

Celebrating 100 years
Clean, Renewable, Reliable Electricity

Kakabeka Falls Generating Station

100 YEARS

1906-2006



ONTARIO POWER
GENERATION



Celebrating Hydroelectricity

Hydroelectric power is a clean, renewable source of electricity that fuelled Ontario's economic growth in the first half of the 20th Century. Today it remains one of the cleanest, most cost-effective and reliable



**Kakabeka Falls
Generating Station**

means of generating electricity, contributing about one-third of Ontario Power Generation's total production – virtually free of smog-related emissions.

Today, OPG operates 35 hydroelectric plants, a green power portfolio of 29 small hydroelectric plants and more than 240 water control structures on 26 river systems across Ontario.

In 2006, Ontario Power Generation is celebrating both the 100th anniversary of public power in Ontario, and the centennial of Kakabeka Falls Generating Station (GS).

The **Kakabeka Falls Generating Station (GS)**, located on the Kaministiquia River just downstream of Kakabeka Falls, in the Village of Kakabeka Falls, is one of 10 hydroelectric generating stations on five river systems operated by Ontario Power Generation's Northwest Plant Group.

Since 1906 Kakabeka Falls GS, has safely provided clean, renewable electricity to the people of Ontario. The 25 MW station annual output is capable of meeting the electricity needs of roughly 14,000 homes. A tribute to those who have maintained the plant over the past century is that most of the station's original equipment, commissioned so long ago, is still in operation.

It all started...

The Kakabeka Falls GS story begins in 1896 when an entrepreneur, Edward Spencer Jenison, from Chicago, approached the Provincial Government seeking approval of a project to develop waterpower in the Kaministiquia River near Kakabeka Falls. His objective was to serve the electricity demands of customers in the growing Lakehead communities of Fort William and Port Arthur.

Jenison's proposal was seen as a great venture in the 1890s – a time when hydro power development was in its infancy. Not only was the proposed Jenison enterprise regarded as almost a pioneer undertaking from the point of view of hydroelectric construction, it also posed transmission challenges. Power from the station would have to be transmitted a distance of approximately 32 km (20 miles), a significant challenge in those early days when alternating current was just passing out of the experimental stage.



Overview of construction site. Superintendent's house in the background, circa 1906.



Early residents of Kakabeka Falls. Employees of the Kaministiquia Power Company. Circa 1906.

Jenison's request was granted by an enactment of the Ontario Legislature. Shortly after gaining the rights to develop Kakabeka however, Jenison sold the rights to three prominent Canadian business men, who formed the Kaministiquia Power Company specifically to develop and sell Kakabeka power.

The first decade of the 20th century was one of tremendous growth for Ontario. In 1905 the cities of Port Arthur and Fort William were becoming a grain port, flour milling industries started and the demand for electricity became urgent.

Construction

By September 1905 the Kaministiquia Power Company's plan to build and operate a generating station on the bank of the Kaministiquia River had begun.

Construction of the Kakabeka Falls Generating Station was a formidable engineering project. It involved the building of a railroad siding and a temporary station on the Canadian Northern Railway, 0.8 km from the Falls, as well as the construction of a narrow gauge railway to move equipment to the site. Three aqueducts, each 3 metres in diameter, were constructed to carry the water from Ecarte Rapids above the Falls to the surge chamber and then through four penstocks to the generating station below – a total drop of 58 metres.

Foundation of the powerhouse under construction — 1905.

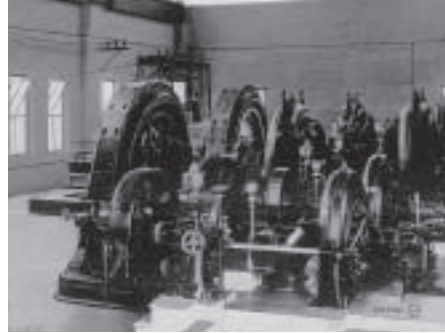
Raising the 95 ton crane — 1905.



The project employed more than 600 men. The original plant called for two 7,000 HP (5 MW) units with potential for another 21,000 HP (16 MW) to be installed in the future when demand increases warranted it. The two unit plant and primary installations were completed in October of 1906 and on October 4th 1906 the plant began producing power for the City of Fort William.

Expansion in 1911 added a third 5 MW unit and the powerhouse was extended to its present size. The final development to the limit of stream flow was made in 1914 by the addition of a larger 9 MW unit. To accommodate the increased capacity a third aqueduct was added at this time.

It was not until the late 1990's that the original three aqueducts were replaced by a single aqueduct capable of accommodating the flow requirements of all four units.



Inside the original 2 unit powerhouse, commissioned in 1906. The Francis turbines were manufactured by J.M. Voith in Heidenham Germany.

Construction - Penstock and surge chamber in the background.



Workers on the aqueduct form.

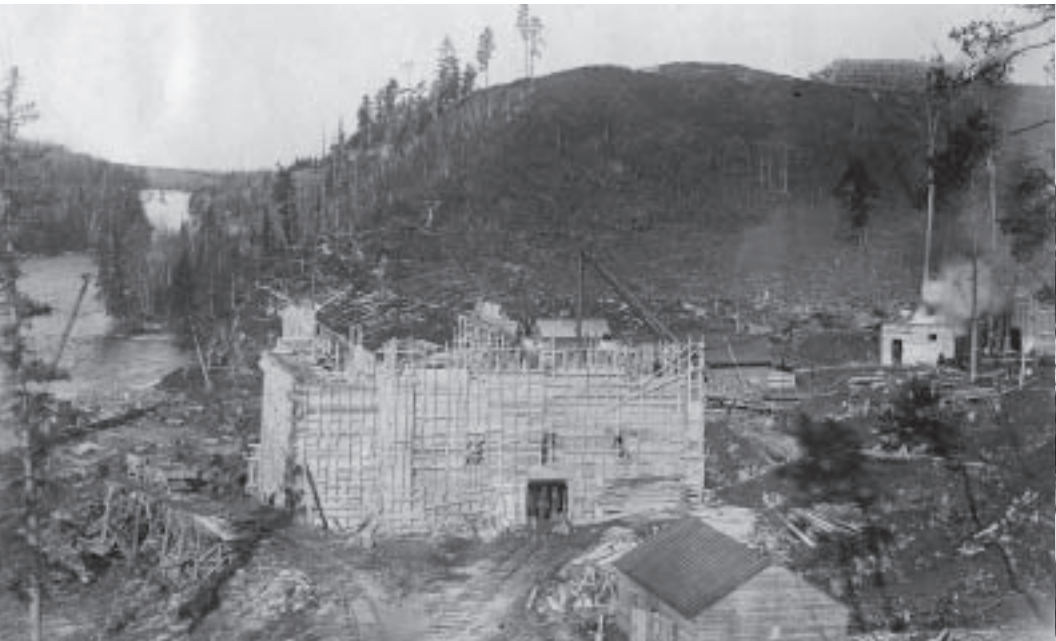


Ontario Hydro purchases Kakabeka Falls G.S.

From 1906 through 1949 the plant was operated by the Kaministiquia Power Company. In 1949, the business and assets of the Kaministiquia Power Company were purchased from the parent Abitibi Power and Paper Company in Toronto by the Hydroelectric Power Commission of Ontario (later known as Ontario Hydro). This included the Kakabeka Falls Generating Station as well as the storage dams and other associated facilities in the vicinity of the plant. With the purchase of the station, the Hydroelectric Power Commission was now in a position to amalgamate all the power resources in Northwestern Ontario, and by doing so the Commission was able to guarantee more reliable electrical service.

In 1999, as a result of the restructuring of Ontario Hydro, Ontario Power Generation was formed and was transferred all of Ontario Hydro's generating assets including Kakabeka Falls GS. Amongst the oldest of OPG's 64 generating stations across the province, Kakabeka Falls GS remains an important and reliable source of power.

Forming of the powerhouse concrete super structure.

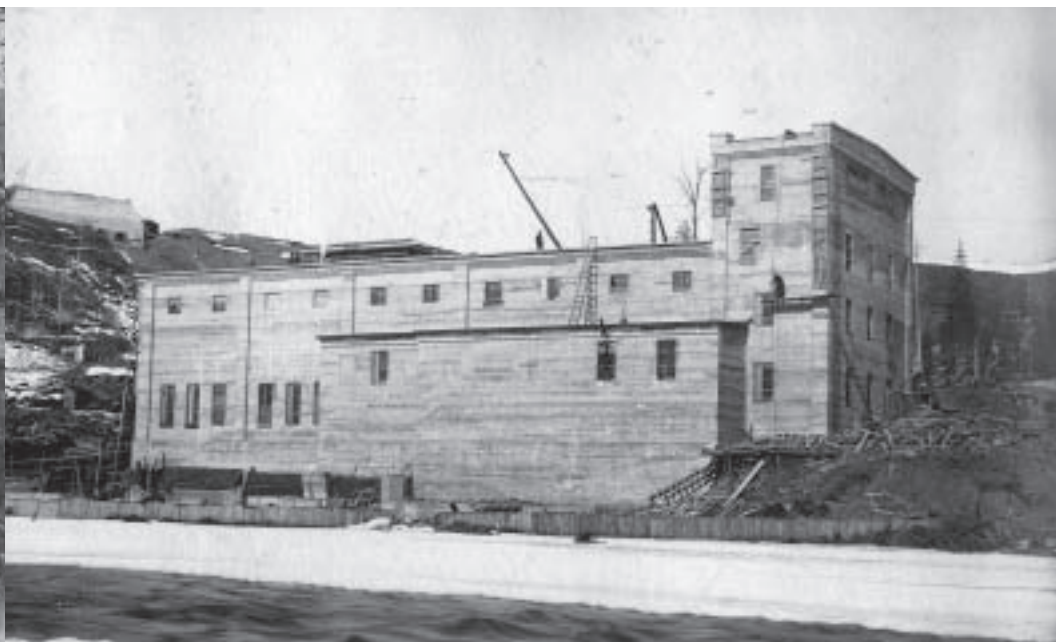


The Station

While the station has been maintained on an ongoing basis, to ensure both reliability and safe operation, the power house today looks much as it did in 1914. Remotely operated from Thunder Bay, the power house is mass concrete on rock up to the generator room floor level. The reinforced concrete superstructure with structural steel roof trusses supports a concrete slab and membrane roof.

The turbine sets are original equipment and are J.M. Voith from Heidenheim Germany and the generators were made by the Canadian General Electric Company. Units 1 to 3 have a rated output of 5.3 MW and unit 4 has a rated output of 8.7 MW for a total plant rated output of approximately 25 MW.

Original two unit powerhouse nearing completion in 1905.



The Main Dam and Intake Structure

The station site includes a main dam section approximately 2 km upstream of the powerhouse which is used to control and divert water flow to the generating station. The main dam is comprised of one automatic sluice gate which is remotely controlled from Thunder Bay and six stop log sluices that are operated at site. The intake structure, located on the east side of the main dam, consists of three gated intake openings which allow the control of water flow into a large aqueduct which is 5m in internal diameter. The aqueduct terminates at a large surge chamber which transitions to 4 original steel penstocks. There is a dedicated penstock for each unit and each is founded on the natural slope of the escarpment. The penstocks are sized to allow the required rated flow to each of the units.

Water is conveyed to the generating station through the intake structure and moves through the large aqueduct and into the surge chamber. It then flows through the penstocks and into the generating station, discharging back into the Kaministiquia River.

The main dam also operates to allow excess water to bypass the generating station. Water flowing through this dam goes over Kakabeka Falls and past the generating station down the Kaministiquia River. OPG provides scenic water flows over the Falls of at least 4.25 cms (cubic metres per second) on weekdays, and 8.50 cms on weekends during daylight hours from late May to mid October.



Main dam and intake structure

Commitment to the Environment

As a conscientious steward for the watersheds on which it operates, OPG strives to optimize the energy output of its plants while respecting the environment and needs of others. Working closely with the Ministry of Natural Resources (MNR), and in consultation with various other stakeholders on the watershed, OPG has developed a Water Management Plan for the Kaministiquia River System that supports sustainable development of water resources for water power and other uses, while protecting and enhancing the natural ecosystems. The plan identifies how Kakabeka Falls GS and the other facilities on the system, will operate to manage water levels and flows to balance environmental, social and economic objectives.

As part of the Water Management Plan, OPG has partnered with the MNR to conduct studies of Lake Sturgeon to understand and assess spawning locations, success and flow requirements in the Kaministiquia River.

Kakabeka Falls GS is included as part of the Northwest Plant Group's environmental managed system that is registered under the rigorous standards of ISO 14001:2004.

Biologists setting drift nets for ongoing Lake Sturgeon research in Kaministiquia River.



Investing to Ensure Future Reliability

In addition to an annual preventive maintenance program that ensures the station's efficient operation year after year, Ontario Power Generation has invested in several major upgrades over the last decade. Most notable was the \$27 million investment in 1998 to replace the three original concrete aqueducts with one large aqueduct. In 2000 there was a major electrical upgrade during which the switchyard was removed from the station and all the transformer breakers were moved inside resulting in more reliable performance. In the past four years major overhauls on each of the four units which included new generator windings has been completed.

As it enters its second century of operation, Kakabeka Falls Generating Station continues its long tradition of providing the area and Ontario with a clean, reliable and renewable source of electrical energy.



Working on the generator rewind

Construction of the original third aqueduct in 1914




1997 construction of single new aqueduct





Aerial view of Kakabeka Falls Generating Station 2006



Ontario Power Generation is an Ontario-based electricity generation company whose principal business is the generation and sale of electricity in Ontario. Our focus is on the efficient production and sale of electricity from our generation assets, while operating in a safe, open and environmentally responsible manner.

Ontario Power Generation cares about your safety

Ontario residents and visitors are asked to stay clear of OPG hydroelectric stations and dams. They are unsafe places for recreation activities in the summer and throughout the year. Water flows can change quickly and without notice. Some dams have gates that may be remotely controlled and in just a few minutes, can change a dry or calm riverbed into a river with dangerous flows. Strong currents in the reservoirs behind the dams – especially near the power intakes and sluiceways, also pose dangerous hazards.

Remember to stay clear of all hydroelectric power stations, dams and spillway channels...and STAY SAFE

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