RENEWABLE ENERGY TECHNOLOGIES

CLEAN ENERGY TECHNOLOGIES

SMALL HYDRO POWER

Canada has tremendous potential for small hydro development with more than 5500 identified sites (11,000 MW), the majority of which are located in British Colombia, Newfoundland, Québec, Ontario, Northwest Territories and Yukon. There is also significant untapped low-head hydro potential with heads less than 15 metres, estimated at about 20,000 MW. Refurbishment of old existing or decommissioned small hydro plants presents an opportunity to increase capacity as well. The current small hydro capacity in Canada is approximately 3300 MW (Statistics Canada, 2004) and new capacity is growing at a rate of 150 MW/y.

Hydropower is the most predictable of the renewable energy sources, with highly efficient systems and extremely low maintenance costs. Small hydro is clean and renewable, with zero GHG emissions during operation. It uses little or no storage in reservoirs, often termed “run-of-river”, and can bring about environmental and socio-economic benefits through integrated design, multipurpose planning and community involvement. In Canada, it is generally accepted that there are three categories under small hydro: micro hydro (less than 100kW), mini hydro (100 kW –1MW), and small hydro (1MW – 50MW).

Hydraulic energy experts at the CANMET Energy Technology Centre-Ottawa (CETC-Ottawa) are actively involved with provinces, utilities, private industry, academic institutions and other organizations on key projects to reduce equipment and construction costs, to increase turbine and site efficiencies, and to support technology demonstrations nationally and internationally. This facilitates the realization of the small hydro capacity available within Canada while at the same time helps the industry strengthen its expertise in both products and services within Canada and abroad.

A key component of CETC-Ottawa’s activities is the Laval University Hydraulic Machinery Laboratory (LAMH) in Québec City. LAMH is the only independent hydro turbine testing laboratory in Canada and one of the top five labs worldwide at measuring the accuracy of turbine efficiencies. LAMH was developed through the support of CETC-Ottawa and Laval University. The lab validates new hydro turbine designs with improved efficiency and provides educational facilities to train future engineers and researchers. The importance of LAMH is also recognized by major turbine manufacturers who carry

Improved Camelback Francis Turbine in the No. II Powerhouse, Energy Ottawa

Canada

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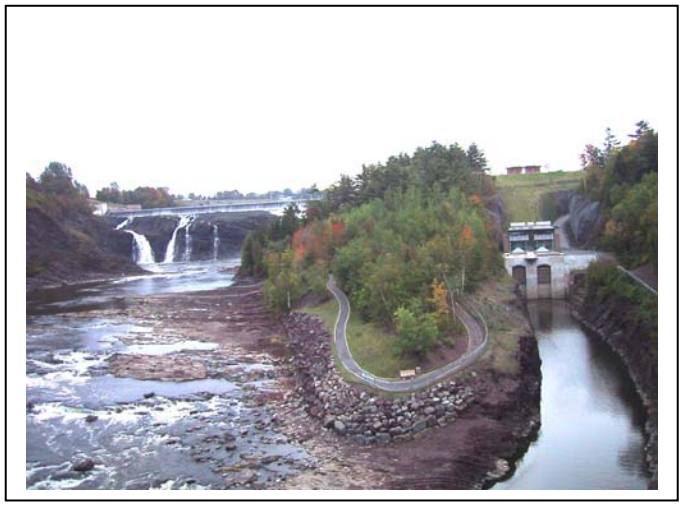
out R&D projects with the lab through the Canadian consortium on hydraulic machines. This allows the test facility to be fully certified, essential to maintaining and developing Canadian expertise in turbine design and testing.

CETC-Ottawa's research and development in emerging technologies where there is market potential in Canada and internationally creates economic opportunities for the Canadian small hydro industry. One example is very low-head turbines. Research is underway to increase efficiencies and reduce capital costs that will significantly reduce civil work and encourage development of very low head sites with high flow that would otherwise not be economically viable. These turbines could also be used to retrofit existing structures and are fish friendly because of the low velocity of the water through the turbine.

CETC-Ottawa's hydraulic energy experts also support demonstration projects that showcase innovative Canadian technologies. Refurbishment at the historic No. 2 and 4 Power Houses at Chaudière Falls, owned by Energy Ottawa Inc., increased site capacity from 5 MW to 8 MW. Automation and control systems allowed remote control of the power plant and Computational Fluid Dynamics (CFD) based optimization of the turbine design improved output by 20%.

Internationally, CETC-Ottawa was instrumental in carrying out the CIDA-China project to transfer Canadian small hydro technologies to China. The project involved design enhancement of the Francis turbine using Canadian technology geared for the Chinese small hydro market, as well as plant automation, river basin optimization technologies and micro hydro systems, demonstrating Canadian expertise to one of the largest international markets for small hydropower.



Hydroelectric generation station at the Parc des Chutes-de-la-Chaudière (24 MW), Lévis, Québec

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