Harnessing the power of water
with engineered reliability

Generating energy from the power of water represents large amounts of clean, renewable energy. 71 percent of the earth’s surface is covered by water. The world’s hydro power potential amounts to 20 billion Mega Watt hours per year and only 30 percent of this has been developed so far.

Hydro power is not only environmentally friendly, but also cost-effective. Hydro power plants have the highest operating efficiency of all known generation systems. They are largely automated, and their operating costs are relatively low. Hydroelectric power plants also play an important role in water resource management, flood control, navigation, irrigation and in creating recreation areas.

Voith Hydro is an industry leader in the production of generators, turbines and the associated control systems to put the power of water to work. A range of services, from engineering through manufacturing and project management to commissioning, completes our portfolio as a leading product and service provider.

As part of our international network each Voith Hydro facility operates under the same cutting edge platform and is equipped with consistent best-in-class processes and tools. This network also ensures that we can meet special customized requirements: from individual components to project planning, through project management and plant maintenance. With branches and production facilities for electrical and hydraulic machines and components in Europe, Asia and North and South America we are close to our customers and all major hydro power markets.

Voith Hydro is also a trend-setter in the field of “new renewables”. Wave and ocean current power technology from Voith Hydro are amongst the pioneering initiatives for the commercial development of the power of the oceans in the foreseeable future.
Our promise to the customer. Precise and creative. Our products and services are designed specifically for our customers’ needs. Always efficient and economical, and, above all, following our values and visions for a sustainable solution.

**Competence and capabilities**

- Consulting, engineering, erection and commissioning
- System/plant assessments
- HyService – global, fast and effective for modernization and rehabilitation of existing hydroelectric power plants
- Complete equipment, installation and services for hydroelectric power plants
- Francis, Pelton, Kaplan, bulb turbines, pump-turbines, standard and custom
- Storage pumps, radial, semi-axial and axial-flow pumps
- Generators and motor-generators for constant and adjustable speed, excitation systems
- Frequency converters, protection systems, switchyards for all voltages, transformers
- Power plant automation, control centers for hydro power plants and cascades, including plant management and diagnostic systems
- Shut-off valves
- Integrated Management System to safeguard excellence and quality

**Engineered reliability.**

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From the beginning, Francis turbine development has always been synonymous with Voith.

With decades of continuous optimization based on the latest hydrodynamic research, well over half the turbines manufactured by Voith Hydro are of the Francis type.

Our Francis turbines, including the world’s largest and most powerful, are in service around the globe. What better testimony to our more than 140 years of hydro turbine experience?
Characteristics

Francis turbines are used primarily for medium heads and large flows applications. Their special hydraulic characteristics result in relatively high-speed compact units, right up to the largest capacities.

Voith Hydro also supplies cost-effective Francis units in standardized designs and packages for small hydro plants.
References and milestones

1870  Hydro turbine production began.

1873  First Francis turbine with a modern distributor.

1903  Niagara Falls, Canada:
Double spiral turbines with $P = 5.2$ MW and $H = 79.5$ m.
Most powerful turbines of their time.

1912  Niagara Falls, Canada:
Double spiral turbines with $P = 12$ MW and $H = 54.9$ m.
Most powerful turbines of their time.

1974  Grand Coulee III, USA:
P = 820 MW and $H = 87$ m.
Most powerful and largest Francis turbines in the world with 9.7 m runner diameter.

1974  Rovina-Piastra, Italy:
P = 133 MW at the high head of $H = 554$ m.

1978  Itaipu, Brazil/Paraguay:
P = 800 MW and $H = 118.4$ m.
Overall design and joint supply of turbines and generators for the world’s most powerful hydro plant to date at 13,300 MW.
1991 Norris Dam, USA:
First aerating Francis turbine runner increases dissolved oxygen content for enhanced aquatic life.

1997 Three Gorges, China:
Participation in the supply of turbines, generators and electrical equipment for the world's largest hydroelectric power plant with a total capacity of more than 18,000 MW.

2003 Omkareshwar, India:
8 x 66.3 MW; large low head Francis turbines with operating head in the range of about 30 m.

2005 Xiaowan, China:
6 x 714 MW; Francis turbines including 8.7 m outside diameter ring gates.

2007 Jin Ping II, China:
8 x 610 MW; high head Francis turbines equipped with ring gates; first application of the splitter blade design for a large runner (runner diameter about 6.5 m).