THE NATURSTROMSPEICHER

Using water to store energy
YOUR WIND FARM CAN DO MORE THAN YOU THINK ...

... WHY NOT MAKE IT A VERSATILE ENERGY STORAGE PLANT?

With our Naturstromspeicher, our natural energy storage plant, you can turn your wind farm into a highly versatile power plant and make your portfolio fit for the future energy market.

The Naturstromspeicher is the combination of a wind farm with a pumped storage hydro-electric power plant. It utilises the towers and bases of wind turbines as water reservoirs.

In terms both of building construction and machinery, the Naturstromspeicher uses standardised technology throughout. That means we can achieve competitive costs for investment and long-term operation of the installations.

Fit for the future ENERGY market
THE NATURSTROMSPEICHER

THIS IS HOW IT WORKS:

Your power plant which stores, regulates and delivers in case of shortages.

The wind farm towers are prefabricated and fully standardised modular system. The tower heights can be increased by additional 40 metres. The wind turbines are used in the power class of 3.4 megawatts. What is known as the active reservoir is located in the bottom part of the turbine tower. It stands in what we call the passive reservoir, an external reservoir that holds the majority of the water volume.

The pumped storage hydro-electric plant is available in three output classes. They will have certified type approval and are designed for height differences of 150 – 350 metres between the lower reservoir and the upper reservoirs. The power station is fully electronically controlled.

Even the power house is a standardised, modular design.

The near-natural design of the lower reservoir means it integrates harmoniously into the landscape. There are often suitable areas in valley locations that can be developed into lower reservoirs. The upper and lower reservoirs are connected by the penstock.

The innovative feature of our pipe design is something only the engineers get to see: it is made of polyethylene (PE). We have developed a special pipe-laying method that enables quick and easy construction.

We concentrate on economy, efficiency and ecology.

Ecology
We adopt a sensitive and responsible approach to handling the environmental circumstances of each individual site. We have a team of experts for the job. They include geologists, biologists, geo-ecologists and noise abatement experts.

The lower reservoir can also be equipped with a Naturwärmespeicher, a natural heat storage plant. Your power plant can then also supply high-efficiency heat to entire urban districts. We call our combination of solutions for heat and power storage Naturversorgung, natural energy supply.

Using water to store energy

THE BIG GREEN BATTERY
IMAGINE IF SUPPLY FLUCTUATIONS FROM RENEWABLES COULD BE MADE IMPERCEPTIBLE IN FUTURE

Up to now we have needed combustible-fuel fired power stations to balance out the fluctuations in the power supply from renewable energy sources. In the future, a large part of that job will be taken over by special adaptive power stations such as the Naturstromspeicher. Versatile power stations will become the second pillar of the energy revolution. And they offer three advantages in one: They avoid the high cost of shutdown for renewable energies and maintain grid stability. At the same time, their use improves capacity utilisation and, therefore, the economics of the combustible-fuel fired reserve capacity.

THE NATURSTROMSPEICHER COMPLEMENTS YOUR PORTFOLIO ECONOMICALLY. ECOLOGICALLY. SUSTAINABLY.

> The reservoir base makes the wind turbines higher. As a result you can increase your power generation from wind energy by as much as 25 percent.
> You can offer balancing power for fast-response grid stabilisation.
> Your plant will always be in demand on the 15-minute reserve market.
> Often it is possible to balance your own portfolio at the same time.
> You can temporarily store grid surpluses within seconds; according to plant type with outputs of 16, 24 or 32 MW and a reservoir capacity of up to 150 MWh.

VERSATILE PUMPED STORAGE PLANTS ARE USED ALMOST ROUND THE CLOCK FOR THE VARIOUS PURPOSES.

> With the Naturstromspeicher in your portfolio, you have valuable reserve capacity available in times of short supply.
> The system operates at defined costs.
> As well as an uncomplicated approval procedure, the concept provides for manageable fixed costs instead of difficult and drawn-out individual project work.
> Our pumped storage reservoirs integrate harmoniously into the landscape without major disruption. That means it can be easily implemented in a large number of locations.

FLEXIBILITY
VERSATILE
FAST-RESPONSE GRID STABILISATION

With pumped storage

With pumped storage

Wind Energy/Photovoltaic

Flexibility

Combustible-fuel fired power station

With pumped storage

Storage of renewable energy: Less output limiting required

Flexibility

Release of stored RE

Wind Energy/Photovoltaic

Combustible-fuel fired power station

Storage of renewable energy: Less output limiting required

Release of stored RE

Imagined if supply fluctuations from renewables could be made imperceptible in future.

Economically, ecologically, sustainably.

The reservoir base makes the wind turbines higher. As a result you can increase your power generation from wind energy by as much as 25 percent.

You can offer balancing power for fast-response grid stabilisation.

Your plant will always be in demand on the 15-minute reserve market.

Often it is possible to balance your own portfolio at the same time.

You can temporarily store grid surpluses within seconds; according to plant type with outputs of 16, 24 or 32 MW and a reservoir capacity of up to 150 MWh.

Versatile pumped storage plants are used almost round the clock for the various purposes.

Flexibility

Versatile

Fast-response grid stabilisation
THE NATURSTROMSPEICHER IN GAILDORF

The pilot project delivers flexibility to the rural district of Schwäbisch-Hall in Baden-Württemberg as part of the ongoing energy revolution.

The first Naturstromspeicher is under construction in Gaildorf in the Swabian-Franconian Forest on the Limpurger Berge uplands. In the valley, about 200 metres below, runs the river Kocher. The people of Gaildorf are closely involved in the development of “their” power plant.

In the forest above the town of around 12,000 inhabitants, four wind turbines are being erected. Their turbine hubs will be positioned at the same geodetic height as one another. At those altitudes, there are moderate prevailing wind speeds so that each turbine can be expected to produce more than 10 GWh of electricity a year. Initially, the Naturstromspeicher will be operated mostly in control-power mode.

Convincing qualities of our Naturstromspeicher secure € 7.15 m grant from BMUB

The project is funded with a € 7.15 m grant from the Environmental Innovation Programme by the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety.

FACTS AND FIGURES

Wind turbine capacity: 4 x 3.4 MW
Rotor diameter: 137 m
Annual electricity generation from wind power: 42 GWh
Turbine hub height above ground: 155 – 157 m
Pumped storage plant capacity: 16 MW

Electrical storage capacity: 70 MWh
Head: 200 m
Water volume: 160,000 m³
Active reservoir: 31 m
Passive reservoir: 8 – 13 m

„The financial support from the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety marks a highly significant milestone in the implementation of this innovative project. I am convinced and hope sincerely that the Gaildorf Naturstromspeicher can make an important contribution to the success of the energy reforms."
Annette Sawade (SPD), Chair of the Community Matters Subcommittee, member of the Transport and Digital Infrastructure Committee, member of the Petitions Committee

„A large part of the wind turbine installations and the penstock is sited on land owned by the Graf Pückler Foundation. As a Church foundation with a large forest estate, we see no contradiction in the responsible management of God’s creation. Quite the opposite. That is why we are putting our faith in renewable energy for our electricity needs."
Matthias Rebel, Managing Director of the Graf Pückler Foundation

„I am convinced of the project Naturstromspeicher for Gaildorf. Focusing on innovative technology we now spearhead the energy transition."
Frank Zimmermann, Mayor of Gaildorf
The Max Bögl Group based in Neumarkt/Oberpfalz is one of the 10 biggest companies in the German building industry. Established in 1929 in Neumarkt, Max Bögl is still a family-run business now in its third generation and produces an annual turnover of over €1.6bn with a world-wide workforce of around 6,000 people.

The main product of the Wind Energy Division is the hybrid tower “System Max Bögl” made of prefabricated concrete parts and steel sections. It consists of prefabricated half-ring sections that substantially simplify the construction of the turbine tower. The prefabricated sections are produced at two of the company’s own factories and meet the strictest standards of quality and accuracy. This proprietary design makes renewable energies more efficient and more attractive to the midland market.

Over the decades, Max Bögl has become an internationally operating technology and service provider. Today, the group’s operations extend across all aspects and complexities of contemporary construction – from buildings and transport routes through civil engineering and tunnel construction to structural steelwork and plant installation, prefabricated construction, and supply and disposal services. Many of those disciplines are also important in the construction of the Naturstromspeicher. All activities in the fields of civil engineering and infrastructure will be executed by the Max Bögl Group itself. Interfaces between the individual trades are reduced to a minimum.

The Max Bögl Group is a Max Bögl Group company.