**The United States** – Hydropower significantly contributes to the US energy portfolio, representing approximately 6.2% of the nation's electricity generation in 2023. Enhanced technology, policy support, and increased installed capacity have further reinforced this sector. The US has a theoretical hydropower potential of 512 GW, encompassing about 4,488 TWh/year in gross potential and 153 GW in remaining technically feasible hydropower potential.

However, regulatory and environmental hurdles for new projects mean the focus has shifted towards refurbishing and modernizing existing facilities. Developing non-power dams and small hydro projects presents new growth opportunities, yet transmission bottlenecks pose ongoing challenges.

The Inflation Reduction Act of August 2023, primarily aimed at inflation control, holds potential implications for the energy sector. It could further incentivize the modernization of energy infrastructure, benefitting hydropower refurbishment, and possibly mitigating financial risks. Additionally, the Act may bolster energy storage solutions like pumped hydro, which can help address existing transmission constraints and foster a more integrated energy system.

### ANDRITZ IN THE US

At ANDRITZ, we leverage our extensive expertise and commitment to hydropower excellence. Our approach goes beyond addressing technical challenges; we aim to set the highest industry standards.

# REINVIG
# HYDRO
# FOR THE

Our advanced runner central aeration system exemplifies our innovation drive. This cutting-edge technology stabilizes water flow during part-load operations, reducing the need for external compressors and minimizing noise and vibration.

Environmental sustainability is also at the forefront of our R&D efforts, especially regarding aquatic life. Our initiatives focus on sustainable hydropower practices, including oil-free designs and fish-friendly technologies.

Reflecting on ANDRITZ's efforts in the U.S., the Charlotte office, set up in 1991, has played a pivotal role in major rehabilitation initiatives along important waterways. In the turbine sector, our supply and →

## THE UNITED STATES

Total population: 333.29 million
GDP per capita: 76,343 USD

Total installed hydro capacity: 102,900 MW
Installed pumped hydro: 22,008 MW
Hydropower capacity added: 96 MW
Hydro capacity under construction: ~ 500 MW
Share of generation from hydropower: 6.2%
Hydro generation per year: 262,000 GWh
Technically feasible hydropower potential: 153,000 MW

All figures concern 2022;
Sources: TheWorldBank, IMF, IHA, Hydropower & Dams World Atlas 2023

# ORATING POWER FUTURE

Powerhouse of Robert S. Kerr hydropower station

Control and cleaning of generator stator stacking, Collierville hydropower station



6.2% Share of electricity generation from hydropower in total production

→ refurbishment of 218 units has achieved a collective output of 8,787 MW. In the area of hydro generators, our supply and revamping of 231 units has culminated in an impressive total output of 14,802 MVA. Especially noteworthy is the extensive renovation of the generator units at Grand Coulee where ANDRITZ has rehabilitated 21 of the 24 generating units.

Given our significant presence and recent string of awards, ANDRITZ is ideally positioned to offer world-class rehabilitation and services to ailing hydro plants. We have been involved in many major US hydropower projects, such as Collierville, (140 MVA), Barkley (186 MW), Keystone (70 MW), Robert S. Kerr (147.2 MW), Old Hickory (162 MW), Keys (6,809 MW), Anderson Ranch (41 MW), and offshore energy project Vineyard (342 MVA).

As we explore the evolution of hydropower and critical related projects, it's insightful to acknowledge the crucial stages that contribute to their success. The transformation of projects like Barkley, Robert S. Kerr, Old Hickory, Anderson Ranch, and Vineyard from initial concepts into substantial achievements underscores the value of strategic planning and effective communication. The process of developing proposals, engaging in thoughtful negotiation, and securing initial agreements, forms the backbone of these projects. This aspect of the journey plays a fundamental role in turning visions into reality. The contribution of proposal development and sales is an essential thread woven throughout the tapestry of each project's success, subtly guiding them from their inception through to fruition.

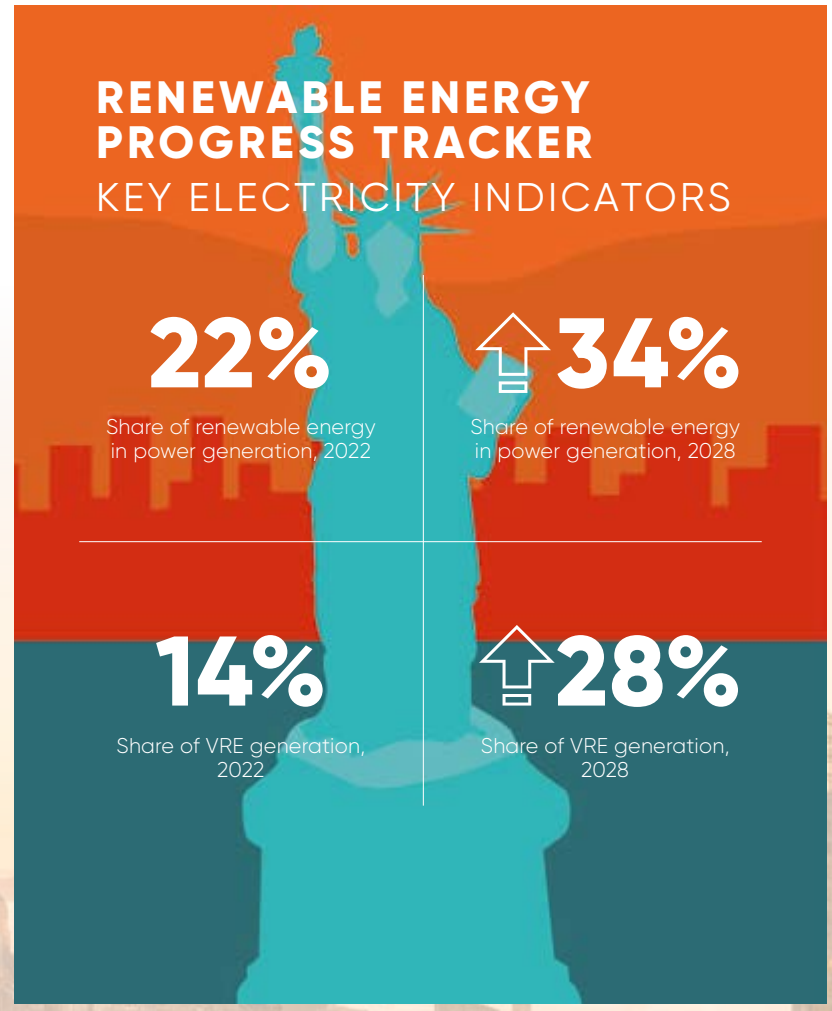
ANDRITZ Hydropower in the US caters to a diverse range of needs, from large new units to smaller, compact hydro units, including automation. Our core business remains the rehabilitation and upgrading of existing plants, aligning with the US market's demands.


**Unit hall of John W. Keys III pumped storage plant at Grand Coulee hydropower complex**

## NEW PROJECTS SINCE 2016

**Collierville (contract awarded 2018):**
This project involved two generator units, each rated at 140 MVA, at the hydropower plant. ANDRITZ was responsible for the design, manufacture, and delivery of new Roebel bars. The first unit was successfully handed over and came back online in early December 2018, two weeks ahead of schedule. Besides the design and manufacturing tasks, ANDRITZ took on the removal of existing windings, inspection, and evaluation of the stator core, as well as the installation of new windings. The advanced Roebel bars installed have increased the efficiency of the generators. This project also set a precedent for future collaborations, as the successful early completion led to immediate approval for the second unit.

**John W. Keys III Plant at Grand Coulee (contract awarded 2019):**
The John W. Keys III pump-generating plant, part of the Grand Coulee Dam, is receiving a major automation overhaul from ANDRITZ. This upgrade is a monumental task involving the replacement of systems dating back to the 1950s and 1970s with state-of-the-art digital controls. The plant comprises six pumping units and six pump-generating units, all of which




Source: IEA



will be modernized. This will result in more efficient operations, reduced maintenance costs, and increased reliability. The project also includes the removal of existing systems and installation of new ones, making it one of the most comprehensive automation projects ever undertaken by ANDRITZ.

**Vineyard (contract awarded 2019):**
The Vineyard Wind 1 project sets out a new standard for offshore wind energy in the United States. ANDRITZ is contributing to this landmark initiative by supplying two state-of-the-art synchronous condenser systems. These systems will be crucial for voltage regulation and reactive power control, ensuring the reliable integration of renewable energy into the grid. The systems will have a rated condenser output of +171 / -133 MVAr and operate at 11.5 kV, 60 Hz. This project serves as a blueprint for sustainable energy solutions and is a cornerstone in the ANDRITZ portfolio of renewable energy projects.

**Barkley (contract awarded 2020):**
Situated on the Cumberland River in Western Kentucky, this 186 MW hydropower plant will undergo a comprehensive rehabilitation program. The work will include a turbine and generator overhaul, aiming to boost the plant's annual power generation to approximately 150 GWh. The Barkley project is more than just a rehabilitation though; it's a transformation. In a comprehensive overhaul, ANDRITZ will replace the existing Kaplan turbine generator units with new, more efficient models that will operate at a capacity of 46.5 MW each. The project also includes the installation of advanced auxiliaries and ancillary equipment. Once fully commissioned, the plant is expected to contribute significantly to the US Army Corps of Engineers' renewable energy targets.

**Keystone (contract awarded 2021):**
ANDRITZ was awarded a contract by the US Army Corps of Engineers for the rehabilitation of both generators at the Keystone generation station in Oklahoma. The project is part of an ongoing ANDRITZ commitment to modernize aging infrastructure. Completion is scheduled for the second half of 2024.

**Robert S. Kerr (contract awarded 2021):**
Located on the Arkansas River in Eastern Oklahoma, this project involves the rehabilitation and upgrade of all four turbines and generators at the hydropower plant. Once completed, the plant is expected to generate approximately 152 GWh per year.

**Old Hickory (contract awarded 2023):**
This 162 MW hydropower plant on the Cumberland River is slated for a major

**References**:
U.S. Energy Information Administration. (2023). Electric Power Monthly. Retrieved from https://www.eia.gov/electricity/monthly/
The U.S. Department of Energy. (2023). Hydropower Vision: A New Chapter for America's 1st Renewable Electricity Source. Retrieved from https://www.energy.gov/

overhaul, including the turbines and generators. The ANDRITZ scope of work involves design, manufacture, transport, erection, testing, and commissioning. The first unit is expected to be recommissioned in August 2026.

**Anderson Ranch (contract awarded 2023):**

In a significant new development, ANDRITZ has secured a contract from the Bureau of Reclamation's Pacific Northwest Region for the modernization and runner replacement of two turbine units at the Anderson Ranch Dam Powerplant in Mountain Home, Idaho. The comprehensive scope of work encompasses complete runner replacements, various component rehabilitations, and on-site tasks such as disassembly, alignment, and unit recommissioning. This contract serves as a continuation of a fruitful collaboration between ANDRITZ and the Bureau of Reclamation, building on the success of the earlier Palisades project. The Anderson Ranch project is designed to upgrade the existing vertical Francis runners, achieving a combined total output of approximately 41 MW.

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Powerhouse, Old Hickory hydropower station


Anderson Ranch hydropower plant, dam, and reservoir

Unit hall, Barkley hydropower station