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By Email to:
The Right Honourable Justin Trudeau, Prime Minister of Canada
The Honourable James Gordon Carr, Minister of Natural Resources
The Honourable Catherine McKenna, Minister of Environment and Climate Change
The Honourable Hunter Tootoo, Minister of Fisheries, Oceans and Canadian Coast Guard

Re: Pan-Canadian Climate Action Plan – A Clean Energy Future

Dear Prime Minister Trudeau, Minister McKenna, Minister Carr and Minister Tootoo:

Ontario Rivers Alliance (ORA) would like to congratulate you and the Liberal government on your impressive win in the recent Federal election. ORA is very optimistic that this government will follow through on its promises to review policy and legislative changes imposed by the previous government, with a goal of restoring key environmental protections.

ORA is a Not-for-Profit grassroots organization acting as a voice for several stewardship groups, associations, and private and First Nation citizens that have come together to protect, conserve and restore healthy river ecosystems.

ORA celebrates and supports the climate leadership that our new Canadian government has demonstrated to the World. It will take great courage and bold measures to break away from those technologies that emit greenhouse gases (GHG) and contribute to climate change.

With the recent Paris Climate Summit, and a comprehensive pan-Canadian climate framework to follow, we call on this government to commit to a bold climate solution: 100% authentic clean and green energy by 2050.

ORA is writing to offer our recommendations related to Canada's riverine ecosystems, and to help guide the federal government's path forward with regards to a clean and renewable green energy mix for Canada that will help inform the immediate decisions to be made regarding Canada's commitments and plans for reducing GHG emissions.

Recommendations:

For the purpose of defining our path forward on GHG commitments, ORA recommends the following:

1. Hydroelectric using headponds/reservoirs/impoundments/diversions, or peaking and cycling operating strategies are not considered "renewable", and are excluded under any renewable energy mix or carbon credit program.
2. Require provinces to complete a comprehensive inventory of GHG emissions coming from reservoirs, along with related estimates of the carbon inputs/budget for the respective watersheds.

3. New and existing waterpower facilities are required to pay their fair share of carbon taxes in relation to their contribution of GHG emissions.
4. An Environmental Impact Assessment is mandatory for all license renewals and upgrades to waterpower facilities, including those considered exempt through transition or grand-parenting provisions.
5. Any new and existing hydroelectric facilities are required to include/demonstrate effective upstream and downstream fish passage, fish friendly turbines, and make up-front provisions for dam decommissioning.
6. A study to compare the economic, ecological and socio-economic costs of wind, solar and waterpower, taking into consideration the investment dollars required, net generation output, footprint, and potential impacts.
7. A national water and waterpower strategy is implemented, using the protection and conservation of riverine ecosystems as its guiding principle.
8. A fully open, transparent and meaningful public and First Nation consultation process is required throughout all application, assessment, permitting and approvals processes.

Background

The claim of "clean and green hydro" is a common refrain coming from industry and governments, and most provinces rely heavily on hydroelectric in their energy mix. However, there are a multitude of studies that support the view that hydroelectric facilities today are neither clean nor green.

Governments and utilities often use the term "clean" categorically and without caveat or qualification.[1] This is misleading - just because dams are not spewing out smoke does not mean they are clean or green. Indeed, waterpower has resulted in significant and ongoing impacts to fish and wildlife populations and habitat, to ecological processes, and to aboriginal communities for decades.[2] Those that are aware of the impacts and yet ignore or mislead the public must be held accountable.

In addition, when headponds or reservoirs are flooded, they can produce carbon dioxide and methane for decades, and possibly centuries.[3,4] For instance,

> *With smaller dams storage becomes increasingly important. Reservoirs silting up or becoming overloaded with nutrients are common problems with major reservoirs and could be at least as serious where shallower bodies of water are created – the shallower a water body, the more easily eutrophic it can become. Likewise, methane generation occurs largely where water and sediment meet, and this means that a shallower water body is likely to release more methane [CH_4] per unit area than a deeper water body. Shallow reservoirs are not unlike paddy fields which are known to contribute substantially to methane emissions…..*[5]

The effect of damming on methane emissions conducted in a central European impounded river revealed that the reservoir reaches are a major source of methane emissions and that areal emission rates far exceed previous estimates for temperate reservoirs or rivers. It showed that sediment accumulation correlates with methane production and subsequent ebullitive release rates. Results suggested that sedimentation-driven methane emissions from dammed river hot spot sites can potentially increase global freshwater emissions by up to 7%.[6]

The impacts, risk and concerns associated with dams, reservoirs and flow regulation have been well known for many years, but conveniently ignored by governments and industry. The Environment and Climate Change Canada's website includes an excellent summary of many of the environmental issues related to hydroelectric. In fact, as far back as 2004, the federal government acknowledged the threat that climate change poses to the current network of dams and reservoirs, and reports that

> *Largely because of the climate-change driven pursuit of "clean" energy sources, attention has also focussed on the role of water storage in affecting production and emission of greenhouse gases (GHG). In contrast to the widespread assumption (e.g., in Intergovernmental Panel on Climate Change scenarios) that GHGs emitted from reservoirs are negligible, measurements made in boreal and tropical regions indicate they can be substantial (St. Louis et al., 2000; World Commission on Dams, 2000). Although Canada is attempting to complete an inventory of the Canadian situation, comprehensive data concerning flooded areas are difficult to access (St. Louis et al., 2000) and accuracy of methods to estimate gas fluxes from reservoir surfaces remains uncertain (Rosa and dos Santos, 2000).* [7]

The hydro lobby is very powerful and deep pocketed, and has gone to great lengths to undermine and debunk studies that clearly demonstrate the significant contribution that reservoirs make to total world GHG emissions.[8] Shifts in water temperatures, or the availability of fresh water due to climate change could lead to reductions in electricity production capacity in more than two thirds of the world's power plants between 2040 and 2069, said a study from an Austrian research centre. In fact, Keywan Riahi, Director of the Energy Program at the International Institute for Applied Systems Analysis says, "*power plants are not only causing climate change, but they might also be affected in major ways by climate*".[9]

According to a new NASA and National Science Foundation funded study of more than half of the world's freshwater supply, climate change is rapidly warming lakes around the world, threatening freshwater supplies and ecosystems. The rate of warming is faster than either the ocean or the atmosphere[10], with even greater warming in northern Canada[11]. As warming rates increase over the next century, algal blooms, which can rob water of oxygen, are projected to increase 20 percent in lakes, and emissions of methane will increase by 4 percent over the next decade.[12] Additionally, new studies are reporting on the increased evaporation rates from reservoirs[13], and there are increasing reports from around the globe of rivers and lakes drying up. Consequently, a rapidly changing climate may not support the hydro facilities we already have,[14] let alone support the notion that more hydroelectric dams and reservoirs are a good idea.

In fact, the World Economic Forum in its "Global Risks 2015" report lists "water crises" as its number one global risk in terms of impact – beating out the rapid spread of infectious disease, weapons of mass destruction, and failure of climate-change adaptation.[15]

In addition, hydroelectric projects often overestimate economic benefits, and underestimate the far-reaching effects on biodiversity and critically important fisheries. Current site-specific assessments largely ignore cumulative impacts on hydrology and ecosystem services, in favour of profits, and to the detriment of the environment and citizens.

The obvious need for provision of safe and effective fish passage and fish friendly turbines at waterpower facilities has also been largely ignored in Ontario, by both the federal and provincial

governments[16], where there are currently only 2 or 3 fish bypasses installed at hydroelectric facilities across the province. There are also no up-front dam decommissioning provisions required when a new or upgraded waterpower facility is approved – unlike in the mining industry where a mining company cannot commence or recommence mining operations until a certified Closure Plan and the associated Financial Assurance are in place.[17]

ORA questions the label of "renewable" for hydroelectric that uses reservoirs when water quality, habitat and/or fisheries are degraded/jeopardized, and when water in its reservoirs is lost through evaporation.[18]

> Although storage of water in reservoirs increases evaporation, the total effect cannot be estimated because information about reservoir areas and water depths is lacking. Greatest losses occur in shallow reservoirs and where dams have been constructed in hydro-climatic zones characterized by naturally high rates of lake evaporation (den Hartog and Ferguson, 1978), such as Lake Diefenbaker in the central Prairies (e.g., Canada-Saskatchewan, 1991).[19]

Hydroelectric facilities should not be an "*eligible renewable energy resource if it will cause an adverse impact on instream beneficial uses or cause a change in the volume or timing of streamflow"*.[20] Hydroelectric can cause major damage to fish and wildlife, water quality, communities and businesses that rely on healthy rivers, and it is the only "renewable" energy source that can drive species toward extinction.

In the United States (US), the dam re-licensing process involves a substantial Environmental Impact Statement, which considers the project's impacts, that are then weighed against the value of the power it generates, as well as the projected ecological value of its removal. Based on these findings, the regulator may decide not to re-license a project, or apply a conditional approval, and maintains the ability to terminate or modify a project's license if they perceive it has been violated.[21] This would be an important change for waterpower facilities in Canada.

It would be prudent to look to the US where the attitude towards dams is very different, and obsolete dams are being removed at a rapid pace. In 2014 alone, 72 dams were removed and, to date, 1,185 dams have been removed across the US. "*Dam removal brings a variety of benefits to local communities, including restoring river health and clean water, revitalizing fish and wildlife, improving public safety and recreation, and enhancing local economies."* [22] This is happening now, because there is a growing awareness that our future is reliant on the life and health of our rivers.

Rather that list all of the numerous negative impacts of hydro within the body of this letter, we have attached our in-depth report entitled "Hydro Impacts 101: The Trade-offs" (Report) for your review and consideration. The Report is a comprehensive compilation of a small representation of the multitude of studies describing the negative environmental and socio-economic impacts that are likely to result from both large and small waterpower facilities.

Alternatives

ORA recommends that this government undertake a study to compare the economic, ecological and socio-economic costs of wind and solar vs. waterpower, taking into consideration the investment dollars required, net generation output, footprint, and potential environmental

impacts. It is absolutely necessary to determine the most efficient, cost-effective, and "clean and green" form of renewable energy in order to move forward with a strong climate plan. A recent report compared the cost and efficiency of wind power to waterpower, indicating that:

> an investment of $17 million in wind power would result in annual generation of 21.9 MWH, while that same investment in re-powering the upper three dams on the Boardman River would result in annual generation of 10.9 MWH. In other words, an investment in wind power produces twice the amount of electricity as the same investment in hydropower on the upper three dams of the Boardman River.[23]

Even with small waterpower projects, the headpond can flood many hectares of land and extend for several kilometers upstream, and impact on many more kilometers of downstream riverine ecosystem and wetlands. To further maximize the power production from a river, multiple cascading waterpower facilities are often constructed, and can involve additional upstream reservoirs. It is ORA's submission that the footprint, as well as the socio-economic and environmental impacts of a hydroelectric project would far outweigh that of a wind project.

Other viable alternatives to new waterpower do exist, and are often more sustainable and less costly environmentally and economically. The most obvious is to improve the efficiency and sustainability of existing power facilities, reduce the demand for power through conservation and by decreasing energy consumption, retrofitting power plants and irrigation systems with more efficient eco-friendly technologies, and reducing losses through transmission in power lines. There are also a number of renewable options that can be considered, such as solar, wind, geothermal and biomass. Of course it is important that individual projects be assessed to ensure they are environmentally sustainable.

Finally, there are also several emerging technologies, such as those related to battery storage[24], thorium-based nuclear Molten Salt Reactors[25], and the recycling and reprocessing of used nuclear fuel[26], which will all need further evaluation.

Conclusion

Unfortunately, mitigation of many of the more serious effects of waterpower have rarely been required in Ontario, and has often resulted in significant ongoing collateral damage spanning many decades or more.[27] Basic mitigation measures such as effective upstream and downstream fish passage, installation of fish friendly turbines, or up-front dam decommissioning provisions are rarely considered, let alone required.

It is clear that allowing our societies to continue to be powered by carbon fuels is not sustainable; however, this does not mean that all renewable energy sources can simply be viewed as having no environmental or socio-economic cost whatsoever[28], or as a clean and green alternative, without a careful and reasoned 3rd party independent science-based assessment of the trade-offs.

The Ontario government has included hydroelectric in its "green energy" mix, and the generous rates and peaking bonuses have encouraged a rash of new hydro facilities to be proposed, as well as upgrades to existing waterpower facilities that enable facilities to hold water back from downstream flow in order to produce power during peak demand hours. Many proponents arbitrarily adjust their operating strategy by using seasonal operating bands to peak on a daily

basis – without first conducting an environmental assessment to determine the potential impacts, or the sustainability of the operation.

Climate change will impose some of its greatest effects on both the long-term availability and the short-term variability of water resources in many regions of this Canada. These effects have already been felt in many areas through increased frequency and magnitude of droughts, extreme rain and flooding, destruction of infrastructure, illness and disease, duration of accumulated snowpack, and changes in soil moisture and runoff. These effects have also created havoc with municipal waste water treatment facilities that were never built with climate change in mind, and are releasing massive amounts of untreated and undertreated effluent/nutrients into riverine ecosystems.

Meeting our climate change goals and commitments cannot just be about carbon and the atmosphere, but it also has to be about conservation and protection of water. Water and climate must be amongst our top priorities. Most climate change impacts transfer to the water. Mounting turmoil in the world's water supply is largely the result of the Earth's powerful response to industrial degradation over the past 150 years. The biggest lakes in the world are either drying up, impacted by blue-green algae, or degraded from mounting pollution. Water scarcity and insecurity have lead to unrest and war in many areas throughout the world, and has resulted in mass migration of populations.

"*Climate warming will adversely affect water quality and water quantity, as well as the magnitude and timing of river flows, lake levels and water renewal times."*[29] Drought conditions could make many waterpower projects uneconomical, while more extreme rainfall will heighten the risk of dam failures (14 dams were breached in South Carolina flood in October of 2015) and rapid release of high volumes of water.[30,31] "*Climate will interact with overexploitation, dams and diversions, habitat destruction, non-native species and pollution to destroy native freshwater fisheries.*"[32] We must recognize the hazards of infrastructure that would degrade water quality and water quantity, threaten our fisheries, or that jeopardize the ecosystem services that healthy wetlands provide during times of drought and flooding. Canada must have a water and waterpower policy.

According to a new NASA and National Science Foundation-funded study of more than half of the world's freshwater supply, climate change is rapidly warming lakes around the world, threatening freshwater supplies and ecosystems. As warming rates increase over the next century, the researchers say, algal blooms, which can rob water of oxygen, will likely increase 20 percent in lakes. Algal blooms that are toxic to fish and animals will likely increase by 5 percent. In addition, the researchers say, emissions of methane, a greenhouse gas 25 times more powerful than carbon dioxide on 100-year time scales, will increase 4 percent over the next decade, if the current warming rates continue. "*These results suggest that large changes in our lakes are not only unavoidable, but are probably already happening,"* said lead author Catherine O'Reilly, associate professor of geology at Illinois State University, Normal. Earlier research by O'Reilly has seen declining productivity in lakes with rising temperatures.[33]

Professor Michael English, a Wilfrid Laurier University professor, reported on research which indicates that Canada's North is taking a serious hit from climate change. "*In the very high latitudes, the changes are most pronounced on a global scale, so over [the past 51 years], you're getting a change of close to 4 degrees"*.[34] "*It puts the question into what the future availability of freshwater resources is in these parts of Canada, especially considering it's also experiencing unprecedented rates of industrial expansion – and that brings with it unknown*

demands on water," says Bill Quinton, Canada Research Chair in Cold Regions Hydrology at Wilfrid Laurier University.[35]

"*Reservoirs are sources of GHG to the atmosphere, and their surface areas have increased to the point where they should be included in global inventories of anthropogenic emissions of greenhouse gases.*" [36]

Whether large or small, hydroelectric proposals generate huge public and stakeholder pushback, and for good reason, as they can severely impact on communities, recreation, fisheries, drinking water, and livelihood for several kilometers upstream and for many more kilometers downstream of a dam – and power procurement contracts are for a term of 40 years.

Undoubtedly there will be a much more civilized, clean, and environmentally sustainable form of power generation and storage available within the next 10 years. With 40-year power procurement contracts, and no provisions for dam decommissioning, the taxpayers will be left with the full financial responsibility of removing the thousands of small and large dams across Canada that are fueling climate change and degrading our riverine ecosystems. It is time to stop promoting and encouraging power generation that will only exasperate our climate change woes, and that could compromise the ability of our future generations to survive on this planet.

"*Climate change is the critical issue of our time*."[37] Healthy rivers are the key to successful adaptation to the extremes of climate change. There is an urgent need to integrate climate change into water protection strategies and policies.

Hydroelectric isn't the answer to our climate change dilemma – it is the absolute wrong prescription for a warming climate with increasing intensity of droughts and flooding. Protecting our freshwater must be recognized as an issue of national security – it is essential to our own, and our children's survival on this planet.

ORA urges you to integrate our recommendations into the upcoming pan-Canadian climate framework, and to focus on protecting our water, as well as our air.

ORA wishes to register as a stakeholder, and to be involved in any future discussions on renewable energy and/or a climate change framework. ORA would be happy to meet with you or your representatives to answer any questions or to discuss this important issue further.

Respectfully,

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Attachment: Hydro Impacts 101: The Trade-offs

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