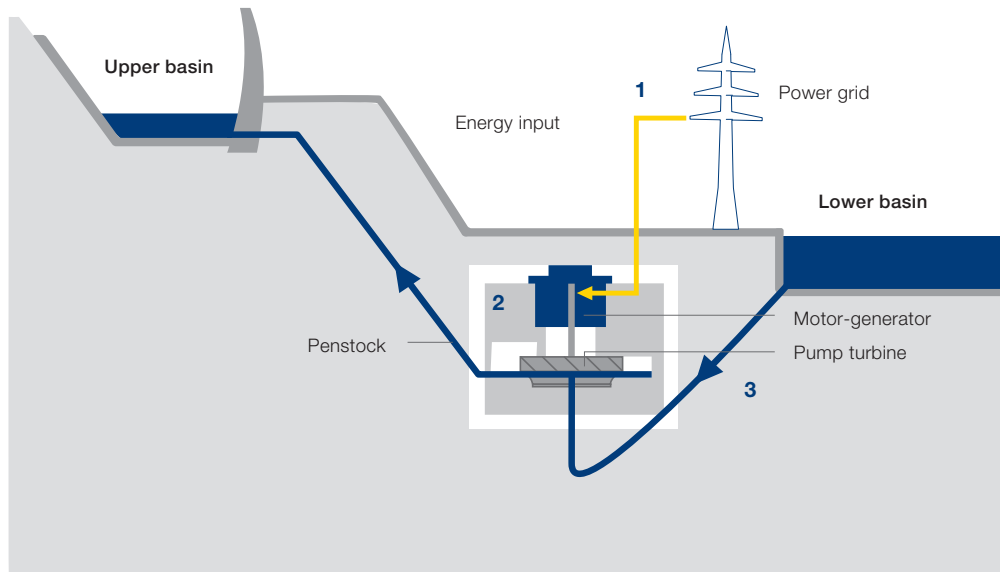
Proportion of participating experts who agree with this statement



How does a pumped storage plant work?

If strong wind and lots of sun threaten to overload the grid, the plant switches into pumping mode: electrical motors drive pumps that push water from a basin into a higher reservoir. As soon as energy demand increases, the water in the upper reservoir is let down again into the lower reservoir. The water runs through turbines, which drive generators, and within seconds, electricity is fed into the grid. Pumped storage plants can also blackstart and provide power to grids affected by a blackout or requiring stabilization. Hydropower is the only generating technology that can do this.

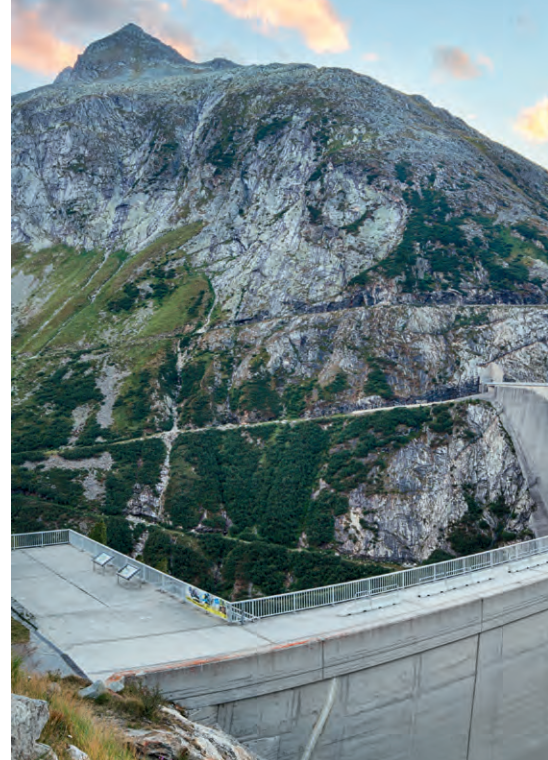
The experts participating in the survey agree that pumped storage plants provide excellent short-term storage and can be used several times a day. Pumped storage facilities are flexible and multi-functional: They can store excess solar power and make it available at a later time – Power from sunshine at noon can be stored and fed into the grid in the evening. By curtailing renewable sources and preventing a grid overload, pumped storage plants support the overall power system and contribute to grid stability and safety of supply. Hydropower is therefore the ideal facilitator for a future-oriented energy mix in Europe.



Storage of electricity - pump operation

1. Power is taken from the power grid to run the electric motor.
2. The electric motor drives the pump turbine.
3. The water from the lower basin is pumped into the upper basin.

The Reisseck pumped-storage power station in southern Austria



Safe, clean, tried and trusted

Hydropower is the largest and most cost-effective source of renewable energy in the world.

Popular support is the cornerstone of a successful transition to a renewable energy supply. However, rising electricity prices and exceptions for some branches of industry have generated scepticism towards the energy transition among the population of the countries participating in the survey. Hydropower is the exception: Experts believe that this source of energy is still the leading choice, and is seen as a safe, clean and proven technology.

Experts assess hydropower's reputation in the population as "good to very good"

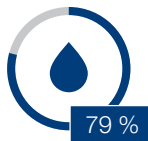
Proportion of experts who agree with this statement in



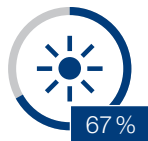


Hydropower has the best reputation among renewable energy sources

Proportion of participating experts who agree with this statement



Hydropower



Photovoltaics



Wind power



Bio mass

Hydropower provides a better balance between environmental impact and the amount of energy produced than other renewable energy sources

Proportion of participating experts who agree with this statement





Limberg dam in Austria

02

The potential of hydropower
is far from being exhausted





The Kops II power station
commissioned in 2008

Available potentials for hydropower

Hydropower is not only the most popular renewable energy source; it is also the oldest, most widespread and reliable form of renewable energy generation. Hydropower plants have been supplying the population with low-carbon electricity since the end of the 19th century.



Technological developments, innovations and modernisation can boost the efficiency of existing systems and ensure compliance with the latest ecological standards. For example: Fish can be directed past generating stations via lock flows and fish ladders; state-of-the-art turbine blades improve water quality and ensure minimal risk of injury for fish that still find their way into the turbines, and oil-free hubs help protect the environment.

Germany has around 50,000 retaining dams or weirs, of which only 7,000 are fitted with hydropower systems. With the aid of compact turbines, existing dams and weirs could be used for power generation. Modernising existing hydropower plants would also significantly improve their performance.

Above: The runner of a pump turbine before installation

Bottom: For existing weirs with low heads: the Voith StreamDiver



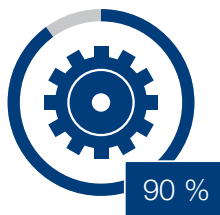
Practical example: Rheinfelden

The modernisation of the Rheinfelden power plant shows how various innovations enable hydropower to be used with greater efficiency and cause less impact on the environment. The capacity of the power plant more than tripled, increasing from 185 to 600 million kilowatt hours per year. Numerous compensatory measures have also improved the local eco-system. A

waterway of around 900 metres of near-natural environment has turned the former power station channel into a valuable habitat for numerous fish and plant species. A total of 64 compensatory measures have been implemented, including preservation of the Rhine's characteristic rapids and the construction of a fish pass and spawning site.

Modernising and expanding existing systems should have priority while promoting hydropower

Proportion of participating experts who agree with this statement



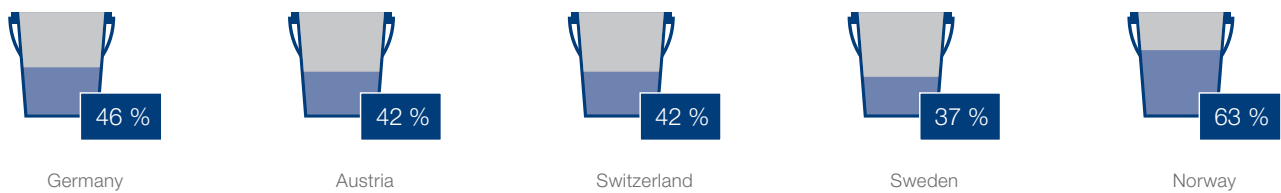
Fitting of a turbine for the run-of-river power station, Rheinfelden



The Rheinfelden run-of-river power station. The new power plant was built from 2003 to 2010

There is a lot of untapped potential for hydropower in the study countries

Proportion of experts who agree with this statement in

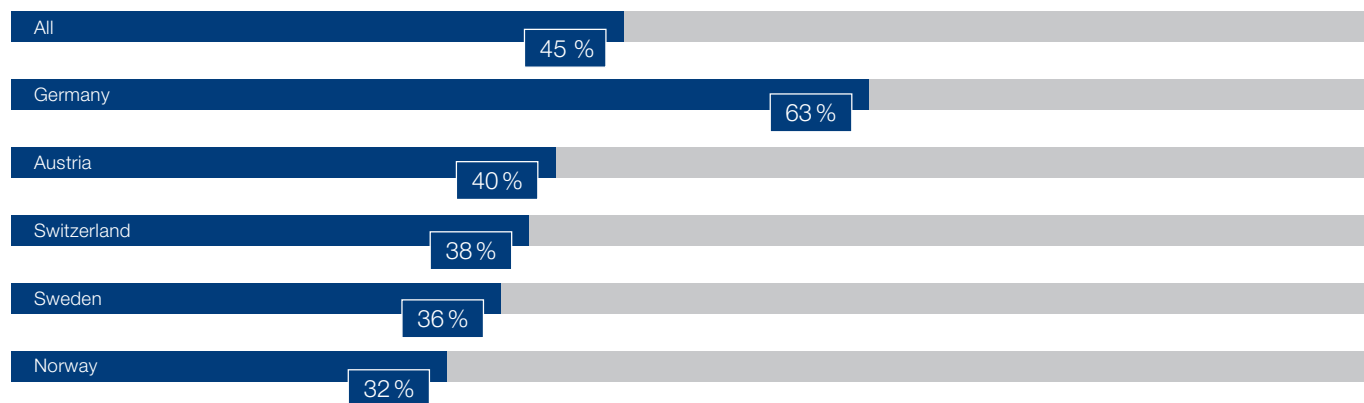


Lack of political will

Energy policies determine the sources of energy used and shape the future of our energy supply. 45 percent of experts participating in the survey believe that hydropower lacks political support. In Germany, 63 percent of the experts consulted see a deficit in this area. Given the growing need for ecologically sound and economically efficient solutions for the energy transition, there is a considerable need for action here.

Hydropower does not receive enough political support

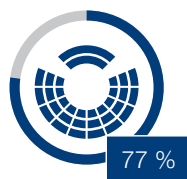
Proportion of experts who agree with this statement



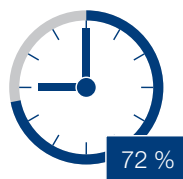
Why is this potential not exploited despite the obvious benefits?

TNS Enid asked European experts to identify the obstacles preventing a greater focus on hydropower

Proportion of experts who agree with this statement



Political will



Planning and approval times



The small power station at Brunnenfeld supplies energy to 360 homes

The importance of hydropower for Europe's future energy supply is undisputed amongst energy experts, who all emphasize its enormous potential. However, experts also underline the need to use associated opportunities to ensure a sustainable and efficient transition to renewables in Europe.

In the interests of the environment, consumers and industry, it is high time to take political steps, to cut time-consuming bureaucracy and effectively promote the use of hydropower. Germany can learn a thing or two from its European neighbours here. If the energy transition is to be a success in Europe, the government must stop treating hydropower as a poor relation.

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