**M E M O R A N DUM**

**TO:** Paul Mercer Commissioner, Department of Environmental Protection and

 Maine Board of Environmental Protection

**FROM:** Stephen M. Kasprzak, P. O. Box 7662, Cape Porpoise, ME 04014

**SUBJECT:** Proposed 145-mile Transmission Corridor by Avangrid-Central Maine Power

**DATE:** September 5, 2018

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I am writing to ask Maine’s Department of Environmental Protection (MeDEP) to deny a permit for the 145-mile transmission corridor proposed by Avangrid-CMP to carry hydroelectricity generated by Quebec Hydropower from Canada to Massachusetts because Quebec Hydropower reservoir hydroelectric facilities are starving the fisheries in the Gulf of Maine and warming its waters.

**PREFACE**

In a recent 2016 Canadian study of trends in river discharge from 1964-2013, the authors found: that there has been a three-fold increase in river discharge during winter , when electric demand peaks, into the estuaries of Labrador Sea and Eastern Hudson Bay for the 2006-2013 period compared to 1964-1971 and a forty percent reduction in discharge during the summer. (*Recent Trends and Variability in River Discharges Across Northern Canada* Dery et. Al. 2016).

Let’s put these findings in layman’s terms. It would be declared an extreme drought by meteorologists if total spring and summer precipitation was forty percent below normal. If it happened for fifty continuous years on land in the northern latitudes, the people would have starved to death. In the ocean waters of Newfoundland, Labrador and Maine, the fisheries are being starved to death.

For the past fifty years, a three-fold increase in river discharge of these warm reservoir waters (mid-thirty degree Fahrenheit) during the three months of winter represents a deluge of biblical proportion to the frozen seas. There are thousands of reservoir hydroelectric facilities throughout the northern latitudes operating in a similar manner.

The cumulative impact is predictable! Since the start of regular satellite observations in 1979, there has been an overall decline in Arctic sea ice in the past forty years. However, total sea ice in the Antarctic has increased by one percent per decade. Is this deluge of warmer than natural discharged waters a key factor in the decline of Arctic sea ice?

The proliferation of large reservoir hydroelectric dams by Quebec Hydropower over the last 50 years never would have been allowed in Maine for the following reasons:

1. The construction and management of these dams would have violated Section 401 of the Clean Waters Act and Maine’s Natural Resources Protection Act.
2. These dams are starving the fisheries of Hudson Bay, Labrador Sea and the Gulf of Maine, by reducing the transport of the annual budget of dissolved silicate during spring freshet to silicon diatom phytoplankton, which is the essential basis of the marine food web.
3. The reduction in diatom phytoplankton blooms have increased carbon in the air by significantly reducing the natural transference of carbon dioxide from the atmosphere to the ocean.
4. These reservoir dams are warming the waters of the Hudson Bay, Labrador Sea and the Gulf of Maine by capturing the spring freshet behind these dams and holding these waters to maximize hydropower generation during peak demand in the winter months.

I have listed below observations which support each of the claims made above, and it would be the height of hypocrisy for MeDEP to issue a permit for this corridor and reward the bad behavior of Quebec Hydropower.

If a permit is issued, it should be conditioned on Quebec Hydropower changing the management of their reservoir facilities to a Run of River mode, which uses the natural flow of the river. This would restore large silicon diatom phytoplankton blooms to feed the fisheries and increase carbon dioxide transference from the atmosphere to the ocean. It should also help to stop the warming of the waters of Hudson Bay, Labrador Sea and the Gulf of Maine.

**QUEBEC HYDROPOWER’S RESERVOIR FACILITIES AND OPERATIONS ARE INCONSISTENT WITH MAINE’S NATURAL RESOURCES PROTECTION ACT**

1. ***“Half of the Gulf of Maine’s ecosystem lies in Canada, where much of the water feeding the Gulf and affecting its temperature comes from*,” was written by Colin Woodward in 10/15/15 Maine Sunday Telegram article, *“Climate of Fear: Marine Researchers Muzzled in Canada.”***  If Quebec’s reservoir hydroelectric facilities are so good for the Gulf of Maine’s ecosystem, why are Canadian researchers being muzzled?

1. **It is time to recognize that Quebec Hydropower’s reservoir hydroelectric facilities are a key regional driver in the unprecedented decline in the Gulf of Maine’s fisheries, as well as contributing to the warming of these Gulf waters.**

For example, *“The hydroelectric diversion of the Eastman River into the LaGrande River in northern Quebec increased winter flow (February) of the combined Rivers from 930 M³/sec*

*before 1980 to 2,600 M³/sec in 1984, with plans to increase this to more than 6,000 M³/sec in the future (Prinsenberg 1980; Ingram and Lourouche 1987; Harding 1992).*

A water flow of 2600 M³/sec equals 91,747 ft.³/sec and is 14 times greater than the February median flow of 6,500 ft.³/sec on the Penobscot River at W. Enfield, Maine.

Quebec Hydropower has 66 hydropower generating sites, and 38 are Run of River with a total capacity of 11,100 megawatts (MW), and 28 are reservoirs with a total capacity of 26,800 MW.

Maine’s total hydropower generating capacity is 723 MW, which is less than 2 percent of Quebec Hydropower’s capacity.

1. **Quebec Hydropower’s reservoir facilities have eliminated the spring freshet on these rivers by capturing and storing the spring run-off.**

This would be an act of pollution on Maine’s rivers under the Clean Waters Act, because the storage of these free-flowing cold waters has significantly reduced the historic and natural delivery of the annual budget of dissolved silicate to the Gulf of Maine via the waters flowing through the Hudson Strait and the Labrador current.

1. **In 2006, the Maine Department of Environmental Protection (MeDEP) and S. D. Warren argued before the U. S. Supreme Court over whether S. D. Warren was polluting the Presumpscot River and violating Section 401 of the Clean Water Act (CWA), because it was using too low a minimum flow during hot summer months.**

MeDEP argued that dissolved oxygen levels were too low in the river downstream of the Eel Weir Dam and a higher flow was needed to provide more dissolved oxygen for aquatic life.

The Supreme Court agreed with MeDEP in a 9 to 0 decision, and Justice Souter wrote “*The decision interprets term “discharge” according to its “ordinary and natural meaning”* and rejects efforts by S. D. Warren to have the Court read into CWA Section 401 any requirement that the regulated activity result in the *“addition of a pollutant.”*

In other words, holding back clean water laden with dissolved oxygen was polluting downstream water, which did not have enough dissolved oxygen to support the river’s fisheries and aquatic life.

**STARVING THE FISHERIES**

1. **Before reservoirs for hydroelectric facilities were built, the brooks, streams and rivers in these watersheds freely and naturally transported 80% of the annual budget of dissolved silica to the ocean with the majority of this transport occurring in the spring run-off.**

 The construction of these reservoirs have not only flooded and eliminated the functions and values of hundreds of thousands of acres of wetlands, but have also captured the cold and free-flowing water of thousands of miles of brooks, streams and rivers in these reservoirs, along with the dissolved silica, which was being transported in the spring freshet by these once naturally free-flowing water bodies.

1. **Quebec Hydropower’s reduction of spring and summer outflows is polluting Hudson Bay, Labrador Sea and the Gulf of Maine by depriving the silica encased diatom phytoplankton population of its much needed dissolved silica during its growing season.**

Diatoms are algae cells enclosed with cell walls made of silica, and their growth rate and size are determined by the availability of dissolved silica and the temperature of the water. In March, with more daylight hours, the diatom population increases its rate of photosynthesis enabling it to start dividing and multiplying into a healthy diatom bloom and the more silica, the bigger the diatoms and bloom.

These reservoirs prevent the cold natural waters of the spring freshet from reaching the coastal estuaries, and these retained waters are then exposed to “aging” as the water temperature quickly rises and changes in its biochemistry occur before being discharged from the dam.

 The Gulf of Maine is one of the most important oxygen producing ocean “rain forests” in the world, and its diatom rich ecosystem is responsible for superior fisheries, ameliorating ocean acidification and regulating climate change. The cumulative effect and the proliferation of reservoir hydropower in its ecosystem are destroying it.

1. **The Gulf of Maine’s cod catch was only 79,816 pounds in 2017, compared to 21,000,000 pounds in 1991.**

Reservoir hydroelectric facilities in Quebec and Canada have contributed to this 99% decline by significantly reducing the supply of dissolved silica during the spring run-off and, thereby, negatively impacting the ocean’s food chain. Diatoms are silica encased phytoplankton, and the essential basis of the marine food web.

1. **Sutcliffe et. al. (1983) hypothesized that reducing the spring freshet by hydroelectric regulation in the Hudson Bay area may affect northern cod populations along the Labrador coast.**

 It is no longer a question of may!

1. **Collapse of the Atlantic northwest cod fishery**.

In 1992 the Canadian Federal Minister of Fisheries and Oceans, John Crosbie, declared a moratorium on the Northern Cod fishery, which for the preceding 500 years had largely shaped the lives and communities of Canada’s eastern coast. In the summer of 1992, when the Northern Cod biomass fell to 1% of earlier levels, Canada’s federal government saw that this relationship had been pushed to the breaking point, and declared a moratorium, ending the region’s 500-year run with the Northern Cod.

1. **Northern Cod stock declined over last year; scientists urge minimum fishing effort.**

 On March 23, 2018, FISH-NL president Ryan Cleary is quoted: *“Twenty-six years after the northern cod moratorium and the iconic northern cod stock is in worse shape”,* and *“Most all commercial stocks off Newfoundland and Labrador today—including cod, capelin, shrimp and crab—are on the decline, and the common thread is management or lack thereof.”*

1. **Concern over serious fish decline off Newfoundland.**

 Conservationists, fishermen and the government are all concerned about a huge decline of up to 70 percent, in the capelin population off the coasts of Newfoundland and Labrador. The capelin which feed on the tiniest of creatures, silicon diatom phytoplankton, etc., and in turn are food for a variety of larger fish such as cod, turbot, halibut, Harp seals, and a variety of seabirds, and even whales. Capelin is a major part of the diet for many seabirds including puffins on the east coast of Canada, especially in Newfoundland.

**SMALLER DIATOM PHYTOPLANKTON BLOOMS MEAN MORE CARBON IN THE AIR**

1. **Diatoms are responsible for an estimated 20% to 25% of carbon dioxide transference from the atmosphere to the ocean**.

The results of a 2010 Study by Daniel Boyce using a 100-year data set concluded that the abundance of diatom phytoplankton had declined by 40% since 1950, and in a recent NASA Study in “Global Biogeochemical Cycles,” the authors have concluded the global diatom populations have declined by 1% per year from 1998 to 2012.

1. **Hydroelectric development is having a negative impact on the Gulf of Maine’s ecosystem**. The following was written in a 1998 Canadian study:
2. “*Hydroelectric development on major rivers is seasonally altering the physical structure of the water column in coastal waters,”* and *“the implications of these hydro developments on the marine environment are not fully understood.”* (Harding 1992)
3. *“Hydroelectric development has markedly reduced this spring run-off, and this may be enough to delay the phytoplankton bloom and thereby shorten an already brief growing season for larvae fishes and benthic invertebrates” (Morin et al. 1980).*

**LARGE RESERVOIR HYDROELECTRIC FACILITIES ARE WARMING**

**THE WATERS THEY DISCHARGE INTO**

1. **The countries who are the biggest producers of hydroelectricity are warming their nearby oceans.** The Gulf of Maine and South China Sea are two areas in the global ocean, which are warming the fastest, and they are located next to the two largest producers of hydroelectricity in the world. Number one is China, and number two is Canada. Quebec Hydropower is Canada’s largest producer, and it’s warmer than natural discharge waters flow via the Labrador Current into the Gulf of Maine.
2. **The advocates of hydroelectricity claim it is a power source that is clean and renewable because it uses the earth’s annual water cycle to generate electricity**.

They fail to mention that hydroelectric reservoir facilities have changed the seasonal pattern of annual natural water cycle by significantly reducing the spring run-off and summer outflows and using the captured waters to double and triple the winter outflows, due to high winter demand for electricity.

This is just the opposite to a typical unregulated river, which experiences low flows in winter when water is stored in the seasonal snowpack, then high flows during the snowmelt-driven freshet in spring and early summer.

1. **As stated earlier, the Gulf of Maine and China Sea are warming at an alarming rate, and now there is another area.**

The third area is Barents Sea, and scientists say *“changes are so sudden and vast that in effect, it will soon be another limb of the Atlantic, rather than a characteristically icy Arctic Sea.”* The Barents Sea is being impacted by Norway and Russia, which are the 5th and 6th largest producers of hydroelectricity in the world.

The water impounded by these large reservoirs is heated by the sun, and the discharged water from the impoundment is much warmer than the natural free flowing water upstream of the reservoirs. The temperature of the Gulf of Maine’s waters is responding to the cumulative impact of more and more reservoir hydropower generation sites being built in the past fifty years. Since 1969, Quebec Hydro has built 22 reservoir hydropower dams, which is almost one every other year.

1. **The destruction of Quebec’s wetlands and the elimination of naturally free-flowing water bodies in conjunction with maximizing hydropower generation, which Avangrid-CMP wants to transmit through Maine, are inconsistent with the Preamble of Maine’s Natural Resources Protection Act.**

*“The Legislature has also found that the cumulative effect of frequent minor alterations and occasional major alterations of these resources poses a substantial threat to the environment and economy of the State and its quality of life. The terms “wetland,” “wetlands,” “waterbody,” and “waterbodies” are used interchangeably and collectively in this rule to refer to freshwater wetlands, great ponds, rivers, streams, brooks, coastal wetlands, and the areas adjacent to them. In recognition of the important roles of wetlands in our natural environment, Maine’s Board of Environmental Protection supports the nation-wide goal of no net loss of wetland functions and values.”*

Quebec Hydropower is the third largest producer of hydropower in the world, and it produces fifty times more hydropower annually than Maine. Its infrastructure includes not only 28 large reservoirs, but also 668 dams. . The surface area of these reservoirs is enormous, with the five largest totaling 4,686 square miles (3,000,000 acres), which is almost the size of the state of Connecticut.

Quebec Hydropower has other large reservoir hydropower plants outside of Quebec. For example, the Churchill Falls Generating Station in Newfoundland and Labrador is a reservoir facility and houses 11 generating units with a combined capacity of 5,428 MW. Water is contained by a reservoir created not by a single large dam, but by a series of 88 dikes that have a total length of 40 miles. The size of the diked reservoir is 2,770 square miles (1,777,000 acres), which is twice the size of Rhode Island. The outflow from this facility flows directly into the Labrador Current and eventually into the Gulf of Maine.

Compare this unfettered development in Canada to Maine. Since the 1970’s Maine has had a policy of no net loss of wetland functions and values and has prevented the impoundment of even its smallest tributaries flowing to The Gulf of Maine, in order to protect its ecosystem.

**SUMMARY**

I repeat for emphasis, it would be the height of hypocrisy for Maine Department of Environmental Protection to issue a permit for a 145 mile corridor to transmit reservoir generated hydroelectricity, which has been so harmful not only to the ecosystem of the Gulf of Maine, but also to our global environment.

The mighty diatoms are the microscopic plants that dominate all other ocean species in converting carbon dioxide to carbon and releasing oxygen. Diatoms are responsible for 20 to 25% of the oxygen we breathe. The world’s saltwater diatom populations are mostly found along coastal and continental shelf waters fed by the nutrients of stream and river waters.

Here in Maine, we criticize those that irresponsibly bring destruction to the world’s oxygen producing forests, and yet we are fully complicit in policies that diminish the freshwater delivery of the critical necessary nutrients like silica to our own “ocean rain forests.”

The proliferation of reservoir hydroelectric facilities on Quebec’s major rivers has greatly altered the seasonal timing of silica-laden freshwater quantities delivered to Hudson Bay, Labrador Sea and eventually the Gulf of Maine. The diatom plankton ecosystems have not evolved to be starved of nutrients in the spring and summer and then fed nutrients under lower light and temperature conditions in late fall and winter. As a result, diatom population is adversely affected, and the rest of the food chain is starving and the percent of carbon dioxide in the atmosphere is increasing.

SMK/gcl

cc: Maine Public Utilities Commission