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Re: Ontario Power Generation - Proposed Coniston Generating Station Life Extension Project Environmental Report

Dear Sirs:

The Ontario Rivers Alliance (ORA) is a not-for-profit grassroots organization with a mission to protect, conserve and restore riverine ecosystems across the province. The ORA advocates for effective policy and legislation to ensure that development affecting Ontario rivers is environmentally and socially sustainable.

The ORA is not making a Part II Order (Section 16) request, as provided for in the Class EA for Waterpower Projects (Class EA) with regard to adverse impacts on constitutionally protected Aboriginal and treaty rights. However, we would like to address some of the claims in your response to ORA's 10 March 2022 comments, as well as a few concerning details contained in the Coniston GS Environmental Report (ER). Underlining is for emphasis only.

Greenhouse Gas Emissions:

Ed, your 14 April 2022 response to my question asking how the Coniston GS would reduce greenhouse gas (GHG) emissions was, "*Coniston GS would displace 12,880 Mg of carbon dioxide per year for each MW of power that would have otherwise been emitted through the use of natural gas*. *Therefore, the proposed undertaking is assumed to help offset that amount of greenhouse gas emissions (GHGs)*".[1]

[1] *14 April 2022 Ontario Power Generation Response Letter – Response #1 GHG Emissions. P-2*

OPG frequently claims hydroelectric is "clean" and "non-emitting" yet can't back that up because it doesn't measure its GHG emissions. Therefore, you have no idea of the total carbon dioxide, methane and nitric oxide emissions that are being generated at the Coniston GS facility, which includes the entire reservoir, the turbine intake, the spillway and downstream of the dam. It is certainly not zero, and you admit that in your response when you say, "*OPG acknowledges that a reservoir produces some GHG emissions, however reservoirs on the Canadian Shield are not known to produce significant GHGs*".[2]

The ER is misleading when it states, "*OPG strives to be a leader in climate change and climate change mitigation by implementing operational and growth strategies that support reductions in greenhouse gas emissions and better understanding climate change.*"[3] In fact, OPG is ignoring its potential contributions to GHGs accumulating in the atmosphere and by not acknowledging it is not taking steps to detect, measure and report the emissions generated by its facilities, or looking for ways to mitigate those emissions.

ORA suggests that since OPG has 153 hydroelectric facilities in North America, it could be a leader in the Hydropower Industry and start using autonomous drone-based NASA GMap technology to detect, measure and publicly report emission data at all its facilities.[4]

Additionally, your claim that "*reservoirs on the Canadian Shield are not known to produce significant GHGs*" was not referenced and I have never seen such a study. Rather than citing a particular study that I could review, you did provide a link to a webpage of "*readily available research from Hydro Quebec on reservoirs and greenhouse gas emissions*"[5]. It was an attempt to substantiate your claim; however, none of Hydro Quebec's (HQ) studies are available on their website.

Instead, HQ's web page indicates "*Impoundment of hydroelectric reservoirs induces decomposition of a small fraction of the flooded biomass (forests, peatlands and other soil types) and an increase in the aquatic wildlife and vegetation in the reservoir. The result is higher greenhouse gas (GHG) emissions after impoundment, mainly CO_2 (carbon dioxide) and a small amount of CH_4 (methane). However, these emissions are temporary and peak two to four years after the reservoir is filled. During the ensuing decade, CO_2 emissions gradually diminish and return to the levels given off by neighbouring lakes and rivers.*[6] You will note that later in the submission we find out that HQ doesn't always report on bubble ebullition of methane – only diffusion of methane which is not as persistent.

This information was very familiar, as it was also used in a 2016 Intrinsic Corp. (Intrinsik) report *"retained by OPG to compare GHG emissions associated with various methods of energy production in Ontario over the next 40 years"*. The report also claimed that Hydroelectric GHG emissions per Energy Production (g CO2e/kWh) was zero (0).[7] It was shocking to read something so blatantly untrue, so let's explore its rationale.

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[2] *Ibid.*
[3] *Coniston Environmental Report – Final, 4.7.1 Introduction. P-148/225*
[4] *In the News: Using drones to map GHG emissions – Geoscience BC uses NASA technology to detect and analyze aerial greenhouse gas emissions using drones. Context Energy Examined.*
[5] *14 April 2022 Ontario Power Generation Response Letter – Response #1 GHG Emissions. P-3*
[6] *Hydro Quebec webpage: Greenhouse gas emissions and reservoirs.*

While the Intrinsic report acknowledged that "*during the periods of peak emissions following flooding, GHG emissions may be similar to those associated with gas-fired facilities, decreasing from a rate of 671 g CO_2e/kWh in the first year following flooding to 238 g CO_2e/kWh following the fourth year… the flooding of reservoirs and the emissions associated with the decomposition of biomass was considered to be a component of the construction phase and was not included within the operational stage of the current study*".[7]

Consequently, OPG ignored consideration of the CO_2 emissions that HQ reported would gradually diminish over the decade following construction, and methane emissions were totally ignored.

The Intrinsic report was clear that the process of decomposition of biomass in the reservoir was well understood as the source of carbon and methane emissions and "*similar to those associated with gas-fired facilities".* Yet, it justified eliminating the operation phase by reporting that "*GHG emissions associated with the decomposition of biomass are reported to be temporary, with some estimating a peak in emissions approximately 2 to 5 years following impoundment, followed by a gradual decline in emissions which may reach those found in natural lakes after more than 10 years (Hydro Quebec, 2016 website [7])".*

Let's take a look at a Bachelor's Thesis published in 2020 for McGill University, Montreal, Quebec. Table 5.2 below shows that CO_2 estimates of the Eastmain-Opinica hydroelectric reservoir (Quebec) that is 12-13 years old, is much greater than the Eastmain 1 facility at 1-6 years old.[8] Notice that again, methane was not included here.

Table 5.2 Comparison between the present study and northern hydroelectric reservoir CO_2 emission

Location	Reservoir	Area (km^2)	Age (year)	CO_2 emission mg $m^{-2}d^{-1}$	CO_2 emission g C $m^{-2}yr^{-1}$	Reference
Quebec	Eastmain-1	603	1-6	n/a	98 to 171	Current study
	Laforge-1	1000	1-5	2300 (200-8500)	229 (20-846)	Duchemin et al., 1995; Duchemin, 2000
	Robert-Bourassa	2500	12-19	1500 (160-12000)	149 (16-1195)	Kelly et al. 1994; Duchemin et al. 1995; Duchemin 2000
	Eastmain-Opinica	1000	12-13	3450 (2200-4300)	343 (219-428)	Kelly et al., 1994; Duchemin et al., 1995; Duchemin, 2000
	Cabonga	400	68-70	1400 (320-4800)	139 (32-478)	Duchemin et al., 1995; Duchemin, 2000
Ontario	ELARP	0.2	4	2000 (1100-3700)	199 (110-368)	Kelly et al. 1994

However, in a study by Dr. Alain Tremblay, HQ, reports that "*After the first 10 years, CO2 emissions are similar to those from natural aquatic systems in the same watershed. Such a clear pattern is not observed for CH_4 as organic matter mineralization in CH_4 is highly dependent on the hypolimnetic oxygen concentration (Clayer et al., 2016) and CH_4 bubbling is also related to sedimentation rate and its nature."*[9] This was a rare admission from Hydro Quebec, but it was not reflected in the Intrinsic report or in OPG's decision to exclude the operation phase of a facility, or on HQ's webpage.

[7] *Hydro Quebec. 2016. Greenhouse gas emissions and reservoirs. Accessed August 2016.*
[8] *Xing, W.T., Evaluating the change in net CO2 exchange caused by flooding a black spruce forest through the creation of a hydroelectric reservoir. (2020).*
[9] *Demarty, M., Tremblay, A., Long term follow-up of pCO2, pCH4 and emissions from Eastmain 1 boreal reservoir, and the Rupert diversion bays, Canada. Ecohydrol. Hydrobiol. (2017), http://dx.doi.org/ 10.1016/j.ecohyd.2017.09.001*

Also, a review by Phyoe and Wang (2019) found the same thing: *"Barros et al. (2011) and St. Louis et al. (2000) reported a negative relationship between CO_2 fluxes and the age of temperate reservoirs. A similar result was not found in CH_4 fluxes because few studies included bubble ebullition, and bubbles are a more important factor for methane fluxes than for carbon dioxide (Duchemin 2000).*"[10] It is clear, CH_4 emissions do not decline after the first 10 years continue to persist.

Since the magnitude of greenhouse gas emissions from a reservoir depends on several factors like temperature, precipitation, sediment build-up, type of submerged vegetation and soil, reservoir age, area, volume, and depth, OPG should be reporting GHG emissions at the Coniston GS and all its waterpower facilities.

Climate Change:

In assessing Climate Change impacts on future Wanapitei River streamflow, OPG does admit that "*The operation phase of the proposed Project is the primary focus as the facility will be in place for fifty to one hundred years. As such, the climate change assessment conducted went out to 2070.*"[11] However, it is totally unacceptable that the potential 100-year operation phase of hydroelectric facilities was totally excluded from OPG's consideration of GHG emissions in their assessments of the impacts of climate change. It has been common knowledge since the late 1990s that hydroelectric reservoirs are a significant source of GHG emissions, and that gaseous biomass continues to collect behind these dams.

In fact, the climate change section of the ER, states, "*The proposed Coniston GS will assist Ontario in mitigating climate change impacts. It will do this in two ways. First, the generation of hydroelectric power is a sustainable source of power that does not produce greenhouse gases and therefore is an important component of Ontario's climate change plan. Second, the Coniston GS together with OPG's other facilities and those of a couple of other private producers provide the primary water control capabilities within the Wanapitei River watershed. As such, these facilities provide at no cost to the public, control of water levels and flows on the river. In a future where climate change will result in greater uncertainty with respect to water, this capability allows for the potential mitigation of many deleterious effects of climate change on River flows and levels"*.[12]

Not only does it falsely claim that hydropower is a sustainable source of electricity that does not produce greenhouse gases, but it also does not mention that during heavy rain events and Spring freshet, its dams can back water up and cause flooding scenarios that could place life and property at risk. People and property are much safer without these regulating dams.

Hydro Quebec and the Science:

Sometime before 2011, HQ commissioned an independent study by Eric Duchemin, Institute of Environmental Sciences, University of Quebec, to research GHG emissions coming from Quebec hydroelectric reservoirs. Duchemin has numerous citations in the study of GHG emissions coming from reservoirs in the northern boreal regions of Quebec. However, a close read of a 2006 Duchemin et al study explains a lot, as he cited Alan Tremblay to report, "*However, Tremblay et*

[10] *Phyoe, W.W., Wang, F. A review of carbon sink or source effect on artificial reservoirs. Int. J. Environ. Sci. Technol. 16, 2161–2174 (2019). https://doi.org/10.1007/s13762-019-02237-2*
[11] *Coniston Environmental Report, 4.7.4. Climate Change Mitigation of} Greenhouse Gas Reduction. P-160/225*
[12] *Ibid.*

al (2005) did not consider bubbling fluxes (CH_4) in their estimates".[13],[14] That explains a lot now, doesn't it!

Also, in a 2011 Montreal Gazette news article, Duchemin said,

> *"(Hydro-Quebec) has the tendency to minimize the importance of the emissions from its reservoirs… You transform the forest, the river, the valley into a huge immovable zone where you have enormous amounts of micro bacteria where a huge amount of methane is emitted that was not emitted before."* What's more, Duchemin said, reservoirs continue to emit greenhouse gases for decades because they are the depositories for all the gaseous biomass in the reservoir watershed. Eric Duchemin, PhD, Environmental Sciences.[15]

Unfortunately, this article has been totally wiped clean from the Montreal Gazette archives and the web; however, I am pleased to report that early on the article was posted to ORA's website Blog. Dr. Duchemin has an online presence, and his comments can easily be verified.

GHG Emissions in Boreal and Temperate Regions:

As much as hydropower producers like to claim boreal stats when talking about GHG emissions, many if not most of OPG's reservoirs are located in temperate humid regions, defined as Georgian Bay Ecoregion-5E, Ontario portion of the Agassiz Clay Plan Region-5S, Lake Simcoe-Rideau Ecoregion 6E, and Lake Erie – Lake Ontario Ecoregion-7.[16]

GHG emissions of methane, carbon dioxide, and nitrous oxide, may be released from reservoirs to the atmosphere through four different pathways: (1) diffusive flux at the reservoir surface, (2) gas bubble flux in the shallow zones of a reservoir, (3) water degassing flux at the outlet of the powerhouse downstream of turbines and spillways, and (4) flux across the air-water interface in the river downstream of the dam.[17]

Another study out of Quebec quantified the long-term historical and future evolution of GHG emissions from 1900 to 2060, examining the cumulative global surface area of 9,195 reservoirs in four different climate zones (boreal, temperate, subtropical, and tropical) around the world. It reported:

> *"reservoir-induced radiative forcing continues to rise due to ongoing increases in reservoir methane emissions, which accounted for 5.2% of global anthropogenic methane emissions in 2020. We estimate that, in the future, methane ebullition and degassing flux will make up >75% of the reservoir-induced radiative forcing, making these flux pathways key targets for improved understanding and mitigation".*[18]
>
> *"While CO_2 and CH_4 diffusion are modelled as decreasing with reservoir age, ebullition and degassing remain constant, such that these two latter emission pathways grow increasingly*

[13] *Duchemin et al., "First Assessment of Methane and Carbon Dioxide Emissions from Shallow and Deep Zones of Boreal Reservoirs upon Ice Break-up." March 2006.*
[14] *Tremblay A., Therrien J., Hamelin B., Wichmann E. & LeDrew L. (2005) GHG emissions from boreal reservoirs and natural aquatic ecosystems. In: Greenhouse Gas Emissions: Fluxes and Processes, Hydroelectric Reservoirs and Natural Environments (eds A. Tremblay, L. Varfalvy, C. Roehm & M. Garneau) pp. 209–31. Springer, New York.*
[15] *Hydro Power's Dirty Side, The Montreal Gazette, By William Marsden, Postmedia News April 15, 2011.*
[16] *The ecosystems of Ontario – Part 1: ecozones and ecoregions.*
[17] *Yang, Le; Lu, Fei; Zhou, Xiaping; Wang, Xiaoke; Duan, Xiaonan; Sun, Binfeng. Progress in the studies on the greenhouse gas emissions from reservoirs.*
Online: https://www.sciencedirect.com/science/article/pii/S1872203214000249
[18] *Soued, C., Harrison, J.A., Mercier-Blais, S. et al. Reservoir CO_2 and CH_4 emissions and their climate impact over the period 1900–2060. Nat. Geosci. **15**, 700–705 (2022). https://doi.org/10.1038/s41561-022-01004-2*

important with time. Thus, while CO_2 diffusion was the dominant flux pathway in the twentieth century, C–CH_4 emissions, mainly via ebullition and degassing, are expected to surpass C–CO_2 around 2032 and account for 75% of reservoir C emissions by 2060. In addition, the higher greenhouse warming potential of CH_4, relative to CO_2, amplifies the climate impact of CH_4 emissions. Furthermore, estimated fluxes do not account for future global temperature increases or water eutrophication changes, both of which would probably stimulate CH_4 emissions more strongly than CO_2. Methane emissions, and especially CH_4 ebullition and degassing are expected to dominate future reservoir C-GHG release (39% and 32% in 2060, respectively; (Fig. 2 - below), implying that mitigation efforts aimed at reducing CH_4 fluxes via pathways could be quite effective." [19]

While temperate systems dominate global reservoir area (Fig.1), tropical and subtropical systems jointly surpassed temperate reservoirs as C emitters in the mid-1960s, and their relative contribution has increased steadily since, such that it is expected to reach 64% of total reservoir C emissions by 2060 (Fig.2). [19]

The study clearly indicates that carbon dioxide and methane diffusion decrease within the first 20 or more years of a new reservoir being created (not 2 to 4 or 5 years); however, methane emissions through ebullition and degassing persist and can increase over time. As stated previously, the bulk of OPG's hydroelectric facilities are in a temperate humid climate region; however, measurements made in boreal and tropical regions indicate they can be substantial.[19,20]

A Swiss study of a temperate hydropower reservoir indicates that "*the total methane emissions coming from Lake Wohlen, was on average > 150 mg CH_4 m^{-2} d^{-1}, which is the highest ever documented for a midlatitude reservoir. The substantial temperature-dependent methane emissions discovered in this 90-year-old reservoir indicate that temperate water bodies in older headponds can be an important but overlooked methane source*".[21]

Reservoir:

You also responded that *"Visual examination of the stretch of the Wanapitei River immediately above the Coniston GS demonstrates that very little area would have been inundated for a reservoir. There is no large lake or impoundment immediately above the Coniston GS. There is a limited forebay to store water since Coniston is a run-of-the river GS.*[22]

Yet, your response letter used the storage factor as a plus when it comes to climate change, reporting that "*these facilities provide, at no cost to the public, control of water levels and flows on the River. In a future where climate change will result in greater uncertainty with respect to water, this capability allows for the potential mitigation of many deleterious effects of climate change on River flows and levels*."[23]

[19] *St. Louis, V.L., Kelly, C.A., Duchemin, E., Rudd, J.W.M., Rosenberg, D.M. 2000. Reservoir Surfaces as sources of greenhouse gases to the atmosphere: a global estimate. BioScience 50(9): 766-775.*
Online: https://academic.oup.com/bioscience/article/50/9/766/269391
[20] *World Commission on Dams. 2000. Introduction to Global Change, Working Paper of the World Commission on Dams, Secretariat of the World Commission on Dams, Cape Town, South Africa.*
[21] *DelSontro, Tonya, McGinnis, Daniel F., Sobek, Sebastian, Ostrovsky, Ilia, Wehrli, Bernhard, 2010, Extreme Methane Emissions from a Swiss Hydropower Reservoir: Contribution from Bubbling Sediments.*
Online: https://pubs.acs.org/doi/full/10.1021/es9031369
[22] *14 April 2022 Ontario Power Generation Response Letter – Response #1 GHG Emissions. P-2*
[23] *14 April 2022 Ontario Power Generation Response Letter – Response #1 GHG Emissions. P-3*

OPG must also take into account that its reservoirs have flooded rapids and falls, displaced forests, wetlands and other natural areas that are generally considered carbon sinks.

This "*very little area*" is extremely misleading to the public because the plant is part of a long cascading series of 4 hydroelectric facilities. It must be an incredible drop from Wanapitei Control Dam, all the way down to McVittie GS.

Wherever water levels have been lifted from their former undeveloped elevation must be considered the full extent of the reservoir/s. This crucial detail is not set out in the ER; however, the full extent of the cascading facilities must be considered when detecting, measuring and reporting total GHG emissions (CH_2, CH_4 and N_2O). This cascading system creates one very large artificial and ongoing multi-level series of reservoirs that are highly regulated through the WRWMP, and likely very high in GHG emissions.

Upstream Coniston Wastewater Treatment Plant (WWTP):

I receive Sewage Bypass Alerts from the City of Sudbury whenever the Coniston WWTP bypasses partially treated or untreated effluent. It happens quite often and adds to the pollution factor of the river where microbes feed on biomass behind the dam and breathe out methane.

Sediment Behind the Dam:

You also suggested that the sediment behind the dam is not OPG's responsibility, "*OPG does not own the sediment above the dam. The sediment that exists is primarily a result of all human activities in the watershed above. OPG does regularly capture the trash and other debris that flows down the river and disposes of this material*."[24]

However, if the dam was not there the sediment would continue on down through the system, but you do take responsibility for removing the trash and debris that collects at the dam.

It is also the sediment accumulation built up behind the dam where microbes feed on the biomass that collects there. Sediment accumulation in oxygen-starved environments correlates with methane production and subsequent ebullitive release rates. A 2006 study reports that sedimentation-driven methane emissions from dammed river sites can potentially increase global freshwater emissions by up to 7%.[25]

The sediment is OPG's responsibility, and so is the methane it generates.

Run-of River:

Throughout the Environmental Report, the facility is referred to as a run-of-the-river or run-of-river system, and this is a favourite but misleading term that proponents like to use

[24] *14 April 2022 Ontario Power Generation Response Letter – Response #1 GHG Emissions. P-8*
[25] *Maeck, A., DelSontro, T., McGinnis, D.F, Fischer, H., Flury, S., Schmidt, M., Fietzek, P. and Lorke, A., 2013. Sediment Trapping by Dams Creates Methane Emission Hot Spots, Environmental Science and Technology, 8130-8137, Online: http://www.dx.doi.org/10.1021/es4003907*

because it gives the public the mistaken belief that water is free flowing with no storage and water levels and flow volumes are continuous.

This ER reports "*The WRWMP does refer to the system as a run-of-the-river system (Figure 5-3 of the WRWMP) and defines the term, although the term can be interpreted differently*."[26] However, the proponent is undergoing a Class EA and must adhere to its requirements when preparing an ER. According to the Class EA, the definition of **Run-of-River** is, "*A run-of-river facility uses only the natural flows in the river, as they are available, for generation. Therefore, the flow in the river is either passed through the plant, or partially released around the plant if the flow exceeds the capacity of the plant to use all of it*."[27] That does not describe the Coniston GS.

The definition that more closely represents the operation at Coniston GS is "***Run-of-River with Modified Peaking*** *– Many run-of-river plants allow for limited storage of water over the course of the day or days. This allows the plant to produce more electricity during periods of high demand i.e., during the day/work week, and save water during periods of low demand i.e., at night/weekends. This type of plant can provide electricity service to the system, but with limitations imposed by the amount of storage and flexibility available (generally through a headpond)."*[28]

The Coniston GS is not a run-of-river. It is operated as a Run-of-River with Modified Peaking in a cascading line-up of the Wanapitei Lake Control Dam, and 3 hydroelectric facilities, at Stinson, Coniston and McVittie, as well as a fourth facility run by Trans-Alta at Moose Rapids. These types of cascading peaking networks are highly problematic, resulting in a multitude of negative environmental effects, and a ramped up GHG emitter.

Conclusion:

The collateral environmental damage caused by dams and waterpower facilities has been well documented for decades, including the loss or serious decline in migratory fish species (waterpower facilities are key factors in the listing of some iconic fish species as species at risk in Ontario and elsewhere)[29,30], declining biodiversity[31], impaired water quality (including elevation of mercury concentrations in fish tissue), and are critical threats to imperilled aquatic species.[32]

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[26] *Coniston Generation Station, Environmental Report – P27/225*
[27] *Class Environmental Assessment for Waterpower Projects, May 2022 – Ninth Edition, Prepared by Ontario Waterpower Association. P-78/97*
[28] *Ibid. P-78/97.*
[29] *MacGregor, R., Casselman, J., Greig, L., Dettmers, J., Allen, W.A., McDermott, L., and Haxton, T. 2013. Recovery Strategy for the American Eel (Anguilla rostrata) in Ontario. Ontario Recovery Strategy Series. Prepared for Ontario Ministry of Natural Resources, Peterborough, Ontario. x + 119 pp. P-45.*
[30] *MacGregor, R., Haxton, T., Greig, L., Casselman, J.M., Dettmers, J.M., Allen, W.A., Oliver, D.G., and McDermott, L. 2015. The demise of American Eel in the upper St. Lawrence River, Lake Ontario, Ottawa River and associated watersheds: implications of regional cumulative effects in Ontario. Pages 149–188 in N. Fisher, P. LeBlanc, C. A. Rose, and B. Sadler, editors. Managing the impacts of human activities on fish habitat: the governance, practices, and science. American Fisheries Society, Symposium 78, Bethesda, Maryland.*
[31] *Carew-Reid, J., Kempinski, J., and Clausen, A. 2010. Biodiversity and Development of the Hydropower Sector: Lessons from the Vietnamese Experience – Volume I: Review of the Effects of Hydropower Development on Biodiversity in Vietnam. ICEM – International Centre for Environmental Management, Prepared for the Critical Ecosystem Partnership Fund, Hanoi, Viet Nam. Online:https://www.icem.com.au/documents/biodiversity/bioHPdevt/Volume%20I%20Biodiversity%20and%20development%20of%20hydropower-Vietnam%20experience.pdf*
[32] *Wilcove D.S., Rothstein, D., Dubow, J., Phillips, A., Losos, E. 1998. Quantifying threats to imperiled species in the United States BioScience 48: 607–615. Online: http://faculty.washington.edu/timbillo/Readings and documents/global*

Significant ecological damage from waterpower has been ongoing for many decades in Ontario and other locations worldwide.[33] In the past, attempts to effectively mitigate many of these impacts have been sporadic to non-existent in Ontario.

In fact, a very high environmental and socio-economic price has been paid in the past in terms of losses to valued natural resources due to the installation of dams and waterpower facilities. The socio-economic costs of these losses are generally ignored[34,35] and rarely reported to the public.

ORA recommends that OPG engage reliable scientists who apply rigour and ethics to independent peer-reviewed, third-party studies, rather than relying on Hydro Quebec web pages or studies that are questionable at best.

In closing, ORA is very willing to work with OPG to help develop a new path forward in the detection, measurement and reporting of GHG emissions coming from its hydroelectric facilities in Ontario.

ORA would have made a Part II Order request if it were possible; however, our policy and legislation have been gutted.

Respectfully,

Linda Heron
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(705) 866-1677

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div patterns origins/general tropical biodiv conservation/Wilcove et al Bioscience 1998 Quantifying threats to biodiv.pdf

[33] *World Commission on Dams. 2000. Introduction to Global Change, Working Paper of the World Commission on Dams, Secretariat of the World Commission on Dams, Cape Town, South Africa.*

[34] *Wang, G., Fang, Q., Zhang, L., Chen, W., Chen, Z., Hong, H. 2010. Valuing the effects of hydropower development on watershed ecosystem services: Case studies in the Jiulong River Watershed, Fujian Province, China, Estuarine Coastal and Shelf Science. 86.3*

[35] *Institute for Fisheries Resources.1996. Cost of Doing Nothing: The economic burden of salmon declines in the Columbia River basin. Report No. 1 of 3.*
Online: https://pcffa.org/wp-content/uploads/2016/10/CDNReport-Columbia.pdf