

Media Release

Voith GmbH
Center of Competence Corporate and
Market Communication EMEA
St. Poeltener Strasse 43
89522 Heidenheim, Germany
Tel. +49 7321 37-2060
Fax +49 7321 37-7107

www.voith.com

Page 1 of 5

2017-07-26

A milestone for hydropower: Successful startup of Frades II, the largest variable speed pumped storage plant in Europe

- **Voith supplies innovative pumped storage technology for Portuguese power plant**
- **Significant contribution to grid stabilization and further expansion of electricity generation from renewable energy**
- **Variable speed pump storage units are regarded as the prototype for the future worldwide**

Vieira do Minho, Portugal: With its increasing use of solar and wind power, Portugal has for many years been focusing on the flexible and dynamic potential of pumped storage to stabilize electricity grids.

In the north-west of the country, the new pumped storage plant Frades II has been in operation since April 2017. Technology Group Voith supplied the plant with two variable speed pump turbines each with a rated output of 390 MW, two asynchronous motor-generators with a rated output of 440 MVA each, the frequency converter and control systems as well as the hydraulic steel components. The generator sets are the largest and most powerful of their kind in Europe. The plant operator is the Portuguese utility company Energias de Portugal (EDP).

Innovative pumped storage technology using variable speed turbines

"The key element of the plant is a special asynchronous motor-generator – the doubly fed asynchronous generator," explains Thomas König, who is responsible for Electrical Balance of Plant at Voith Hydro in Heidenheim, Germany. Unlike a conventional asynchronous generator, with a rotational speed firmly locked to the line frequency of 50 Hz, in the new doubly fed asynchronous generators the mechanical speed is not tied to line frequency and so can vary.



The new system offers two advantages: On the one hand, the plant can respond faster and more flexibly to the active and reactive demand from the power grid. On the other, it offers additional stability in the event of a drop in voltage, reduces the likelihood of a power failure and enables a fast restart if a power outage does occur. "If the grid voltage drops to 5% of its normal value, the Frades II power plant can remain stable for 600 milliseconds, that is four times longer than conventional turbines with fixed speeds. In emergency situations this time difference can be crucial when there is a need to prevent a large-scale power outage," says Thomas König.

Voith GmbH
Center of Competence Corporate and
Market Communication EMEA
St. Poeltener Strasse 43
89522 Heidenheim, Germany
Tel. +49 7321 37-2060
Fax +49 7321 37-7107

www.voith.com

Page 2 of 5

Innovation as benchmark

The new Frades II pumped storage power plant called for innovative thinking of Voith's engineers in a large number of areas. For example, the rotor of the motor-generator had to be completely redesigned in order to cope with the high centrifugal forces, the much higher current and the voltage from the frequency converter. The converter for the excitation is larger, heavier and 25 times more powerful than in a comparable synchronous unit and therefore also requires a new electrical protection system.

EDP reaps the benefits of these innovations, as Lars Meier, Head of Technical Sales and Tender Management at Voith Hydro in Heidenheim, explains: "The motor-generator technology with variable speed at Frades II increases the total number of operating hours for the plant. More operating hours and higher availability generate more revenue and ultimately more benefit. This is one of the reasons why comparable power plants can very quickly write off the necessary investments. Another fantastic spin-off of the technology is the increased operational efficiency overall."

Prototype plant for other projects worldwide

The Frades II pumped storage power plant makes a significant contribution to stabilizing the grid and to the ongoing expansion of power generation from renewable energy in Portugal. Following the successful startup, the biggest variable speed pumped storage plant in Europe is considered the flagship project for further plants worldwide.



Background information to Frades II pumped storage power plant

The pumped storage power plant is located in the north-west of Portugal and is installed in an underground cavern. It is not designed as a stand-alone facility but represents an important addition to the eight plant Cávado-Rabagão-Homem cascade system. The difference in height between upper and lower basins is 420 meters. Voith was awarded the order to equip the Frades II pumped storage power plant in the fall of 2010.

Voith GmbH
Center of Competence Corporate and
Market Communication EMEA
St. Poeltener Strasse 43
89522 Heidenheim, Germany
Tel. +49 7321 37-2060
Fax +49 7321 37-7107

www.voith.com

Page 3 of 5

Portugal focusing on renewable energies

Portugal is banking above all on wind, solar and hydropower for its electricity generation. Since the turn of the century, the country has multiplied its capacities for electricity generation from wind power. In 1998, Portugal had just over 51 MW installed capacity in wind power plants; 18 years later it was already more than 5,000 MW. Highly efficient pumped storage plants form the backbone for the further expansion of electricity generation from regenerative energy sources. Almost a third of renewable energy in Portugal comes from hydropower.

On the importance of hydropower

Hydropower is the biggest, oldest and most reliable form of renewable energy generation. Worldwide it makes an indispensable contribution to a stable power supply and thus to economic and social development – in industrialized countries and also in regions seeing strong growth. In addition, hydropower contributes significantly to climate-friendly energy generation. Since the early days of hydropower exploitation, Voith has been a leading supplier of this technology and is constantly refining and improving it.

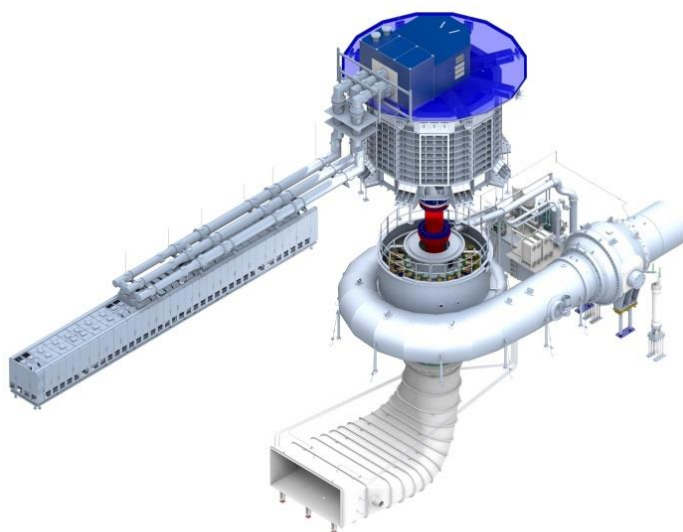
About the company

For 150 years, Voith technologies have been inspiring its customers, business partners and employees all over the world. Founded in 1867, Voith today has around 19,000 employees and earns 4.3 billion euros in sales. It has locations in more than 60 countries and is one of the largest family-owned companies in Europe. As a technology leader, Voith sets standards in the energy, oil & gas, paper, raw materials and transport & automotive markets.





Caption 1: The pumped storage power plant is located in the north-west of Portugal and is installed in an underground cavern.



Caption 2: 3D model of the generator in the Frades II pumped storage power plant.

Voith GmbH
Center of Competence Corporate and
Market Communication EMEA
St. Poeltener Strasse 43
89522 Heidenheim, Germany
Tel. +49 7321 37-2060
Fax +49 7321 37-7107
www.voith.com

Contact:

Marian Möbius

Manager Product & Corporate Communication EMEA

Key Account Voith Hydro

Tel. +49 7321 37 - 6157

Marian.Moebius@Voith.com

www.voith.com

Voith GmbH
Center of Competence Corporate and
Market Communication EMEA
St. Poeltener Strasse 43
89522 Heidenheim, Germany
Tel. +49 7321 37-2060
Fax +49 7321 37-7107

www.voith.com

Page 5 of 5

Twitter

<https://twitter.com/voithgmbh>
https://twitter.com/voith_hydro
https://twitter.com/voith_paper
https://twitter.com/voith_turbo
https://twitter.com/Voith_DS
https://twitter.com/Voith_Career

Instagram

<https://www.instagram.com/voithgmbh/>

LinkedIn

<https://www.linkedin.com/company/voith-gmbh>
<https://www.linkedin.com/company/voith-hydro>
<https://www.linkedin.com/company/voith-turbo>
<https://www.linkedin.com/company/voith-paper>
<https://www.linkedin.com/company/voith-digital-solutions>

Facebook

<https://www.facebook.com/VoithGlobal/>

YouTube

<https://www.youtube.com/user/VoithTurboOfficial>
<https://www.youtube.com/user/VoithPaperEN>
https://www.youtube.com/c/Voith_Hydro

