MAINTAININ LEADERSHIP GREEN ENER

Canada – With more than 83 GW of installed hydroelectric capacity, Canada has the world's fourth largest hydroelectric generation capacity after China, Brazil and the USA. Contributing approximately 8.9% to the total global hydroelectric generation, Canada's hydropower accounts for over 60% of its total national installed capacity from all generation sources.

Nonetheless, Canada is facing new power requirements and requires additional capacity to respond to the continuous growth in power demand. For example, in the province of Quebec, an additional 20 GW of new capacity will be required by 2050, equivalent to approximately 50% of the current installed capacity, which is close to 40 GW. Similarly, according to the provincial government in British Columbia, electrical demand there will increase from its current 12 GW of installed capacity by around 15% between now and 2030. Given that Canada has the potential to more than double its current hydropower

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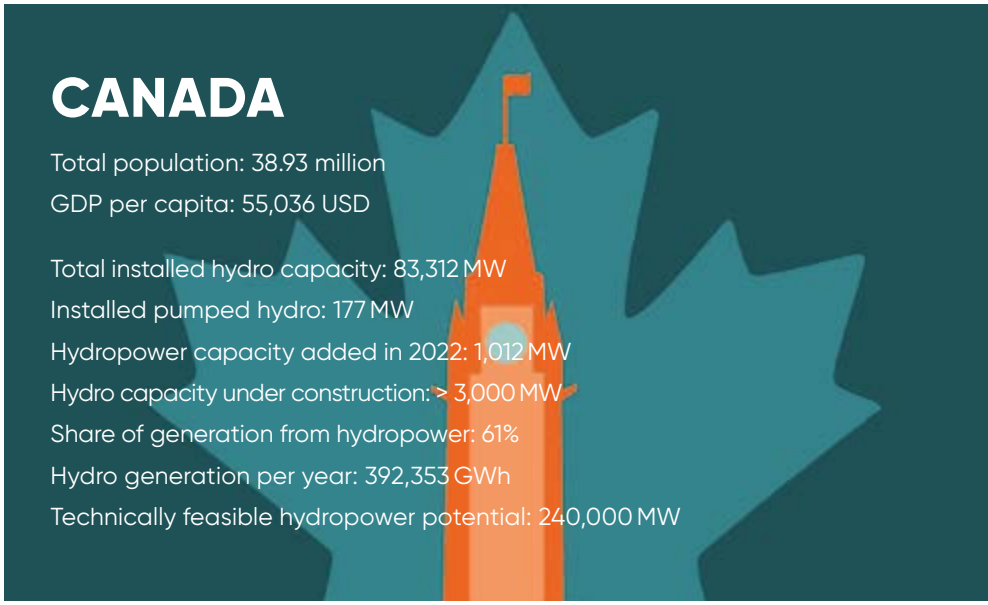


All figures concern 2022;
Sources: TheWorldBank, IMF, IHA, Hydropower & Dams World Atlas 2023

capacity, hydropower will certainly play a vital role in meeting national decarbonization objectives.

With this substantial increase in demand already forecast, Canada also has to address its aging hydropower fleet, which requires both maintenance and adaptation to meet changing operating requirements. In fact, most of the nation's generating stations will need to be rehabilitated as the bulk of its hydroelectric power plants were built in the early 1990s and thus require upgrades and potential efficiency improvements.

With a substantial presence in Canada supported by a highly skilled and experienced team, ANDRITZ is very well positioned to respond to this new electricity demand. With its Hydropower head office in Pointe Claire, Quebec, and other locations in Boucherville, Quebec, Chambly, Paris and Peterborough, ANDRITZ has already targeted various potential fields of work where our integrated solutions in the hydro sector "from water-to-wire" can make a significant contribution.

The company is one of the leading suppliers of electromechanical equipment and services for hydropower plants in Canada and offerings from ANDRITZ Hydropower Canada include R&D, design, project management, procurement, manufacturing, delivery, installation, and commissioning services for hydroelectric generating station equipment. This includes turbines, generators, governors, exciters, automation, all types of gates, and multiple associated auxiliary systems. More specifically, ANDRITZ' widely recognized expertise is focusing on the following sectors.

REHABILITATING AND UPGRADING THE CURRENT HYDROELECTRIC PORTFOLIO

The necessity of rehabilitating the current hydroelectric fleet has been clearly →

EB Campbell Generation Station

identified by most utilities in Canada and represents a need to replace/upgrade close to 350 generating units over the next 15 – 20 years. This work has already been initiated by many of our customers, including Hydro-Quebec, Ontario Power Generation, Manitoba Hydro and BC Hydro, Newfoundland & Labrador Hydro, Evolugen, and NB power.

In order to respond to the rehabilitation needs of all these existing facilities, ANDRITZ has accrued the staff, experience, expertise and know-how across all the required fields of engineering, project management, sourcing, installation, commissioning, and servicing. This enables ANDRITZ to provide a full service for any large hydro units, as well as small units, including automation and any related heavy mechanical components.

Some examples of rehabilitation projects carried out by ANDRITZ Hydropower in Canada:

THE EB CAMPBELL GS LIFE EXTENSION PROJECT

In April 2017, ANDRITZ won the mandate from SaskPower for a project to extend the lifetime of six units rated at 37 MW each through a refurbishment program. The scope included a successful model test, the design, and the supply of replacement runners, new distributors, new stators with new laminations and new coils. The scope of supply also included replacement of head gates, trash racks, and hoists, the installation and the refurbishment of intake gate guides, generator poles, turbine and generator shafts, bearings, and many other components. The balance of plant elements includes the assessment/replacement of selected instrumentation and controls.

Scheduled for six consecutive years starting in 2019, the entire six units will be completed in 2025.

THE SIR ADAM BECK G1/G2 UPGRADE PROJECT

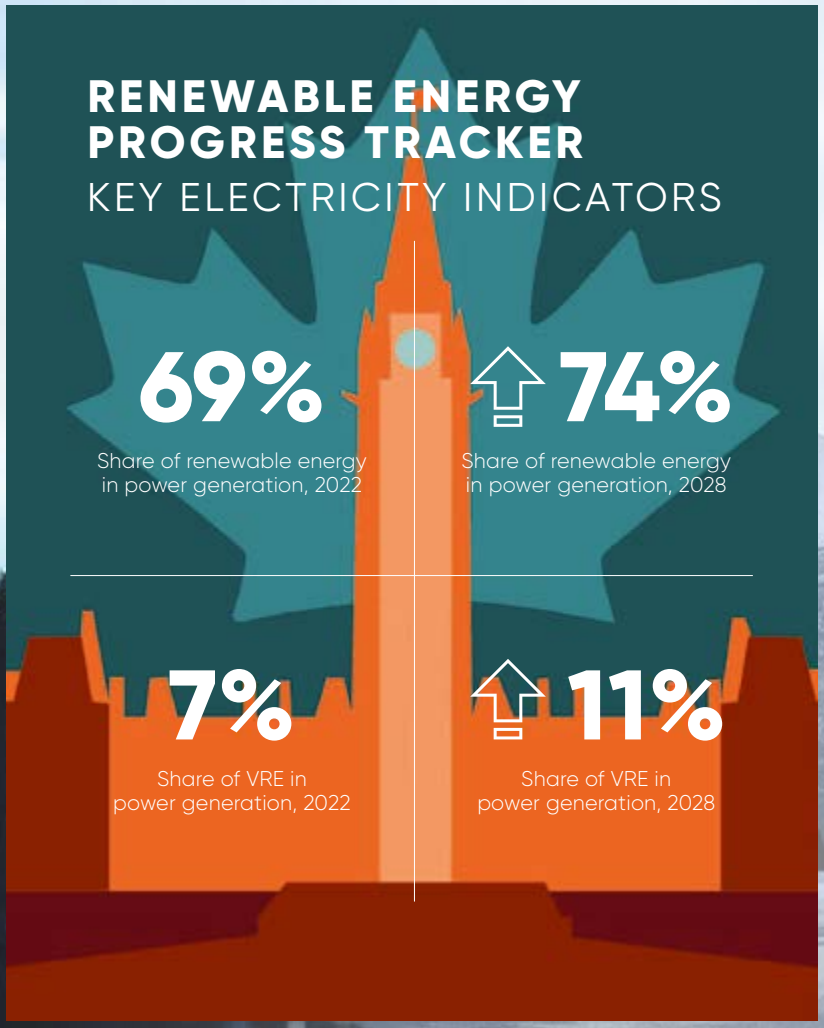
In 2018, ANDRITZ was selected by Ontario Power Generation (OPG) for the upgrade of two units (G1 and G2) at the Sir Adam Beck plant. The contract included the engineering, dismantling, and replacement of turbines and generators of the two units as well as automation, EPS, and headgate works. The Sir Adam Beck Ground Station 1 (SAB1) is a 10-unit station located close to Niagara Falls, in Ontario. The station was originally placed in service

between 1922 and 1930 and has always worked at a very high capacity.

Working collaboratively with OPG has proven to be very successful, the project also included the dismantling and replacement in situ of the spiral cases to adapt to the new configuration of the improved turbines.

THE MUSKRAT FALLS GENERATING STATION

ANDRITZ executed the contract for the 824 MW Muskrat Falls hydropower plant, owned by Newfoundland & Labrador Hydro, including the design, supply, and installation of four new vertical Kaplan units with a capacity of 206 MW each. In addition to the turbines, the project included, synchronous generators, digital governor systems with servomotors and high-pressure oil supply systems, static excitation, control, protection, and monitoring systems. ANDRITZ also supplied the hydro-mechanical works under a separate contract. The four new generating units operated by Newfoundland & Labrador Hydro were completed in November 2021 and are providing more than 800 MW of clean, renewable, and dispatchable capacity. →



Source: IEA

THE DES JOACHIMS PROTECTION AND CONTROL SYSTEMS UPGRADE

ANDRITZ completed a two-year long protection and control upgrade of eight generating units at the Des Joachims power plant in Rolphton, in February 2022. Des Joachims is a key 428.8 MW generating station in the eastern region of Ontario Power Generation's service area. The scope of work included an engineering and drawings package for the upgraded protection and control system, and associated instrumentation and manufacturing of the protection and control panels at our shop in Chambly, equipment and cables installation at the power plant and commissioning of the upgraded equipment.

PUMPED STORAGE INITIATIVES

With its unique integrated single source capability and capacity to provide all the required components, ANDRITZ is well positioned to respond to the needs of upcoming pumped storage projects currently being developed across Canada.

These pumped storage projects present themselves as a very attractive solution to meet new green energy demands with the environmentally friendly technology.

During periods of low electricity demand, pumped storage plants draw on excess electricity to pump water up to a reservoir.

61% Share of electricity generation from hydropower in total production

Like a battery, this water serves as a reserve of energy that can later be used to produce hydroelectricity during peak periods. The technology also helps provide ancillary services to help with grid operator stability requirements.

In fact, around the world pumped storage projects are expected to grow from the current 160 GW of capacity to reach 240 GW by 2030, according to the International Hydropower Association (IHA). Canada is following this trend as pumped storage hydropower is one of the fastest growing solutions to meet peak demand and to balance the grid.

Seven major pumped hydro storage projects are planned across Canada in Ontario, Alberta and Yukon. They are all planned for the 2030s and the installed capacity varies from 75 MW (Alberta) up to 1,000 MW (Ontario) with various peak production periods.

CONCLUSION

Canada's key energy objective is to maintain its leadership in the hydroelectric sector as part of its future green energy strategy. With its unique capabilities from engineering to commissioning, the know-how and agility of its Canadian management team combined with the depth of its overall resources, ANDRITZ Hydropower Canada is definitely well positioned to respond to that goal.

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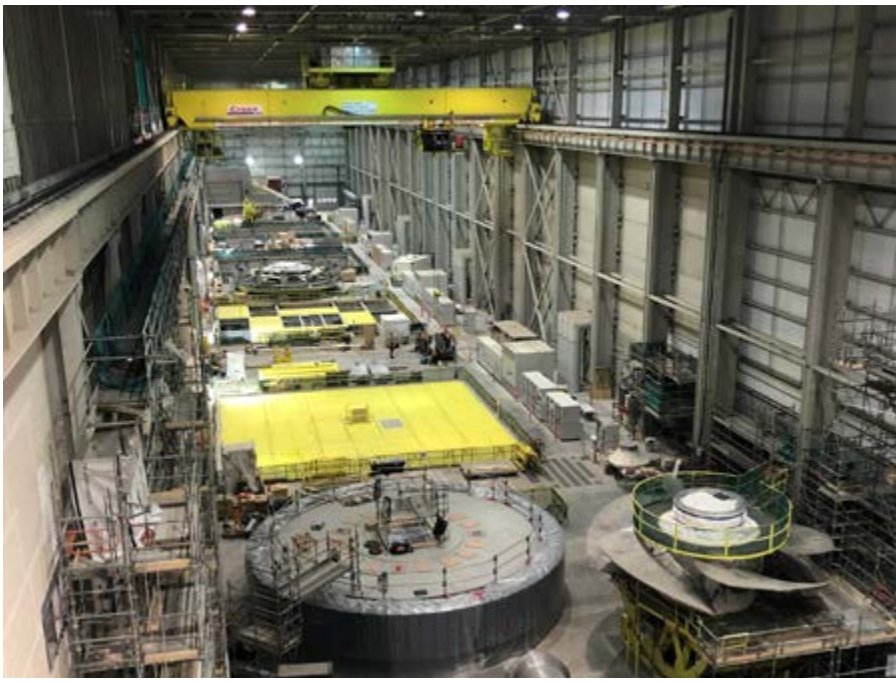
Gates at Muskrat Falls hydropower plant



Powerhouse of Muskrat Falls hydropower plant

Accumulator instrumentation at the Des Joachims hydropower plant

Sir Adam Beck hydropower station