February 14, 2019

Gerald D. Reid, Commissioner
Department of Environmental Protection
17 State House Station
28 Tyson Drive
Augusta, ME 04333-0017

Subject: Proposed CMP New England Clean Energy Corridor (NECEC) Project

Dear Commissioner Reid:

I am writing to ask Maine's Department of Environmental Protection (DEP) to deny a permit for the 145-mile NECEC project proposed by Avangrid-CMP to carry hydroelectricity generated by Hydro-Quebec (HQ) from Canada to Massachusetts.

CMP's application to DEP for the proposed NECEC project is incomplete because it does not list all of the components. In the Introduction of its Application CMP has written: "The proposed NECEC Project is composed of the following components . . . New 145.3-mile +/- 320 kv HVDC Transmission Line from Canadian border to a new converter substation located north of Merrill Road in Lewiston."

The project components do not start at the Canadian border, and must include the reservoir hydroelectric generating facilities located in Canada, which are storing and reducing water flows into the Gulf of Maine's ecosystem during the biologically active season of the year and significantly increasing the flow during the winter, which is the biologically inactive time of the year. H-Q recognized these reservoir generating facilities as components in the project in a 12/14/18 letter, in which, they wrote: *"Excess water not used to generate electricity is stored in large reservoirs for use in later periods."* (See Attachment #8)

The following was written in the January 29, 2019 edition of the Bangor Daily News in regards to this letter:

"Hydro-Quebec seemed content to let CMP fight for the project alone before regulators for much of 2018. But at the end of the year, the utility took a more proactive approach, meeting with editorial boards and providing a two-page letter detailing its "spillage" issues to CMP, which entered it into the record at the Maine Public Utilities Commission.

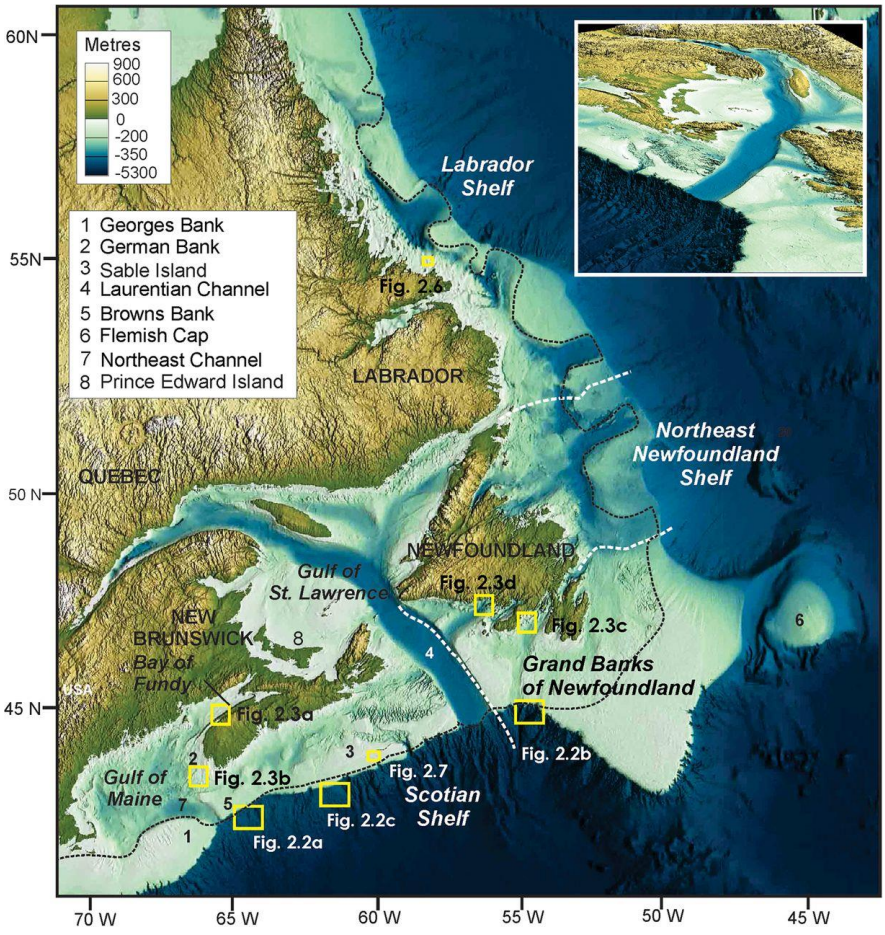
The letter provided figures on the amount of water the utility spilled that could have been converted into sellable energy, if only Hydro-Quebec had a way to get it to market. Instead, by "spilling" the water, the company essentially wasted it.

Hydro-Quebec said that, in 2017, it spilled water that could have produced 4.5 terawatt hours of electricity, or slightly more than half the energy needed to fulfill the Massachusetts contracts. In 2018, the letter continued, Hydro-Quebec spilled water that could have been converted into 10.4 terawatts worth of energy. The company said it didn't spill at all due to transmission constraints prior to 2017."

The epic magnitude of these stored waters has weakened the thermohaline current and created the physical, chemical and biological conditions that are now starving the fisheries. As the maps below and on the next 3 pages illustrate, the discharged waters from all of H-Q's reservoir hydroelectric facilities discharge into one of three water bodies, either the Gulf of St. Lawrence, or James Bay and Hudson Bay or Labrador Sea. All of these water bodies and their watersheds are part of the Gulf of Maine's ecosystem.

The strength of the thermohaline current and thus the transport of deep nutrient enriched ocean water into the St. Lawrence Estuary, Grand Banks, Georges Bank (#1 below) and Gulf of Maine via Northeast Channel (#7 below) depends on the amount of fresh water flowing into these water bodies. Reduced spring and summer outflows from these reservoir hydroelectric dams have created a chokehold on the delivery of the annual budget of dissolved silica and other nutrients via both the rivers and upwelling ocean waters driven by thermohaline currents.

These dams and accompanying flow regulation are denying phytoplankton essential nutrients which in turn starves marine ecosystem biota from zooplankton, to copepods, to fish and including Right Whales. It is very important to acknowledge that these reservoir components have changed the thermohaline circulation, not only in the Gulf of St. Lawrence, but also in the Labrador Current. Subsequently, this has changed the thermohaline current in the Gulf of Maine, as the St. Lawrence waters and Labrador Current mix together over the Scotia Shelf, which is offshore of Nova Scotia, and then flow into the Gulf of Maine.

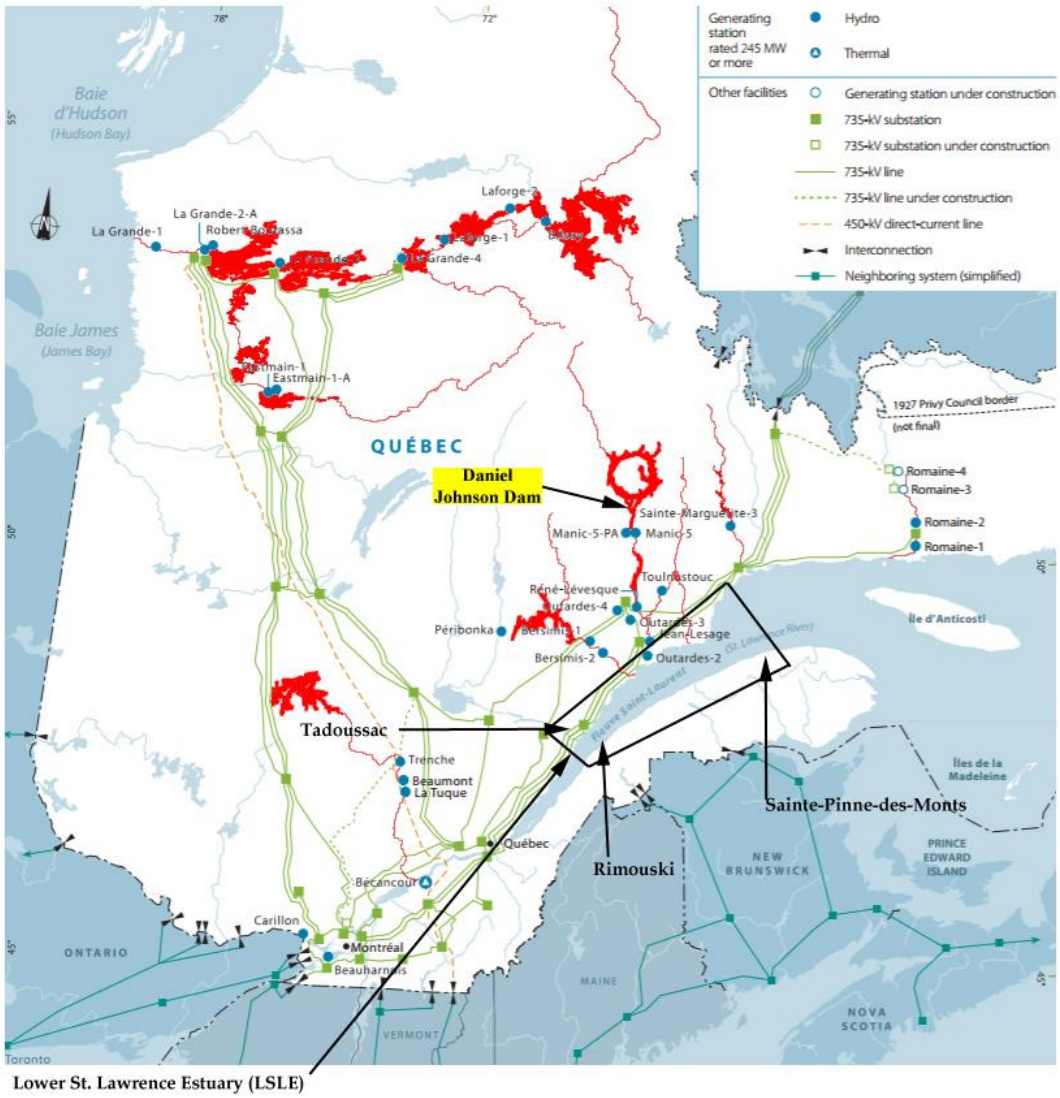


Map 1

Source: SHAW, TODD, LI, MOSHER & KOSTYLEV Geological Survey of Canada (Atlantic), Bedford Institute of Oceanography

In a recent Canadian study of trends in river discharge from 1964-2014, 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).

RED AREAS HIGHLIGHTED BELOW REPRESENT SOME OF H-Q'S MAN-MADE STORAGE OF WATER RESOURCES BEING CHOKED OFF FROM FEEDING THE GULF OF MAINE ECOSYSTEM



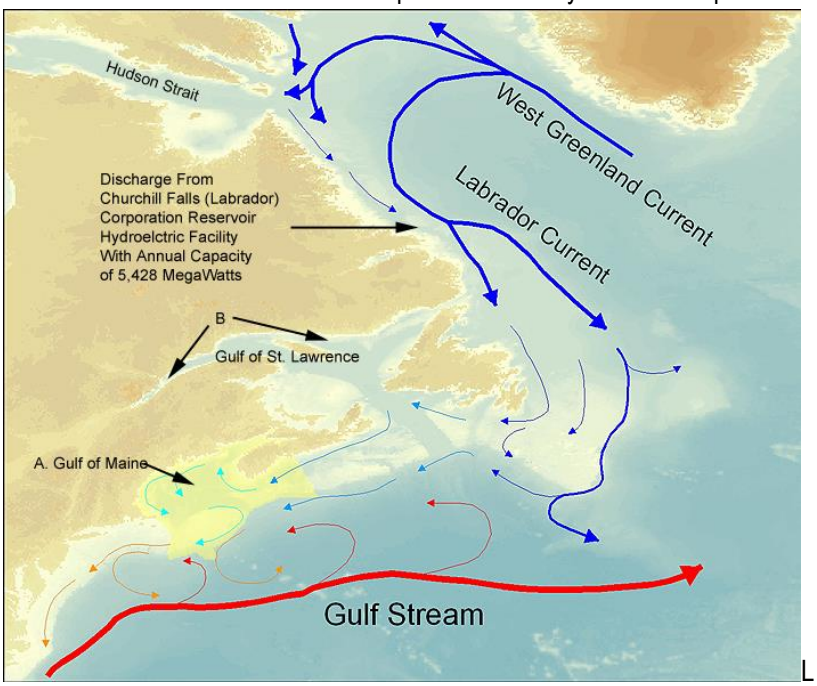
Map 2 Source: New England News Collaborative

The Daniel Johnson Dam is the fourth largest reservoir in the world and has a storage capacity of 142 km³, which is equal to the amount of water in 27 Moosehead Lakes. It is the headwater of the Manicouagan River, which flows into Lower St. Lawrence Estuary. It was commissioned in 1970 and *"Serious levels of hypoxia first appeared in the St. Lawrence Estuary in the mid-1980's. In 2003, this area covered approximately 540 square miles of the sea floor and has continued to grow over the last few years."* (Quebec Ocean Fact Sheet 2, January 2011)

This dam has greatly altered the seasonal timing of spring freshet waters enriched with dissolved silicate, oxygen and other nutrients. This has led to a change from a phytoplankton-based ecosystem dominated by diatoms to a non-diatom ecosystem dominated by flagellates, including dinoflagellates, which has led to the starvation of the fisheries and depletion of oxygen in the estuary and spreading into the Gulf of St. Lawrence.

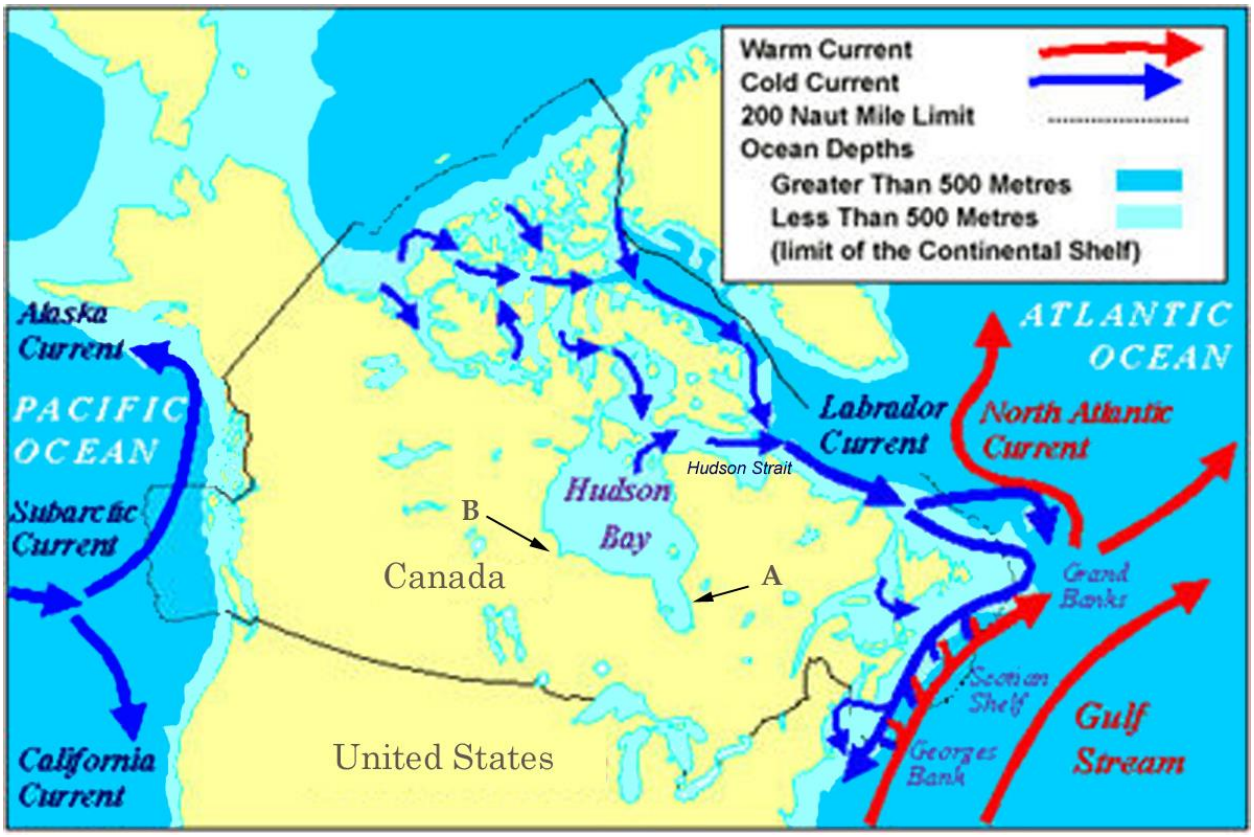
This hypothesis has been confirmed in a 2005 study, RECENT EUTROPHICATION AND CONSEQUENT HYPOXIA IN THE BOTTOM WATERS OF THE LOWER ST. LAWRENCE ESTUARY: MICRO PALEONTOLOGICAL AND GEOCHEMICAL EVIDENCE," by Thibodeau, Devernal, and Mucci. The authors analyzed two sediment box cores recovered from the lower St .Lawrence estuary and observed the following: *A ten-fold increase in the accumulation rate of dinoflagellate cysts and benthic foraminifera in the sediment over the last four decades,"* and *"Our results imply that a significant increase in marine productivity in the Lower St. Lawrence Estuary occurred since the 1960's."*

The increased marine productivity is in the form of dinoflagellate cysts, which is starving the estuary and Gulf of oxygen. See Attachments 4 and 5 for a more comprehensive analysis on the importance of silica.



Map 3 Source: Blog.WeatherFlow.com

In Map 3 on page 4, Maine's six major rivers discharge into the Gulf of Maine in the area marked "A." The hydroelectric facilities on these rivers typically operate in a "run of river" mode and have an annual capacity of 526 MW. Maine's total capacity is only 723MW. In the area marked "B," Hydro-Quebec has 16 reservoir hydroelectric facilities built on 9 rivers discharging into the St. Lawrence River and/or its Gulf (see Map 2 on page 3 for more details).



Map 4 Source: The Canadian Encyclopedia

In the area marked "A," Hydro-Quebec has 9 reservoir hydroelectric facilities in the watershed of the LaGrande River and 2 on the Eastmain River. The annual capacity of these 11 facilities is 17,383 MW (see Map 2 on page 3).

In the area marked "B," Manitoba Hydro has 4 reservoir hydroelectric facilities in the watershed on the Nelson River with an annual capacity of 3,837 MW.

According to a 2007 report by Straneo and Soucier: "Our results suggest that approximately 15% of the volume and 50% of the freshwater carried by the Labrador Current is due to Hudson Strait Outflow." Storing the waters of the spring freshet has significantly reduced the transport of essential nutrients during the biologically active season of the year. (I bolded for emphasis.)

The applicant has also failed to define "clean" energy and how this "clean" energy is generated. Part of the Approval Criteria, which is mandated by Maine Statutes, requires that "*the applicant has made reasonable provisions to realize the environmental benefits of the project, if any, and to mitigate its adverse environmental impacts."*

The applicant advocates in its recent letter to PUC that the spillage from it reservoir dams is a benefit which can be used to generate electricity, but failed to discuss how it will mitigate the following adverse environmental impacts, which this unprecedented storage has caused in downstream water bodies:

1. **THE SEVERE CHANGE IN NATURAL FRESHWATER FLOW AND HYDROPOWER'S ELIMINATION OF THE SPRING FRESHET**. "Run-off is transferred from the biologically active to the biologically inactive period of the year. This is analogous to stopping the rain during the growing seasons and irrigating during the winter, when no growth occurs." (Dr. Hans Neu 1982 See Attachment #2 Pg 41)

2. **REDUCING THE FLOW OF FRESH WATER DURING THE BIOLOGICALLY ACTIVE SEASON OF THE YEAR, OR EVEN REVERSING THE CYCLIC FLOW ALTOGETHER, REPRESENTS A FUNDAMENTAL MODIFICATION OF A NATURAL SYSTEM.**"Life as we know it in our coastal waters and its level of productivity has evolved over thousands of years in response to these seasonal variations. Such a modification must have far reaching consequences on the life and reproduction cycle in the marine environment of the region affected." (Dr. Hans Neu 1982 See Attachment #2 Pg 41)

3. **ALTERING THE SEASONAL TIMING OF SPRING FRESHET WATERS ENRICHED WITH DISSOLVED SILICATE, OXYGEN AND OTHER NUTRIENTS, HAS STARVED THE FISHERIES.** This has led to a change from a phytoplankton-based ecosystem dominated by diatoms to a non-diatom ecosystem dominated by flagellates, including dinoflagellates, which has led to the starvation of the fisheries and depletion of oxygen and warming of the waters in the estuaries and coastal waters of the Gulf of St. Lawrence, Gulf of Maine and northwest Atlantic. (See Attachments #'s 4 and 5.)

4. **THE COLLAPSE OF THE COD FISHERIES IN GULF OF MAINE, GULF OF ST. LAWRENCE AND GRAND BANKS OF NEWFOUNDLAND, WHICH OCCURRED AT THE SAME TIME AND TO THE POINT OF DEPLETION BY THE EARLY 1990'S**.The major force, if not the driving force, has been the proliferation of huge reservoir hydroelectric facilities by Hydro-Quebec on the rivers throughout the ecosystem of these three water bodies.. Dr. Hans Neu, a Senior Research Scientist at Bedford Institute of Oceanography, Dartmouth, Nova Scotia warned Hydro-Quebec, in a February 9, 1977 article in The Sherbrooke Record, that the proliferation of its reservoir hydroelectric facilities might be the cause of declining fish stocks, and not overfishing. (See Attachment #1)

5. **"IT CAN BE ASSUMED THEREFORE THAT FRESH WATER REGULATION MODIFIES THE CLIMATE OF THE COASTAL REGION TO BE MORE CONTINENTAL-LIKE IN THE SUMMER AND A MORE MARITIME-LIKE IN THE WINTER."** ((Dr. Hans Neu 1982 Attachment #7)) "In winter this is caused by an increase in

upwelling of deeper warmer water and in summer due to slower surface currents which will allow the surface layer to absorb more heat during its passage through the system.

6. **"OBVIOUSLY, THESE CHANGES WHICH ARE ALREADY IMPLEMENTED ARE A FUNDAMENTAL MODIFICATION TO THE FRESH WATER REGIME OF CANADA AND TO THE PHYSICS AND DYNAMICS OF ITS COASTAL REGIONS**. There is no doubt in the mind of the author that if Canada continues this development and the USSR follows its lead, the hydrological balance of our globe would be threatened and as a result the biological productivity of our oceans, primarily in their coastal waters, may be seriously jeopardized." (Dr. Hans Neu, The Sherbrooke Record, Feb. 9, 1977 on page 4 of Attachment #2)

7. **"EVEN IF WE CANNOT YET MEASURE THE EFFECTS WITH CERTAINTY IN OUR OWN MARINE ENVIRONMENT, SIMILAR CHANGES MUST ALREADY HAVE HAPPENED TO THE COASTAL WATERS OF ATLANTIC CANADA AND THE EFFECT MUST INCREASE AS REGULATION OF OUR RIVERS CONTINUES.** Of particular concern is the increased development of hydro-power – under construction or in the design stage – in Labrador, Ugava Bay, James Bay and Hudson Bay, which are bound to threaten the productivity of the Grand Banks of Newfoundland." (Dr. Hans Neu Attachment #2)

8. **THERE HAS BEEN MUCH CONCERN OVER THE EFFECTS OF THESE DAMS ON THE INLAND ENVIRONMENT, YET NOBODY HAS STUDIED WHAT HARM THEY ARE DOING TO THE OCEAN ENVIRONMENT."** (Dr. Hans Neu, Sherbrooke Record Feb.9, 1977)

The passage of time has proven all of Dr. Neu's concerns and predictions to be correct, and H-Q has failed to mitigate these adverse environmental impacts. I have written a more comprehensive analysis on these environmental impacts in Attachments 1-7 to this report, and I have referenced Dr. Neu and "Silica Stories," by Conley and De LaRoucha 2017 extensively:

1. February 4, 2019 Fact Sheet "Hydro Dams Blamed for Decline in Fish Stocks"
2. January 15, 2019 Report, "Hydro-Quebec's Dams Have a Chokehold on the Gulf of Maine's Ecosystem
3. December 23, 2018 Maine Sunday Telegram Editorial "Hydroelectric dams produce green energy? Think Again"
4. November 28, 2018 Report "Reservoir Hydroelectric Dams – Silica Depletion – A Gulf of Maine Catastrophe"
5. October 15, 2018 Report – "The Problem Is The Lack of Silica"
6. October 9, 2018 Portland Press Herald Editorial "Reject CMP Power Line Because Hydro-Quebec Facilities Damage Ecosystem"
7. February 11, 2009 Fact Sheet: "Man-Made Storage of Water Resources – A Liability to Ocean Environment."

The applicant has failed to specifically address the following part of the Approval Criteria in the State Statute, which reads as follows:

7 "Environmental and energy considerations. The advantages of the project are greater than the direct and cumulative adverse impacts over the life of the project based upon the following considerations:

A. Whether the project will result in significant benefit or harm to soil stability, coastal and inland wetlands or the natural environment of any surface waters and their shore lands; [1989, c. 309, §5 (AMD).]
B. Whether the project will result in significant benefit or harm to fish and wildlife resources. In making its determination, the department shall consider other existing uses of the watershed and fisheries management plans adopted by the Department of Inland Fisheries and Wildlife and the Department of Marine Resources; [2009, c. 561, §39 (AMD).]

The department shall make a written finding of fact with respect to the nature and magnitude of the impact of the project on each of the considerations under this subsection, and a written explanation of their use of these findings in reaching their decision."

I have documented in this letter, with its attachments and in two editorials, the adverse environmental impacts and, in my opinion, the applicant has failed to address how it intends to mitigate these impacts.

I ask the reader to please take note of my October 9, 2018 editorial (Attachment # 6), my December 23, 2018 Editorial appears on pages 34-36 of Attachment 2 and a January 5, 2019 Portland Press Herald Editorial "Hydro-Quebec Offers Misleading Claims About Climate Impact," by Bradford H. Hager, MIT earth sciences professor on pages 37-39 of Attachment 2..

In the Commentary Section of the January 15, 2019 Portland Press Herald appears a letter "Science about Quebec Hydropower Must Not be Overlooked," by Alain Tremblay, Ph.D. and Francois Bilodeau, M.Sc., who are senior environmental advisors with Hydro-Quebec.

Their commentary leads off: "In recent op-eds, various opponents have criticized Quebec hydropower putting forward a series of falsehoods that absolutely need to be corrected." The rest of the commentary was focused on the points raised by Professor Hager, and there were no comments on the observations and hypotheses in my two editorials. Obviously, we can only conclude that they did not consider my observations to be falsehoods.

In closing, the following Feb. 7, 1977 observation, in The Sherbrooke Record, by Dr. Neu should never have been ignored and H-Q has only itself to blame for the billions of dollars spent on reservoir hydroelectric facilities which I believe have caused more harm than good.

"Until now it was assumed that hydro power is 'clean' with little or no impact on the environment, particularly that of the ocean. That this might not be the case is difficult to understand. Obviously, designing storage schemes and forecasting output of power is easier to grasp than to quantify the changes imposed on the population dynamics of the biota in the coastal region. There is the possibility that damages imposed by man-made lakes on the ecosystem may outweigh the benefits they provide. This is the crux of the problem."

Dr. Neu made these comments in 1977, and at the time H-Q had four large reservoir hydroelectric facilities on line with a storage capacity of 212.84 km^3. (see Attachment #7). They then built four more large facilities with a storage capacity of 200.0 km^3 from 1979-1993. (The water volume in Moosehead Lake in Maine is 5.19 km^3.)

The negative adverse environmental impacts of man-made storage doubled in less than 16 years.

H-Q is the engineer of this colossal destruction of the Gulf of Maine's ecosystem, which includes Gulf of St. Lawrence and its Estuary, James Bay and Hudson Bay and Labrador Sea.

DEP can stand tall in this process by demanding H-Q respond to my observations on the negative environmental impacts caused by their reservoir hydroelectric facilities and denying the permit if they fail to mitigate these impacts.

Sincerely,

Stephen M. Kasprzak

SMK/gcl
Encs.
cc: Service List for The CMP NECEC Hearing Updated January 31, 2019
Governor Janet T. Mills
Maine Utilities Commission