OVERVIEW OF
REGULATED HYDROELECTRIC FACILITIES

1.0 PURPOSE

This evidence describes the regulated hydroelectric facilities. It also identifies the regulations, agreements, and programs key to these facilities.

2.0 DESCRIPTION OF REGULATED HYDROELECTRIC FACILITIES

A total of 54 OPG hydroelectric generating facilities are subject to OEB regulation. These facilities are operated and maintained by two Regions within OPG's Renewable Generation & Power Marketing ("RG&PM") organization: Eastern Region and Western Region. Attachment 1 is a map, which provides an overview of Eastern Region and Western Region.

Hydroelectric facilities typically include: generating equipment (e.g., turbines, generators, transformers, protections and controls), related civil works (e.g., powerhouses, dams, headworks, spillways, water conveyance canals, diversion tunnels), and the facilities required to operate and maintain the generating stations (e.g., control centres, work centres, and headquarters).

Chart 1 presents information on OPG's Regions and regulated hydroelectric stations.

Chart 1

Regulated Hydroelectric Facilities General Information

Region	Generating Station	Number of In-Service Units	Net In-Service Capacity (MW)	Original Unit In-Service Dates
Eastern	Abitibi Canyon	5	345	1933-1959
	Arnprior	2	82	1976-1977
	Barrett Chute	4	176	1942-1968
	Bingham Chute	2	1	1923-1924
	Calabogie[1]	2	0	1917
	Chats Falls (OPG owns 4 of 8 units)	4	96	1931-1932
	Chenaux	8	144	1950-1951
	Chute[2]	2	3	1923-1924
	Coniston	2	3	1905-1915
	Crystal Falls	4	8	1921
	Des Joachims	8	429	1950-1951
	Elliot Chute	1	2	1929
	Lower Notch	2	274	1971
	Matabitchuan	4	10	1910
	McVittie	2	3	1912
	Mountain Chute	2	170	1967
	Nipissing	3	0	1909
	Otter Rapids	4	182	1961-1963
	Otto Holden	8	243	1952-1953
	R.H. Saunders	16	1,045	1958-1959
	Stewartville	5	182	1948-1969
	Stinson	2	5	1925
Western	Aguasabon	2	47	1948
	Alexander	5	69	1930-1958
	Auburn	3	2	1911-1912
	Big Chute	1	10	1909-1919 (rebuilt 1993)
	Big Eddy	2	8	1941
	Cameron Falls	7	92	1920-1958
	Caribou Falls	3	91	1958
	DeCew Falls I	4	23	1898
	DeCew Falls II	2	144	1948
	Eugenia Falls	3	6	1915-1920
	Frankford	4	3	1913
	Hagues Reach	3	4	1925

	Hanna Chute	1	1	1926
	High Falls	3	3	1920
	Kakabeka Falls	4	25	1906-1914
	Lakefield	1	2	1928
	Manitou Falls	5	73	1956-1958
	Merrickville	2	2	1915-1919
	Meyersberg	3	5	1924
	Pine Portage	4	145	1950-1954
	Ragged Rapids	2	8	1938
	Ranney Falls	3	10	1922-1926
	Seymour	5	6	1909
	Sidney	4	4	1911
	Sills Island	2	2	1900
	Silver Falls	1	48	1959
	Sir Adam Beck I	8	438	1922 – 1930
	Sir Adam Beck II	16	1,499	1954 – 1958
	Sir Adam Beck PGS	6	174	1957 – 1958
	South Falls	3	6	1916-1925
	Trethewey Falls	1	2	1929
	Whitedog Falls	3	68	1958

Note 1: Calabogie Generating Station was critically damaged by a tornado in September 2018 and will be out of service until the completion of a redevelopment project, scheduled in 2022.
Note 2: Formerly Indian Chute.

2.1 Eastern Region

The Eastern Region was created through the organizational realignment implemented across OPG in the second half of 2020. The Eastern Region combines all regulated hydroelectric facilities formerly from Eastern Operations and Northeast Operations and seven facilities formerly from Central Operations. The Eastern Region operates 22 regulated hydroelectric facilities in total. The regulated facilities are on the St. Lawrence, Ottawa, Madawaska, South, Wanapitei, Abitibi, Montreal and Matabitchuan Rivers. Attachment 2 shows the locations of Eastern Region facilities.

The R.H. Saunders Generating Station ("R.H. Saunders") is a 16-unit hydroelectric station on the St. Lawrence River at Cornwall, Ontario. R.H. Saunders is connected to the 16-unit St. Lawrence - Franklin D. Roosevelt Power Project, which is owned and operated by New York Power Authority ("NYPA"). Together, the two generating stations span the entire St. Lawrence River. Associated facility structures include: the powerhouse, dams, headworks, dykes, bridges, and ice booms. Under the Memorandum of Understanding between OPG and NYPA,

both parties equally share the costs associated with Joint Works at the St. Lawrence facilities (including the Iroquois Control Dam and Long Sault Dam, headworks, dykes, and the Barnhart Island bridge). R.H. Saunders is maintained and controlled from a work centre and control centre located at R.H. Saunders.

There are four facilities on the Ottawa River (Otto Holden, Des Joachims, Chenaux, and Chats Falls) and there are five facilities on the Madawaska River (Mountain Chute, Barrett Chute, Calabogie, Stewartville, and Arnprior). The Ottawa River and Madawaska River regulated hydroelectric generating stations are maintained by six work centres, and are remotely operated from a control centre located at R.H. Saunders.

The eight units and Joint Works (dams, sluices and bridges) associated with the Chats Falls generating stations on the Ottawa River are jointly owned with Hydro-Québec. Four generating units are owned by OPG, and four are owned by Hydro-Québec. OPG operates and maintains the entire station through an Operating Service agreement with Hydro-Québec which was renewed in 2019.

There are 12 other regulated hydroelectric facilities: three on the South River (Elliot Chute, Bingham Chute and Nipissing); three on the Wanapitei River (Stinson, Coniston and McVittie); two on the Abitibi River (Abitibi Canyon and Otter Rapids); two on the Montreal River (Chute and Lower Notch); one on the Matabitchuan River (Matabitchuan); and one on the Sturgeon River (Crystal Falls). These facilities are maintained by four work centres, and are remotely operated from a control centre located in Timmins. The facilities on the South, Sturgeon and Wanapitei Rivers joined the Eastern Region from former Central Operations.

2.2 Western Region

The Western Region was created through the organizational realignment implemented across OPG in the second half of 2020. The Western Region combines all regulated hydroelectric facilities previously from Niagara Operations and Northwest Operations and 18 facilities previously from Central Operations. The Western Region operates 32 regulated hydroelectric facilities in total. The regulated facilities are on the Niagara, Nipigon, English, Kaministiquia,

Aguasabon, Winnipeg, Mississippi, Rideau, Otonabee, Trent, Muskoka, Beaver and Severn Rivers. Maps showing the location of these facilities are provided in Attachments 3 and 4.

The Niagara area regulated facilities include three Sir Adam Beck facilities and two DeCew Falls facilities. The Sir Adam Beck facilities include Sir Adam Beck I, Sir Adam Beck II, Sir Adam Beck Pump Generating Station ("PGS") and associated structures such as tunnels, the open cut canal and the International Niagara Control Works structure (also known as International Control Dam), as well as the PGS reservoir. Water conveyance structures (i.e., tunnels and canals) divert water from the upper Niagara River to the Sir Adam Beck generating stations. Water is discharged from the generating stations into the lower Niagara River. Under a Memorandum of Understanding, OPG and NYPA equally share the costs associated with Joint Works at Niagara including the International Control Dam.

The DeCew Falls facilities include DeCew Falls I, DeCew Falls II and associated water conveyance structures such as Intakes 1 and 2, and the Waterworks canal. Water conveyance structures divert water from the Welland Canal, through Lake Gibson and Lake Moodie, to the DeCew generating stations. Water discharged from the generating stations flows through Twelve Mile Creek to Lake Ontario.

The Niagara area generating stations are controlled from a control centre located at the Sir Adam Beck complex and are maintained from two work centres. The International Control Dam has its own control centre and is maintained by a work centre.

The Western Region operates nine regulated hydroelectric facilities formerly from Northwest Operations: three on the Nipigon River (Pine Portage, Cameron Falls, and Alexander); two on the English River (Manitou Falls and Caribou Falls); two on the Kaministiquia River (Silver Falls and Kakabeka Falls); one on the Aguasabon River (Aguasabon); and one on the Winnipeg River (Whitedog Falls). These generating stations are maintained from four work centres and are remotely operated from a control centre located at the Thunder Bay headquarters.

The Western Region also operates 18 regulated hydroelectric facilities previously from Central Operations: five on the Muskoka River (Ragged Rapids, Big Eddy, South Falls, Trethewey Falls and Hanna Chute), one on the Beaver River (Eugenia Falls), one on the Severn River (Big Chute), seven on the Trent River (Ranney Falls, Meyersburg, Sidney, Hagues Reach, Seymour, Frankford and Sills Island), two on the Otonabee River (Auburn and Lakefield), one on the Mississippi River (High Falls) and one on the Rideau River (Merrickville). These generating stations are maintained from two work centres.

The facilities on the Trent, Otonabee, Mississippi and Rideau Rivers are remotely operated from the control centre at R.H. Saunders. The facilities on the Muskoka and Beaver Rivers are remotely operated from the control centre at the Sir Adam Beck complex.

3.0 KEY HYDROELECTRIC REGULATIONS, AGREEMENTS AND PROGRAMS

OPG's regulated hydroelectric facilities are subject to international treaties between Canada and the United States, federal and provincial legislation and regulatory requirements, as well as several contractual arrangements with third parties. Collectively these regulations, agreements and programs result in additional costs and program needs with respect to the operation and management of the regulated hydroelectric facilities.

This section provides an overview of:

- Regulations, treaties and agreements with regard to water rights for the regulated hydroelectric facilities;
- Agreements with other utilities and generators related to operational requirements, guidelines, joint works, water sharing, water diversions, and compensation settlements;
- Dam and public safety governance and programs; and
- Indigenous Relations.

A summary of the legislative and regulatory framework applicable to OPG's regulated facilities is provided at Ex. A1-6-1.

3.1 Water Rights

3.1.1 Regulation of Water Rights

Rights to and restrictions on the use of water are determined by international treaties between Canada and the United States, together with the application of interprovincial agreements, federal and provincial legislation, common law as it pertains to real property and riparian rights, as well as the terms and conditions of certain leases and permits with and from the Government of Canada and the Province of Ontario. Water management plans authorized by the Ontario Ministry of Natural Resources and Forestry ("MNRF") prescribe water elevation and flow limits for many of Ontario's major rivers.

3.1.2 International Boundary Rivers

Through a series of agreements between the Government of Canada and the Province of Ontario, OPG has been granted the right to exercise Canada's rights with respect to the construction, maintenance, and operation of hydroelectric generating facilities on the Niagara and St. Lawrence Rivers under the *Boundary Waters Treaty of 1909*, the *Niagara Diversion Treaty of 1950*, the *Niagara Development Act of 1951*, and the *International Rapids Power Development Agreement Act of 1952*.

The *Boundary Waters Treaty of 1909* governs all boundary waters between Canada and the United States. Water rights on both the Niagara and St. Lawrence Rivers are subject to this treaty. The Treaty created the International Joint Commission ("IJC") to help prevent and resolve disputes over the use of boundary waters between Canada and the United States. The IJC established the International Niagara Board of Control to oversee water level regulation on the Niagara River, and the International Lake Ontario-St. Lawrence River Board ("ILO-SLRB") to ensure Lake Ontario outflows meet IJC requirements, including dependable flow for hydropower and adequate depths for navigation on the St. Lawrence River.

Since 1956, Lake Ontario and the St. Lawrence River were managed following an IJC order of approval termed Plan 1958-D with deviations from the plan allowed. Scientific studies revealed this plan contributed to several negative ecosystem impacts and as a result a new plan was introduced. Plan 2014 was recommended for use by the IJC's Great Lakes Adaptive

Management Committee and International St. Lawrence River Board of Control ("ISLRBC"). An IJC Order of Approval was issued in December 2016 creating the ILO-SLRB as a successor to the ISLRBC and officially adopting Plan 2014 for use starting in 2017, after 14 years of scientific study and public consultation. The IJC Plan 2014 document reports that it is expected to have only a small impact on hydroelectric generation.

The *Niagara Diversion Treaty of 1950* between Canada and the United States, among other things, determines the priority of use for the waters flowing out of Lake Erie (Niagara River and Welland Canal), sets minimum flow requirements over Niagara Falls, and provides for the allotment of the waters available for power generation. It also recognizes that certain diversion waters are to be excluded from determination of the power generation water allotment.

The International Niagara Committee ("INC") was created by the Governments of Canada and the United States pursuant to the *Niagara Diversion Treaty of 1950* to determine and report the amounts of water available for purposes of the Treaty, including water used for power diversions at Niagara. The INC is independent of the IJC, but works in collaboration with the IJC's International Niagara Board of Control.

The *Niagara Parks Act* (Ontario) provides the Niagara Parks Commission with the authority to grant certain rights to use the waters of the Niagara River for purposes of power generation. By agreement executed February 2005, the Niagara Parks Commission granted OPG sole rights to take water from the Niagara and Welland Rivers for purposes of power generation until December 31, 2056.

The DeCew Falls stations use water that is conveyed through the Welland Canal from Lake Erie under an agreement between OPG and the St. Lawrence Seaway Management Corporation that has been renewed through June 30, 2038.

3.1.3 <u>Interprovincial Rivers</u>

Four of OPG's hydroelectric generating stations are located on the Ottawa River which forms the provincial boundary between Ontario and Quebec. The *Ottawa River Water Powers Act,*

1943, (concurrent legislation, Ontario and Quebec) authorized the water power developments at OPG's Otto Holden, Des Joachims, and Chenaux sites on the Ottawa River. The fourth station, Chats Falls, is owned jointly by OPG and Hydro Quebec (Section 2.2). The four generating stations are subject to water power lease agreements with the MNRF. A renegotiation of the *Agreement Regarding the Review of the Rent for the Water Powers of the Ottawa River*, which sets the water rental rates for the *Ottawa River Water Powers Act*, was completed on November 26, 2020. The updated agreement holds the 2020 water rental rate constant until 2023 after which it rises annually with inflation.

An Agreement Respecting Ottawa River Basin Regulation, dated March 2, 1983, between the Governments of Canada, Ontario, and Quebec, established the Ottawa River Regulation Planning Board and Secretariat to oversee the integrated management of the waters within the Ottawa River basin. OPG participates as a member of the Board.

Whitedog Falls is located on the Winnipeg River which flows from the Lake of the Woods in northwestern Ontario to Lake Winnipeg in Manitoba. Manitou Falls and Caribou Falls are located on the English River which is a major tributary to the Winnipeg River just east of the Manitoba-Ontario provincial border. These three generating stations are subject to water power lease agreements with the MNRF.

Concurrent federal and provincial (Ontario and Manitoba) legislation authorizes regulation of the waters of the Lake of the Woods, Lac Seul, the English and Winnipeg Rivers, control of flows, and utilization of water diverted from the Lake St. Joseph. The Lake of the Woods Control Board is the regulating authority for managing these waters.

3.1.4 Provincial Rivers

Forty-one of OPG's regulated hydroelectric generating stations are located on seventeen interior Ontario rivers. Tenure at thirty-one of these sites is authorized by water power lease agreements with the MNRF, or licence agreements with Parks Canada. The remaining ten of these sites are owned by OPG.

In addition, OPG holds eight Crown Leases and twenty-seven Licences of Occupation, issued by MNRF, that provide additional land tenure and flooding rights for facilities associated with the regulated hydroelectric generating stations.

Water Management plans, authorized by the MNRF, exist for fourteen of the seventeen interior rivers and prescribe flow and water level elevation limits. The other three rivers (Rideau, Trent, and Severn) fall under federal jurisdiction and are not subject to Ontario Water Management Plans.

3.2 Agreements with Other Utilities

OPG also has agreements with NYPA, Hydro-Québec and Manitoba Hydro to address issues such as operational requirements/guidelines, cost sharing and management of joint works, water utilization, and settlement of water/energy transactions.

3.3 Dam Safety and Waterways Public Safety

3.3.1 Dam Safety

There are 202 dams and special hydraulic structures associated with OPG's regulated hydroelectric stations.

In Canada, dams come under provincial jurisdiction, with the exception of dams situated in boundary waters, on canals (e.g., the Trent Severn Waterway and the Rideau Canal), and those owned by the Government of Canada. The majority of OPG's dams fall within the jurisdiction of the Province of Ontario, or through Parks Canada for dams located on the Trent Severn Waterway or Rideau Canal; however, the structures on the Ottawa River are also regulated by the Province of Quebec. OPG provides regular submissions to the Province of Quebec to demonstrate that these structures remain in compliance with the *Quebec Dam Safety Act and Dam Safety Regulation*.

The Province of Ontario currently governs dams under the *Lakes and Rivers Improvement Act* ("LRIA"), administered by the MNRF. In June 2019, OPG entered into an Agreement with MNRF that allows OPG to undertake repairs and alterations to OPG dams under OPG's Dam

Safety Program oversight and provides relief from obtaining LRIA Section 16 approval. The Agreement with MNRF requires that OPG have a robust dam safety managed system and maintain a good LRIA compliance record. Transport Canada also has regulatory approval authority over OPG dams under the *Canadian Navigable Waters Act* as they may relate to alterations to the dams or approved works (e.g. safety booms, buoys etc.).

For dams located on the Trent Severn Waterway and the Rideau Canal system, OPG is required to meet Parks Canada dam safety criteria (2010 Directive), primarily as it applies to upgrading structures.

While the regulatory regime in Ontario continues to develop, OPG has well-established programs based on the *Canadian Dam Association Dam Safety Guidelines* (2013) and the *Canadian Dam Association Guidelines for Public Safety Around Dams* (2011), as well as other industry guidelines that are, in many respects, a model for emerging standards and regulatory requirements. OPG's Safe Operations Policy and the associated Dam Safety Program Management Document directs that dams be designed, constructed, operated and maintained in a manner that meets all regulatory requirements or, in the absence of regulations, the safety guidelines published by the Canadian Dam Association or other industry best practice.

Pursuant to OPG's Dam Safety Program, dam safety reviews are completed periodically for all dams owned and operated by OPG.

3.3.2 Waterways Public Safety

Since 2002, OPG has developed a number of technical documents concerning public safety around dams, as well as materials to educate the public and raise awareness of the hazards associated with dams and hydroelectric facilities.

Currently there are no regulations covering public safety around dams, beyond the federal requirements administered by Transport Canada under the *Canadian Navigable Waters Act* (2019) or *Canada Shipping Act* (2001) and the associated regulations. Transport Canada's involvement in public safety is primarily related to the installation of safety measures (e.g.

safety booms, buoys) and enforcement of restrictions to navigation. However, the MNRF issued a Best Management Practice document in August 2011 to guide owners on improvements to safety around dams. In addition, the Canadian Dam Association issued Guidelines for Public Safety Around Dams in October 2011. The MNRF document and the *Canadian Dam Association Public Safety Around Dams Guidelines* are based off of OPG's more stringent Waterways Public Safety Program as further described in the following paragraph.

In the absence of government regulations, OPG in 2003 developed a Waterways Public Safety Program to guard the public from hazardous risks associated with the operations of dams and hydroelectric stations (e.g., high currents pinning a person against a structure; dangerous undertows; sudden changes in flows and water levels resulting in stranding or drowning a person). The program includes: installation of physical control measures (e.g., booms, buoys, fencing, signage, audible alerts), operating procedures, and employee training requirements. A major element of the program is public education. For example, OPG has worked to establish a "Stay Clear - Stay Safe" message. OPG actively engages other agencies such as the MNRF, Ontario Provincial Police, St. John's Ambulance, Life Saving Society, the Ontario Waterpower Association, and numerous other stakeholders in water safety education to partner in delivering the message to the public.

3.4 Indigenous Relations

OPG's hydroelectric assets are widely dispersed throughout Ontario. Many of the generating stations and dams are in close proximity to various Indigenous communities. This proximity to dams and generating stations has had direct and indirect effects on some Indigenous communities during initial construction and from on-going operations.

OPG has engaged in a past grievance settlement program since 1992 to address some of these effects on Indigenous communities. The program is voluntary and non-adversarial. The successful outcome is a negotiated settlement acceptable to both parties.

To date, OPG (and formerly Ontario Hydro) has completed 23 settlements with First Nation communities across Ontario.

LIST OF ATTACHMENTS

Attachment 1: OPG Station Map Overview

Attachment 2: Eastern Region – Overview

Attachment 3: Western Region – Section 1 Overview

Attachment 4: Western Region – Section 2 Overview