Renewable Energy:
Hydro Electric Power Plants

Factsheet 03

Facts and Figures

Using the Energy of Water

Water plays a major role in energy production. The heat from water is used in heat pump technology, hot thermal water in geothermal energy to heat greenhouses. The use of the flow energy of seawater is being intensively researched for future energy production. The element hydrogen will be an energy carrier of the future. This factsheet is about the traditional use of hydropower, the flow energy of water in rivers and the potential energy of stored water in dams and mountain lakes.

The power of water is one of the oldest sources of energy. At the end of the 18th century, there were more than 500,000 mechanically operated watermills in Europe. With the invention of the generator (1867, Werner v. Siemens), the mechanical energy of waterwheels could be converted into electrical energy (as with the bicycle dynamo in the past). Currently, 9 of the 10 largest power plants in the world are hydroelectric power plants. In Latin America, hydropower has a share of 66% (globally: 15%, Europe: 24,1%).

General mode of operation

The general mode of operation is the same for all hydroelectric power plants: the water is fed via pipes or canals to turbines that convert the flow energy into rotational energy. The rotational energy is converted into electricity by generators, and converters adapt the direct current to AC current, which is then fed into the power grid.

Run-of-river power plants use the flow energy of the water in rivers. A weir is built so that a gradient is created in addition to the flow.

Storage power plants work with a steep gradient and large quantities of water. The potential energy of the water is converted into flow energy when the water is fed into turbines.

Pumped-storage power plants are typical for mountainous regions and use the natural gradient. Water rushes down from a mountain lake in pipes and drives turbines, which generate electricity. The water is then pumped up again.

Attention

The use of hydropower has strong ecological effects. Especially the construction and use of reservoirs and barrages can lead to conflicts because of the enormous consumption of landscape and the necessary flood plains. Knowing about and weighing up the advantages and disadvantages is therefore of particular importance.

Professions & Competence Profiles

For the operation of hydropower plants

- industrial mechanics,
- electricians/electronics technicians, mechatronics technicians,
- technical draughtsmen and also industrial and office clerks

are constantly needed in the field of hydropower.

In the academic field, you can go for a Bachelor's degree in "Mechanical Engineering with specialisation in hydropower, solar technology, energy from biomass".

A Glimpse into the Near Future

Climate change with a lack of rainfall and increasing drought will limit the use of hydropower from storage power plants in the affected countries of Europe in the future.

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3 Country Check on Hydro Electric Power Plants

Spain

Spain has long history of using hydropower. In 2021, the share of hydropower was 14.3% (Europe: 24,1%). But the share is steadily decreasing as other renewable energy sources are increasingly used.
2022 it said: The tendency for hydropower plants on the Iberian Peninsula to be less productive will probably continue over the next few months, according to the Ministry of the Environment. The reason is the continuing drought. The water reserves of the power plants were 42.6% full in April; that is 18.4% less than in the same month last year.

Greece

In 2019, total energy consumption was 23.51 billion kWh, of which hydropower accounted for 14%. Hydropower plays a minor role, Greece is a water-scarce country. There are mainly smaller reservoirs. Repowering older plants would be one way to increase the use of hydropower.

Slovakia

In 2019, 26.64 billion kWh were consumed, 95% of the demand was self-generated. Hydropower accounted for 24%.
Slovakia has good potential for the expansion of hydropower, with the Gabcikovo run-of-river power plant alone covering 11% of the national electricity demand. But the high share of nuclear power hinders the expansion of alternative energies.

Remember

The production of renewable energy also involves the consumption of resources, interference with nature and environmental pollution. Save energy where possible.

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Supported by:

Federal Ministry for Economic Affairs and Climate Action

European Climate Initiative EUKI

on the basis of a decision by the German Bundestag

This project is part of the European Climate Initiative (EUKI) of the German Federal Ministry for Economic Affairs and Climate Action (BMWK).'