-ENVIRONMENTAL IMPACT STUDY-

HUDSON BAY FORCED WATER VAPOR EMISSIONS Have Created a Moisture Laden Atmospheric Warming Blanket Over Greenland

By

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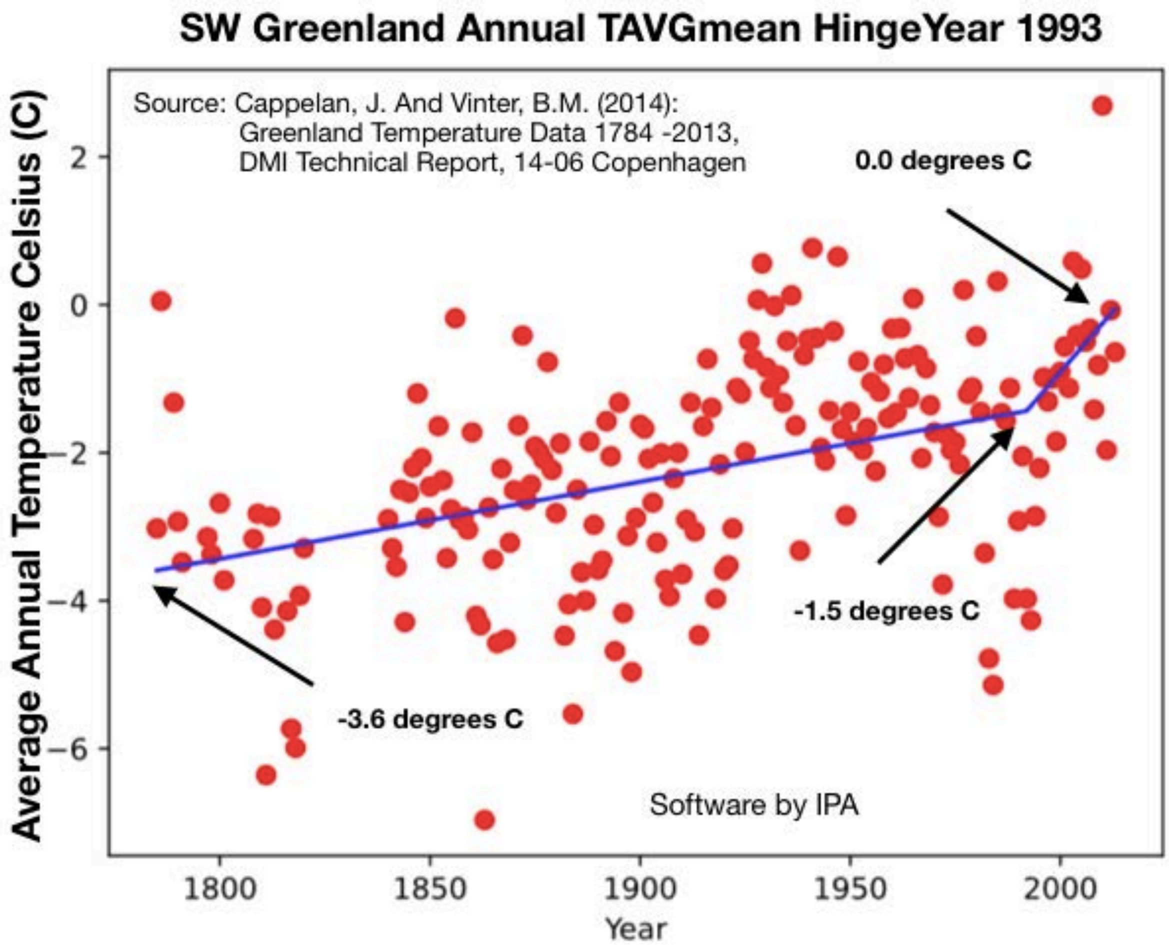
Hudson Bay Forced Water Vapor Emissions
Have Created the "Hockey Stick" Depicted in this Southwest Greenland Graph



- The red dots in the graph are the average of annual temperatures from different weather stations along 800 plus miles of the southwest coastline of Greenland. The left blue trend line is the "shaft" of the "hockey stick" and reveals an increase of only 2.1 degrees Celsius (C) over 204 years compared to 1.1 degrees C over the past 100 years.

- The 1993 hinge year is the "heel" of the "blade" and corresponds with the commissioning date of the Brisay hydroelectric dam in Northern Quebec.

- The "blade" on the SW Greenland "hockey stick", depicted by the right blue trend line, reveals an abrupt warming trend of 1.5 degrees C from 1993 to 2013. The "positive feedbacks" of the Brisay Arctic mega power station (AMPS) forced water vapor emissions have created an instantaneous and extreme warming rate that is 6.8 times faster than the global rate of the past 100 years.

Abstract

This is an environmental impact study on the effect of Arctic mega hydropower stations (AMPSs) on the climate, based on a quantitative analysis, using data from weather stations in Siberia, northern Canada, and Greenland. Notable findings following construction of the AMPSs include the rapid increase of Arctic winter precipitation, temperatures rising much faster than the rest of the world and Arctic winter temperatures increasing faster than summer temperatures. Rivers upon which AMPSs have been built experience much greater flows of relatively warm water during the winter compared to rivers in their natural frozen state. My hypothesis is that the measured increases in Arctic winter and summer precipitation are the product of forced evaporation and increased humidity levels from regulated dam releases and their colossal reservoirs. This evaporation creates “positive feedback” loops of water vapor emissions that increase humidity and amplify the greenhouse effect. The impacts of AMPSs has historically not been well documented by the scientific community, which this Study seeks to rectify. Evidence points toward these forced water vapor emisssions as a major driver of climate change in the Arctic, to an extent far beyond their local environments. There have been increases in temperature hundreds of miles downwind and downcurrent from AMPSs coinciding with their construction, including in Greenland, which contains the second largest body of ice in the world. I share this information to raise awareness of this problem and inspire action to curtail these negative impacts on northern Quebec and Greenland which have global implications.

The entire Study is available online at www.arcticbluedeserts.com.

Preface

Dr. Robert H. Giles, at the University of Massachusetts Lowell, having read my book, **Arctic Blue Deserts**, invited me to be a guest lecturer on October 24, 2023 for his Honors/STEM course, **Energy and the Developing World**. The subject was Hydropower and I was to discuss the topic, “Are Arctic Dams Climate Friendly?”

Dr. Lee K. Jones, Mathematic and Statistics Professor, introduced me that day. His company, Individual Prediction Analysis (IPA) developed the graphing software that best captures the historical timing of temperature changes coinciding with the commissioning dates of hydroelectric mega dams.

After my lecture, the first question from a very animated student, as I watched the heads of the classmates nodding approvingly in eagerness to hear the answer, was: *“Why have we never heard about this before?*”

My response was that voices warning that Hudson Bay regional hydroelectric power will starve the fisheries, warm the climate and change the ocean’s hydrologic balance apparently have been suppressed by the governments and corporations who own the hydroelectric power facilities.

These students and Professors Giles and Jones have inspired me to write this Study. I hope those who read my work will use the scientific data and analysis to spread the word and promote scientific discussion about why Arctic dams are not climate friendly and that Arctic Mega Power Stations (AMPSs) on James Bay and Hudson Bay rivers may be the major drivers melting Canadian and Greenland glaciers.

A very special thanks to Roger Wheeler for all his research and time preparing graphs, his son-in-law Charles Fizer for converting the NOAA data into visually understandable forms, my daughter Sarah, grandson Sawyer and my family and friends in the US and Canada who assisted with the editing and research.

Prologue

Christopher Ketcham has been a freelance journalist for more than 20 years, publishing in Harper's, National Geographic, the New Republic, and many other magazines and websites. He recently wrote the following:

"On an afternoon last October that felt too warm for the season, I went to hear Kasprzak present his findings about megadams at the University of Massachusetts at Lowell. Kasprzak had been invited by the head of the school's physics department, Robert Giles, who had reviewed his research and found it compelling enough that the students in his honors class, Energy and the Developing World, needed to hear it.
Kasprzak brought with him a dozen copies of a self-published book, 'Arctic Blue Deserts,' which he distributed to the students. He had spent $50,000 for a run of 3,000 copies. 'This is how much I believe in getting this out in the world,' he told me. He intended the 260-page treatise, as he explained in the introduction, to be 'a counter narrative' about the 'dramatic climate change facing the Arctic, caused in large part I believe, by the impact of mega reservoir hydroelectric dams radically altering the region's natural water cycle.' Kasprzak, Giles told me, had marshaled 'amazing data' in the book. 'People have got to hear his message,' said Giles. 'I think this whole discussion is a game-changer in how we approach climate issues.'

Kasprzak launched into the counter narrative, with a series of PowerPoint slides that opened with black and white photos of the massive hydropower complexes built in Soviet Russia in the 1950s. It was the Soviets, he explained, who first understood the climatic implications of stoppering rivers and backing them up to create inland seas. By 1955, in a stunning instance of environmental hubris, the Soviet government had made clear its goal of warming the region by the creation of these inland seas. Rivers of immense volume and length, such as the Ob, Yenisei and Angara, would be transformed into bodies of inert water heated by the sun, the water evaporating in greater volume to produce water vapor emissions, a powerful greenhouse gas.

'*Astonishing climatic change would occur,' trumpeted Radio Moscow in August of 1958. 'Evaporation (from the inland sea) would increase and with it the humidity of the air. The extremes of yearly and daily temperature characteristic of these would be greatly modified.' The most important modification from the increase in heat-trapping humidity was the warming of the Arctic climate"*… (**The Whole Dam Truth**, Christopher Ketchum, Contributing Editor, truthdig.com, April 25, 2024)

Introduction

This Environmental Impact Study (EIS) is focused on the climate changing impacts of forced water vapor emissions from Arctic mega power stations (AMPSs) and downstream hydropower plants (HPPs) on rivers in the Kola Peninsula, Siberia and Hudson Bay's watershed.

The forced winter water vapor emissions are created by evaporation from the release of relatively warm summertime solar heated reservoir waters into the frigid Arctic atmosphere. Prior to the age of the AMPSs, water and land surfaces were locked in ice.

The forced summer water vapor emissions are from the natural evaporation from surface areas of gigantic man made inland seas. For example, the length of four reservoirs combined is 800 miles on the 1150 mile long Angara River in central Siberia. Approximately 75 percent of the 560 mile long La Grande River in Northern Quebec has been converted to a series of large reservoirs.

Forced water vapor emissions from AMPSs and HPPs create multiple "positive feedbacks", which are defined as follows:

"Climate feedback: process that can either amplify or reduce the effects of climate forcings. A feedback that increases an initial warming is called a 'positive feedback'. A feedback that reduces an intial warming is a "negative feedback'." (NASA, Global Climate Change, Vital Signs of the Planet)

One of the first "positive feedbacks" from the AMPSs was increased winter and summer humidity, which was predicted in 1949 by the Soviet Union, followed by more clouds, increased precipitation, warmed atmospheric and coastal sea temperatures, diminishment of sea ice, and loss of glacier volumes.

Now, due to the unnatural mega reservoir surface areas and warmer high winter river flows, compounded by multiple AMPSs and HPPs on the same river, temperature value and precipitation amounts are acutely amplified by the positive feedbacks from these extreme increases in summer and winter evaporation, which forms moisture laden atmospheric warming blankets.

Using forced water vapor emissions to warm the climate is not an original hypothesis. In 1949, the Soviet Union had announced to the UN its plans to irrigate the Asian Desert and use the evaporation from Siberian reservoirs and hydroelectric AMPSs to increase the humidity of central Siberia and warm the Arctic. An example of Soviet intentions: ***"For each step outlined here computations have been made and verified; how much power can be produced; how great the evaporation will be;***

how many calories wil be transmitted to the atmosphere in one area and taken to another to change the climate of the Arctic and the desert." By W. Mandel from California Eagle (Los Angeles, Ca) February 2, 1950.

Quantitative analysis of weather data corroborates this hypothesis and reveals why the Manitoba Nelson River and James Bay Hydroelectric Projects, in northern Quebec and upwind of nearby Greenland, may be the major drivers melting the glaciers. Tipping points have also been documented at Canadian and Russian downwind weather stations as far away as 1,700 miles from the AMPSs.

The Robert Bourassa AMPS in northern Quebec was commissioned in 1980. The 1980 to 2013 weather data for Kuujjuarapik and Kuujjuaq reveal an extreme warming trend, 5 times faster than the global rate of 2 degrees over the past 100 years.

In 1993, the Brisay AMPS was commissioned by Hydro Quebec and it created an environmental Frankenstein diverting an estimated 45 percent of the Caniapiscau River into its 1,700 square mile reservoir. Warming rates from 1993 to 2013 at the two weather stations doubled to 10 times the global rate. The availability of data at these two weather stations unexplainably ceased in 2013.

After the 1993 Brisay AMPS was built, the southwest Greenland average annual temperature rose 1.5 degrees over the the next 20 years to 0 degrees Celsius. Extrapolating the historic trend line shows it should have taken more than a hundred years for the average annual temperature to reach 0 degrees Celsius temperature.

Post Brisay, Greenland's surface melt extent increased three fold and global mean sea level has risen 3.98 inches in 30 years (National Snow and Ice Data Center).

This tipping point in sea level escalation was preceded by a rise of only 4 to 5 inches in mean sea level between 1900 and 1992 (NASA Tracking 30 Years of Sea Level Rise). Since the Brisay was commissioned, global mean sea level has risen almost 4 times faster than the historic rate.

The problem lies not in hydroelectric dams as a whole, but from a small percentage of large dams with serious impacts on the fragile Arctic climate. This Study is focused on the impact of forced water vapor emissions from just 51 of them and their "positive feedbacks" and why the 15 on Hudson Bay rivers may be the major drivers warming southwest Greenland and melting the glaciers.

The weather data and graphs in this EIS are compelling evidence for making the case that a key step for slowing and reversing the melting of Greenland glaciers can only occur if the Brisay AMPS is removed and the natural flow of the Caniapiscau River is restored. Then, the return of strong climate cooling "negative feedbacks" would significantly counter all the "positive feedbacks" associated with this AMPS.

Section 1

Southwest Greenland annual average temperature graph depicts a “hockey stick”.

“The “blade” of the “hockey stick” reveals a sudden and unprecedented warming trend. The 1993 hinge year is the “heel” of the blade and coincides with the commissioning date of the Brisay hydroelectric AMPS in northern Quebec.

Background Information:

The data and analysis in this EIS corroborates the following hypotheses of Dr. Hans Neu, Bedford Institute fo Oceanography, Dartmouth, Nova Scotia, Canada:

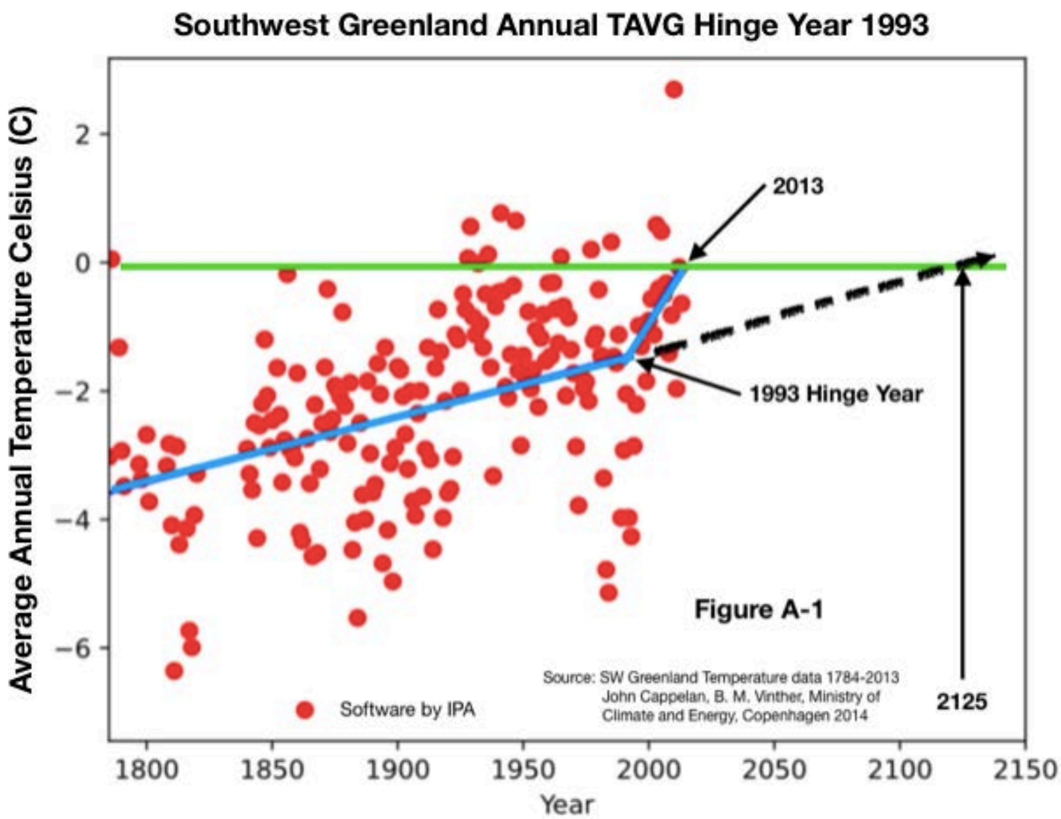
“Modifications to the freshwater run-off (e.g., hydopower developments and water diversions), alter the flow regime and with it the salinity and temperature structure of the system.” **(Run-off Regulation for Hydro-Power and Its Effect on the Ocean Environment**, Hans Neu, Hydrological Science Journal, Vol. 21, Issue 3, September 1976

“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 more maritime like in the winter. *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”* (**Man-Made Storage of Water Resources- A Liability to Ocean Environment**, Hans Neu, Janurary 1982)

Note for EIS hinge graphs on **software by Individual Prediction Analysis**:

“Recorded average temperatures exhibit year to year as well as longer term variations. A trend curve averages out short term changes and retains hypothesized behavior. Traditionally straight lines, which best fit the data, were used as trends. Over the last 3/4 century temperatures have increased so dramatically that trend curves need more flexibility than linearity to adequately fit temperature data. We used a trend curve, which we call a hinge, that consist of two lines joined at a year (called the hinge year) that best fits the temperature data for a given location. The hinge year is an appropriate mean or median time that the dams most effecting the given location went online.” Individual Prediction Analysis (IPA)

Forced water vapor emissions are a powerful greenhouse gas and major driver of Arctic warming. After the 1993 Brisay AMPS was built, the southwest Greenland average annual temperature rose 1.5 degrees Celsius (C) over the next 20 years to 0 degrees C, compared to a rise of only 2.1 degrees C over the previous 204 years. Extrapolating the historic trend line shows it would have taken more than 100 years after 1993 for the temperature to reach 0 degrees C.



1784 to 2013 Average Annual Temperature Trend Line
1993 to 2125 Extrapolation of 1784-1993 Trend Line

The Brisay hydroelectric AMPS is located about nine hundred miles to the southwest of the Greenland weather stations. It is my hypothesis that evaporation from the regulated and relatively warm discharged AMPS' waters and its 1,700 square mile reservoir has created forced water vapor emissions, which form a moisture laden atmospheric warming blanket extending over northern Quebec and across the Labrador Sea to southwest Greenland.

Section II

Weather stations at Kuujjuarapik and Kuujjuaq on the Labrador Peninsula upwind of southwest Greenland reveal a tipping point in 1993 and an earlier one in 1980.

In Canada and Russia, the pre-AMPSs subarctic winter atmosphere was extremely arid and lacking in precipitation. Coinciding with the buildup of AMPSs and their forced water vapor emissions in Hudson Bay's watershed, the data appears to show that "positive feedback" is a plausible source of the increased precipitation levels and rising temperatures.

It appears that the 1949 Soviet hypothesis to use evaporation to increase atmospheric humidity may also be coming to fruition in northern Quebec.

I believe the weather data is providing compelling evidence corroborating my hypothesis of a causal relationship between the AMPSs presence and increased precipitation and temperatures.

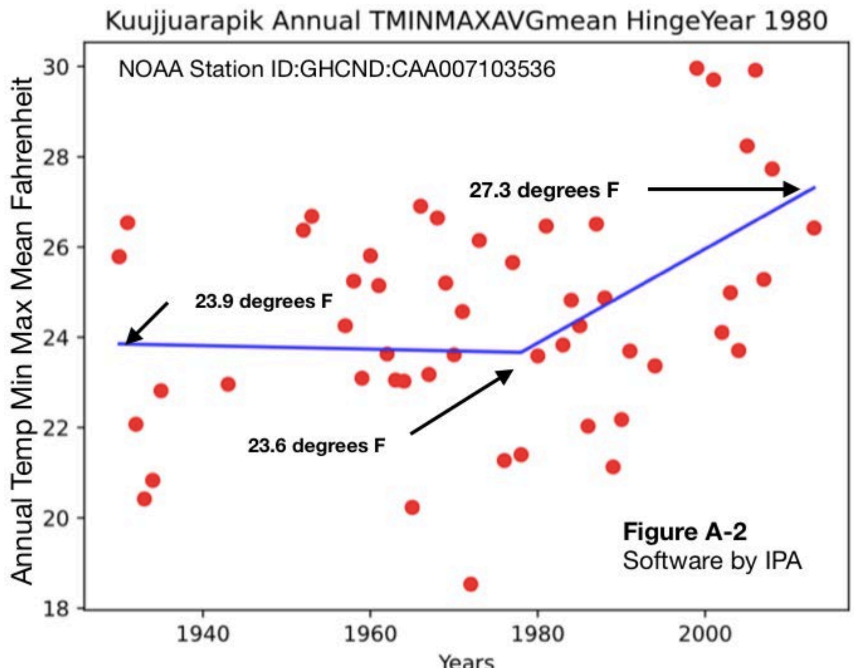
The 1980 and 1993 tipping points are very apparent on the graphs of Maine's shrinking snowpack and warming winters prepared by the Climate Change Institute of the University of Maine. These two graphs were published in the March 31, 2024, Maine Sunday Telegram and appear on page 12 of this EIS.

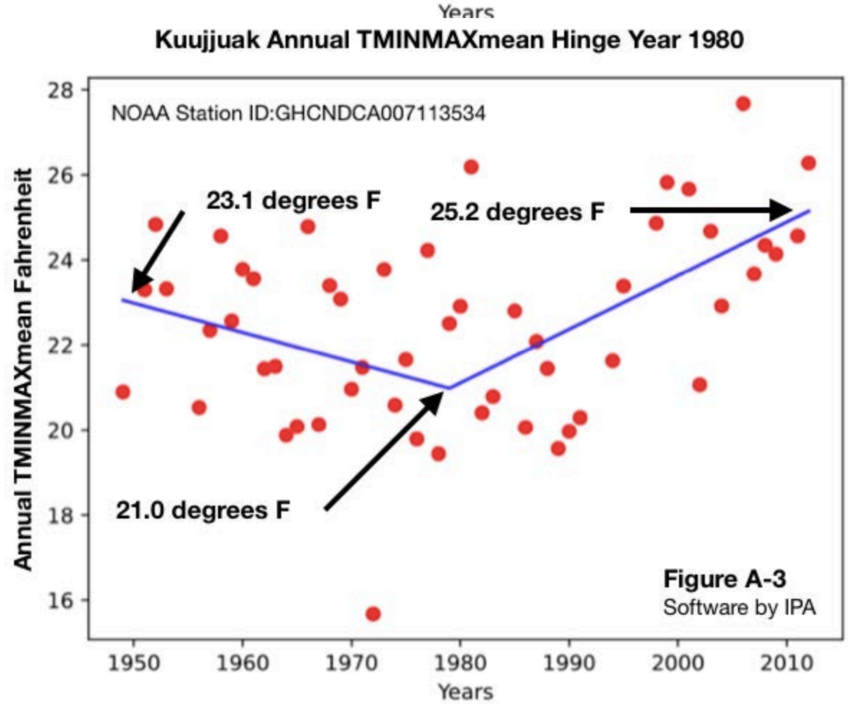
Background Information:

In 1977, Neu predited that the Canadian and Soviet Union AMPs would change the hydrological balance of the world's oceans:

"Obviously, these changes which are already implemented are a fundamental modification to the freshwater 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."* (Letter to Gerald D. Reid, Commissioner of Maine Dept. of Environmental Protection, February 14, 2019) Attachment 2, Neu, The Sherbrooke Record, February 9, 1977)

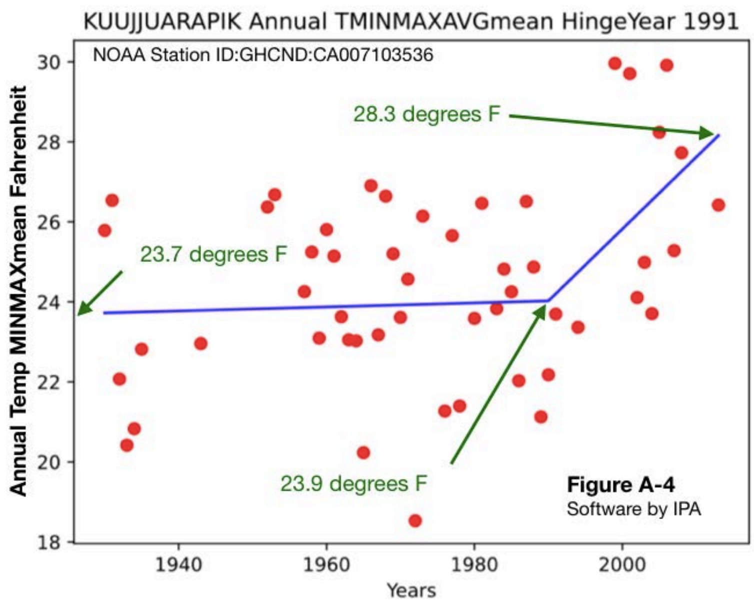
The 1980 hinge year is the year that the Robert Bourassa AMPS began operation under the ownership of Hydro-Quebec and radically reversed a half century cooling trend. The 1980 to 2013 data from the northern Quebec weather stations at Kuujjuarapik and Kuujjuak (See Map 1 on page 11), reveal an acute tipping point and warming trend 5 to 6 times faster than the global rate of 2 degrees F over the past 100 years. The public availability of data ceased after 2013.

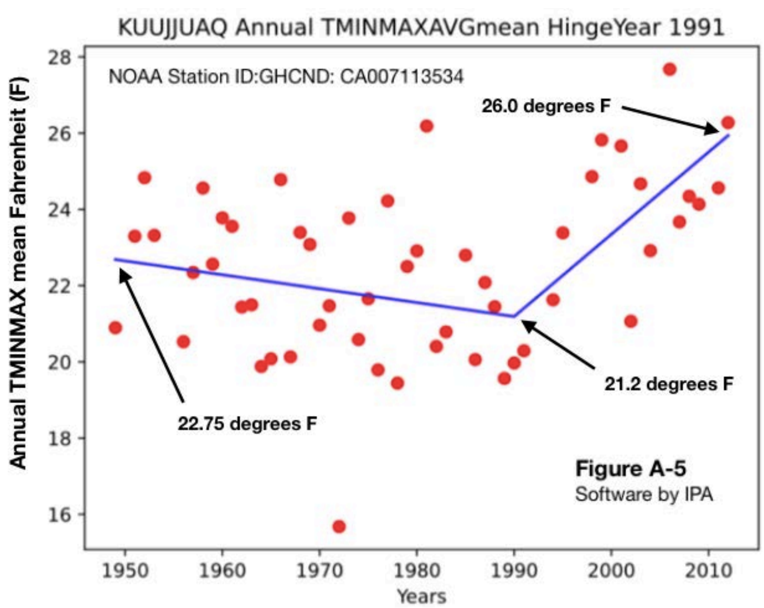




Thirteen years later the warming rate doubled. There was a second and more powerful tipping point in 1993 with the commissioning of the Brisay AMPS, creating the 1,700 square mile Caniapiscau Reservoir and the earlier diversion of 45 percent of the Caniapiscau's annual water flow into the La Grande.

The 1991 to 2013 average annual temperature trend line (blue line in Figure A-4) exposes an ominous increase in temperature of 4.4 degrees Fahrenheit in 22 years, which is 10 times faster than the global rate and the same warming rate was documented at Kuujjuaq (See Figure A-5). There was no data for 1992 and IPA's algorithm moved the hinge year back to 1991.



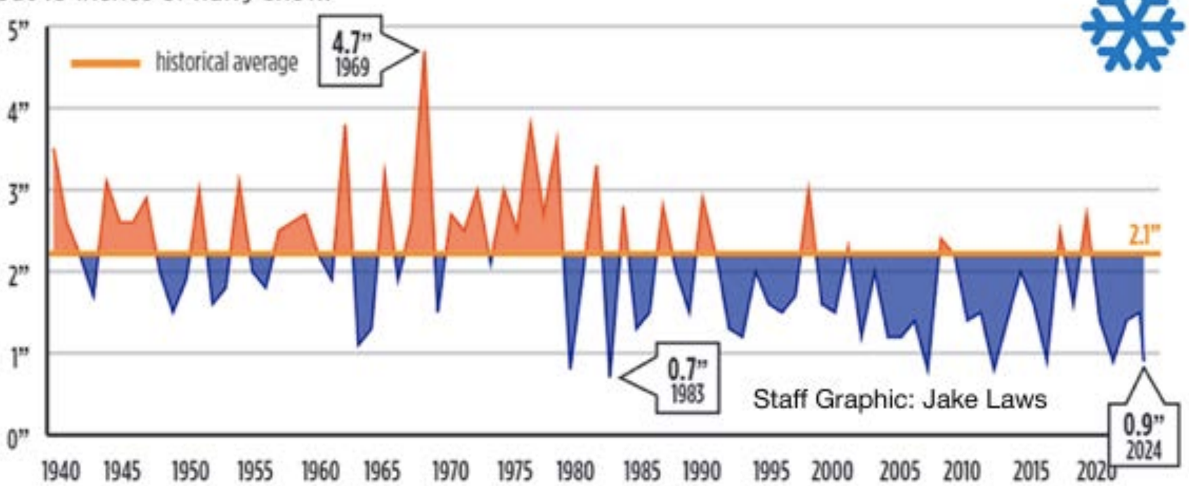


Canada's Labrador Peninsula and the southwestern Coast of Greenland - The Tailpipes for Forced Water Vapor Emissions from Hudson Bay Dams

The 1980 Roberta Bourassa and 1993 Brisay AMPS's tipping points are apparent on these two graphs.

Maine's shrinking snowpack

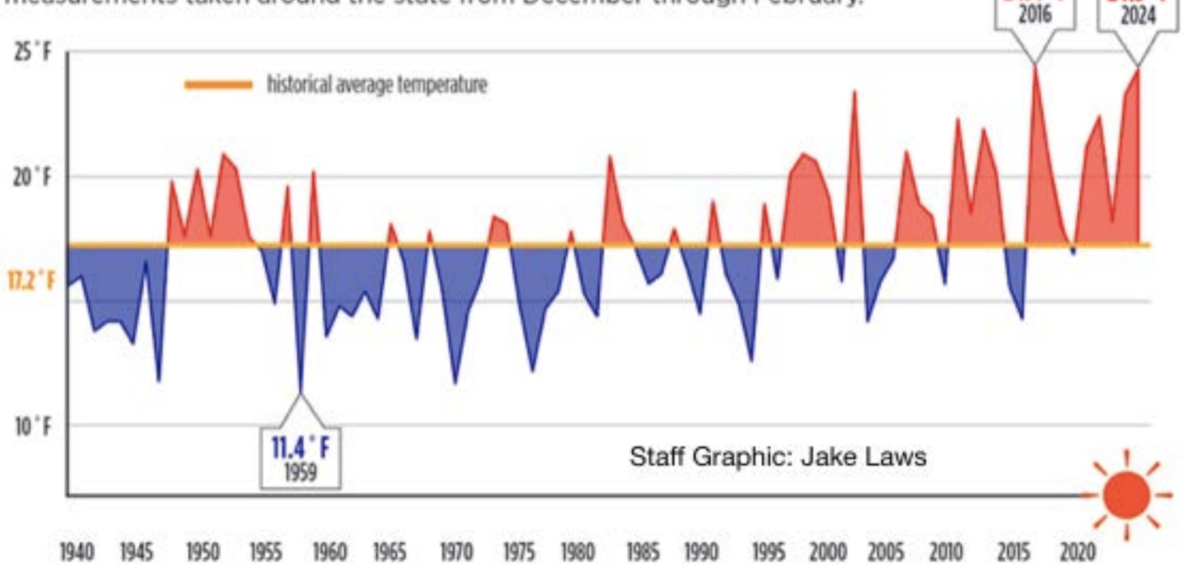
The 2023-24 winter was one of the least snowy in Maine since 1940. The chart is based on measurements taken around the state from December through February. Snow depths are measured in water equivalent because snow density varies. On average, one inch of water equals about 10 inches of fluffy snow.



Source: Climate Change Institute; University of Maine - Maine Sunday Telegram March 31, 2024

Maine's warming winters

The 2023-24 winter was one of the warmest since 1940. This chart is based on measurements taken around the state from December through February.



Source: Climate Change Institute; University of Maine   Maine Suday Telegram March 31, 2024

Section III

Data from the weather station on Ellesmere Island, located to the northwest of southwest Greenland, exposes an acute warming point beginning in 1993.

Scientific studies reveal sudden and rapid increases in Canadian Arctic temperatures in the mid-1990s, accompanied by dire melting of Canada's Arctic glaciers.

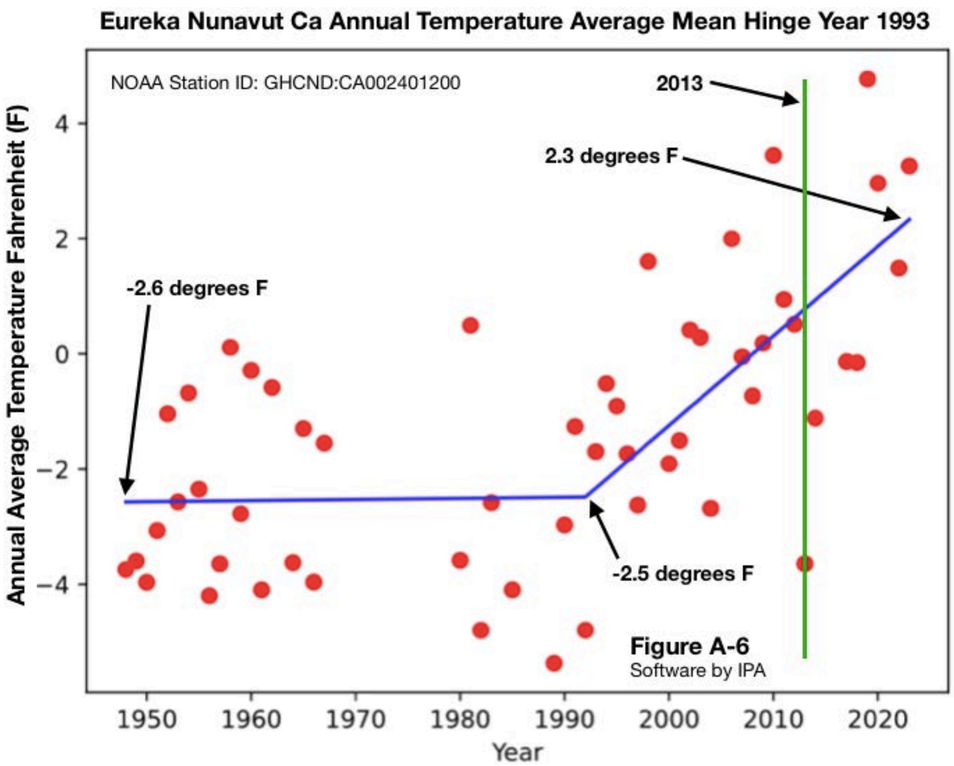
The quantitative analysis of the weather data in this EIS provide compelling evidence that Canadian hydroelectric AMPSs and HPPs are major drivers warming the Arctic climate, rivers, coastal seas and melting the glaciers.

Background Information:

The drastic shift due to the AMPSs in warming temperatures, salinity, and coastal current changes has also impacted fish stocks. **The collaspe of the cod fisheries in the Gulf of Maine, Gulf of St. Lawrence, and Grand Banks of Newfoundland occurred at the same time and to the point of depletion by the early 1990s.** It is my hypothesis that 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 facilites might be the cause of declining fish stocks, and not overfishing."* (Letter to Gerald D. Reid, Commissioner of Maine Dept. of Environmental Protection, S.M. Kasprzak, February 2019, See Attachment #1 to this letter)

Eureka weather station is on Ellesmere Island in Nunavut, Canada and its data reveals an annual warming trend of 4.8 degrees Fahrenheit (F) in just 30 years since 1993, which is 8 times greater than the global rate of 2 degrees over the past 100 years.



The temperature data in my graphs for southwest Greenland, Kuujjuarapik and Kuujjuaq end in 2013. Eureka's data goes through 2022 and shows a continuing escalation of the warming trend. Eureka's warming trend was documented in an ARCTIC TODAY article, **With warming temperatures, Canada's Arctic glaciers are melting faster, Researchers in two separate studies documented dramatic changes beginning in the 1990s after decades of stability***.* By Hannah Hoag July 13, 2018

In one study, Adrienne White, from the Labratory of Cryospheric Research, University of Ottawa said: *"A rise in air temperature has contributed to the glacial melt. On average, temperatures in the region have increased 0.5 degrees Celsius (0.9 degrees Fahrenheit) per decade since the 1940's. But there was a strong shift in the mid-1990s, when the mean annual temperature increase accelerated to 0.74C (1.3F) per decade from 0.12 (.22F). The average summer air temperature shifted to above freezing from below freeziing since 2000.* In the other study, *"Laura Thomson of Queen's University in Kingston, Ontario, detailed the findings of four reference glaciers in the Canadian Arctic, the Meighen Ice Cap, Melville Ice Cap and White Glacier, on Axel Heiberg Island.*

Researchers have made annual measurements of three icecaps and one mountain glacier on four islands in the Canadian Arctic since 1960. The four reference glaciers remained relatively stable until the 1990's. Then we saw large swings said Thomson. The summer melt of these four glaciers has increased more than five-fold in some years since 2005"

MAP 2

- SMK added red dots and black arrows to identify the approximate location of Eureka, Kuujjuaq and Ungava Bay.

SECTION IV

Quantitiative analysis of Russian weather data reveals three tipping points in 1952,1957 and 1967 of extraordinary increases in winter and annual precipitation.

The first began with the regulated waters of Lake Imandra and Pirengskoe on the Kola Peninsula with the commissioning of the 1952 Niva-1 hydroelectric AMPS. There were two existing hydropower plants (HPPs) downstream, namely the 1934 Niva-2 and 1949 Niva-3.

There was a second tipping point in 1957, caused by a major increase in the volume of forced water vapor emissions in Central Siberia with the commissioning of the Novosibirsk AMPS on the Ob River, about 1,200 miles upstream from Dikson. (Map 3)

The third tipping point was in 1967 with the commissioning of the Bratsk AMPS on the Angara River, a tributary of the Yenisei and the Vilyuy AMPSs in Cherynyshevsky on the Vilyuy River, a tributary of the Lena River.

Background Information:

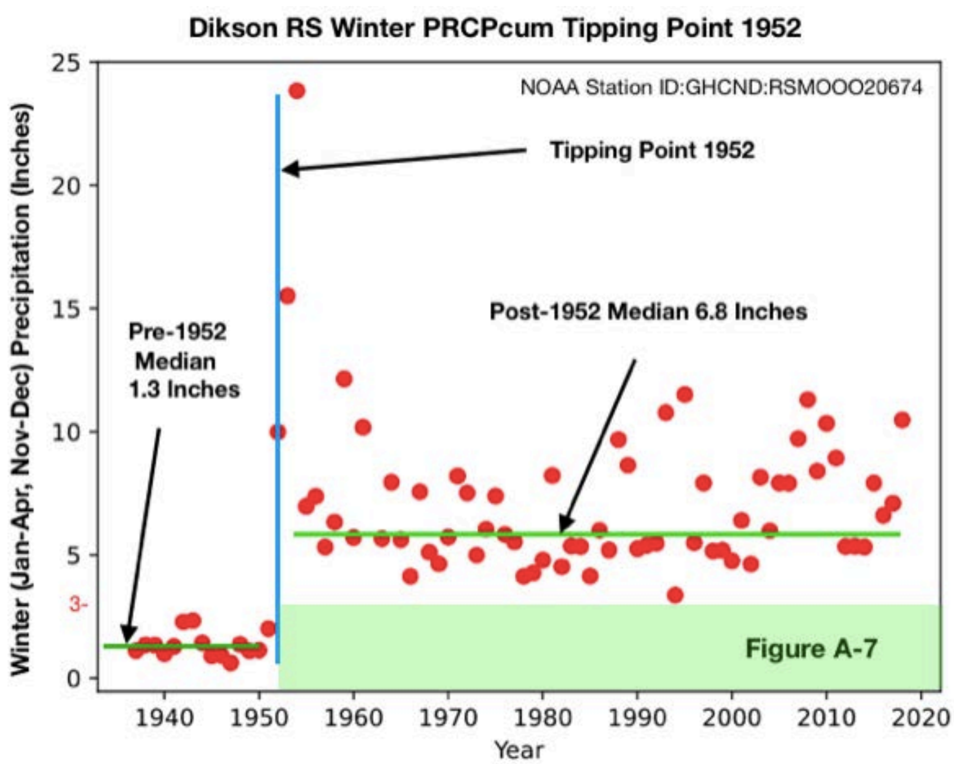
Neu used weather data from Father Point (Pointe au Pere) to verify his hypothesis that: *"Freshwater from the St. Lawrence's drainage system plays a prominet role in the generation of currents and large scale movements in the Gulf of St. Lawrence"…"This regulation of freshwater must result in the modifications to the circulation. In 1963, the properties in February of the system were measured at freshwater inflows of 330,000 cubic feeet per second and 530,000 cubic feet per second in May. The investigation indicated that the regulation of the freshwater should decrease the currents along the Gaspe Peninsula during the summer and increase them during the winter. Slower surface currents and less mixing, during the summer, should result in an increase of the water temperature in the surface layer and thus of the air temperature.* Meteorological data from Father Point appears to verify this assumption." (**Man-Made Changes - The Potential Benefits and Liabilities,** Hans Neu, November, 1968)

Neu warned about the impact on Fisheries in Ungava Bay, James Bay. Hudson Bay and the Labrador Sea. ***"Even if we cannot yet measure the effects with certainty in our own marine environments, similar changes must have already 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, Ungava Bay, James Bay and Hudson Bay, which are bound to threaten the productivity of the Grand Banks of Newfoundland."* (Hydro-Quebec's Dams Have a Chokehold on the Gulf of Maine's Ecosystem, S. Kasprzak, January 15, 2019, see Dr. Hans Neu Attachment #2)

Using forced water vapor emissions to create positive feedback to increase Arctic temperatures is not an original hypothesis. In 1949, the Soviets announced to the United Nations, their plan to build two very large reservoirs on the north flowing Ob and Yenisei Rivers to irrigate the Asian Desert. At the time, the Soviets hypothesized that the evaporation of immense volumes of water from the new reservoirs would also moisten the winds and warm the Arctic climate. This irrigation plan was abandoned and replaced with a scaled down version designed and engineered to warm central Siberia. It was reported in the March 3, 1958 Fort Worth Star-Telegram that *“Moscow radio boasted… ‘Astonishing climatic changes would occur… evaporation (from the inland sea) would increase and with it the humidity of the air’ ”*.

Quantitative analysis of Russian weather data reveals winter evaporation was typically much greater than the summers and identifies three tipping points in 1952, 1957 and 1967 of severe increases in winter and annual precipitation and temperatures. All of these tipping points appear to be “positive feedbacks” from the AMPSs’ forced winter water vapor emissions.

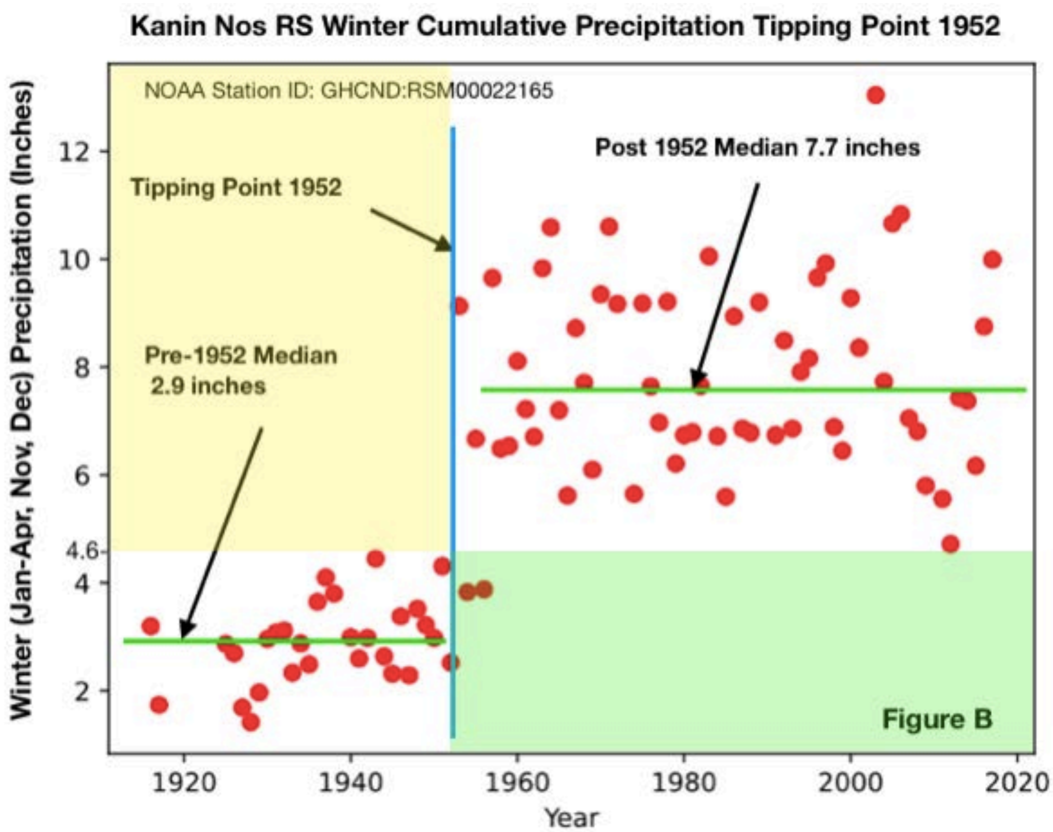
A sudden and exponential increase in winter precipitation occurred after the 1952 commissioning of the Niva-1 AMPS on the Barent Sea’s Kola Peninsula. The Niva-1’s forced water vapor emissions created a positive feedback loop amplifying pre-1952 winter precipitation median five fold, from 1.3 inches to 6.8 inches, over a distance of 1,100 miles at Dikson, Russia along the Kara Sea (See Map 3 page 22).



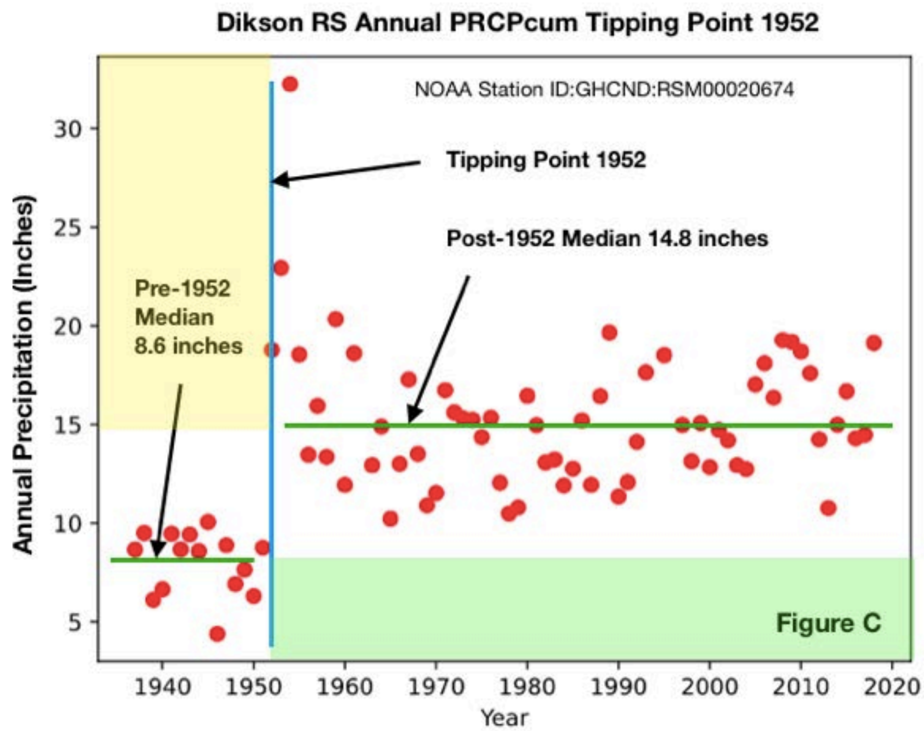
"What is the greenhouse effect? The greenouse effect is the process through which heat is trapped near Earth's surface by substances known as 'greenhouse gases'. Imagine these gases as a cozy blanket enveloping our planet, helping to maintain a warmer temperature than it would have otherwise. Greenhouse gases consist of carbon dioxide, methane, ozone, nitrous oxide, chlorofluorocarbons, and water vapor. Water vapor, which reacts to temperature changes, is referred to as a 'feedback', because it amplifies the effect of forces that initially caused the warming." NASA- Global Climate Change

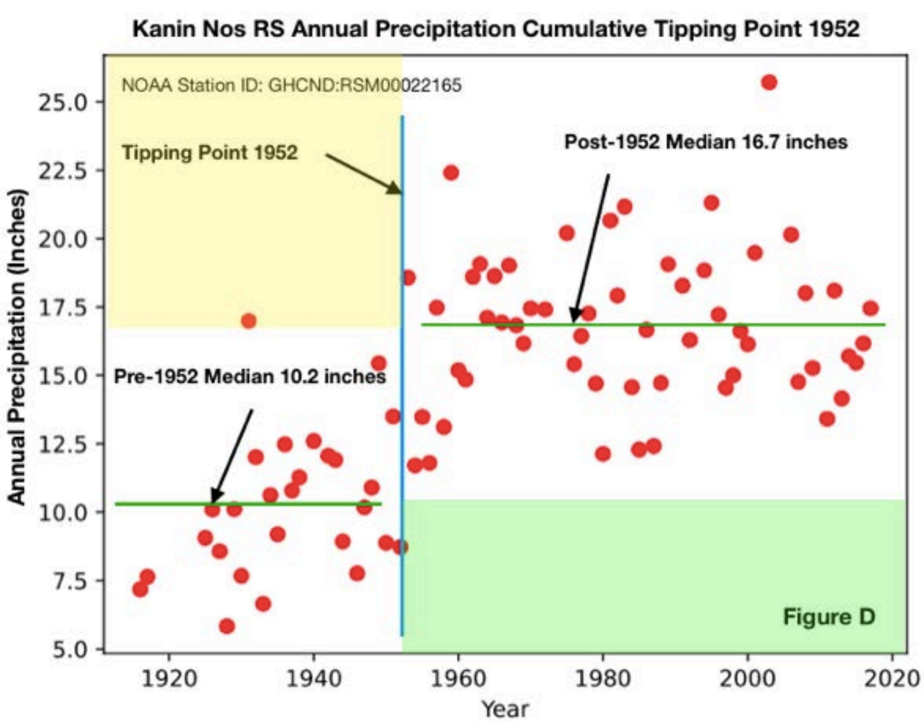
There are also forced water vapor emissions, which are not addressed in this definition, created by immense volumes of winter evaporation from Canadian and Russian AMPSs and HPPs. They cause "positive feedbacks" rapidly amplifying precipitation and warming temperatures in coastal and central Siberia, northern Quebec, Nunavut and Greenland's southwest coastline.

The Kanin Nos weather station is on the Barents Sea coastline and 270 miles west of Lake Imandra on the Kola Peninsula in Russia (See Map 3 on page 22). Its post-1952 winter median precipitation increased 4.8 inches compared to 5.5 inches at Dikson. This is an amazingly striking similarity for two weather stations, 830 miles apart.



In fact, the uniformity of the extreme increases in both winter and annual precipitation medians at both weather stations is profound. Diksons post-1952 annual precipitation increase of 6.2 inches almost equals the 6.5 inches at Kanin Nos.





Map 3

Source: www.freeworldmaps.net

- SMK added black dots and arrow to identify approximate locations of AMPS and/or weather stations discussed in this Study.

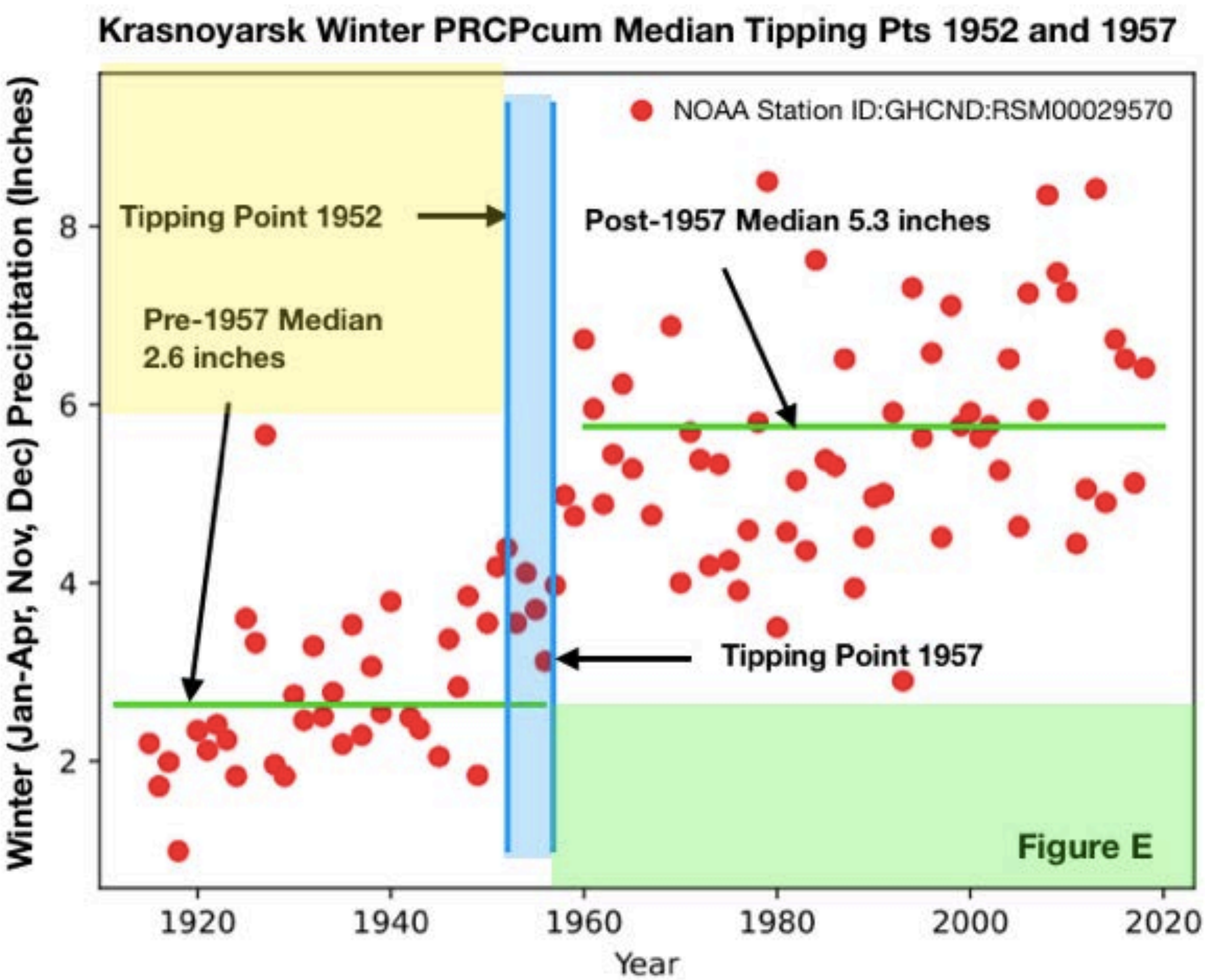
This EIS focuses on hydroelectric projects in four regions:

1. Barent Sea's Kola Peninsula, which has 8 AMPSs and 18 HPPs.
2. Siberia with 10 AMPSs in the watersheds of the Ob, Yeisei, Vilyuy and Kolyma Rivers.
3. Manitoba's Nelson River Hydroelectric Project with 1 AMPS, 4 HPPs and the Churchill River diversion into the Nelson (See Map 1 on page 13).
4. The James Bay Hydroelectric Project on the La Grande River in Northern Quebec has 4 AMPS, 6 HPPs and 4 river diversions into the La Grande (See Map 1).

In northern Quebec, rivers have been diverted to augment hydropower production on the Nelson and La Grande Rivers. The additional massive increase of unfrozen water flow in winter due to these diversions has greatly enhanced the greenhouse impact with more forced evaporation and acute enhancement of precipitation and temperatures in downwind and downriver regions.

In Russia, there was a second tipping point in 1957, when there was a major increase in the volume of forced water vapor emissions in Central Siberia with the commissioning of the Novosibirsk AMPS on the Ob River, about 1,200 miles upstream from Dikson.

The Krasnoyarsk weather station is 400 miles to the east of the Novosibirsk AMPS. Immediately after the start up of this 1957 AMPS, Krasnoyarsk's pre-1957 winter precipitation median of 2.6 inches doubled to a post-1957 median of 5.3 inches. Although the weather station is 1,800 miles to the southeast of the 1952 Niva-1 AMPS on the Kola Peninsula, the weather data reveals a significant increase in winter precipitation, not only here, but also at other stations between Krasnoyarsk and Kola Peninsula (See Figures I and J). In 1967, the Krasnoyarsk AMPS went on line. There were no discernible tipping points on the graph but the additional accumulating impact of its forced water vapor emissions bolstered the 1957 Novobirsk tipping point by keeping post 1957 winter averages much higher than the pre-1957 median of 2.6".

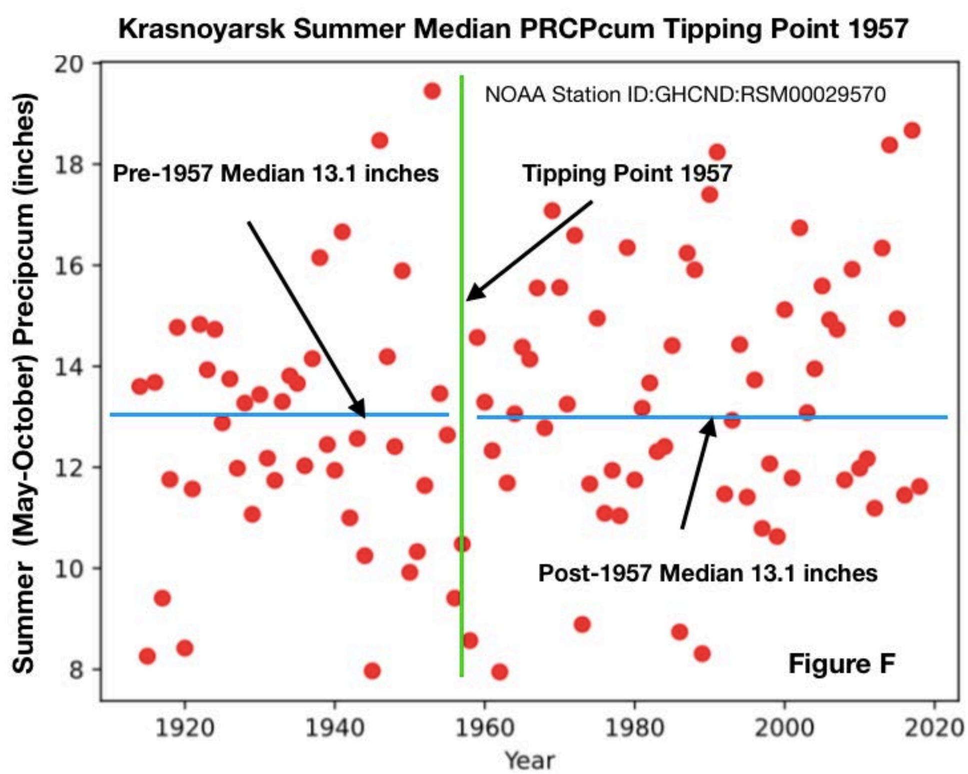


The magnitude of Krasnoyarsk's winter evaporation and its forced water vapor emissions are enormous and extensive according to the following:

"The Krasnoyarsk Dam significantly influences the local climate; normally the river would freeze over in the bitterly-cold Siberian winter, but because the dam releases unfrozen water year-around, the river never freezes in the 200 kilometers (120 mi) to 300 kilometers (190 mi) stretch of river immediately downstream from the dam. In winter, the frigid air interacts with the warm river water to produce fog, which shrouds Krasnoyarsk and other downstream areas."

1. *Gotlib,Y.L. December 1996. "**Possible Improvement of the Ice and Thermal Condition in the Lower Pool of the Krasnoyarsk Hydroelectric Station**." Hydrotechnical Construction. Vol. 30*
2. *Pacific Environment. 21 September 2013 (archive retrieval). "**Hydroelectric Dams: A Looming Threat to Russia's Mighty Rivers**."*

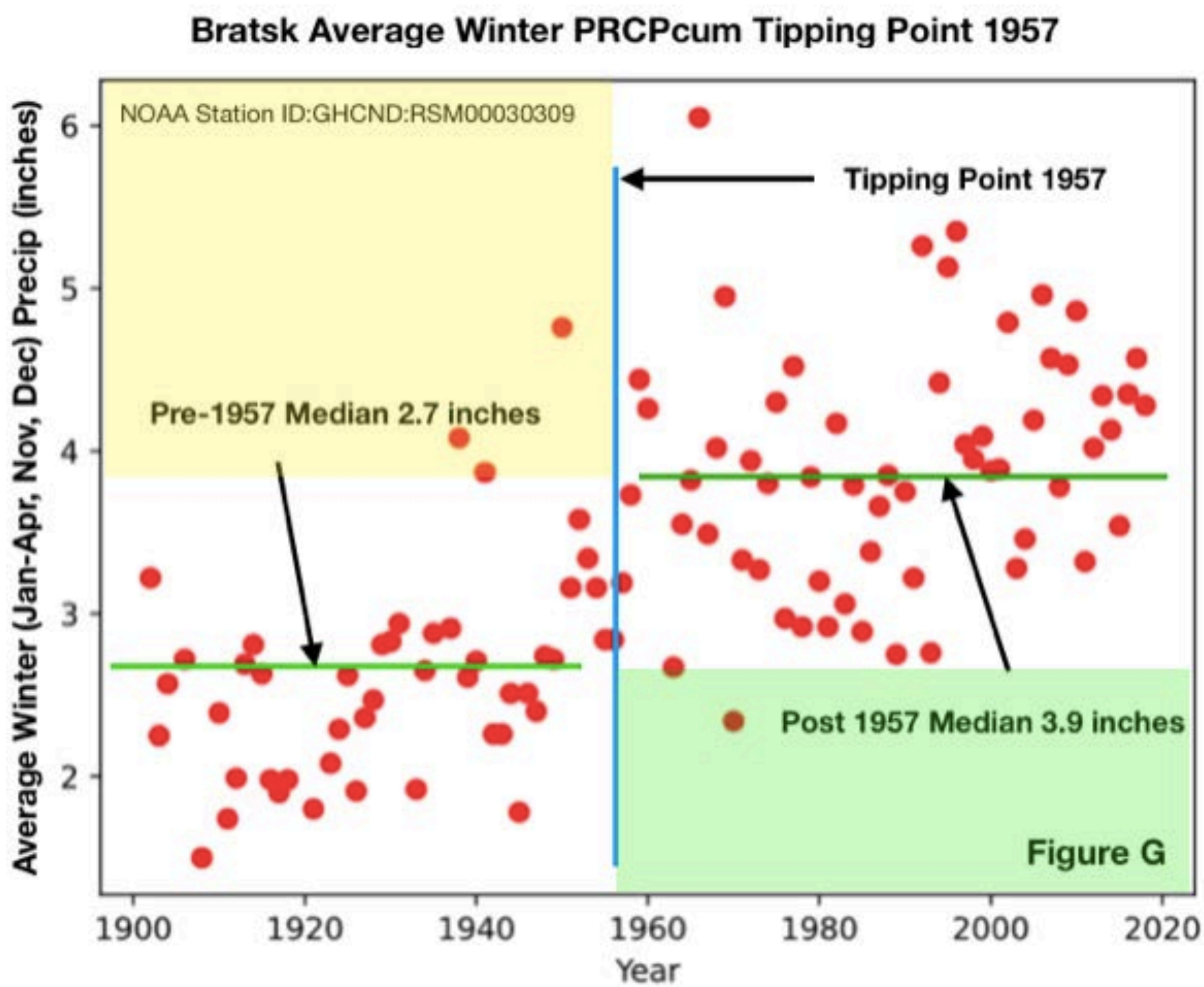
The start up of the 1957 Novosibirsk AMPS has created an unexpected departure from the historical normal winter climate by making unfrozen water available for evaporation. As a result, since 1957 Krasnoyarsk's winter precipitation doubled. Before 1957 all surface water was formerly locked up in ice and unavailable to be readily converted into water vapor by evaporation. It is profound that the post 1957 summer median is unchanged but the post winter median doubled.



The Bratsk weather station is 750 miles to the east of the 1957 Novosibirsk AMPS and the Novosibirsk impact of forced winter water vapor emissions caused the Bratsk's precipitation totals to increase immediately.

It should be noted, as highlighted in green, that the post 1957 winter total precipitation was only 2.7 inches or lower once but it was this low or lower in half of the years pre-1957. Just the opposite happened in regards to higher precipation totals. The pre-1957 six month winter total precipitation was 3.9 inches or higher only three times, as highlighted in yellow, but it was this high or higher in half of the post 1957 years.

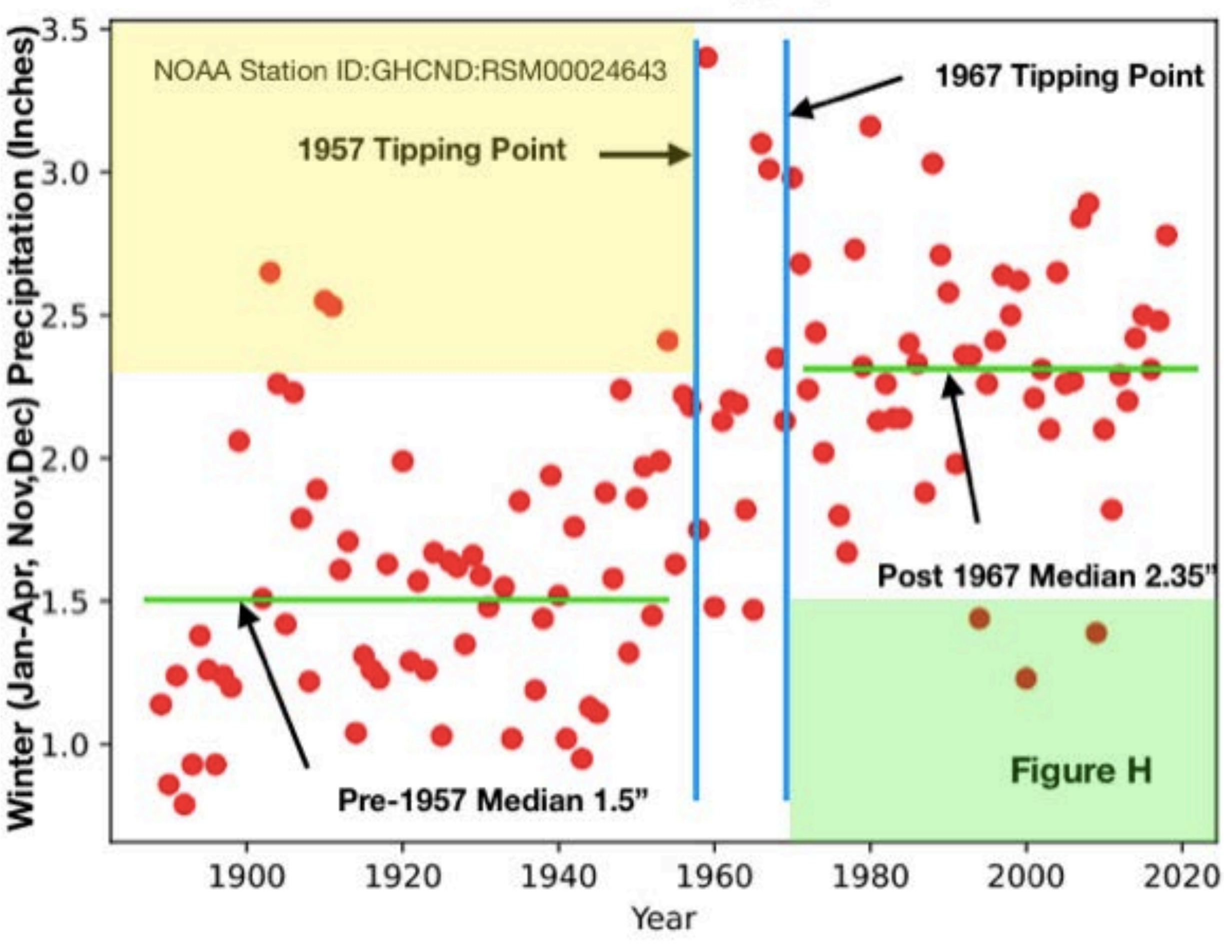
In 1967, the Bratsk hydroelectric AMPS was commissioned, and, as noted at Krasnoyarsk, there were no discernible tipping point in the weather data. However, the cumulative impact of the 1972 Krasnoyarsk and 1967 Bratsk forced water vapor emissions have bolstered the 1957 tipping point recorded at Bratsk by keeping Bratsk post-1957 winter averages above the pre-1957 median of 2.7 inches since 1970.



The third tipping point was in 1967 with the commissioning of the Bratsk AMPS on the Angara River, a tributary of the Yenisei and the Vilyuy AMPs on the Vilyuy River, a tributary of the Lena River.

The Yakutsk (Jakutsk) weather station is 1,700 miles to the east of the 1957 Novosibirsk AMPS and 450 miles southeast of the 1967 Vilyuy AMPS in Chernyshevsky. It appears that the impact of the forced water vapor emissions from each of these AMPSs caused the 1957 and 1967 tipping points with immediate and significant increases in winter precipitation totals.

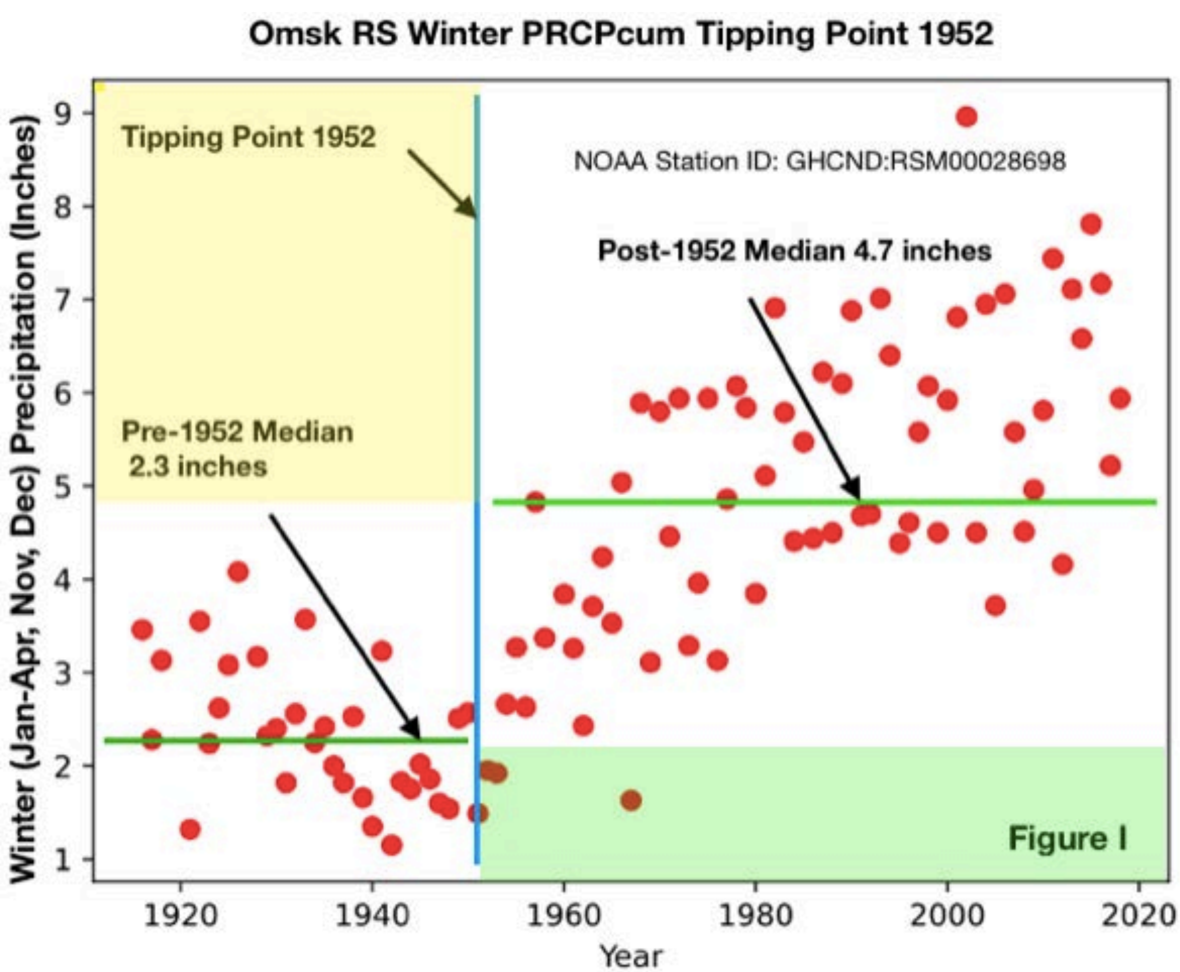
Jakutsk Winter PRCPcum Median Tipping Points 1957 and 1967



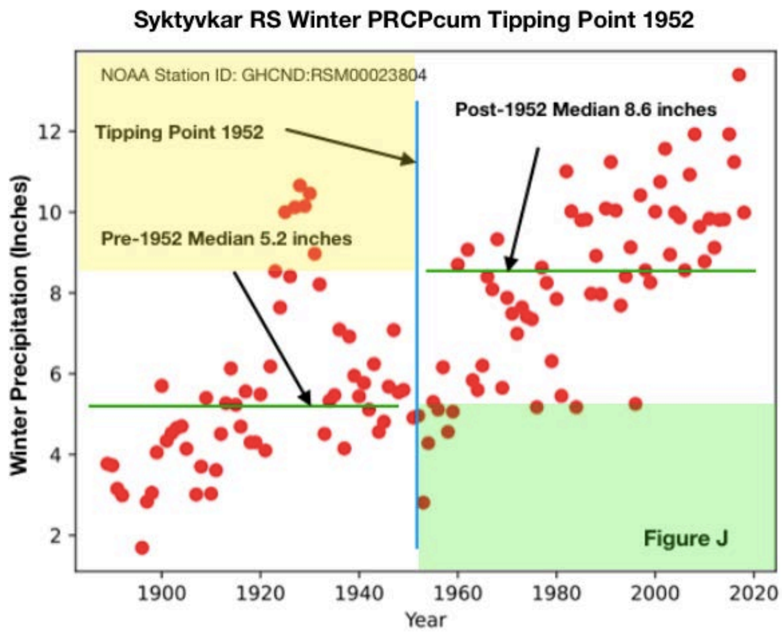
The regulated waters of Lake Imandra and Pirengskoe Reservoir on the Kola Peninsula provide the power for the 1952 Niva-1 hydroelectric AMPS. There were two existing HPPs downstream, namely the 1934 Niva-2 and 1949 Niva-3. When the 1956 Ondskaya AMPS went on line on the Lower Vyg River there was a 1953 existing HPP downstream. When the 1959 Kaitakoski AMPS was commissioned on the Paz River there were two existing downstream HPPs built in 1950 and 1955. By 2008, the Kola Peninsula has a total of 8 AMPSs and 18 HPPs on different rivers. (Magritskii, Water Resources 2008)

The forced water vapor and thermal footprints of the AMPSs on the Kola Peninsula extend easterly 270 miles along the Barent Sea's coastline to Kanin Nos and another 830 miles along the Kara Sea's coastline to Dikson.

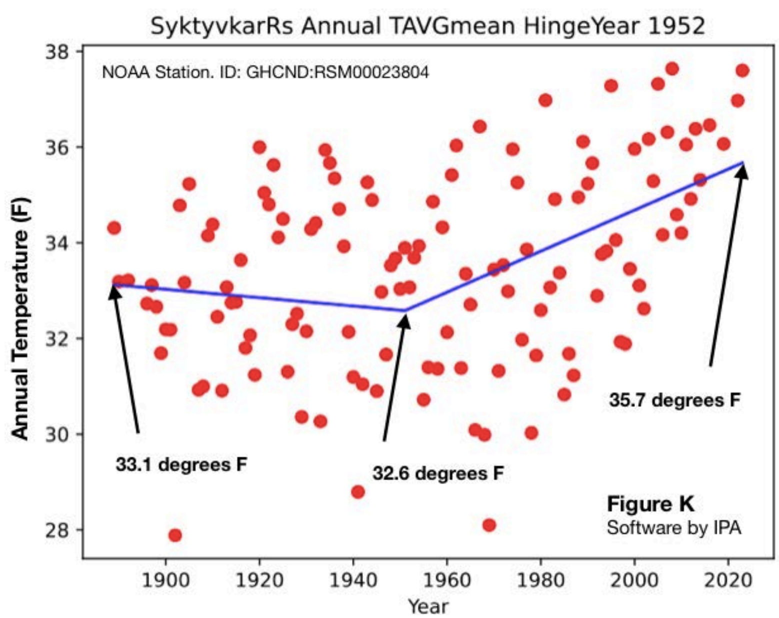
More astonishing is the inland reach of the forced water vapor and thermal footprints to Omsk, Russia, which is 1,600 milles from Lake Imandra. Immediately after the start up of the 1952 Niva-1 AMPS, the pre-1952 winter (Jan-Apr, Nov, Dec) median precipitation of 2.3 inches doubled to a post-1952 median of 4.7 inches.



The Syktyvkar weather station is about midway between Lake Imandra and Omsk. Its pre-1952 winter (Jan-Apr, Nov, Dec) precipitation median of 5.2 inches increased to a post-1952 median of 8.6 inches. It should be noted, as highlighted in yellow, that pre-1952 average winter totals were higher than 8.6 inches six times compared to 50 percent of the years post 1952. Also the post 1952 winter averages are as low or lower than 2.6 inches nine times as highlighted in green compared to 50 percent pre-1957.



Post 1952, Syktyvkar has experienced a warming trend of 5.1 degrees F, which is 3.6 times greater than the global rate of 2 degrees over the past 100 years.



SECTION V

"Positive feedback" from forced winter water vapor emissions amplified precipitation totals and warmed temperatures downwind and downstream of the Russian AMPSs.

Background Information:

Since the 1950s, the AMPSs' suppression of the spring freshet has been a driver in the decline of fish stocks and contributed to the increase in CO_2 levels driven by a steep reduction in carbon sequestration by silica encased diatoms.

"Eighty percent of the annual input of dissolved silicate to the ocean is transported via our rivers and streams." (Paul Treguer et. al. 1995). In our northern latitudes,the majority of this annual budget is delivered by the roaring waters of the spring freshet.

Less dissolved silica, during spring months is starving the silica dependent phytoplankton blooms, which are the essential basis of the marine food web and its role to regulate the climate through natural carbon sequestration.

"Diatoms are at the bottom of the food chain and suck up nearly a quarter of the earth atmosphere's carbon dioxide…Size matters for the creatures that eat them and also for carbon sequestration, as large diatoms are more likely to sink when they die… If smaller size diatoms dominate then carbon sequestration becomes less efficient, and there may be more carbon dioxiide in the atmosphere, which would exacerbate global warming." (Litchman et. Al. 2000).

Besides abrupt and unprecedented precipitation increases, the Arctic's past 72 years have also witnessed sudden and menacing temperature warming trends. Three years of epic changes were in Russia in 1952,1957 and 1967 and another three were 1970, 1980 and 1993 and occurred in northern Quebec, southwest Greenland and Ellesmere Island. These changes are evident by the quantitative analysis of the NOAA collection of weather data and are displayed visually in the graphs contained in this Study. Breaking the data into summer months (May-October) and winter suggests that forced winter water vapor emissions are the major drivers increasing precipitation and warming temperatures. Before the heat pollution of the AMPSs and the ensuing winter tipping points occurred, water was locked up in ice and winter humidity levels were in single digits. It was not possible for these cold regions to experience meaningful winter "positive feedback" loops of increasing water vapor before hydroelectric AMPSs were built on Arctic rivers.

These AMPSs have monstrous reservoir surface areas that absorb and store over 90 percent of the summer solar energy striking the surface (**Arctic Blue Deserts,** Chapter 21, Kasprzak, 2021). The resulting relatively warm winter discharge waters in the unfrozen downstream water continuum have been exposed 24/7 to the very cold dry winter atmospheric weather patterns, creating high evaporation rates and immense volumes of forced water vapor emissions. Since 1952 to the present, Omsk has experienced a winter warming trend of 6.8 degrees F, which is 5 times greater than the global rate of 2 degrees over the past 100 years. It appears that the new forced water vapor emissions, and not CO_2 emissions, were the leading major drivers of the temperature increase, that abruptly ended a 36 year pre-1952 cooling trend.

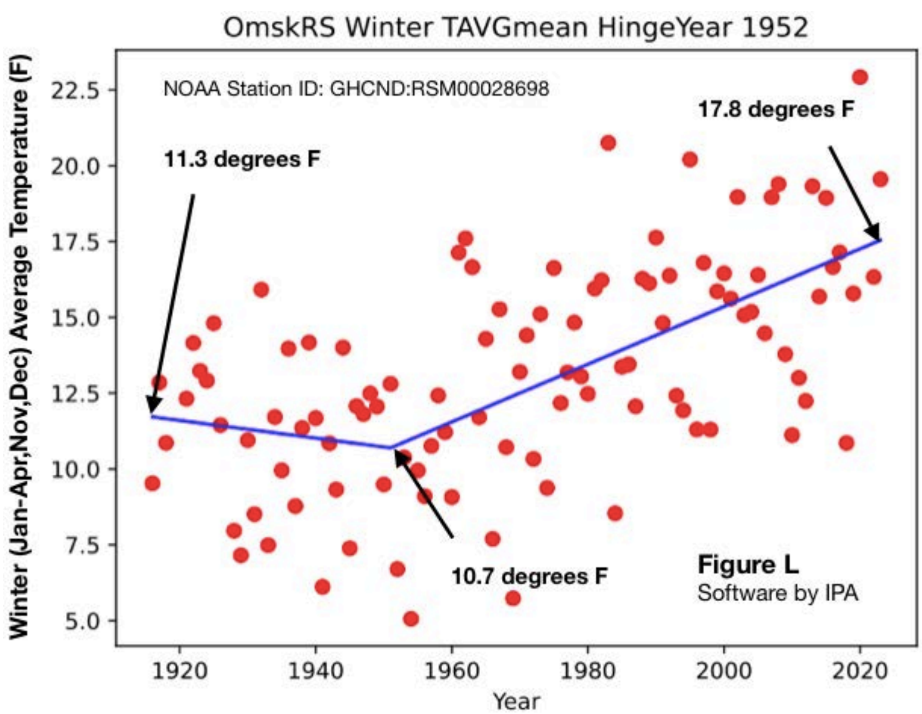
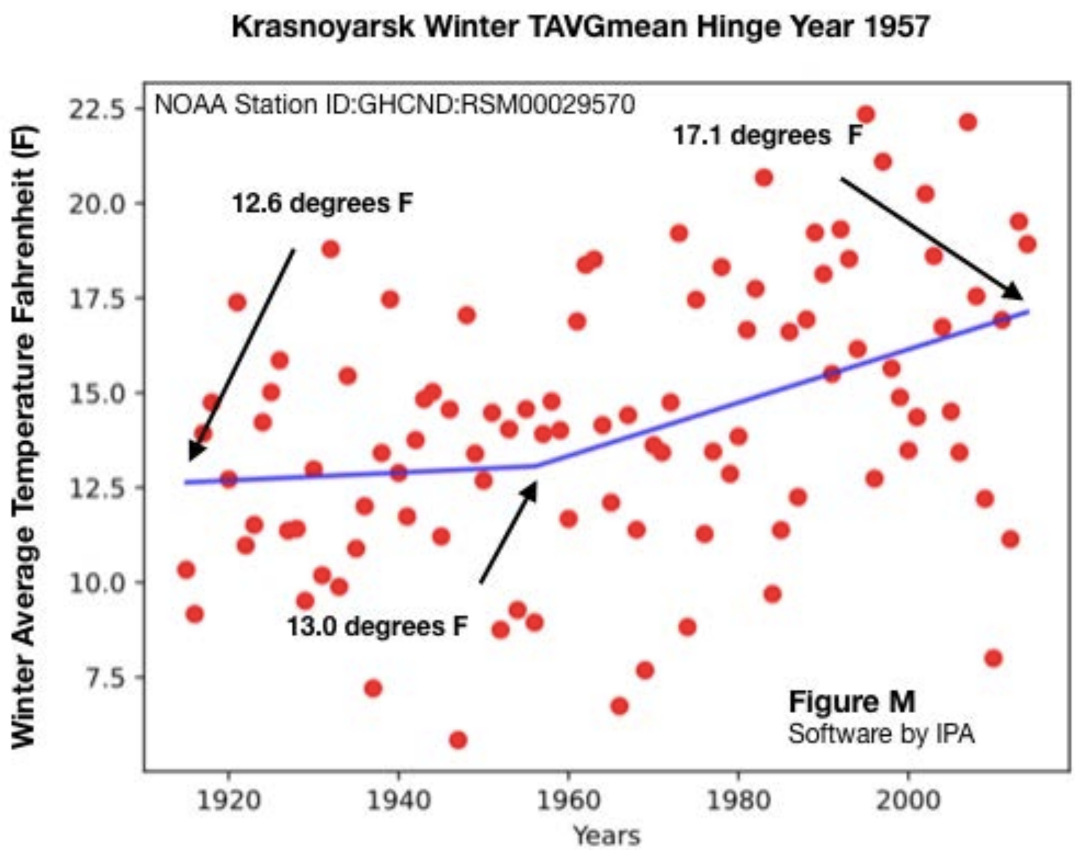


Figure L

In central Siberia, the first AMPS related temperature tipping point was 1952 and a major driver was the Kanin-1 AMPS about 1,600 miles to the northwest of the Omsk weather station. The second tipping point was the 1957 Novosibirsk AMPS that not only doubled the winter precipitation at the Krasnoyarsk weather station but created a feedback loop powering a post-1957 warming trend of 4.1 degrees F, which is 3.6 times greater than the global rate trend. This is about 4 times greater that the 1.1 degrees increase in the sixth month summer average from May through October.



Map 4

Note:

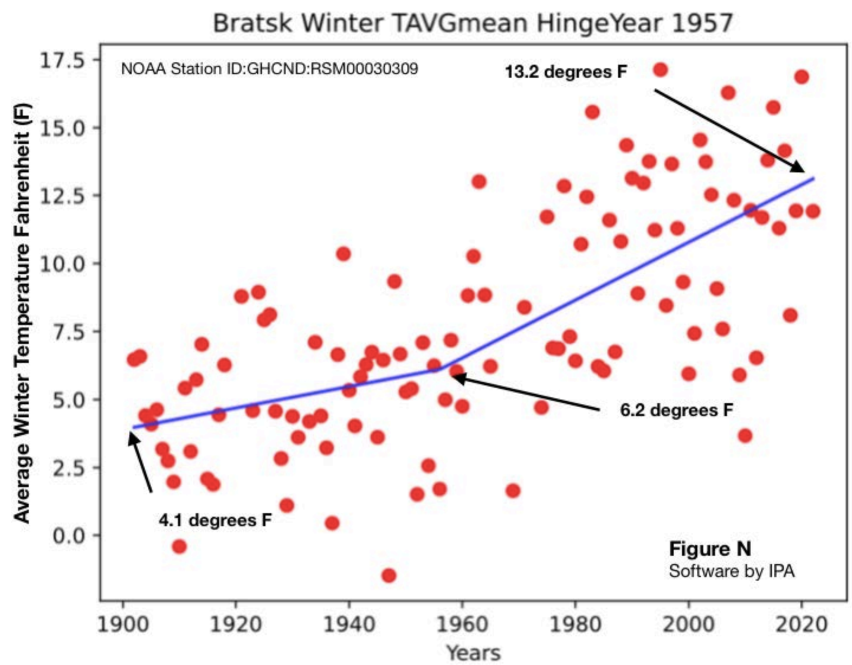
1. The distances between the 1957 Novosibirsk AMPS and Krasnoyarsk and Bratsk weather stations are about 400 and 750 miles, respectively.

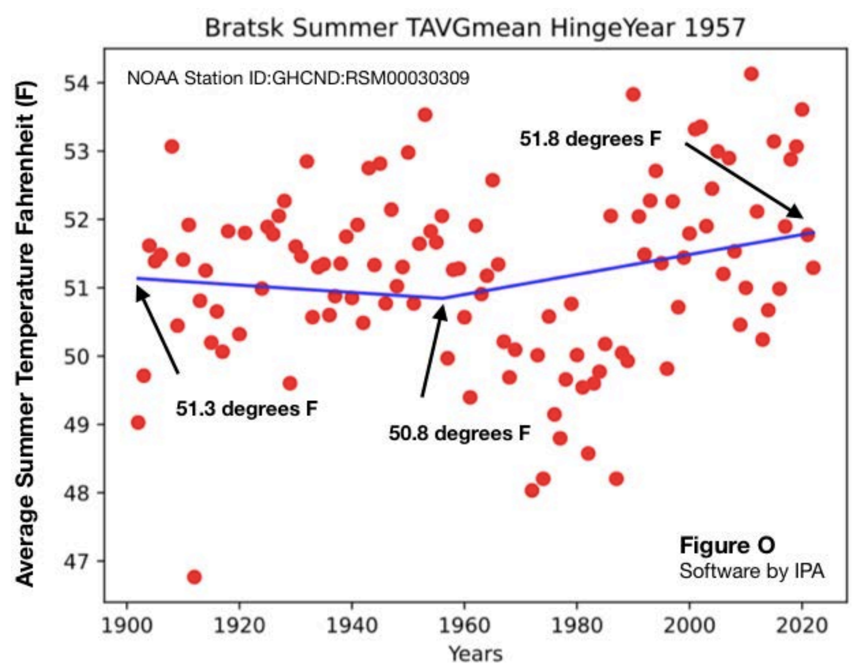
2. The distance between Krasnoyarsk and Yakutsk is about 1,350 miles.

3. The distances between the 1967 Vilyuy AMPS in Cherynshesky and the Viluysk and Yakutsk (Jakutsk) weather stations are about 230 and 450 miles, respectively.

4. SMK added red dots for the approximate locations for Chernyshevsky and Viluysk and the black arrows.

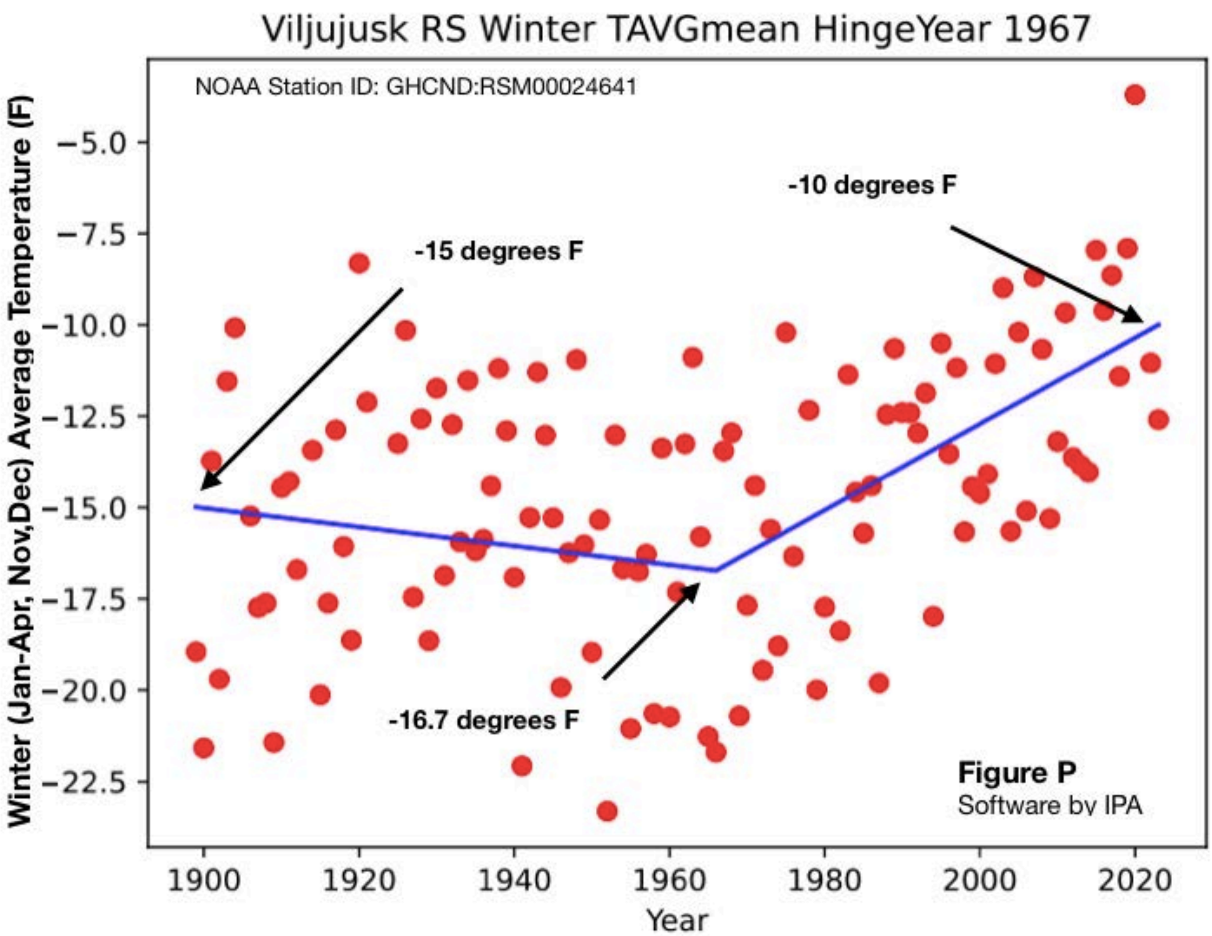
Since the 1957 climate tipping point, Bratsk winters have been warming much faster than the summers. The 1957 to 2022 winter average temperature trend (blue line), for January through April, November and December, reveals an increase of 7.0 degrees Fahrenheit (F) in the six month winter average temperature (See Figure N). This is 5 times faster than the global rate and far greater than the 1.0 degrees F increase in the six month summer average from May through October (See Figure O).





A 67 year cooling trend was permanently altered a**fter the Vilyuy Arctic AMPS was commissioned in 1967.**

The data from the Vilyuysk (Viljujusk) weather station reveals a rapid winter warming rate of 6.7 degrees Fahrenheit (F) between 1967 and 2023. This is a warming rate 6 times faster than the global rate of 2 degrees over the last 100 years. The 1957 to 2023 average winter temperature trend (blue line) in Figure P confirms this abrupt change from a long cooling trend to rapid warming. The 1967 hinge year coincide with the start up of the Vilyuy and Bratsk AMPS.

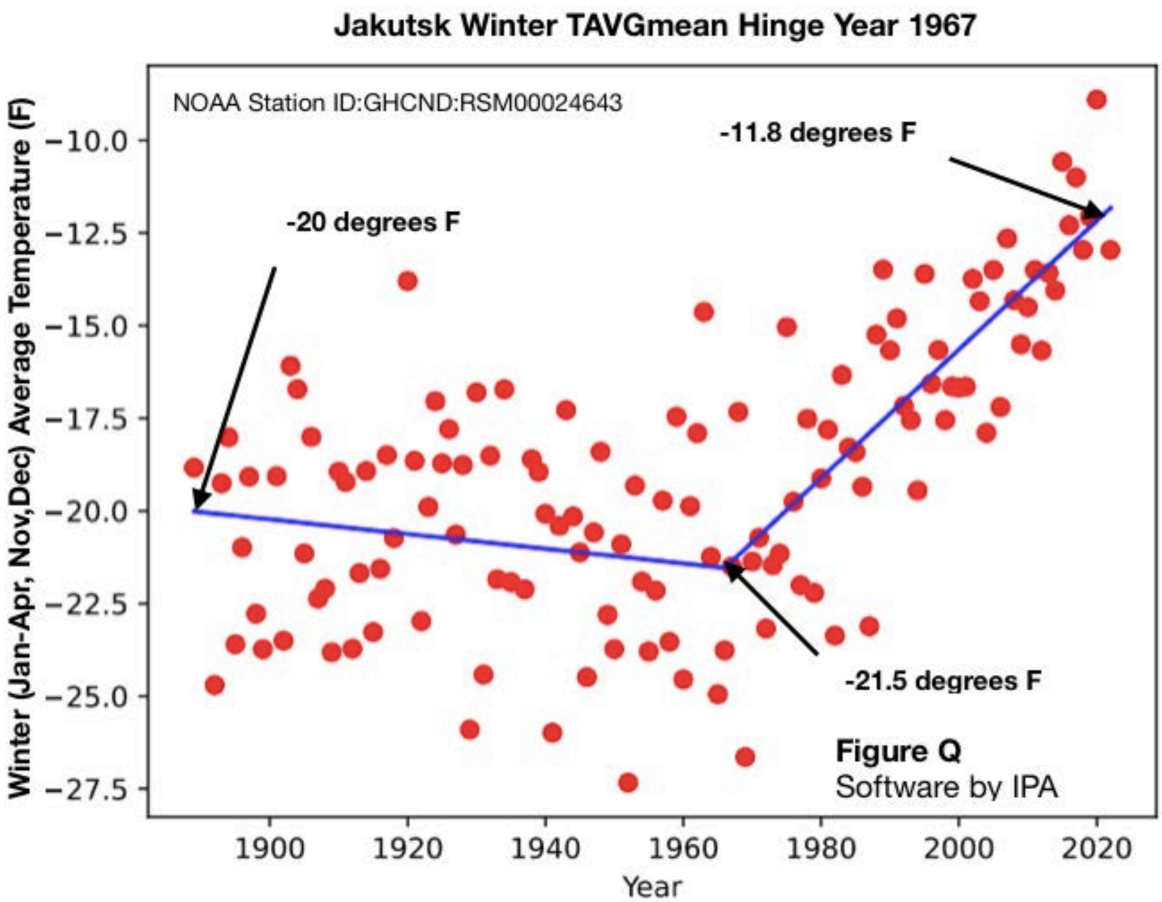


The 1952, 1957 and 1967 precipitation tipping points reveal extreme "positive feedback" loops from the increased humidity due to the winter evaporation of the AMPSs' heat polluted waters. It should be recognized that the coinciding temperature tipping points provide compelling evidence of the sudden and "positive feedback" caused by the forced winter water vapor emissions creating moisture laden atmospheric blankets 24/7 for six months.

After the 1967 commissioning of the Vilyuy AMPS in Chernyshevsky and the Bratsk AMPS (See Map 4 page 32), there was a rapid warming trend documented 450 miles to the southeast at the Jakutsk (Yakutsk) weather station.

Analysis of the data reveals a rapid winter warming rate of 9.7 degrees Fahrenheit between 1967 to 2022. This is a warming rate 9.0 times faster than the global rate of 2 degrees over the past 100 years. The 1967 to 2022 average winter temperature trend (blue line) in Figure Q confirms this abrupt change in climate. The 1967 hinge year coincides with the commissioning of the Bratsk and Vilyuy AMPSs.

The Vilyuy hydroelectric AMPS is located on the Vilyuy River, a tributary to the Yenisei River, which flows into the Laptev Sea bordering the Kara Sea. Its reservoir length is 280 miles and the surface area is 966 square miles.



SECTION VI

Quantitative analysis of Labrador Peninsula and Greenland weather data provides compelling evidence corroborating my northern Quebec hypothesis that forced Arctic climate change from human created water vapor emissions from Canadian hydroelectric AMPSs and HPPs are the major drivers warming Greenland and Nunavut and melting their glaciers. These power stations validate the fears expressed in an October 10, 1991, article from the Vancouver Sun— *"**HUDSON BAY DAMS, Environmental Monster feared by some scientists**"*, by Graeme Hamilton, Montreal Gazette. Hamilton is the current Bureau Chief at the Canadian Press, Quebec and Atlantic Canada.

Scientific studies reveal sudden and rapid deterioration in permafrost and decline in Hudson Bay sea ice extent.

Background Information:

"Hydropower's elimination of the spring freshet is a severe change in the Natural Freshwater Cycle. *Runoff is transferred from the biologically active to the biologically inactive period of the year. This is analagous to stopping the rain during the growing seasons and irrigating during the winter, when no growth occurs."*

and

"***Reducing the flow of freshwater during the biologiclly active season of the year, or even reversing the cyclic flow altogether, represent 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"* (**Man-Made Storage of Water Resources - A Liability to Ocean Environment**, Hans Neu, January 1982)

In Russia, the forced winter water vapor and thermal footprints of cascading AMPSs and HPPs on eight Arctic rivers on the Kola Peninsula extend 1,100 miles downwind along the Barent and Kara Sea coastline to Dikson and 1,600 miles inland to Omsk in central Siberia. Similar footprints from the Novosibirsk AMPS created tipping points at weather stations as much as 1,700 miles downwind and to the east across central Siberia to Yakutsk.

The building of the the Krasnoyarsk, Bratsk, and Vilyuy hydroelectric AMPSs to the east of the Novosibirsk AMPS has had a cumulative impact strengthening their footprints and extending their reach to the Jakutsk weather station. Extreme tipping points in winter precipitation were documented in 1957 and 1967 at Jakutsk and since 1967 its winters have been warming at a rate 9 times faster than the global average.

On the other side of the Arctic, the forced winter and summer water vapor and thermal footprints of Canadian AMPSs in the Hudson Bay watershed are just as extreme and extensive as the Soviet AMPSs. I believe this has created unintended warming consequences downwind along Greenland's southwest coastline and across Nunavut to Ellesmere Island.

One of these environmental monsters is the Robert Bourassa AMPS. It was commissioned in 1980 and the 1980 to 2013 data from Kuujjuarapik and Kuujjuaq, Quebec weather stations reveal an extreme warming trend 5 times faster than the global rate of 2 degrees over the past 100 years (See Figures A-2 and A-3). Thirteen years later after the Bourassa became operational, the Brisay AMPS was commissioned by Hydro Quebec and it created an environmental Frankenstein diverting an estimated 45 percent of the Caniapiscau River into its reservoir. Warming rates from 1993 to 2013 at the two weather stations doubled to 10 times the global rate. The availability of data at these two weather stations unexplainably ceased in 2013 (See Figures A-4 and A-5).

Post Brisay, Greenlands surface melt extent increased three fold and global mean sea level has risen 3.98 inches in 30 years (See Figure Z on page 49). This tipping point in sea level escalation was preceded by a rise of only 4 to 5 inches in mean sea level between 1900 and 1992 (NASA Tracking 30 Years of Sea Level Rise).

What makes Brisay such a powerful monster is the heat polluting consequences of its increased water vapor emissions driven by large relatively warm winter reservoir releases. The additional deluge of warmer winter flows is made possible by an estimated 45 percent diversion of the north flowing Caniapiscau River that once fed Ungava Bay into the La Grande and downstream through six mammoth water vaporizing AMPSs and two HPPs. Its waters now flow into the La Grande River where the regulated winter dam discharges are 8 times greater than the pre-Bourassa natural river flows into James Bay.

The LaGrande's spring freshet has been eradicated and the winter flows increased as noted below:

"In Quebec, peak electricity consumption occurs during the winter when river flows are naturally at their lowest because water is locked up in snow and ice. To meet the demand for electricity during cold weather, dams and diversions have increased the flow on the La Grande by 8 times (from 18,000 to 141,000 cubic feet per second) in order to store water for the following winter and have eradicated the spring flow (flow reduced from 176,000 to 53,000 cubic feet per second)"
("***La Grande Riviere: A Subarctic River and a Hydroelectric Mega Projec****t*", Harper P.P.; *"**Silenced Rivers**"*, McCully, P. 1996)

Hudson Bay System: bathymetry and schematic circulation

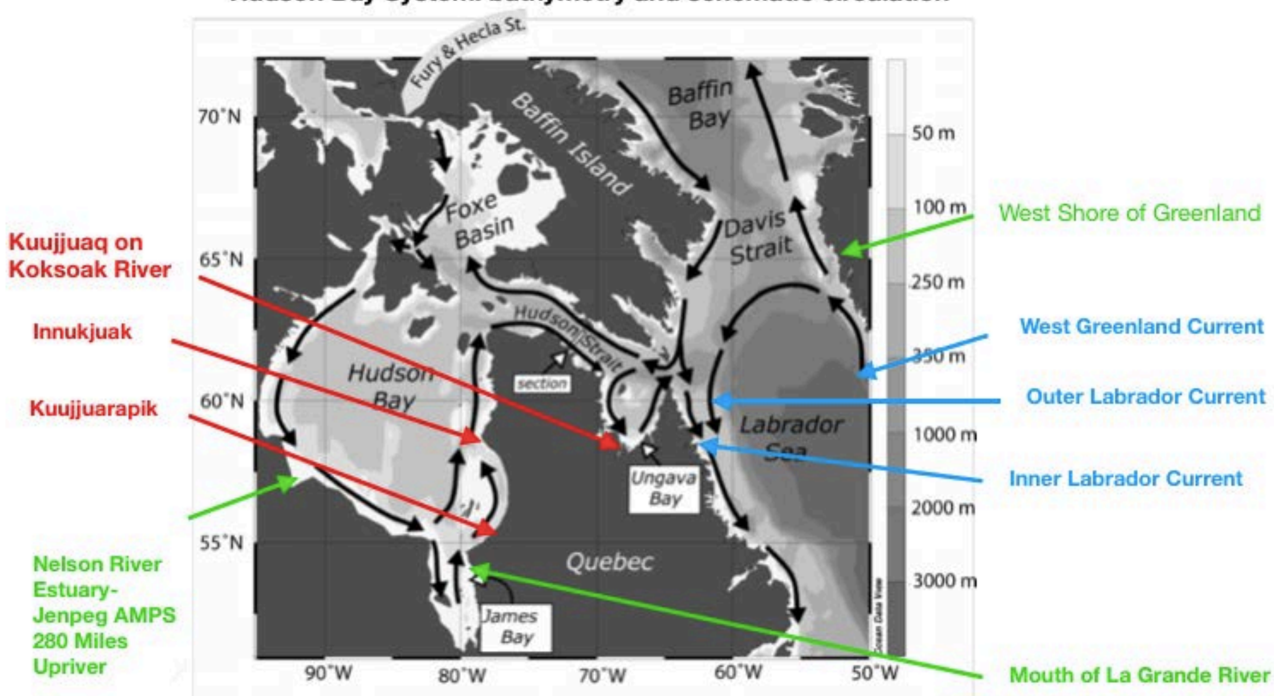


Figure R Source: Strange and Saucier Nov. 2007

The AMPSs have large reservoirs and the capture of the waters of the spring flood are used to store summer's solar energy. They are engineered to regulate the warmed discharge waters behind the dam to spin its turbines to generate winter electricity on a river that pre-AMPSs was locked in ice. The run of river HPPs are usually downstream of flow regulating AMPSs and designed to maximize the river's annual hydropower generation by recycling the AMPSs discharged reservoir waters to spin the HPPs turbines.

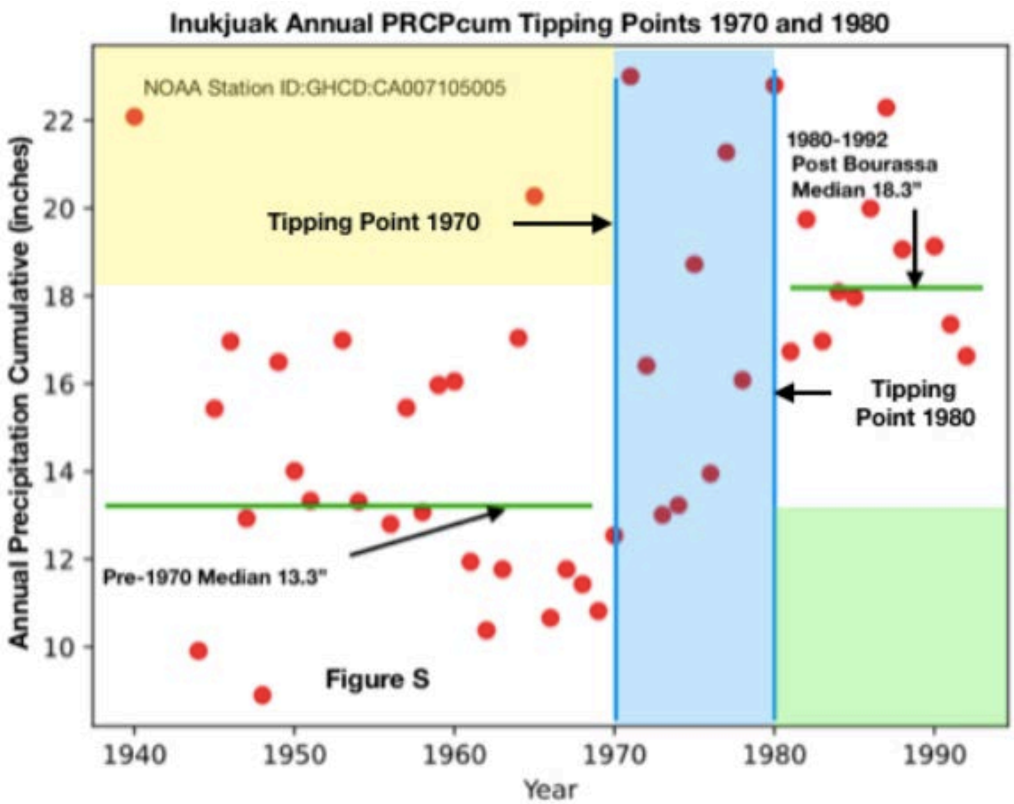
The more AMPs and HPPs located on a river, the greater the volume will be of forced winter water vapor emissions transported by the atmosphere to other regions. Consequently, as the humidity index rises from the uncontrolled winter evaporation , the greater the power of the the moisture laden atmospheric blanket to warm regions downstream and downwind of these man-made heat polluters. For example, the massive amount of water evaporated from the Hoover Dam and other dams on the Colorado River is one third of the river's flow (Dynesius and Nielson, **Fragmentations and Flow Regulation**; McCully, **Silenced Rivers**, 1996). One would expect even higher evaporation losses from the Hudson Bay AMPSs and HPPs because of the extreme difference in temperatures between the relatively warm discharged waters and the frigid Arctic winter temperatures. The fact that Greenland's southwest coastline is downwind of these Hudson Bay Dam's and in close proximity has created an environmental Frankenstein.

There are over 55,000 large dams in the world, according to the International Coalition of Large Dams (ICOLD). It is my belief that the vast majority of them do not cause forced winter water vapor emissions comparable to those created by the AMPs and HPPs built on rivers flowing into the Hudson Bay, the Labrador Sea and the Arctic's coastal seas.

The extrapolated projection of the historic temperature trend line for southwest Greenland in Figure A-1 (page 7) leads me to hypothesize that if the 1985 diversion of the Caniapiscau River was reversed and the James Bay Hydroelectric project was torn down that the current post 1993 warming trend and melt ice extent could be greatly mitigated, if not reversed.

Human forced water vapor emissions from the Nelson River hydroelectric AMPSs have caused instant and acute increases in precipitation 625 miles to the east at Inukjuak's weather station.

After the commissioning of this 1970 Nelson and the 1980 Bourassa AMPSs on the Nelson and La Grande Rivers, respectively, Inukjuak's pre-1970 annual precipitation median increased by 5 inches. It should be noted, that the cumulative impact of water vapor emissions from each of the AMPSs is so great that the natural variabiity in the range of average annual precipitation pre-1970 has been reduced by more than 50 percent and averages below the pre-1970 median have been eliminated as highlighted in green.

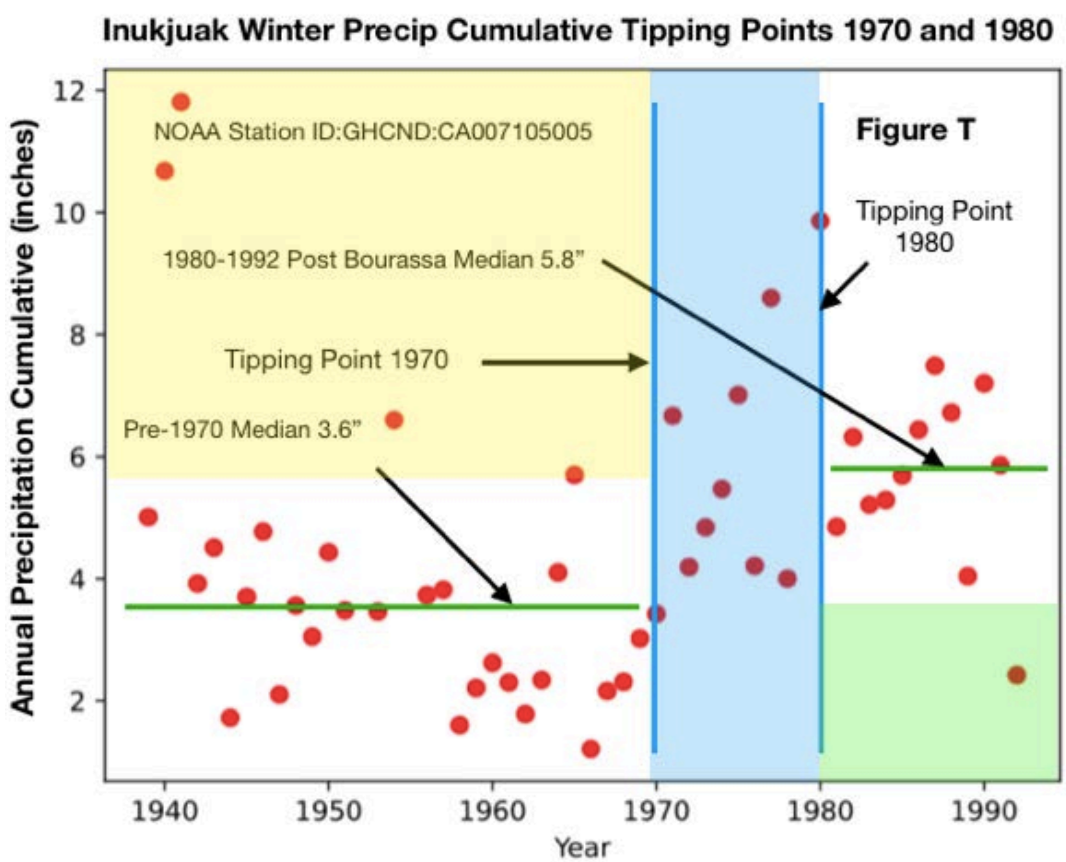


In 1970, Manitoba Electric commissioned the Kettle AMPS, creating Stephen Lake Reservoir, which is 625 miles west of the Inukjuak weather station on the east shore of Hudson Bay. In 1976, they also diverted 85 percent of the Manitoba's north flowing Churchill River into the Nelson River, increasing the Nelson's mean discharge into Hudson Bay by 40 percent.

The Nelson and La Grande River AMPSs' forced winter water vapor emissions and their thermally warming humidity are readily transported by the prevailing west and southwestly winds across Hudson Bay and the Labrador Peninsula and the Labrador Sea to southwest Greenland.

This is comparable to the upwind air pollution from the industrial midwest cities and coal power plants traveling similar distances and making the New England States ”the tailpipe of the nation”.

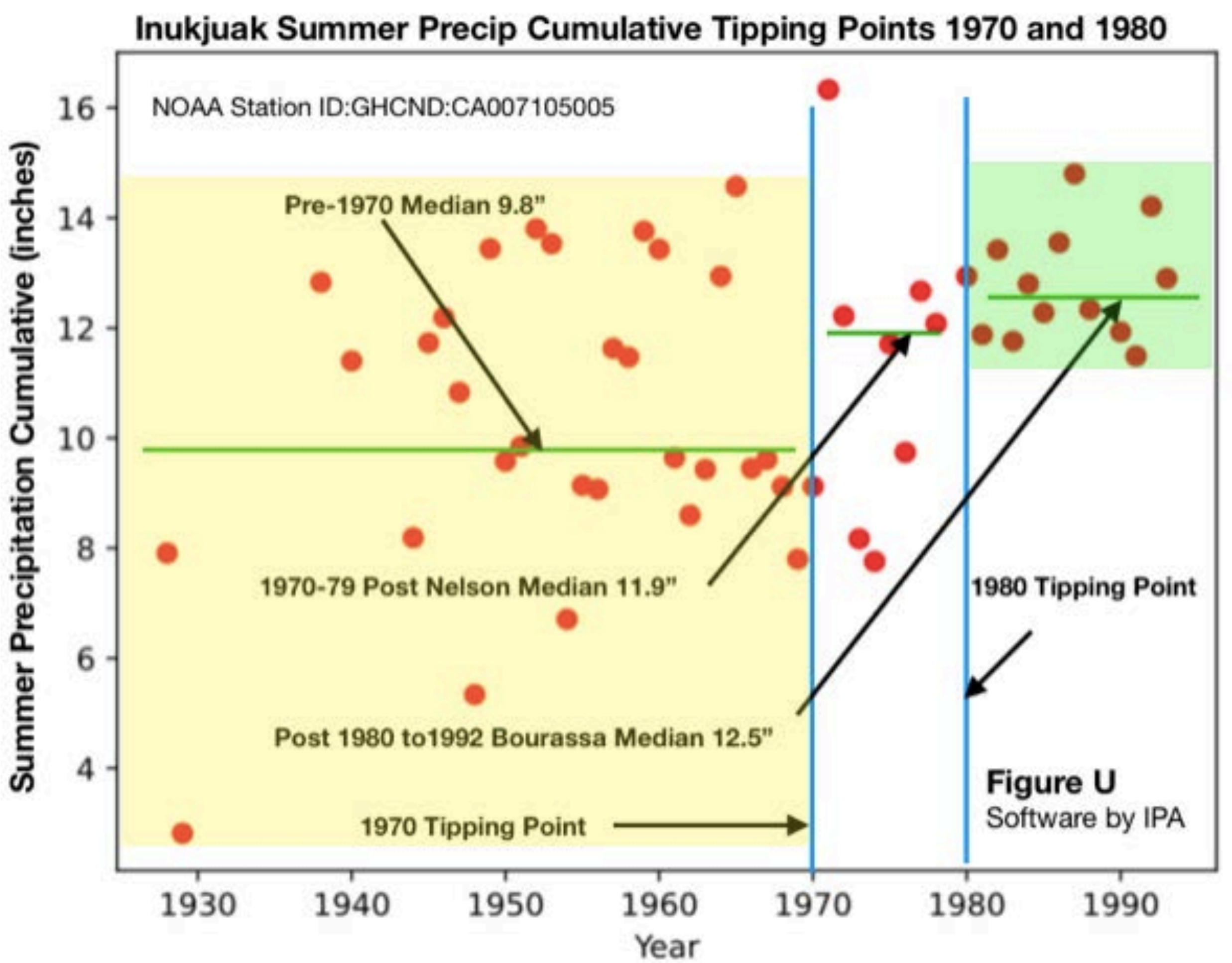
For thousands of miles downstream or downwind, the devastating and amplifying climate impacts of these calculated river diversions and cascading reservoirs appear to be rapidly warming atmospheric and sea temperatures, increasing precipitation and decreasing snowpacks and sea ice extent. These far reaching changes debunk the common belief that hydroelectric AMPSs have only “local impacts” on the climate.



Inukjuak, Quebec is located on the east shoreline of Hudson Bay (See Map 1 on page 13) and the range in summer's 6-month average precipitation totals has been drastically reduced by about 70 percent, as highlighted in green in Figure U.

Inukjuak's average summer precipitation median increased at a slower rate than the winter median. This same phenomenon was also observed at Russian weather stations impacted by AMPSs.

The publication of precipitation data from Inukjuak's weather station on the NOAA web page ceased after 1993.



Scientific studies document unprecedented environmental deterioration in permafrost, fish kills caused by heat stress, one month shortening of the season of sea ice cover and presence of river water flows, along southeast Hudson Bay in the winter.

In response to research published by Simon Thibault and Serge Payette from the University of Laval on melting permafrost in James Bay, Science Daily published the following in their Februrary 17, 2010 article, **Permafrost line recedes 130 km in 50 years. Canadian study finds**:

"(Thibault and Payett) measured the retreat of the permafrost border by observing hummocks known as "palsas," which form naturally over ice contained in the soils of northern peat bogs…."

Helicopter flyovers between the 51st and 55th parallels also reveals that the palsas are in an advanced state of deterioration over the entire James Bay area…."

"While climate change is the most probable explanation of this phenomenon, there is no data available to confirm the suspicion. Professor Payette notes, however, that the average annual temperature of the northern sites he has studied for over 20 years has increased by 2 degrees Celsius (3.6 degrees Fahrenheit)… If this trend keeps up , what is left of the palsas in the James Bay bogs will disappear altogether in the near future, and it is likely that the permafrost will suffer the same fate." (Thibault and Payette, 2010)

The data and analysis in this EIS reveals that climate change from forced water vapor emissions from AMPSs and HPPs on Hudson Bay rivers appear to be the major drivers of the ominous increase in precipitation and warming northern Quebec's climate and causing the rapid deterioration in permafrost.

In another newspaper article, Margaret Munro of Postmedia News quoted Jonathon Smol, an environmental scientist, in **Scientists sounding alarm as Hudson Bay Area thaws**, in the October 9, 2013 edition of Edmonton Journal:

"The study says the change is "unprecedented in the past approximately 1,500 years, " based on analysis of sediments in the region.

Smol says there are plenty of other signs of the remarkable shift underway in the region, including fish kills caused by heat stress, dropping water levels and three weeks less ice cover on Hudson Bay than there was prior to 1995." (Munro, 2013)

This next article was written seven years later and the shortening of the season of sea ice cover had increased to four weeks.

The following was written by Rosemary Eastwood, et al. in the abstract of **Role of River Runoff and Sea Ice Brine Rejection in Controlling Stratification Throughout Winter in Southeast Hudson Bay**, published in Estuaries and Coasts in 2020:

"The Hudson Bay system is undergoing climate-driven changes in sea ice and freshwater inflow and has seen an increase in winter river inflow since the 1960s due in part to flow regualtion for hydropower production. Southeast Hudson Bay and adjacent James Bay are at the forefront of these changes, with more than 1-month shortening of the season of sea ice cover as defined using satellite data, increases in winter inflow from the regulated La Grande River complex, and changes in coastal ice and polynya behavior described by Belcher Islands Inuit…"

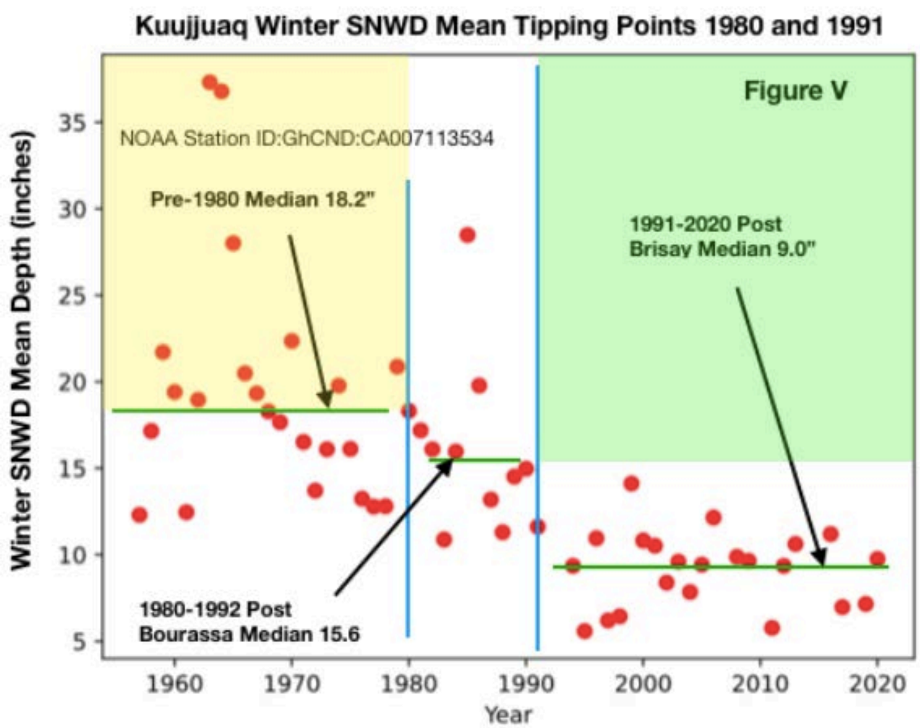
"We find that southeast Hudson Bay, and particularly the nearshore domain southeast of the Belchers, is distinguished in winter by the presence of river water and strong surface stratification, which runs counter to expectations for a system in which local freshwater remains frozen on land until spring freshet (May-June) and sea ice growth is adding brine to surface waters…"

"While past changes in winter oceanographic condition and sea ice cannot be reconstructed from the few available scientific data, the presence of significant runoff in winter in southesast Hudson Bay implies heightened sensitivity to delayed freeze-up under a warmer climate, which will have the effect of reducing brine early in the winter, also promoting increased stratification and river plume transport." (Eastwood et al., 2020)

In addition to increasing precipitation and temperatures, forced water vapor emissions have also caused an immediate and drastic reduction in snowpack depths in northern Quebec.

Snowpack depths were taken from NOAA's daily Record of Climatological Observations and are the amount of snow, ice pellets, hail and ice measured on the ground in inches. Kuujjuaq's historic snowpack depth pre-1980 median has declined by about 50 percent for the post-1991 Brisay AMPS and it has never recovered. This data set covers 1957-2020 and there is no data after 2020. Inukjuak's data collection on snow pack depths ended in 1993 (See Figure X) and at Kuujjuarapik it ended in 2013 (See Figure W). The discontinuance of collecting and/or releasing data from these weather stations is very disquieting during the accelerating climate change of the past 30 years.

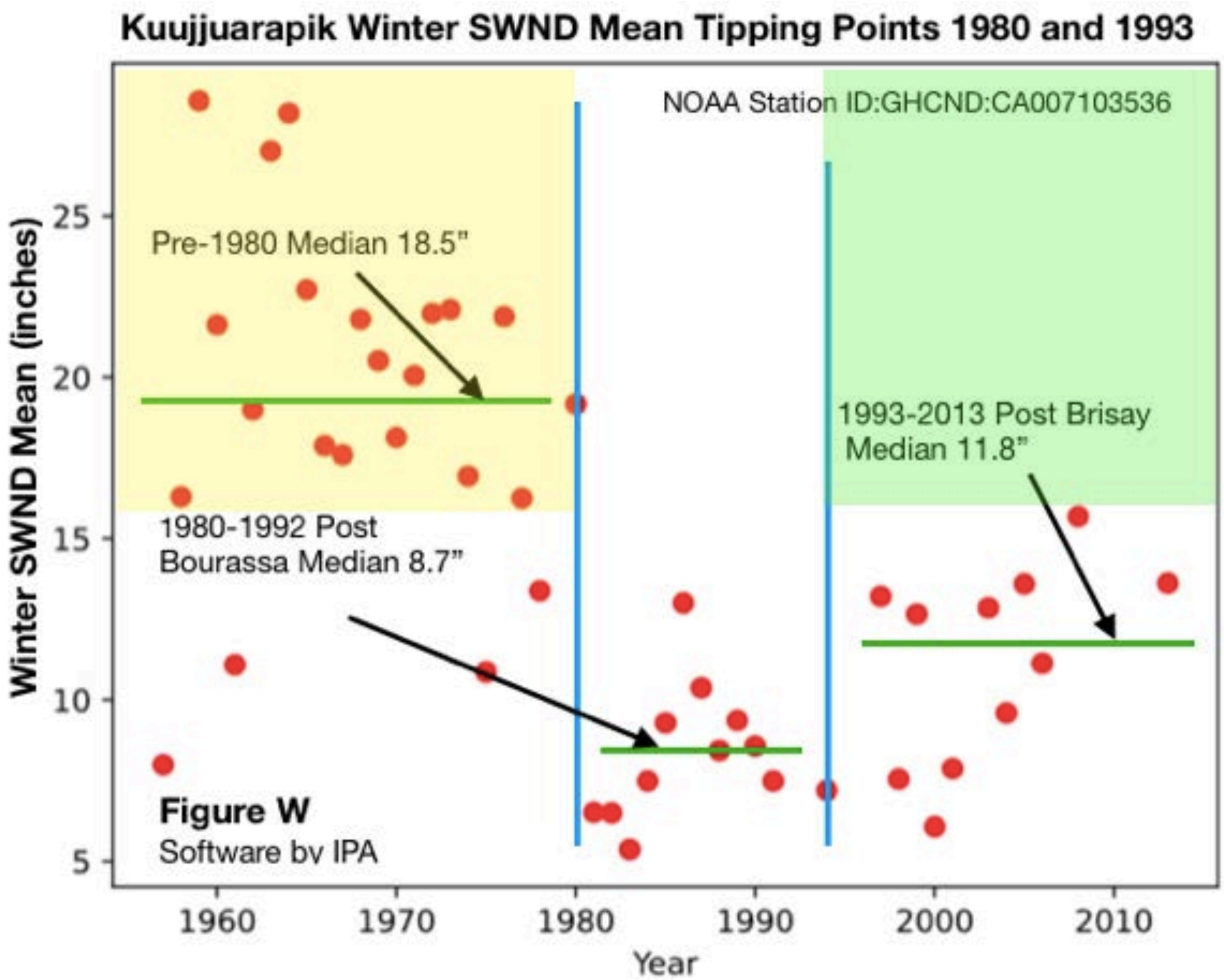
The prevailing winds across the Labrador Peninsula facilitate the transport of an immense volume of forced water vapor emissions from the winter evaporation 24/7 from these Canadian AMPSs across the Labrador Peninsula and over Hudson Strait and the Labrador Sea to Greenland. Throughout the winter, large sections of downstream unfrozen rivers warmed by the hypolimnial dam releases, continually contaminate the atmosphere with great volumes of water vapor amplifying winter temperatures and suppressing snowpack depths. Never before in geologic history have rivers flowed throughout the Arctic winters exposing vast surface areas of unfrozen water to such strong evaporative forces.



In 1980, Hydro-Quebec commissioned the 5,616 Megawatts Robert Bourassa AMPS on the La Grande River. This AMPS is only 73 miles upstream from the mouth, of the La Grande which discharges into James Bay's counter clockwise coastal currents. Kuujjuarapik weather station is situated on the east shore of Hudson Bay about 150 miles down current from the LaGrande's mouth (See Figure R on page 36).

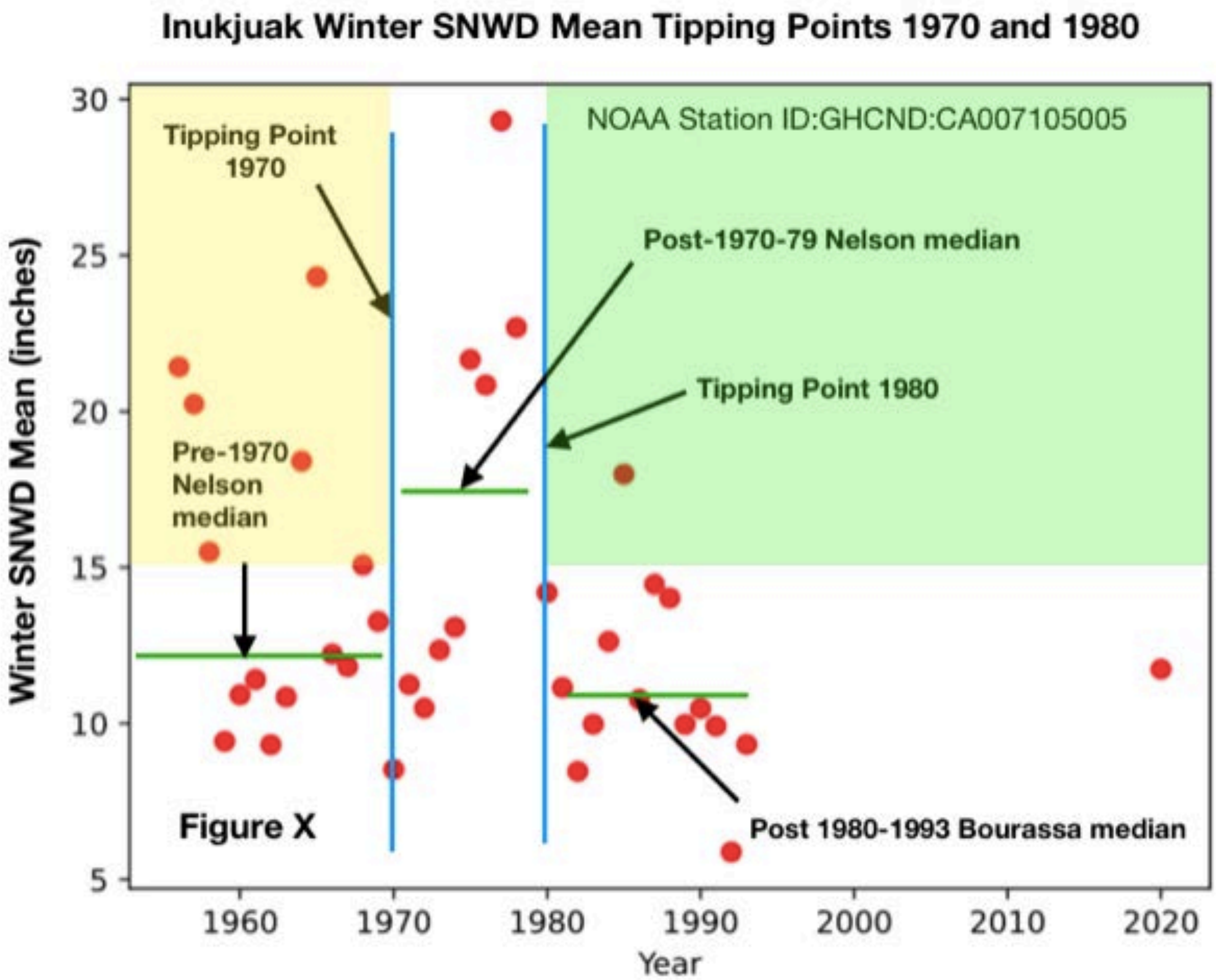
Weather data from Kuujjuarapik, reveals profound and sudden decreases in the snowpack coinciding with the commissioning of the 1980 Bourassa AMPS and the long term suppression after the 1993 Brisay AMPS became operational.

The following year, after 1980, there was a sudden decline of more than 50 percent in the pre-1980 winter (Jan-Apr, Nov,Dec) snowpack depth median of 18.5 inches to 8.7 inches at Kuujjuarapik's weather station, which have not recovered to pre-dam depths highlighted in yellow. See Figure W where the green lines present the pre and post-dam median for the three time periods.



Inukjuak's snowpack was impacted by the 1970 Nelson and 1980 Bourassa AMPSs. The weather data reveals a significant increase in snowpack depths post 1970 Nelson. The steep increase in winter precipitation, during the late 1970's, (see Figure S), may be the driver of the significantly higher snowpack, documented in Figure X.

With the exception of one year, the post 1980-1993 Bourassa Dam data in Figure X documents **the elimination of average snow depths of 15 inches or more.** The reduction of average snowpack depths in the 1980's, despite much higher winter precipitation averages appears to be driven by the post 1980 Bourassa AMPS' relatively warm water 24/7 winter discharges and water vapor emissions. The 8 fold increase above the La Grande's natural winter flows appears to have far reaching impacts in and beyond Hudson Bay's counter clockwise north flowing coastal currents and on the climate of northern Quebec and SW Greenland.



SECTION VII

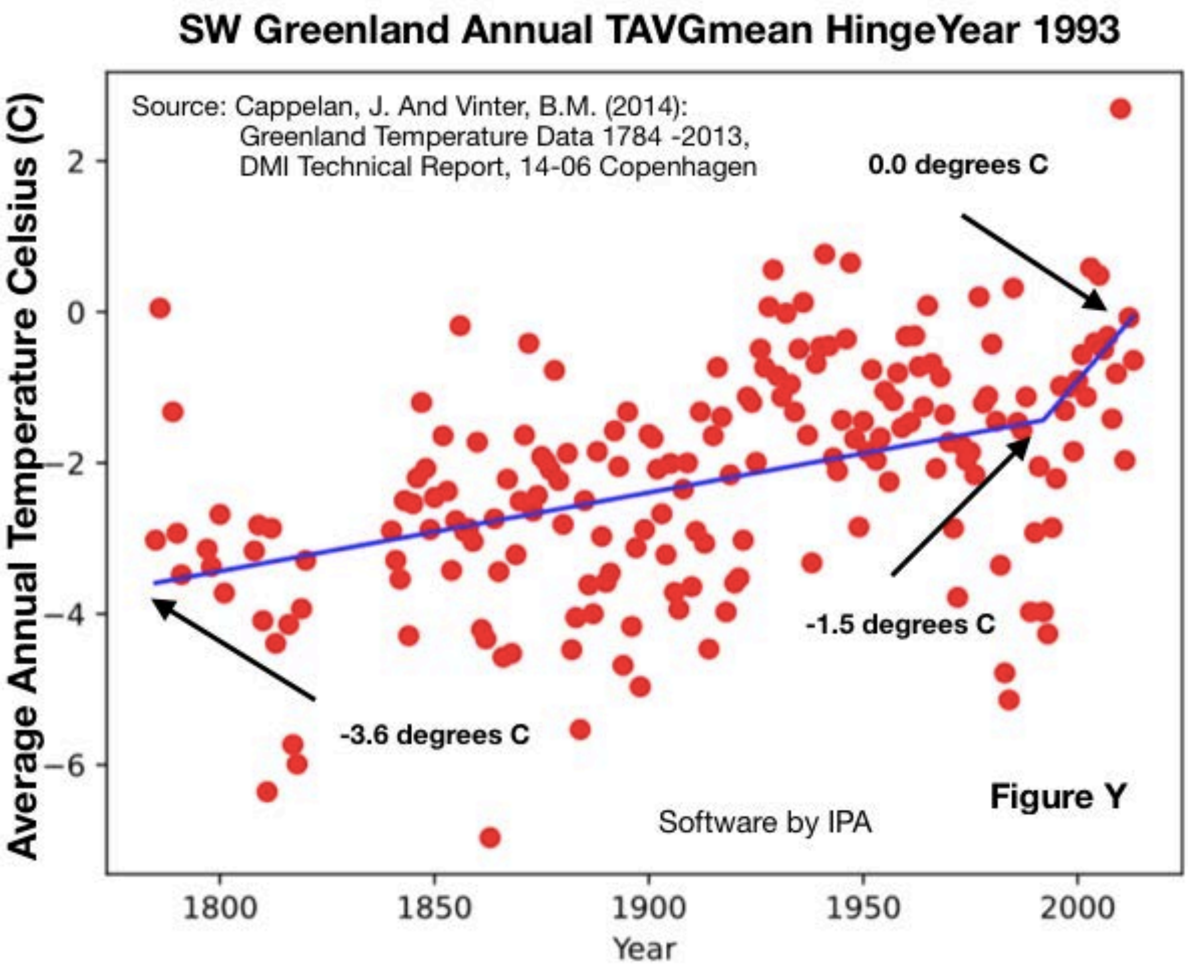
The Brisay AMPS is 290 miles east of Kuujjuarapik and 265 miles south of Kuujjuaq points 1 and 3 respectively, on Map 1 page 13. Brisay's summer and winter water vapor emissions and thermal footprints are causing severe warming trends reaching not only these two weather stations, but also across the Labrador Sea to the southwest coast of Greenland and north across Baffin Bay to Ellesmere Island.

Quantitative analysis of weather data for the Qaqortoq, Nuuk and Ilulissat regions depicts three "hockey sticks" and rapid warming since 1993 (See Figures AA-CC).

Background Information:

"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 ecosytem dominate 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."* (**The Problem Is the Lack of Silica**), S.M. Kasprzak, October 15, 2018 and **Reservoir Hydroelectric Dams - Silica Depletion - A Gulf of Maine Catastrophe**, S.M. Kasprzak November 28, 2018)

The analysis of SW Greenland weather data depicts a ”hockey stick” graph. Its “blade” documents a steep rise in temperatures since the 1993 commissioning of the Brisay hydroelectric AMPS.



On April 22 (Earth Day) of 1998, Michael Mann published his “hockey stick” graph depicting a sharp rise in global surface temperatures since the beginning of the industrial revolution. The “blade” of his “hockey stick” represents unprecedented warming in the past 100 years driven by increasing CO2 emissions. Mann warned in Time Magazine on October 25, 2023 that: *“The hockey stick itself shows a single number for each year, representing the entire northern hemisphere. That hides even larger regional episodes of warming or cooling that provide key insights of their own.”*

A quantitative analysis of weather data in Russia, Canada and Greenland validates Mann’s concerns and provide “key insights” of causation and other “episodes” of unparalled regional warming, glacier melting and rising sea levels.

The “blade” on the SW Greenland “hockey stick”, depicted by the right blue trend line in Figure Y on page 47, reveals an abrupt warming trend of 1.5 degrees Celsius (C) from 1993 to 2013. This warming rate is 6.8 times faster than the global rate of 1.1 degrees C over the past 100 years.

The red dots in Figure Y are the average of annual temperatures from different weather stations along 800 plus miles of the southwest coastline of Greenland and the left blue trend line is the “shaft” of the “hockey stick”. The “knob” of the “shaft” is the 1790’s time period. The 1993 hinge year is the “heel” of the “blade” and coincides with the commissioning date of the Brisay hydroelectric AMPS in northern Quebec.

The blue “shaft” trend line reveals an increase of only 2.1 degrees C over 204 years, which is an average increase of 0.010 degrees C per year and slightly less than the global average increase of 0.011 degrees C per year for the past 100 years.

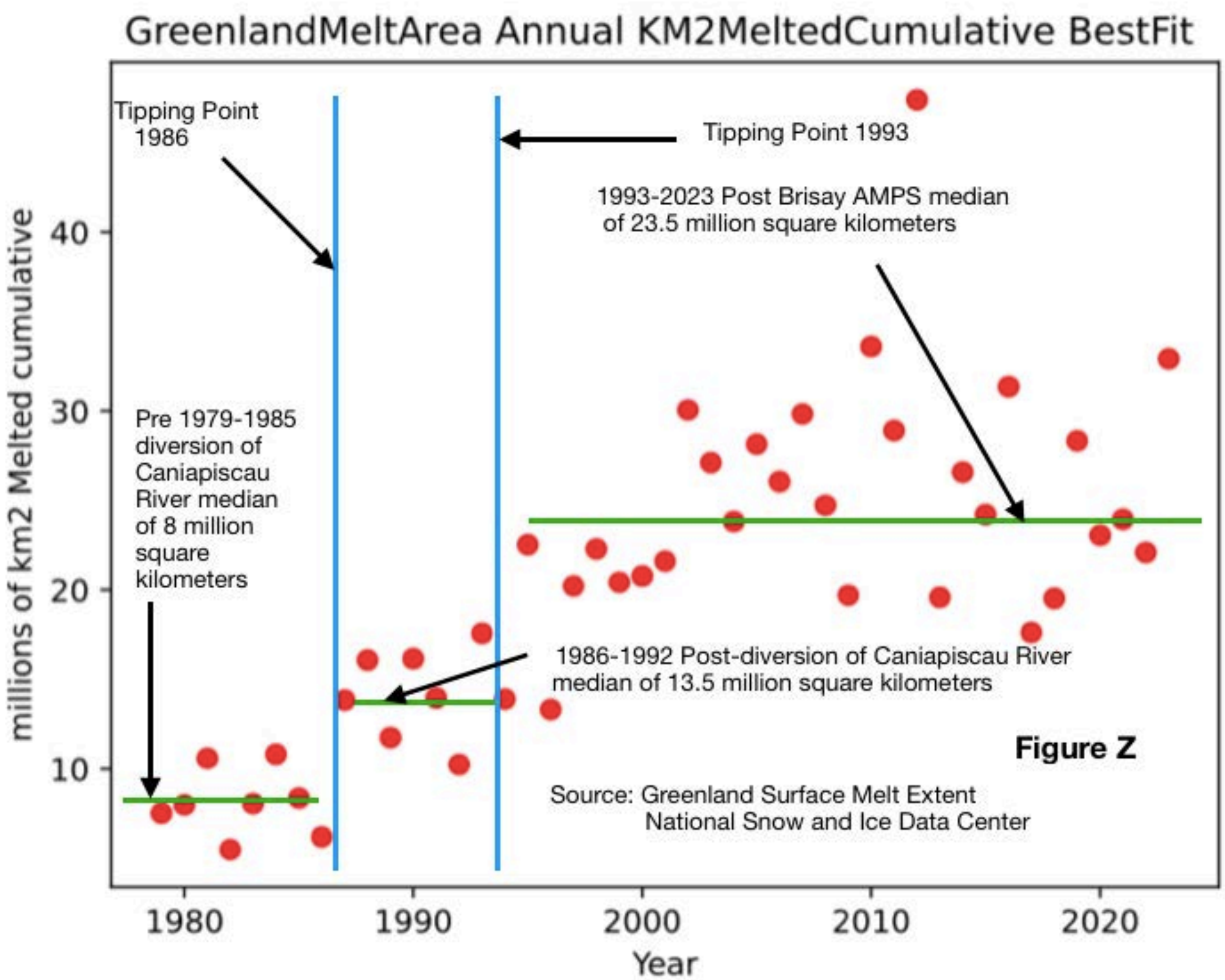
The Brisay AMPS is 290 miles east of Kuujjuarapik and 265 miles south of Kuujjuaq. Brisay’s summer and winter water vapor emissions and thermal footprints are causing extreme warming trends reaching not only these two weather stations, but also across the Labrador sea to the southwest coast of Greenland.

The Brisay AMPS has a monstrous reservoir surface area of 1,700 square miles, absorbing over 90 percent of the summer solar energy it receives. Its relatively warm winter discharge waters are exposed 24/7 to the very cold, dry and often windy winter atmospheric weather patterns, creating high winter evaporation rates and gigantic volumes of forced water vapor emissions, a powerful greenhouse gas. There are five more AMPS with huge reservoirs and two HPPs (See the red dots on Map 1 page 13) downstream of the Brisay compounding the volume of forced water vapor emissions.

What makes the Brisay an even greater environmental monster is the cascading and amplifying heat polluting consequences of its increased water vapor emissions. This is driven by the increased regulated deluge of winter flows created by the estimated 45 percent diversion of the north flowing Caniapiscau River through the Brisay AMPS and further downstream through the other hydroelectric stations. These diverted waters now flow into the La Grande River where the regulated winter outflows are 8 times greater than the pre-Bourassa AMPS natural river flows into James Bay.

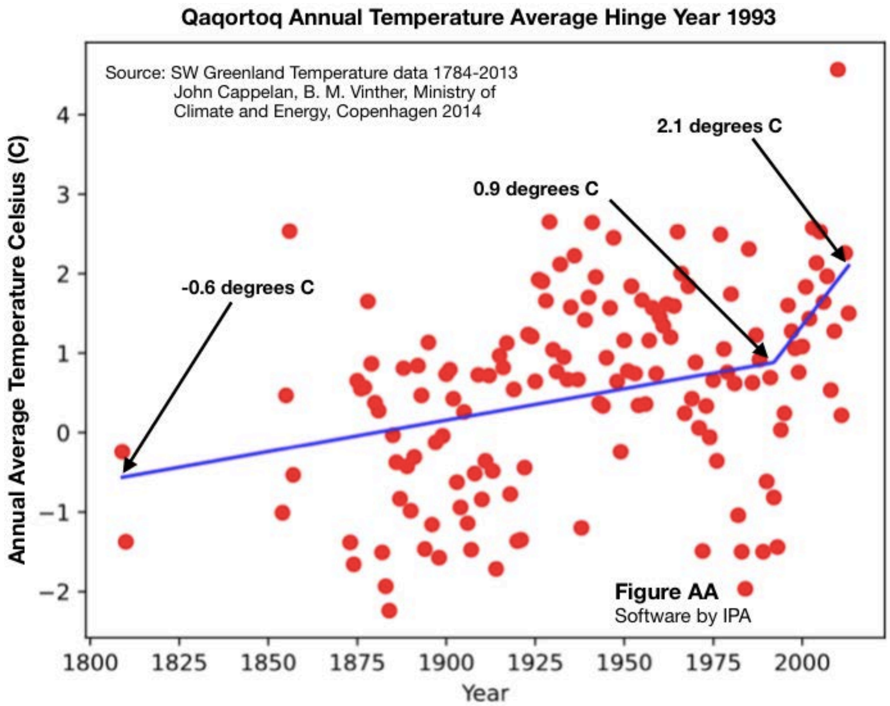
Data from NASA's National Snow and Ice Data Center documents the 1985 and 1993 tipping points of huge increases in Greenlands's surface melt extent. These two years coincide with the August 1985 diversion of the Caniapiscau River and 1993 commissioning of the Brisay AMPS.

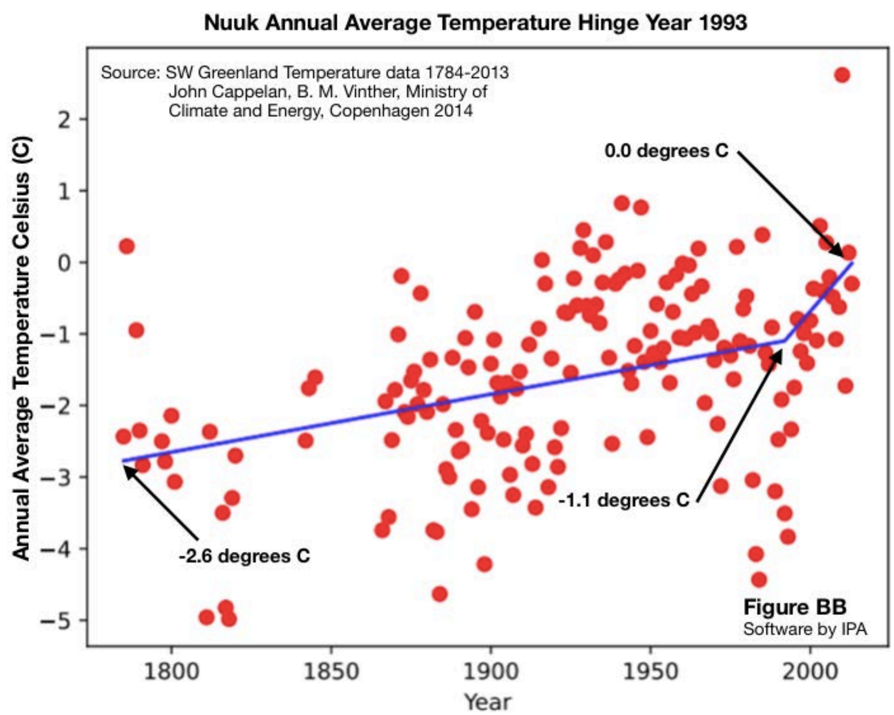
The Brisay's forced summer and winter water vapor emissions and their thermally warming humidity are readily transported by the prevailing west and southwesterly winds across Hudson Bay and the Labrador Peninsula and Sea to Greenland's western shore and farther north to Ellsmere Island.



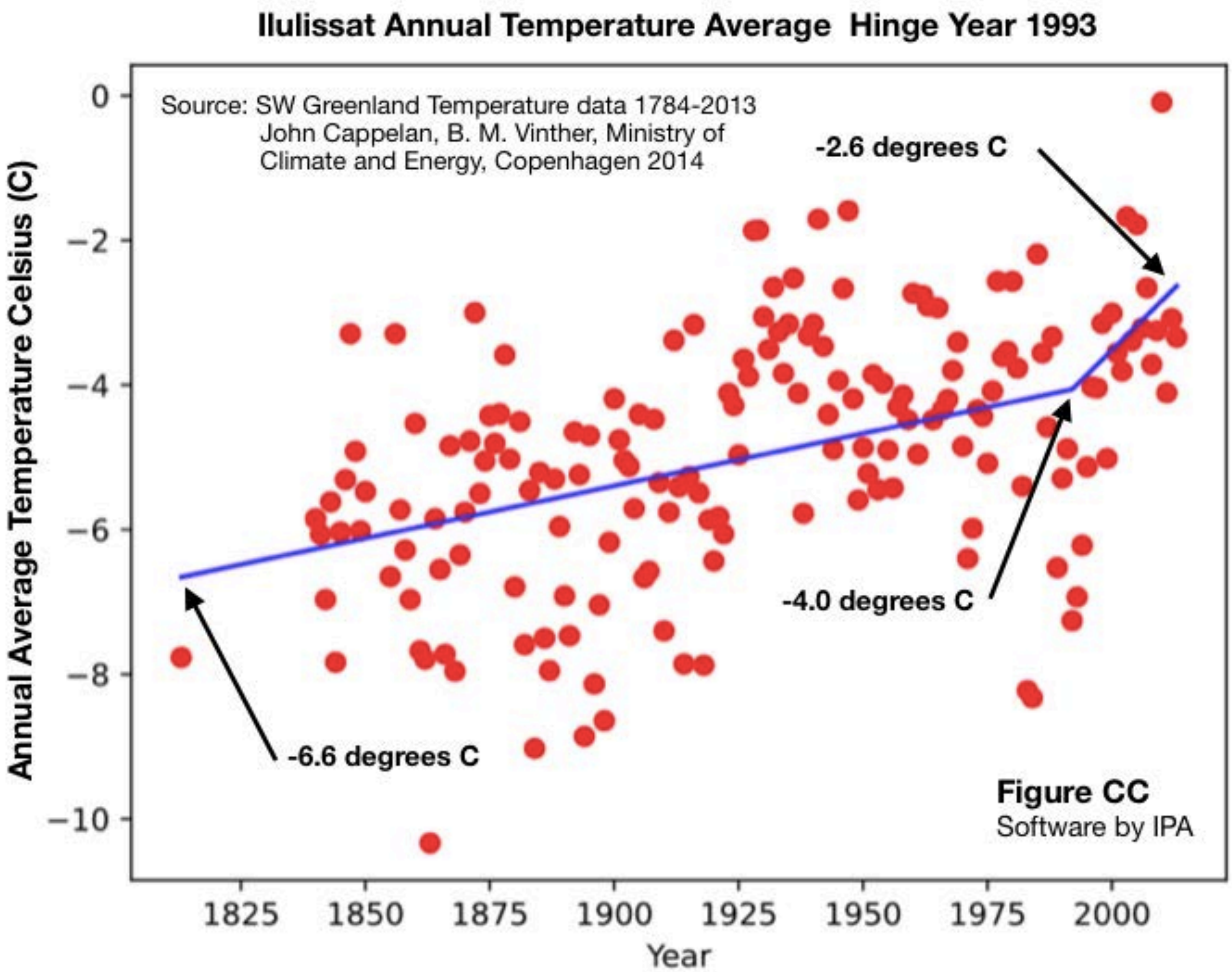
Notes: From 1979-86 and part of 1987, the recorded data in the National Snow and Ice Center is missing data for every other day due to alternate day satellite tracking over Greenland. In order to use this data set, we assumed the melt extent on the days not recorded was the same amount recorded on the previous day.

Points 4, 5 and 6 on Map1 page 11 are Qaqortoq, Nuuk, and Ilulissat, Greenland, respectively, and their weather data along with data from nearby stations was combined to extend the overall record back to the late 1700's. These three master series were then merged to provide the SW Greenland series in Figure Y on page 47.





Between 1993 to 2013, Qaqortoq and Nuuk were warming at rates 5.5 and 5.0 times faster than the global rate of the past 100 years, respectively. Ilulissat is warming at a rate 6.8 times faster and Eureka's warming rate on Ellesmere Island is 8 times faster.



Conclusion and Remediation Plan

To the best of my knowledge, there has never been an environmental study on the cumulative impacts of Quebec, Manitoba and Ontario AMPSs and HPPs on rivers flowing into James and Hudson Bays according to the following two newspaper articles.

1. **<u>James Bay seen as test on environment</u>** Star Phoenix, January 8, 1976, *"The man in charge of assessing the environmental impact of Quebec's massive James Bay hydroelectric project admitted Wednesday no one is sure just what its impact on the environment will be. 'We are using this project as an experience to see what will happen', Alain Soucy said in an interview. We have about $100 million to spend over the next 3 years on remedial action, though.' The head of James Bay Energy Corporation's environmental department said that even if there were severe environmental problems caused by the project it would not be curtailed. 'We can't change the scale of the project or it will not work.' He explained."*

2. **<u>Slow Death in the North? Impact of Hudson Bay dams being ignored, critics charge</u>** The Toronto Star (Toronto, Ontario), Canada) April 9, 1991, *" Are Hudson Bay and James Bay facing the slow death of a thousand cuts? Many environmentalist, native people and even a few government officials fear the answer is yes….. Pollution and changes in the rivers flow could even alter North America's climate….. The projects change the flow of freshwater into the bays. Normally, the rivers flow is highest in the spring. But the dams store the water until its released to spin the turbines later in the year. Cutting the spring flood can change the times and location of ice melting and also affects the bays' salinity. This alteration in a fragile, carefully balanced environment could have devastating effects on the whales, birds and other wildlife. But there's opposition from the hydrocorporation. " We're not against a global review," says Gaetan Guertin, director of impact assessment for Hydro-Quebec. "But if a decision on a 'go' or 'no go' will have to wait (for the results), there will be a reaction from Hydro-Quebec. Some of our projects are very tight in terms of scheduling."*

The graphs contained in this EIS provide compelling evidence that the forced water vapor emissions of the James Bay experiment are the footprints of an environmental Frankenstein melting Greenland's glaciers. They also confirm that studies were warranted before and after AMPSs were built on Hudson Bay regional rivers.

In 1976, if a quantitative analysis had been done on the effects of the 1970 Nelson River AMPS, it would have revealed much higher precipitation totals 600 miles downwind at Inukjuak on the other side of Hudson Bay (See Figures S-U).

In the late 1980s, a simple quantitative analysis of weather data at Inukjuak, Kuujjuarapik and Kuujjuak weather stations would have disclosed that the 1980 Bourassa AMPS was a major driver increasing precipitation and warming northern Quebec 5 times faster than the global rate.

This EIS reveals that the 1993 Brisay AMPS doubled the 1980s warming rate and is a key factor melting the glaciers and raising sea levels.

The extreme 1993 tipping point began with the 1985 diversion into the La Grande River of an estimated 45 percent of the waters of the north flowing Caniapiscau River. The Brisay AMPS regulates the discharge of Caniapiscau Reservoir water, which now flows through the 5 AMPSs and 2 HPPs downstream on the La Grande. This has greatly magnified the impacts of the moisture laden atmosphereic blankets from each of these 7 hydroelectric facilities. Unless we slow down the melting of the glaciers and stop the sea level rise, the cost and degree of damages will grow exponentially.

In 1976, Soucy said Hydro-Quebec was prepared to spend over $100 million on remedial action, which is miniscual compared to the costs to repair recent storm damage exacerbated by the rapid rise in sea level rise since 1993. Coastal communities and property owners in Maine are facing at least $400 to 500 million in damages caused by higher sea levels coinciding with a series of winter storms in 2024.

It is my hypothesis that the immediate ending of the diversion of the Canaipiscau River, by restoring its natural flow northward to Ungava Bay, and the draining of the 1,700 square mile Caniapiscau Reservoir would eliminate all of their forced water vapor emissions and “positive feedbacks”. This would also significantly reduce the magnitude of the moisture laden atmospheric blankets of the 7 downstream hydroelectric stations that had been greatly enhanced by the Caniapiscau diversion.

In addition to this the La Grande-1 and La Grande 2-A HPPs and the 1980 Bourassa AMPS require dismantling in order to drain the 1,100 square mile Bourassa Reservoir. This would eliminate their multiple moisture laden atmosphereic blankets and further reduce SW Greenland’s warming rate.

For complete mitigation, ending the climate warming power of these two hydroelectric projects, the remainder of James Bay’s AMPSs will require elimination along with the AMPS and HPPs in the Manitoba Nelson River Project.