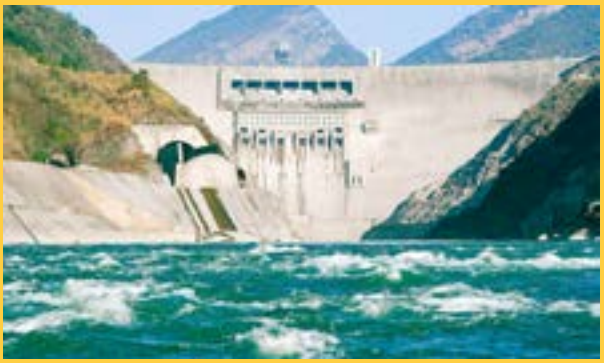
Qian Wei, Minjiang River, 9 × 55.6 MW



Er Tan, Yalong River, 6 × 550 MW

China is the world's most populous country with around 1.4 billion individuals in 2018. And, with an average growth rate above 6%, it has one of the fastest-growing economies. Indeed, measured on a purchasing power parity (PPP) basis, since 2014 China has been regarded as the world's largest economy and it became the world's largest exporter in 2010. China is a major global power.

The technically feasible hydropower potential of China is some 2,720 TWh per year (541.6 GW), about 17% of the global total. To date, about 45% has been developed. Total installed hydropower capacity is 352.26 GW, generating about 1,233 TWh in 2018.

Under government plans to increase renewable energy capacity to a 15% share by 2020 and 30% by 2050, the installed hydropower base is expected to reach about 660 GW by 2050. This will include numerous hydropower projects, both conventional as well as pumped storage. Many such projects are already under construction or are in the planning phase for development in the near future.

In 2018, about 8.5 GW hydropower capacity was added to China's total, more than in any other country of the world.

ANDRITZ HYDRO IN CHINA

ANDRITZ Hydro China is headquartered in Beijing with two further manufacturing workshops in Chengdu and Foshan. Dedicated to the supply and other services for hydropower equipment and covering all types of turbines, generators, main inlet valves, governors, excitation-protection-control and electrical power systems, ANDRITZ Hydro China supplies not only locally but also across Southeast Asia and other international markets. Recent stand out projects from ANDRITZ Hydro China are the San José plant in Colombia and Suki Kinari in Pakistan.

历史 HISTORY

Ren Zonghai, Dadu River, 2 × 123 MW

Tian Huangping pumped storage plant, Zhejiang Province, 6 × 306 MW

With the objective of maintaining and securing a leading position in the important region of Asia, ANDRITZ – in co-operation with several reputable Chinese EPC companies, such as China Gezhouba Group, Sinohydro and others – has been exploring opportunities emerging from the "One Belt One Road" initiavite, such as the China-Pakistan economic corridor.

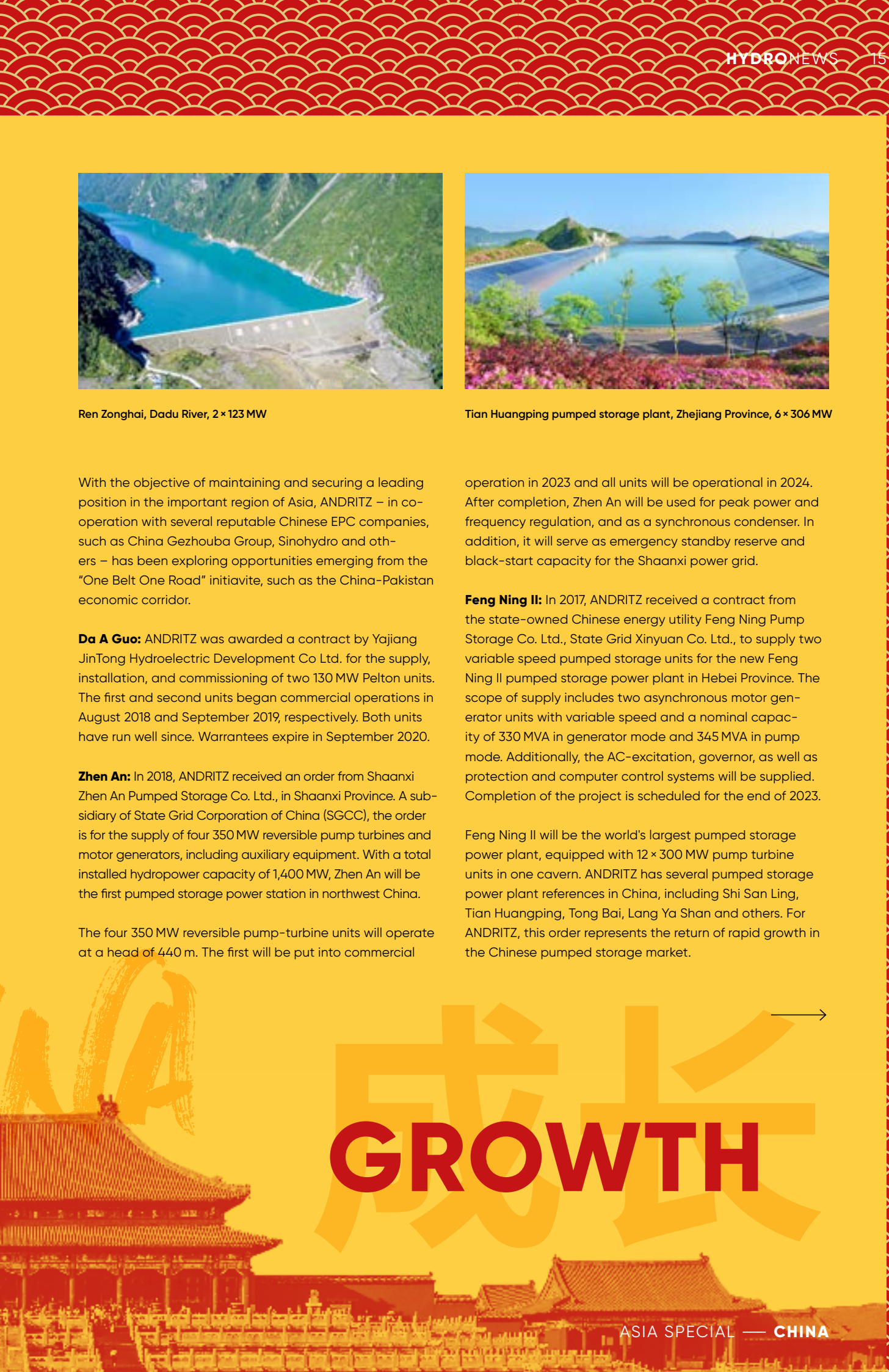
Da A Guo: ANDRITZ was awarded a contract by Yajiang JinTong Hydroelectric Development Co Ltd. for the supply, installation, and commissioning of two 130 MW Pelton units. The first and second units began commercial operations in August 2018 and September 2019, respectively. Both units have run well since. Warrantees expire in September 2020.

Zhen An: In 2018, ANDRITZ received an order from Shaanxi Zhen An Pumped Storage Co. Ltd., in Shaanxi Province. A subsidiary of State Grid Corporation of China (SGCC), the order is for the supply of four 350 MW reversible pump turbines and motor generators, including auxiliary equipment. With a total installed hydropower capacity of 1,400 MW, Zhen An will be the first pumped storage power station in northwest China.

The four 350 MW reversible pump-turbine units will operate at a head of 440 m. The first will be put into commercial operation in 2023 and all units will be operational in 2024. After completion, Zhen An will be used for peak power and frequency regulation, and as a synchronous condenser. In addition, it will serve as emergency standby reserve and black-start capacity for the Shaanxi power grid.

Feng Ning II: In 2017, ANDRITZ received a contract from the state-owned Chinese energy utility Feng Ning Pump Storage Co. Ltd., State Grid Xinyuan Co. Ltd., to supply two variable speed pumped storage units for the new Feng Ning II pumped storage power plant in Hebei Province. The scope of supply includes two asynchronous motor generator units with variable speed and a nominal capacity of 330 MVA in generator mode and 345 MVA in pump mode. Additionally, the AC-excitation, governor, as well as protection and computer control systems will be supplied. Completion of the project is scheduled for the end of 2023.

Feng Ning II will be the world's largest pumped storage power plant, equipped with 12 × 300 MW pump turbine units in one cavern. ANDRITZ has several pumped storage power plant references in China, including Shi San Ling, Tian Huangping, Tong Bai, Lang Ya Shan and others. For ANDRITZ, this order represents the return of rapid growth in the Chinese pumped storage market.



GENERAL FACTS

Population: **1.392 billion**
Access to electricity: **100%**
Installed hydro capacity: **352,260 MW**
Hydropower under construction: **42,000 MW**
Share of generation from hydropower: **17.6%**
Hydro generation per year: **1,232,900 GWh**
Technically feasible hydro generation potential per year: **2,720,000 GWh**

ANDRITZ Hydro in the country:
Total installed / rehabilitated units: **524**
Total installed / rehabilitated capacity: **37,916 MW**
Location: **Beijing, Chengdu, Foshan**
E-Mail: **contact-hydro.cn@andritz.com**

Tong Bai pumped storage plant, Zhejiang Province, 4 × 300 MW

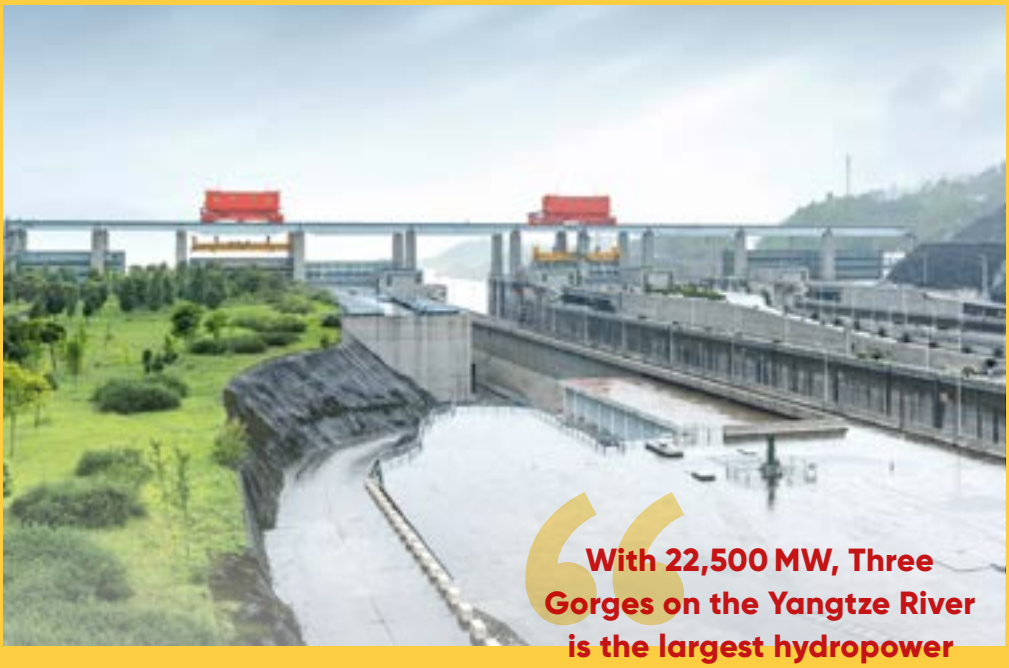
Qian Wei: ANDRITZ supplied the automation control system for Qian Wei ports, shipping channel and hydropower station in Sichuan Province. Qian Wei is a navigation junction project designed for 1,000 tonne-class ships.

With a total installed capacity of about 500 MW (nine Bulb units with 55.6 MW each), the station is located in the lower reaches of the main stream of Minjiang River in Leshan and forms the third step of a river cascade. Its functions include port operation, channel management and power generation. The upper station is the Dong Fengyan navigation and power generation project, the lower station is the Long Xikou navigation and power generation project. The dam is about 57 km away from Le Shan City and about 144 km from Cheng Du City.

Contract scope for ANDRITZ comprises the design, manufacturing, delivery and commissioning of the complete SCADA, local control units, auxiliary control and metering systems. The first unit of the project is scheduled to be in commercial operation by the first quarter of 2020 and the entire project will be finished by the end of 2020.

Yang Fanggou: In May 2019, ANDRITZ signed a contract for supply of the automation control system for Ya-lung River Yang Fanggou hydropower station. Yang Fanggou is part of a

Tian Wanhe, hydropower complex, Sichuan Province



With 22,500 MW, Three Gorges on the Yangtze River is the largest hydropower plant of the world to date.

hydro-engineering complex whose primary task is electricity generation.

With a total installed capacity of about 1,500 MW (four units of 375 MW each), Yang Fanggou is located in the middle of the Ya-lung River in the Tibetan Autonomous County of Mu Li, Liang Shan Autonomous Prefecture, Sichuan Province. It is the sixth level of the seven level-development of the middle Ya-lung River. It is about 235 km away from Xi Chang City.

The contractual scope for ANDRITZ consists of the design, manufacture, delivery and commissioning of the complete SCADA, local control and auxiliary control systems. Yang Fanggou Hydropower Station is scheduled to start production in November 2021. The project will be finished by the end of 2022.

Tian Wanhe (TWH): In early 2019, a frame-service agreement was signed for runner repair, spare parts supply and technical service that ensures long-term cooperation between ANDRITZ Hydro China and Sichuan Chuantou Tian Wanhe Developing Company, operators of a project comprised of three Pelton hydropower plants: Ren Zonghai (2004) 2 × 120 MW, Jin Wo (2004) 2 × 140 MW, Da Fa (2004) 2 × 120 MW.

In July 2019, ANDRITZ signed a contract for the supply of one unit (for Da Fa unit #2, six nozzles) for a rehabilitation experimental program. Supply will be completed within the first quarter of 2020. This will be the first real-world application of the cut needle tip technology. Perhaps more importantly, the success of Da Fa unit #2 nozzle rehab could have a significant impact on future market potential.

AUTHOR

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Repair of Pelton runner for Jin Wo, Sichuan Province, 2 × 40 MW, at ANDRITZ Hydro local manufacturing facility