ANNEXE A

REGISTRE DE PARTICIPATION

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Date	Format	Participant(s)	Event
2016-05-31	Presentation	Joint Congress of the Canadian Meteorological and Oceanographic Society (CMOS) and the Canadian Geophysical Union Conference Attendees	Public lecture within the Joint Congress of the Canadian Meteorological and Oceanographic Society (CMOS) and the Canadian Geophysical Union (CGU)
2016-05-26	Fish Passage Workshop	Stakeholders	Facilitated stakeholder session focused exclusively on fish passage issues at the Mactaquac generating station. Presentations provided by CRI and George Porter, Project Director, followed by facilitated discussion and sharing, and questions and answers.
2016-05-19	Community Dialogue Session	Public	Stakeholders invited to attend presentation and community conversation about the future of Mactaquac at the Best Western Hotel in Woodstock.
2016-05-19	Tour	Teachers and students from the Hartland Community School	Mactaquac Generating Station tour.
2016-05-18	Community Dialogue Session	Public	Members of the public invited to attend presentation and community conversation about the future of Mactaquac at the Riverside Resort in Mactaquac.
2016-05-17	Community Dialogue Session	Public	Members of the public invited to attend presentation and community conversation about the future of Mactaquac at the Crowne Plaza in Fredericton.
2016-05-17	Community Dialogue Session	Public	Stakeholders invited to attend presentation and community conversation about the future of Mactaquac at the Crowne Plaza in Fredericton.

2016-04-07	Presentation	Tim Curry, UNBSJ Energy Fundamentals for Leadership Class	Presented project April 7 to the UNBSJ 2016 class of the Energy Fundamentals for Leaders program.
2016-03-30	Tour	Canadian River Institute	Mactaquac Generating Station tour.
2016-03-29	Presentation	Sam Arnold, Keith Helmut, from Transition Town Woodstock/Woodstock Sustainable Energy Group	Public forum attended by 35-45 people
2016-03-22	Presentation	NBBTU (NB Building Trades Unions)	Mactaquac Project presentation to 50 people at the Delta Hotel in Moncton at the 2016 NBBTU Conference.
2016-03-17	Meeting	Lower Saint John Hydro Community Liaison Committee	Meeting of Committee.
2016-03-10	Presentation	SWNB Eel, Shad and Gaspereau Advisory Committee Meeting, DFO	Presentation to 40 attendees of the Eel, Shad and Gaspereau Committee Meeting hosted by Department of Fisheries and Oceans, Saint John.
2016-03-10	Tour	A group of lineman trainees	Mactaquac Generating Station tour.
2016-03-08	Tour	UNB Engineering	Mactaquac Generating Station tour.
2016-03-01	Tour	NBCC Miramichi Environmental Studies	Participants visited the station on March 1.
2016-02-29	Presentation	Ted D. Needham, UNB 3rd year environmental management class	Presentation to UNB Environmental Management class about the Mactaquac Project.
2016-02-26	Tour	Robyn O'Keefe, UNB	11 participants visited the station.
2016-02-16	Presentation	Fredericton Epsilon Y's Men	Project presentation to approximately 45 members at the Grant Harvey Centre.
2016-02-11	Lecture	Katy Haralampides, UNB Civil Engineering Class.	Mactaquac Project presentation and lecture to UNB Civil Engineering Class.

2016-02-09	Meeting	David DuPlessis, Josée Albert, Andrew Lovell - Agricultural Alliance of NB	Meeting with Agricultural Alliance of NB.
2016-02-01	Meeting	Local Service District Chairs	Meeting with Local Service District Chairs
2016-01-29	Tour	UNB	Mactaquac Generating Station tour.
2016-01-27	Tour	UNB	Mactaquac Generating Station tour.
2016-01-22	Presentation	The Association of New Brunswick Land Surveyors	Presented the Project Information to the group at their annual meeting. NB Power was requested to be a guest lecturer at their session. The session focused on communicating the process by which NB Power is investigating the possible future of the Mactaquac Generating Station in light of its projected end of life service.
2016-01-21	Presentation	St. Thomas University COPP 2023 Class, Philip Lee	Project staff presented the Mactaquac Project from a public engagement perspective at St. Thomas University to 50 students in the COPP 2023 Policy Making in the Info Age communications class.
2015-12-21	Tour	Karen Acott, NB Power	Amy Thompson toured the station with her employees.
2015-11-26	Meeting	Lower SJ Hydro Community Liaison Committee	Regular Meeting of Lower SJ Hydro Community Liaison Committee
2015-11-26	Tour	CFB Gagetown with Electrical Generation System Technicians	Mactaquac Generating Station tour.
2015-11-21	Conference	UNB Association of Civil Engineering Graduate Students, Public	Mactaquac Project presentation UNB Association of Civil Engineering Graduate Students Conference.
2015-11-20	Tour	Elizabeth Matthew, NB Power	Mactaquac Generating Station tour.

2015-11-04	Presentation	Fredericton Strategic & External Relations Committee of Council	Mactaquac Project presentation
2015-10-30	Tour	Canadian Rivers Institute	Mactaquac Generating Station tour.
2015-10-22	Tour	Michele Coleman, NB Power, and conference participants	Mactaquac Generating Station tour.
2015-10-21	Open House	Public	Mactaquac Open House
2015-10-21	Presentation	8th Annual Atlantic Canada Reclamation Conference	Mactaquac Project presentation
2015-10-20	Open House	Dillon, Stantec, Don Small, CRI	Mactaquac Generating Station Open House
2015-10-15	Open House	Public	Mactaquac Open House at Nackawic Lions Club.
2015-10-13	Open House	Public	Mactaquac Open House at the Riverside Resort.
2015-10-08	Open House	Public	Mactaquac Open House at the Crown Plaza, Fredericton.
2015-10-08	Tour	CFB Gagetown	20 Electrical trainees from CFB Gagetown
2015-10-03	Briefing	Union of Municipalities of New Brunswick	Mactaquac Project presentation
2015-10-02	Presentation	Atlantic Salmon Federation and NB Salmon Council	Mactaquac Project presentation
2015-09-30	Presentation	Fredericton Chamber of Commerce	Mactaquac Project presentation
2015-09-25	In person	Participants in the Saint John River Summit	Participation at Saint John River Summit
2015-09-22	Tour	Administration employees from the town of Woodstock	Mactaquac Generating Station tour.
2015-09-18	Meeting	Molly Demma, Saint John River Society	Meeting re: Public Engagement Process

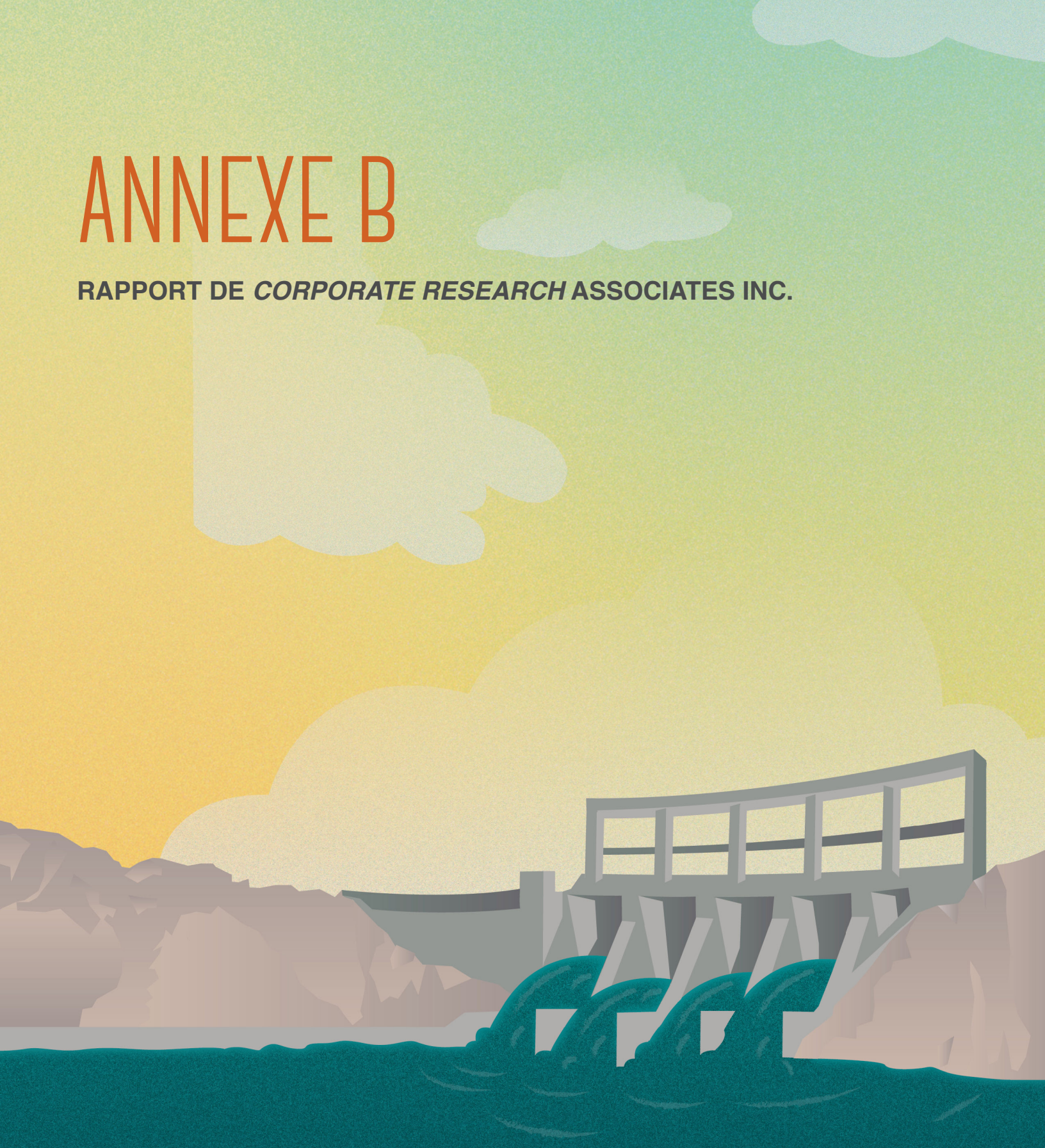
2015-09-17	Meeting	Eugene Price and Mary-Lou	Meeting re: Mactaquac Generating Station
2015-09-10	Tour	Canadian Nuclear Partners	Mactaquac Generating Station tour.
2015-07-28	Meeting	UNB Shad Valley	Mactaquac Project presentation
2015-06-25	Meeting	Lower Saint John River Hydro CLC	Regular meeting of the committee.
2015-06-25	Tour	NB Power staff, Kingsclear FN councillors and members, Public	Grand opening of the Mactaquac Generating Station tour center and open house.
2015-06-04	Meeting	DTI (Design and Technical Services Branches) Tammy Lamey	Public video and attached presentation to a get together of DTI staff from the design and technical services branches.
2015-05-28	Meeting	Energy Fundamentals For Leaders Class, UNBSJ (Tim Curry)	Mactaquac Project presentation to Energy Fundamentals For Leaders Class at Fredericton Crown Plaza.
2015-05-27	Meeting	Molly Demma, St. John River Society (co-chair, CLC)	Meeting re: Public Engagement Process
2015-05-27	Meeting	NB Metal Workers Association (Joel Richardson)	Mactaquac Project presentation
2015-05-26	Meeting	Patrick Polchies, Kingsclear FN	Meeting re: First Nations content at Mactaquac Tour Centre.
2015-05-09	Meeting	Y's Men Nashwaaksis	Mactaquac Project presentation
2015-04-09	Meeting	Varied (Fadi Chidiac)	Mactaquac Project presentation to attendees at 46th Annual H.G. Acres Seminar in Niagara Falls.
2015-04-02	Meeting	Lower Hydro Community Liaison Committee	Regular meeting of the committee.
2015-03-19	Presentation	CANB (Fredericton Northwest)	Mactaquac Project presentation
2015-03-17	Presentation	Construction Association of NB (Saint John)	Mactaquac Project presentation

2015-03-12	Meeting	Friends of Mactaquac Lake, David Campbell	Attendance at annual general meeting of Friends of Mactaquac Lake.
2015-02-17	Meeting	Dave Duplessis Brent Dunphy	Meeting with Keswick Island Property Owners Association
2015-01-29	Meeting	APEGNB Fredericton Branch Annual Meeting Attendees Peter Wedge	Mactaquac Project presentation
2014-12-18	Meeting	DTI	Mactaquac Project presentation at O'Dell Park Lodge.
2014-11-25	Meeting	Transition Town Woodstock Group	Mactaquac Project presentation
2014-11-13	Meeting	Lower St. John River Hydro Community Liaison Committee	Regular meeting of committee
2014-11-07	Meeting	Larry Jewett, Dr. Ivan Methven	Mactaquac Project presentation
2014-10-15	Meeting	SJRS	Meeting with the St. John River Society
2014-09-18	Presentation	New Brunswick Building & Construction Trades Council 2014 Conference at Mactaquac Resort.	Mactaquac project presentation to New Brunswick Building & Construction Trades Council 2014 Conference at Mactaquac Resort.
2014-09-02	Meeting	UNB Students, public	George Porter spoke to a group of UNB students in Officer's Square in Fredericton at noon time at the invite of Tom Beckley
2014-08-19	Town Hall	Public	Town Hall meeting hosted by MLA and candidate Brian MacDonald held at King's Landing in the King's Head Inn.
2014-03-19	Meeting	Université de Moncton	Mactaquac Project presentation to Association of Engineers and Geoscientists
2014-02-11	Presentation	Keswick Ridge School students	Mactaquac Project presentation

2014-02-04	Webinar	Gaia Project educators	Mactaquac Project presentation
2013-12-05	Meeting	CEAA	Mactaquac Generating Station presentation and meeting at CEAA, Halifax
2013-10-03	Meeting	Atlantic Reclamation Conference	Mactaquac Generating Station presentation in Sackville, NB at the Atlantic Reclamation Conference
2013-09-04	Meeting	Nackawic Historical Society	Mactaquac Generating Station presentation and meeting with Nackawic Historical Society

ANNEXE B

RAPPORT DE *CORPORATE RESEARCH* ASSOCIATES INC.



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Énergie NB Power

NB Power Engagement Online Survey Topline Report

Énergie NB Power

Corporate Research Associates Inc.

June 2016

N|A|T|I|O|N|A|L

CRA CORPORATE RESEARCH ASSOCIATES

Accredited Gold Seal Corporate Member

Objectives and Methodology

As part of NB Power's Mactaquac Dam public engagement process, NATIONAL Public Relations was commissioned to undertake a series of public consultations. These consultations took place over a series of months during the latter part of 2015 and in early 2016. The public consultation aimed to inform citizens on the topic and assess their beliefs and attitudes towards the possible options for the station once it reaches the end of its expected service life in 2030. NB Power identified three possible options for the station, including:

- ***Option 1****: Building a new powerhouse and spillway on the opposite side of the river from the existing ones – leaving the earthen dam intact.*
- ***Option 2:*** *Building a new spillway on the opposite side of the river, maintain earthen dam, and decommissioning existing concrete structures – leaving head pond intact with no generation.*
- ***Option 3:*** *Draining the head pond and removing the powerhouse, spillways, and the earthen dam - allowing nature to bring the river back to a natural flow.*

As part of the public consultation, NATIONAL directed residents to a website which provided an opportunity to learn more on the topic and subsequently, share opinions of the Mactaquac Dam via an online survey. Corporate Research Associates was commissioned to assist with the survey design and analyze results.

Over the course of the public consultation, a total of **5,423 online surveys** were completed, including 2,194 surveys by residents living within the area covered by the Comparative Environmental Review (CER) and 3,229 living outside this area in other regions of the province (Southeast: 2,050; Northeast: 634; Southwest: 290; Northwest: 255).

The following topline report presents an overview of the ***2016 NB Power Engagement Online Survey Study*** and includes study highlights and a detailed analysis of the survey findings. Appended to this report is a copy of the final survey questionnaire (Appendix A), and overall banner tables which present the results for each question by key demographic characteristics (Appendix B). All tables in the report are noted by number for easy reference. Unless otherwise noted, all results in this report are expressed as a percentage.

Research Summary: Key Findings

The following offers a brief overview of key findings from the online survey tool:

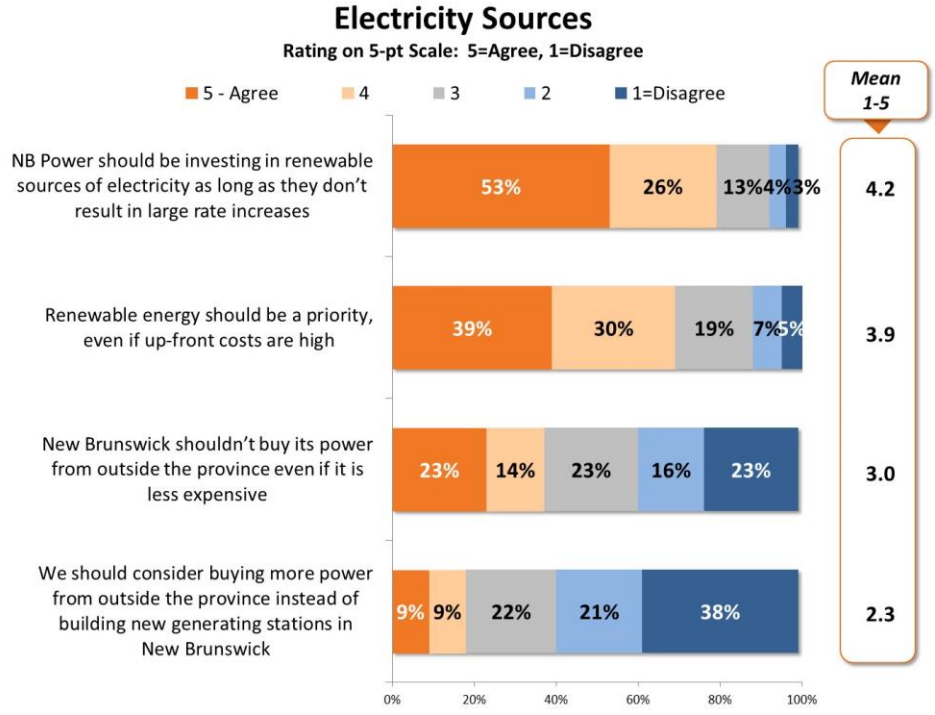
- New Brunswickers are reluctant to having to rely on out-of-province options for their electricity generation. Residents are ***supportive of investments in renewable electricity*** within the province, as long as it does not result in large rate increases.
- Residents are somewhat conflicted with regards to the concept of ***balancing economic and environmental considerations*** when considering the impacts of a potential Mactaquac project. While approximately seven-in-ten residents feel the Saint John River environment should be a top priority in the decision, a similar portion state that they would be ***willing to accept some negative short-term environmental impacts*** if changes resulted in New Brunswick reaching ***long-term environmental goals***.
- While New Brunswickers largely agree the final decision for the project should be based on the ***interests of the province as a whole***, residents recognize the importance of considering the impact such a project will have to the local community.
- Residents' opinions underscore the perceived potential impact this project could have on a troubled economy. In fact, there is strong agreement among residents that NB Power should give priority to ***local suppliers*** for any project related to the Mactaquac Dam. Further, a clear majority of New Brunswickers ***see the importance of a mega project to stimulate economic growth*** in the region and appear moderately open to NB Power and the Province taking on new debt. That said, residents largely feel it is important to consider the long-term economic impact a project such as the Mactaquac Dam will have on ***rate increases to provincial based businesses***.
- Despite showing a clear desire for electricity rates to remain stable, predictable and as low as possible, three-quarters of residents agree they would support a large investment now, if the project benefited future generations of New Brunswickers.

Electricity Sources

Residents clearly see value in renewable energy, and express some desire for New Brunswick to have autonomy in power generation.

In order to explore attitudes and perceptions of electricity sources, residents were first provided background information on the Mactaquac Generating Station in relation to its overall contribution to the province's electricity, and renewable energy specifically. Residents were then asked to indicate their level of agreement to various statements concerning current and future electricity generation.

- Overall, residents largely *agree* that NB Power should be ***investing in renewable sources of electricity***, provided it does not result in large rate increases, and that ***renewable energy should be a priority***, even if up-front costs are high.
- Agreement is moderate with respect to the ***province <u>not</u> buying power from other regions***, even if it is less expensive. Moreover, residents generally ***disagree*** that the province should consider buying more power from outside of the province instead of building new generating stations in New Brunswick.
- Of note, across the province, residents of the affected area are most likely to agree renewable energy should be a priority (Affected area: 73% vs. NW: 61%, NE: 63%, SE: 68% and SW: 68%). (Tables 1a-d)



Q.1a-d: Today, Mactaquac Generating Station provides about 12% of New Brunswick's electricity, and is part of a network of hydro generating stations across our province.

Mactaquac provides renewable energy, which is an important part of our province's energy mix. Without it, we'd have to look for other ways to provide green electricity. For example, we could invest in different renewable options, like wind or solar, or we could purchase energy from outside New Brunswick.

Thinking about how we generate our electricity now and in the future, tell us how much you agree or disagree with the statements below. (n=5,423) *Note: Responses of 'Don't know/Not applicable' have been excluded from the mean calculation.*

The Environment

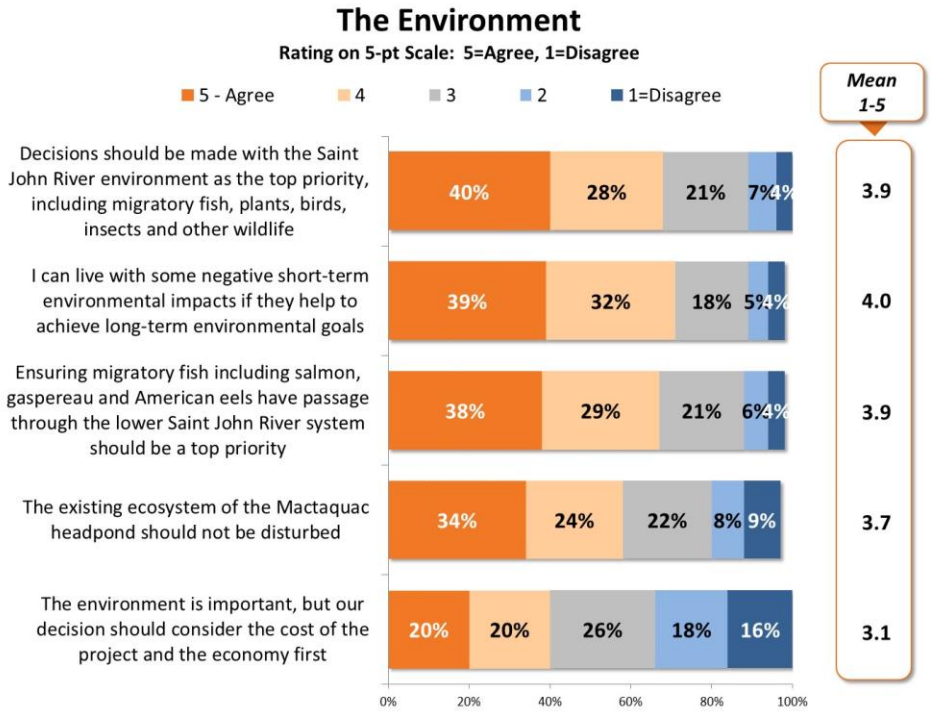
There is broad agreement that environmental impacts should be given top priority, and more than half of residents feel the Mactaquac headpond ecosystem should not be disturbed. That said, a strong minority feel economic considerations should have greater weight in the final decision.

After stating that the Saint John River, the Mactaquac headpond, and the surrounding environment will be impacted regardless of the final chosen outcome of the station, and that dozens of studies are already underway by experts and scientists to better understand the full impact of each option, residents were asked their agreement to various statements regarding the importance of the environment.

- Residents largely *agree* that decisions should be made with the ***Saint John River environment*** as the ***top priority***, while a clear majority also *agree* that ***ensuring passage of migratory fish*** through lower Saint John should be a ***top priority***. Note, residents of the affected area and English speaking residents are less likely than their respective counterparts to offer agreement to each statement.

- That said, ***residents express a general willingness to live with some negative short-term environmental impacts***, provided results lead to positive long-term environmental goals. Moreover, a strong minority (41%) agree that while the environment is important, ***cost and economic factors should be considered first*** and opinion is more divided on this regard.

- Overall, a slight majority (58%) of residents *agree* that ***Mactaquac headpond's existing ecosystem should not be disturbed***. (Tables 2a-e)



Q.2a-e: We know that whatever we decide about Mactaquac will affect the Saint John River, the Mactaquac headpond, and the surrounding environment. So we're studying all aspects of the decision to understand what it could mean to everything from fish species to overall river health.

There are dozens of studies underway already by experts and scientists. Those studies will support the decision we make. But we also need to understand how important the environment is to you.

With the headpond and river environment in mind, tell us how much you agree or disagree with the statements below. (n=5,423) *Note: Responses of 'Don't know/Not applicable' have been excluded from the mean calculation.*

Community Impacts

Overall, New Brunswickers largely agree the decision should be based on the interests of the province as a whole; however, this view is stronger among those living outside the affected area.

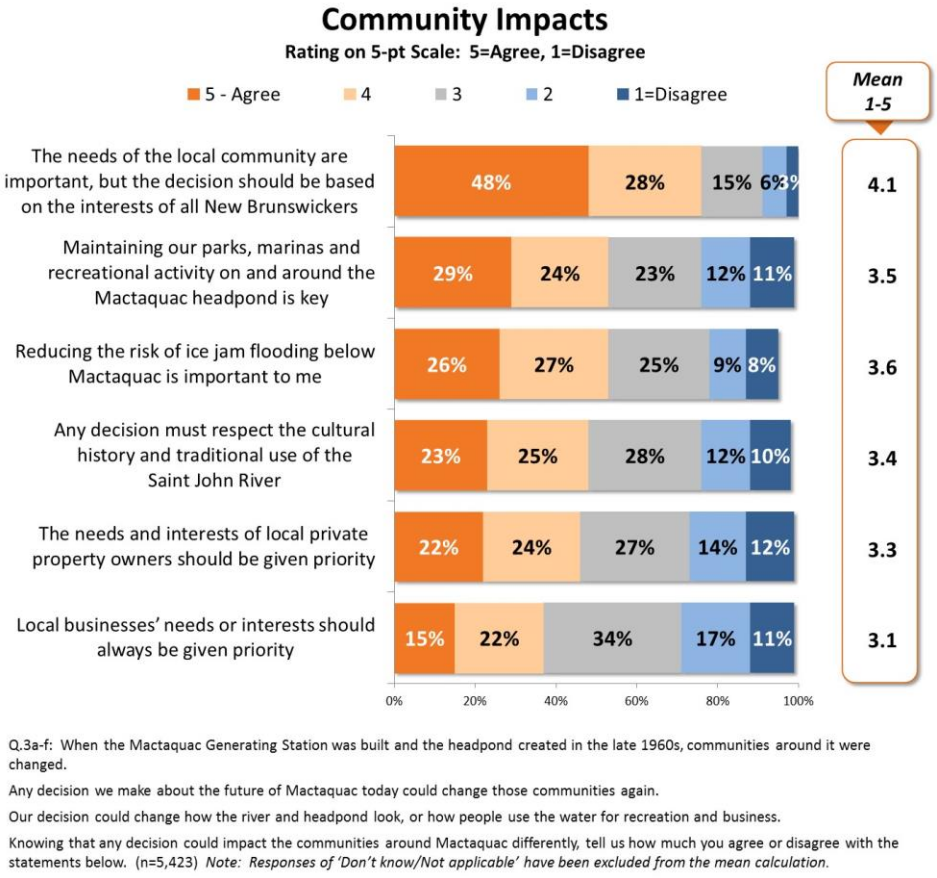
After noting that any decision made concerning Mactaquac may have impacts on how the river and headpond look and/or impact how people use the water for recreation and business, residents were asked to state their level of agreement to various statements concerning possible community.

- Three-quarters (76%) of residents *agree* that while the local community needs are important, ***the decision should be based on the interests of all New Brunswickers***. As may be expected, those living *within* the affected area are less likely than New Brunswickers as a whole to offer strong agreement to this statement (affected area: 67% vs. Overall: 76%), although still in agreement.

- Just over half (53%) *agree* that ***maintaining parks, marinas and recreational activity on and around the headpond is key***, while a similar proportion *agree* any decision must ***respect the cultural history and traditional use of the River*** (48%).

- Nearly half (46%) of residents *agree* the ***needs and interests of local private property owners should be given priority***, while slightly fewer (37%) *agree* that the ***needs or interests of local businesses should always be given priority***.

- Finally, just over half (54%) *agree* that ***reducing the risk of ice jam flooding below Mactaquac is important*** to them. (Tables 3a-f)



Q.3a-f: When the Mactaquac Generating Station was built and the headpond created in the late 1960s, communities around it were changed.

Any decision we make about the future of Mactaquac today could change those communities again.

Our decision could change how the river and headpond look, or how people use the water for recreation and business.

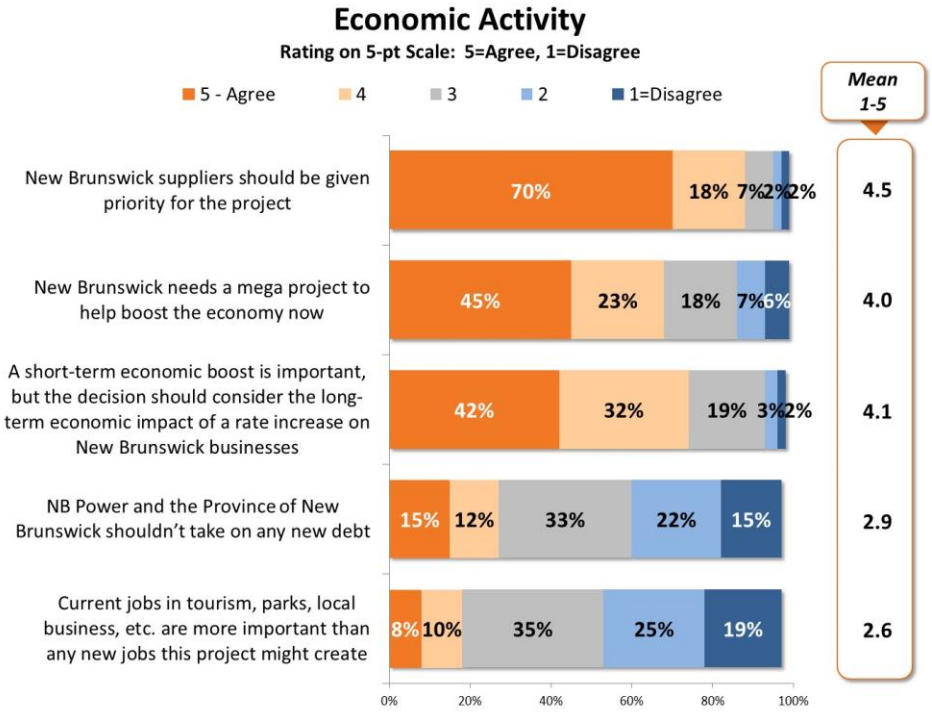
Knowing that any decision could impact the communities around Mactaquac differently, tell us how much you agree or disagree with the statements below. (n=5,423) *Note: Responses of 'Don't know/Not applicable' have been excluded from the mean calculation.*

Economic Activity

Opinions underscore an apparent need for economic activity and residents strongly agree that preference should be given to New Brunswick based suppliers.

To explore opinions regarding the potential economic impact of such a large scale project to the province, residents were asked their agreement to various statements regarding current and future economic activity.

- Nearly nine-in-ten (88%) of residents *agree* that ***local suppliers should be given priority for the project***.
- More than two-thirds (68%) of residents *agree* ***New Brunswick is currently in need of a mega project to boost the economy***. That said, three-quarters (74%) *agree* that while a short-term economic boost is important, the decision should consider the ***long-term economic impact*** of a rate increase to provincial based businesses.
- Residents appear moderately ***open to the idea of New Brunswick taking on debt*** with fewer than three-in-ten (28%) agreeing that NB Power and the Province should <u>not</u> take on any new debt.
- Only two-in-ten (19%) agree that current jobs are more important than any new jobs this project might create. (Tables 4a-e)



Q.4a-e: Large scale projects bring economic activity, including new jobs for New Brunswickers and opportunities for local suppliers, from catering to construction.

New Brunswick could benefit from this economic boost. But we want to know what's important to you as we work to balance the cost of the project with the potential jobs that could be generated.

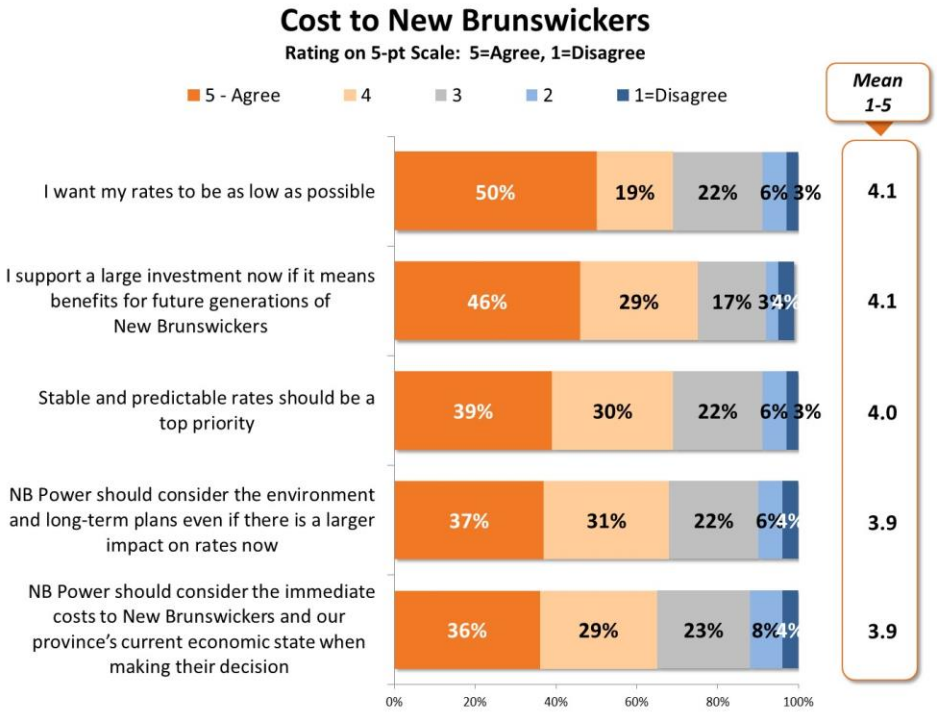
Thinking about the potential economic activity this project could bring to New Brunswick, tell us how much you agree or disagree with the statements below. (n=5,423) *Note: Responses of 'Don't know/Not applicable' have been excluded from the mean calculation.*

Cost to New Brunswickers

Residents appear somewhat conflicted in terms of balancing current and future costs.

As a public utility, electricity rates would be used to cover the cost of the Mactaquac project, regardless of the option chosen. To further explore residents' attitudes and perceptions regarding the cost of such a project to the province, residents were again asked to express their level of agreement to various statements.

- Three-quarters (75%) *agree* they ***would support a large investment now, if it benefited future generations*** of New Brunswickers.
- Seven-in-ten (69%) *agree* that ***rate stability and predictability should be a top priority***. That said, the same proportion (68%) *agree* NB Power should **consider the environment and long-term plans even if there is a larger impact on rates now**.
- Two-thirds (65%) *agree* NB Power should consider the ***immediate costs*** to New Brunswickers and the province's current economic state when making its decision.
- More than two-thirds (68%) *agree* they want electricity ***rates to be as low as possible***.
- Of note, residents living in the affected area were less likely than residents of other parts of the province to agree they want their rates be as low as possible or that stable and predictable rates should be a top priority. (Tables 5a-e)



Q.5a-e: Any solution to the Mactaquac question is going to cost a lot of money. Since NB Power is a public utility, electricity rates will cover the cost.

Any decision we make about how we provide electricity to the province will change your monthly power bill. This means everyone in New Brunswick will be affected by this decision.

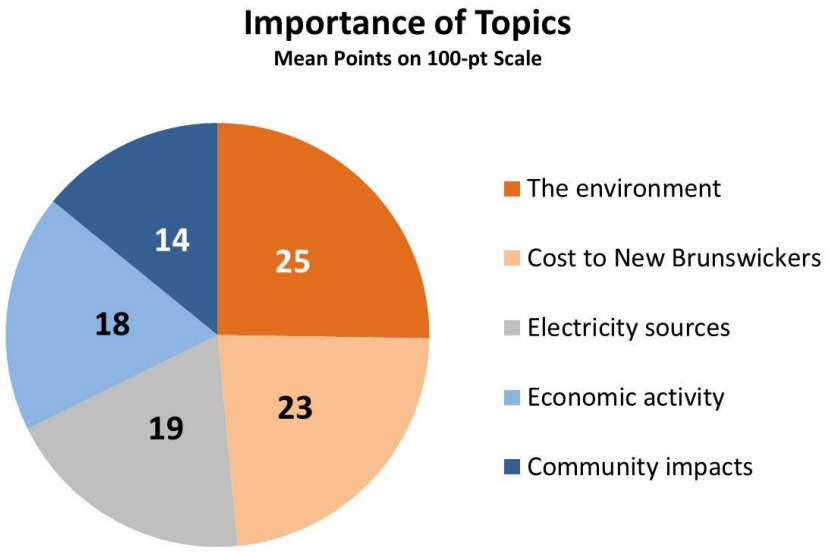
Keeping the cost of this project and its potential impact on power rates in mind, tell us how much you agree or disagree with the statements below. (n=5,423) *Note: Responses of 'Don't know/Not applicable' have been excluded from the mean calculation.*

Importance of Topics

There is mixed opinion as to what is most important with New Brunswickers placing greatest importance on the environment and cost.

At the conclusion of the survey, residents were asked to assign values out of 100 to five specific topics: ***the environment, cost to New Brunswickers, electricity sources, economic activity*** and ***community impacts***. The below chart represents the overall weight and importance New Brunswickers place on each of these factors.

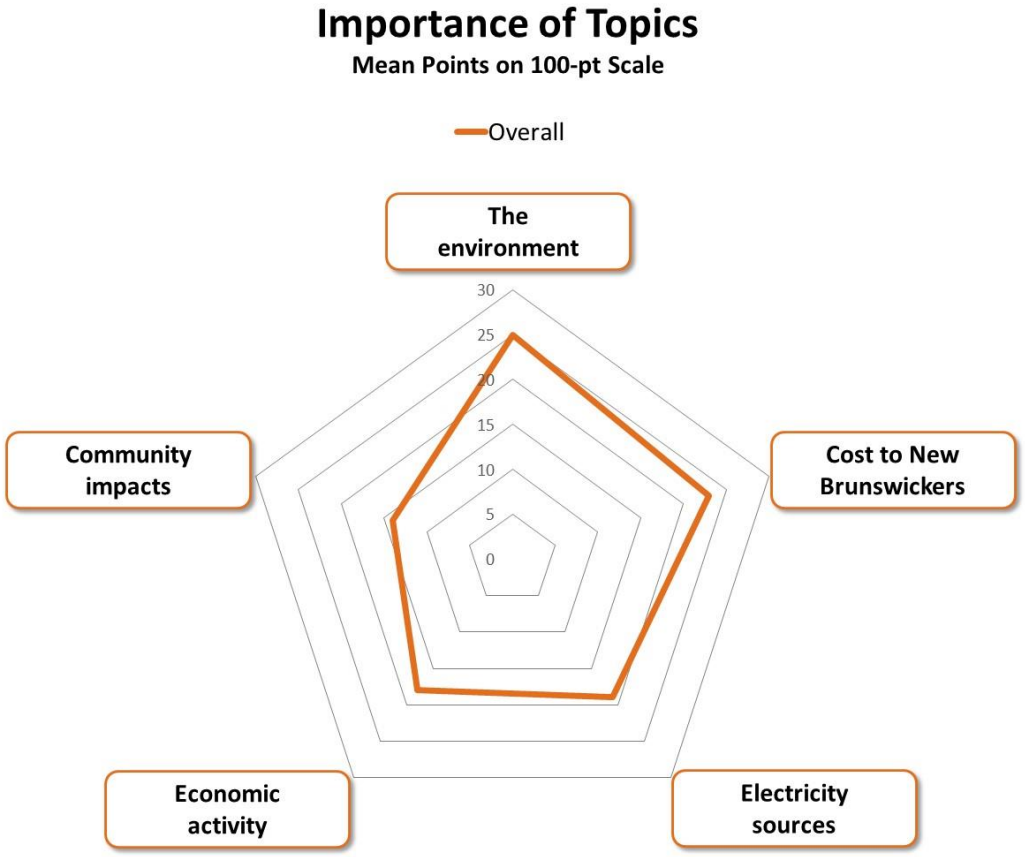
- Overall, ***all factors examined appear to hold some value to residents***, with greatest weight placed on the environment, followed closely by cost to New Brunswickers. Alternatively, community impact is generally considered to be the least important of the five factors. (Tables 6a-e)



Q.6a-e: Please tell us what's most important to you by assigning a value to each topic. You've got 100 points to share between all five. (n=5,423)

Importance of Topics *(cont.)*

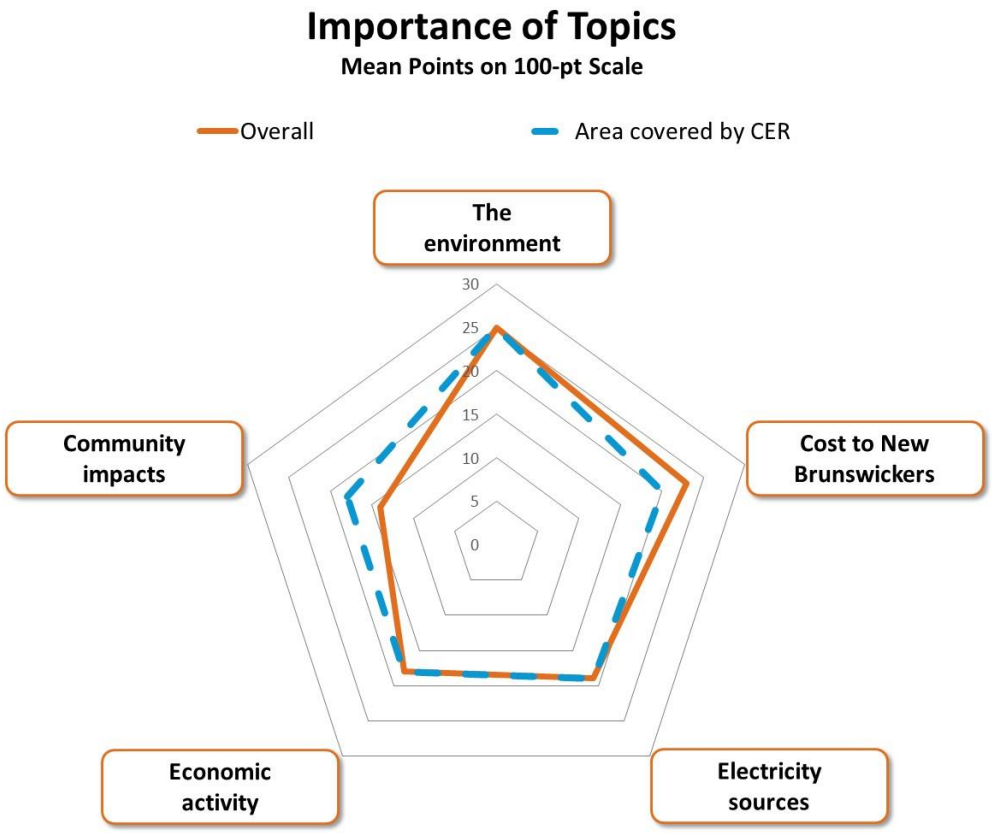
The following graph presents another way to depict overall average level of 'importance' of each of the five topics. Subsequent slides show each region's importance by topic. Note, the numbers shown on the graph reflect a mean range of 0 (center point) to 30 (outer point). As mentioned, two topics are given higher importance to New Brunswickers, namely the ***environment*** and ***cost***. By contrast, ***community impact*** is rated least important of the five areas assessed. (Tables 6a-e)



Q.6a-e: Please tell us what's most important to you by assigning a value to each topic. You've got 100 points to share between all five.
(Overall, n=5,423) (Area covered by CER, n=2,194) (Northwest, n=255) (Northeast, n=634) (Southeast, n=2,050) (Southwest, n=290)

Importance of Topics *(cont.)*

Across regions, those living in the affected area place greater importance on ***community impacts*** than other residents, although the ***environment*** is considered of greatest importance, closely followed by ***cost*** and ***electricity sources***. (Tables 6a-e)



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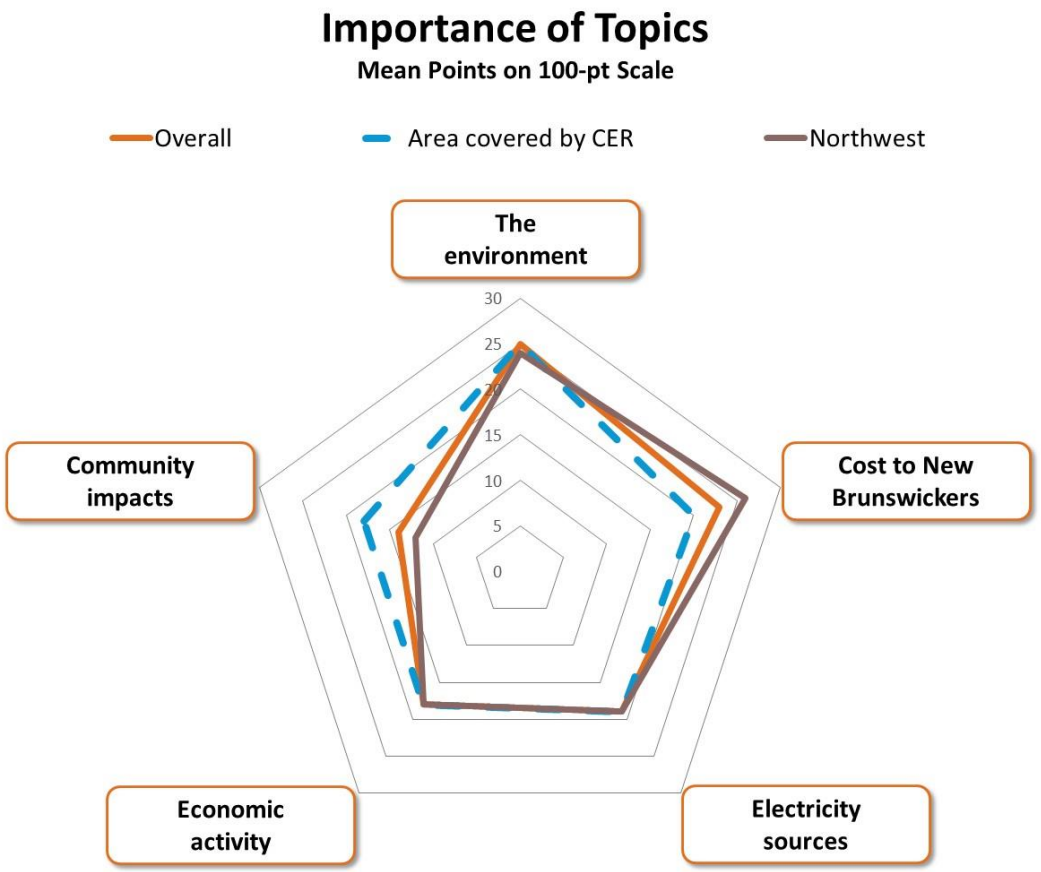
Importance of Topics *(cont.)*

Comparatively, residents in the Northwest region place high importance on ***cost*** and the ***environment***, and less importance on ***community impacts***.



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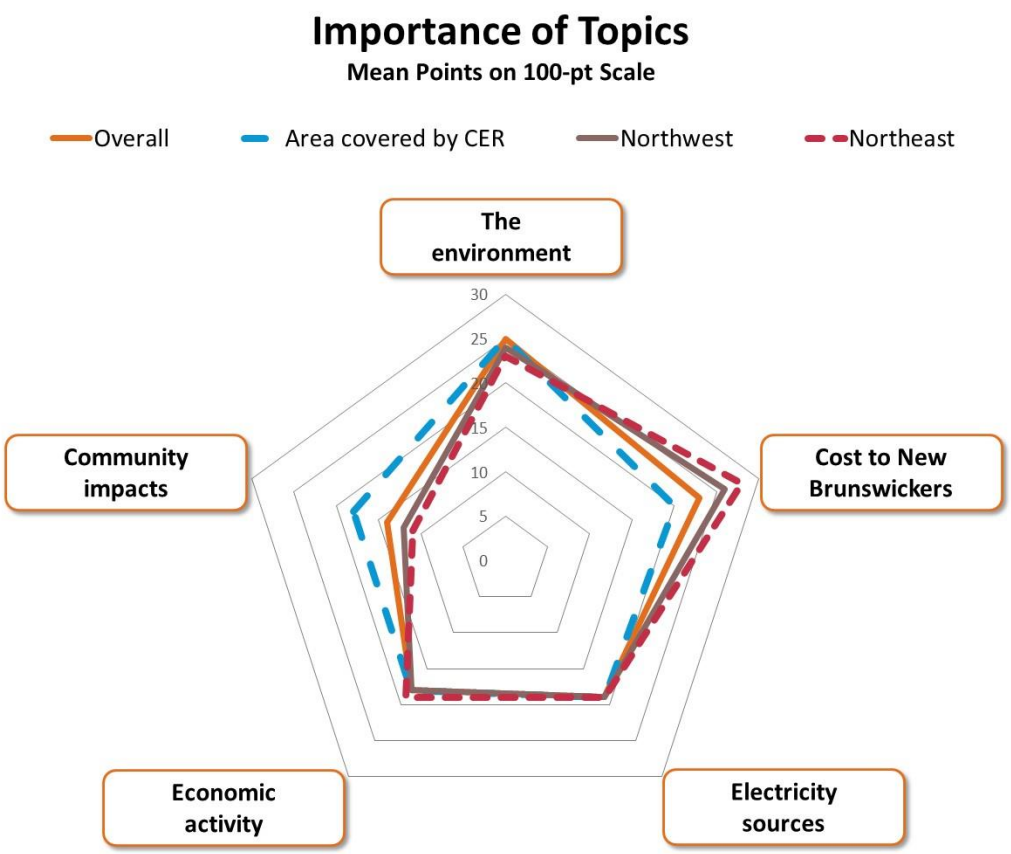
Importance of Topics *(cont.)*

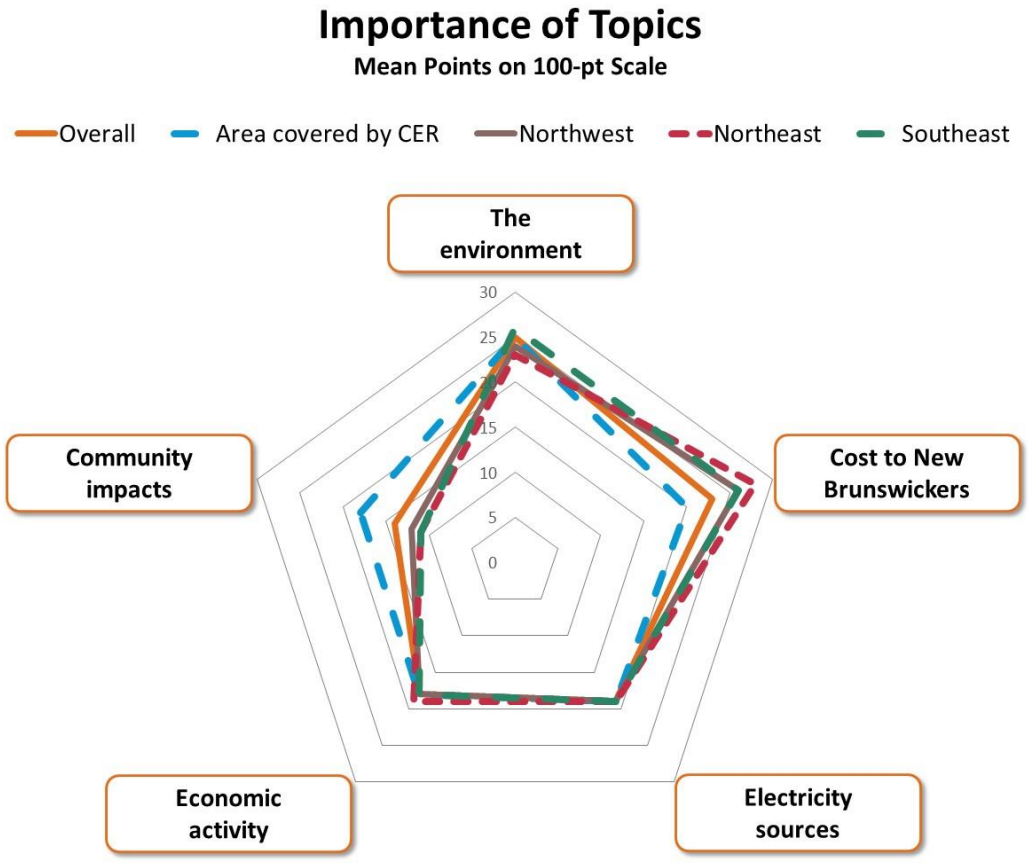
Similarly, residents in the Northeast place greatest importance on ***cost,*** and a comparable degree of importance on the ***environment***, ***electricity sources*** and ***economic activity***. The ***community impact*** is deemed least important. (Tables 6a-e)



Q.6a-e: Please tell us what's most important to you by assigning a value to each topic. You've got 100 points to share between all five. (Overall, n=5,423) (Area covered by CER, n=2,194) (Northwest, n=255) (Northeast, n=634) (Southeast, n=2,050) (Southwest, n=290)

Importance of Topics *(cont.)*

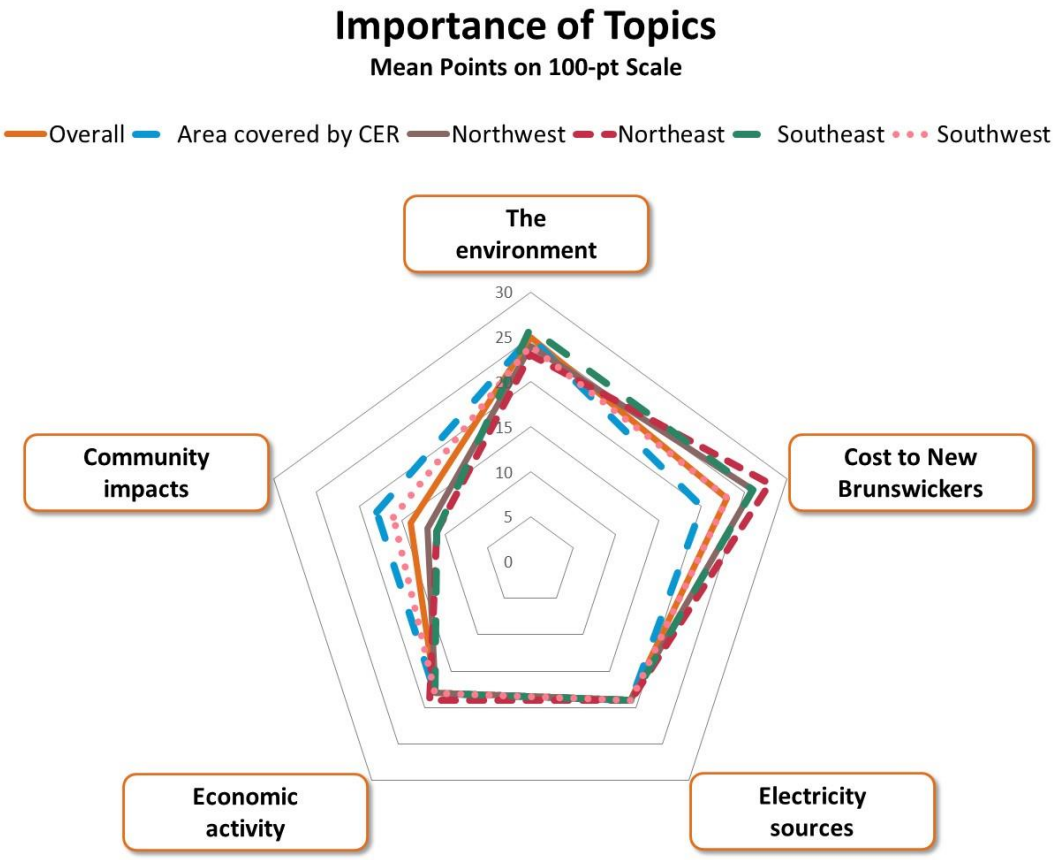
Those in the Southeast region share similar views, mirroring opinion of those in the Northeast. Once again the greatest importance is placed on ***cost,*** with comparable importance given to the ***environment***, ***electricity sources*** and ***economic activity***. The ***community impact*** is again deemed least important. (Tables 6a-e)



Q.6a-e: Please tell us what's most important to you by assigning a value to each topic. You've got 100 points to share between all five. (Overall, n=5,423) (Area covered by CER, n=2,194) (Northwest, n=255) (Northeast, n=634) (Southeast, n=2,050) (Southwest, n=290)

Importance of Topics *(cont.)*

Residents in the Southwest are more similar in opinion to those in the affected area when considering community impact. While they too place the greatest importance on ***the environment, community impact*** is deemed more important to them than other regions. (Tables 6a-e)



Q.6a-e: Please tell us what's most important to you by assigning a value to each topic. You've got 100 points to share between all five. (Overall, n=5,423) (Area covered by CER, n=2,194) (Northwest, n=255) (Northeast, n=634) (Southeast, n=2,050) (Southwest, n=290)

Additional Comments

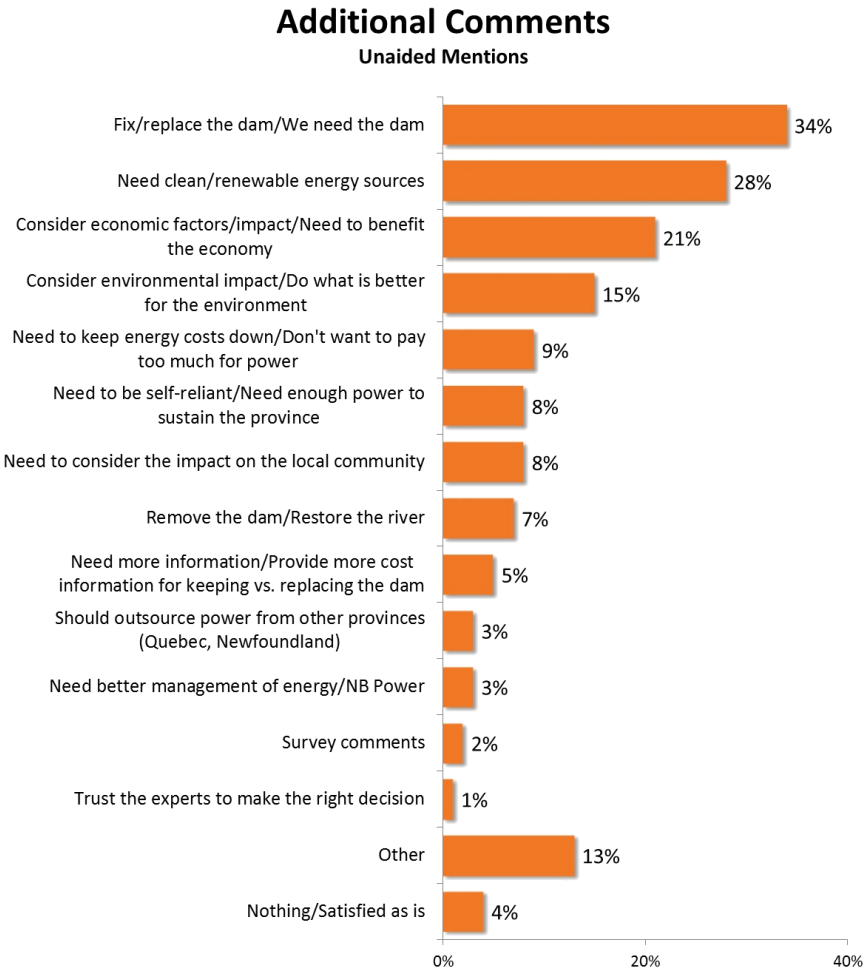
Residents' final thoughts highlight a perception that the dam needs to be replaced and that clean, renewable energy sources are needed.

The final question of the survey asked if there was anything else residents would like to share.

One-third of respondents (n=1,714) offered additional comments, with the most often mention being that the ***dam needs to be replaced / fixed***.

Further comments highlighted the ***need to have renewable energy sources*** and to ***consider economic factors*** in any decision. By contrast, less than two in ten expressed that ***environmental impacts need to be considered***.

No other comment was mentioned by more than one in ten including the need to ***keep energy costs down***, for NB to be ***self reliant in its power generation***, the ***need for community impacts***, or the opinion that ***the dam should be removed and the river restored***. (Table 7)



Q.7: Anything you'd like to add? (n=1,714)

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 1a:

Thinking about how we generate our electricity now and in the future, tell us how much you agree or disagree with the statements below.

NB Power should be investing in renewable sources of electricity as long as they don't result in large rate increases.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	53	50	57	58	56	50	52	60	47	50	53	57
4	26	28	27	23	23	29	27	20	29	26	27	24
3	13	14	12	10	14	13	14	11	18	15	13	12
2	4	4	3	4	4	4	4	4	1	5	4	4
1 - Disagree	3	3	1	3	3	3	3	3	3	3	2	3
Don't know/Not applicable	1	1	1	1	0	1	1	1	2	1	0	1
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	79	78	84	81	79	79	79	81	75	76	80	81
MEAN	4.2	4.2	4.4	4.3	4.3	4.2	4.2	4.3	4.2	4.2	4.2	4.3

Responses of 'Don't know/Not applicable' have been excluded from mean calculation

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 1b:

Thinking about how we generate our electricity now and in the future, tell us how much you agree or disagree with the statements below.

Renewable energy should be a priority, even if up-front costs are high.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	39	42	33	35	39	40	39	41	47	47	36	36
4	30	30	28	28	29	28	30	28	34	27	32	28
3	19	17	22	22	18	20	19	16	13	16	20	20
2	7	6	8	7	7	5	7	7	2	5	7	8
1 - Disagree	5	4	7	8	6	6	5	8	2	4	5	7
Don’t know/Not applicable	0	0	2	1	0	1	0	1	2	1	0	1
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	69	73	61	63	68	68	69	68	80	74	68	65
MEAN	3.9	4.0	3.7	3.8	3.9	3.9	3.9	3.9	4.2	4.1	3.9	3.8

Responses of 'Don’t know/Not applicable' have been excluded from mean calculation

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 1c:

Thinking about how we generate our electricity now and in the future, tell us how much you agree or disagree with the statements below.

New Brunswick shouldn't buy its power from outside the province even if it is less expensive.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	23	23	25	24	22	26	24	19	25	28	22	20
4	14	15	10	11	14	17	15	11	15	16	15	12
3	23	24	22	22	22	19	22	26	31	23	22	22
2	16	16	14	16	16	13	16	16	13	14	17	17
1 - Disagree	23	20	28	25	24	24	22	28	7	18	23	28
Don't know/Not applicable	1	2	2	1	1	0	1	1	8	2	1	1
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	37	39	35	35	36	43	38	29	40	44	37	32
MEAN	3.0	3.1	2.9	2.9	2.9	3.1	3.0	2.8	3.4	3.2	3.0	2.8

Responses of 'Don't know/Not applicable' have been excluded from mean calculation

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 1d:

Thinking about how we generate our electricity now and in the future, tell us how much you agree or disagree with the statements below.

We should consider buying more power from outside the province instead of building new generating stations in New Brunswick.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	9	7	11	12	10	7	8	15	8	5	9	12
4	9	8	11	11	9	8	8	12	6	7	9	10
3	22	22	22	24	23	19	22	24	23	21	23	22
2	21	21	20	18	21	19	21	19	24	22	20	20
1 - Disagree	38	40	32	33	36	46	39	28	30	42	38	35
Don’t know/Not applicable	2	2	5	3	1	1	2	3	10	2	1	2
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	18	15	22	23	19	15	17	26	14	12	18	22
MEAN	2.3	2.2	2.5	2.5	2.4	2.1	2.3	2.7	2.3	2.1	2.3	2.4

Responses of 'Don’t know/Not applicable' have been excluded from mean calculation

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 1: SUMMARY Top Box – scores of 4 or 5 on a 5 point scale

Thinking about how we generate our electricity now and in the future, tell us how much you agree or disagree with the statements below.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
a) NB Power should be investing in renewable sources of electricity as long as they don't result in large rate increases.	79	78	84	81	79	79	79	81	75	76	80	81
b) Renewable energy should be a priority, even if up-front costs are high.	69	73	61	63	68	68	69	68	80	74	68	65
c) New Brunswick shouldn't buy its power from outside the province even if it is less expensive.	37	39	35	35	36	43	38	29	40	44	37	32
d) We should consider buying more power from outside the province instead of building new generating stations in New Brunswick.	18	15	22	23	19	15	17	26	14	12	18	22

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 2a:

With the headpond and river environment in mind, tell us how much you agree or disagree with the statements below.

Decisions should be made with the Saint John River environment as the top priority, including migratory fish, plants, birds, insects and other wildlife.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	40	36	47	48	41	38	39	50	51	41	38	41
4	28	27	27	25	29	32	28	28	34	31	28	25
3	21	23	16	18	20	21	22	15	8	19	23	21
2	7	8	7	5	6	7	7	4	2	6	7	8
1 - Disagree	4	4	3	3	4	2	4	2	1	3	4	4
Don't know/Not applicable	1	0	0	1	0	1	0	1	4	0	0	1
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	68	63	74	72	71	70	67	78	84	72	66	66
MEAN	3.9	3.8	4.1	4.1	4.0	4.0	3.9	4.2	4.4	4.0	3.9	3.9

Responses of 'Don't know/Not applicable' have been excluded from mean calculation

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 2b:

With the headpond and river environment in mind, tell us how much you agree or disagree with the statements below.

The existing ecosystem of the Mactaquac headpond should not be disturbed

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	34	38	27	39	29	41	34	38	47	31	32	40
4	24	23	26	24	24	19	23	29	25	26	24	21
3	22	21	25	23	24	20	22	20	15	26	23	19
2	8	8	8	7	9	8	9	6	6	8	9	8
1 - Disagree	9	9	12	5	10	9	10	4	2	7	10	10
Don't know/Not applicable	2	2	1	2	3	2	2	2	7	3	2	2
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	58	61	54	63	54	60	57	67	71	56	56	61
MEAN	3.7	3.7	3.5	3.9	3.6	3.8	3.6	3.9	4.2	3.7	3.6	3.8

Responses of 'Don't know/Not applicable' have been excluded from mean calculation

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 2c:

With the headpond and river environment in mind, tell us how much you agree or disagree with the statements below.

Ensuring migratory fish including salmon, gaspereau and American eels have passage through the lower Saint John River system should be a top priority.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	38	33	46	46	40	40	37	49	46	40	36	40
4	29	29	31	28	29	28	29	32	33	30	29	28
3	21	24	13	18	21	20	22	12	14	21	22	21
2	6	8	6	4	5	6	7	4	4	5	7	6
1 - Disagree	4	5	3	3	3	4	4	2	2	3	4	4
Don't know/Not applicable	1	1	1	1	1	1	1	1	2	1	1	1
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	68	62	78	74	70	69	66	81	79	70	66	68
MEAN	3.9	3.8	4.1	4.1	4.0	3.9	3.9	4.2	4.2	4.0	3.9	3.9

Responses of 'Don't know/Not applicable' have been excluded from mean calculation

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 2d:

With the headpond and river environment in mind, tell us how much you agree or disagree with the statements below.

I can live with some negative short-term environmental impacts if they help to achieve long-term environmental goals.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	39	36	45	40	42	33	39	43	30	39	39	41
4	32	32	28	32	32	39	32	29	30	31	33	32
3	18	19	16	18	17	18	18	16	26	18	18	16
2	5	7	5	3	5	6	6	5	7	7	5	5
1 - Disagree	4	5	5	5	4	3	4	5	5	4	4	5
Don’t know/Not applicable	1	1	0	1	1	1	1	1	2	1	1	1
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	71	68	74	73	74	72	71	72	61	70	71	73
MEAN	4.0	3.9	4.1	4.0	4.1	4.0	4.0	4.0	3.8	4.0	4.0	4.0

Responses of 'Don’t know/Not applicable' have been excluded from mean calculation

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 2e:

With the headpond and river environment in mind, tell us how much you agree or disagree with the statements below.

The environment is important, but our decision should consider the cost of the project and the economy first.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	20	17	24	26	22	18	20	24	14	18	19	24
4	20	21	22	22	19	20	20	22	20	18	20	23
3	26	28	24	22	24	31	26	20	26	26	26	25
2	18	19	16	15	18	15	18	18	25	20	19	14
1 - Disagree	16	15	15	15	17	16	16	15	14	18	16	14
Don't know/Not applicable	1	1	0	1	0	1	1	0	1	1	0	0
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	41	38	45	47	41	37	40	46	34	35	40	47
MEAN	3.1	3.1	3.2	3.3	3.1	3.1	3.1	3.2	3.0	3.0	3.1	3.3

Responses of 'Don't know/Not applicable' have been excluded from mean calculation

TABLE 2: SUMMARY Top Box – scores of 4 or 5 on a 5 point scale

With the headpond and river environment in mind, tell us how much you agree or disagree with the statements below.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
d) I can live with some negative short-term environmental impacts if they help to achieve long-term environmental goals.	71	68	74	73	74	72	71	72	61	70	71	73
a) Decisions should be made with the Saint John River environment as the top priority, including migratory fish, plants, birds, insects and other wildlife.	68	63	74	72	71	70	67	78	84	72	66	66
c) Ensuring migratory fish including salmon, gaspereau and American eels have passage through the lower Saint John River system should be a top ...	68	62	78	74	70	69	66	81	79	70	66	68
b) The existing ecosystem of the Mactaquac headpond should not be disturbed.	58	61	54	63	54	60	57	67	71	56	56	61
e) The environment is important, but our decision should consider the cost of the project and the economy first.	41	38	45	47	41	37	40	46	34	35	40	47

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 3a:

Knowing that any decision could impact the communities around Mactaquac differently, tell us how much you agree or disagree with the statements below.

The needs and interests of local private property owners should be given priority.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	22	27	22	23	18	26	22	22	32	20	21	26
4	24	23	25	21	24	25	24	22	25	25	22	24
3	27	24	27	32	29	24	27	29	25	26	27	28
2	14	14	13	11	16	12	14	14	7	16	16	11
1 - Disagree	12	12	12	10	13	12	12	10	6	12	13	11
Don’t know/Not applicable	1	0	1	3	1	1	1	2	6	1	1	1
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	46	50	47	44	42	51	46	44	57	45	44	49
MEAN	3.3	3.4	3.3	3.4	3.2	3.4	3.3	3.3	3.7	3.2	3.2	3.4

Responses of 'Don’t know/Not applicable' have been excluded from mean calculation

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 3b:

Knowing that any decision could impact the communities around Mactaquac differently, tell us how much you agree or disagree with the statements below.

Maintaining our parks, marinas and recreational activity on and around the Mactaquac headpond is key.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	29	37	25	25	21	34	29	23	36	25	27	33
4	24	24	25	26	24	21	24	24	32	26	24	22
3	23	18	22	28	28	22	23	30	18	25	24	22
2	12	11	14	11	14	12	12	12	6	13	13	11
1 - Disagree	11	10	12	9	12	10	11	9	4	10	12	11
Don't know/Not applicable	1	0	1	2	1	0	1	2	4	1	1	1
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	53	60	51	50	45	56	53	47	68	51	51	55
MEAN	3.5	3.7	3.4	3.5	3.3	3.6	3.5	3.4	3.9	3.4	3.4	3.6

Responses of 'Don't know/Not applicable' have been excluded from mean calculation

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 3c:

Knowing that any decision could impact the communities around Mactaquac differently, tell us how much you agree or disagree with the statements below.

Local businesses' needs or interests should always be given priority.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	15	18	19	16	12	13	15	17	21	14	15	17
4	22	23	23	24	21	26	22	23	30	24	21	22
3	34	32	34	37	36	37	34	35	29	34	35	35
2	17	17	13	12	19	13	17	14	11	17	18	15
1 - Disagree	11	10	10	11	12	11	11	11	5	11	12	10
Don't know/Not applicable	1	0	1	1	1	0	1	1	4	1	0	0
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	37	40	42	39	33	39	37	40	52	37	35	40
MEAN	3.1	3.2	3.3	3.2	3.0	3.2	3.1	3.2	3.5	3.1	3.1	3.2

Responses of 'Don't know/Not applicable' have been excluded from mean calculation

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 3d:

Knowing that any decision could impact the communities around Mactaquac differently, tell us how much you agree or disagree with the statements below.

The needs of the local community are important, but the decision should be based on the interests of all New Brunswickers.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	48	39	60	62	54	41	47	59	39	46	48	51
4	28	29	24	24	28	28	28	27	33	28	28	26
3	15	18	11	9	12	21	15	10	14	15	15	14
2	6	9	3	2	4	5	6	3	11	6	6	5
1 - Disagree	3	5	2	2	2	4	3	1	0	4	3	3
Don’t know/Not applicable	0	0	0	1	0	0	0	0	3	0	0	0
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	76	67	84	85	82	70	75	85	72	75	76	78
MEAN	4.1	3.9	4.4	4.4	4.3	4.0	4.1	4.4	4.0	4.1	4.1	4.2

Responses of 'Don’t know/Not applicable' have been excluded from mean calculation

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 3e:

Knowing that any decision could impact the communities around Mactaquac differently, tell us how much you agree or disagree with the statements below.

Any decision must respect the cultural history and traditional use of the Saint John River.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	23	22	31	29	23	22	23	26	36	23	22	25
4	25	24	29	24	26	25	25	23	30	24	25	26
3	28	28	27	27	29	30	28	31	19	28	29	29
2	12	13	7	9	12	12	12	12	3	12	13	11
1 - Disagree	10	11	4	9	10	10	10	6	6	11	10	8
Don’t know/Not applicable	2	2	2	2	1	1	2	2	6	2	1	1
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	48	46	60	52	49	47	48	50	66	47	46	51
MEAN	3.4	3.3	3.8	3.6	3.4	3.4	3.4	3.5	3.9	3.4	3.3	3.5

Responses of 'Don’t know/Not applicable' have been excluded from mean calculation

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 3f:

Knowing that any decision could impact the communities around Mactaquac differently, tell us how much you agree or disagree with the statements below.

Reducing the risk of ice jam flooding below Mactaquac is important to me.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	26	25	34	29	26	19	25	36	30	25	25	28
4	27	28	25	29	27	26	27	27	35	29	26	27
3	25	25	24	21	26	31	26	19	18	23	27	26
2	9	10	6	8	9	11	9	8	7	9	10	8
1 - Disagree	8	9	7	5	7	8	8	4	2	8	9	6
Don't know/Not applicable	4	3	5	7	5	7	4	5	7	6	3	4
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	54	53	58	58	53	44	53	64	66	55	51	55
MEAN	3.6	3.5	3.8	3.8	3.6	3.4	3.5	3.9	3.9	3.6	3.5	3.7

Responses of 'Don't know/Not applicable' have been excluded from mean calculation

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 3: SUMMARY Top Box – scores of 4 or 5 on a 5 point scale

Knowing that any decision could impact the communities around Mactaquac differently, tell us how much you agree or disagree with the statements below.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
d) The needs of the local community are important, but the decision should be based on the interests of all New Brunswickers.	76	67	84	85	82	70	75	85	72	75	76	78
f) Reducing the risk of ice jam flooding below Mactaquac is important to me.	54	53	58	58	53	44	53	64	66	55	51	55
b) Maintaining our parks, marinas and recreational activity on and around the Mactaquac headpond is ...	53	60	51	50	45	56	53	47	68	51	51	55
e) Any decision must respect the cultural history and traditional use of the Saint John River.	48	46	60	52	49	47	48	50	66	47	46	51
a) The needs and interests of local private property owners should be given priority.	46	50	47	44	42	51	46	44	57	45	44	49
c) Local businesses' needs or interests should always be given priority.	37	40	42	39	33	39	37	40	52	37	35	40

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 4a:

Thinking about the potential economic activity this project could bring to New Brunswick, tell us how much you agree or disagre with the statements below.

New Brunswick needs a mega project to help boost the economy now.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	45	43	53	55	44	48	44	55	40	45	45	47
4	23	24	25	21	23	19	23	22	27	27	22	20
3	18	19	12	15	18	18	18	14	20	16	18	18
2	7	7	4	4	8	8	7	4	6	6	8	6
1 - Disagree	6	6	5	4	7	5	7	4	3	5	6	8
Don't know/Not applicable	1	1	1	1	1	2	1	1	3	1	1	1
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	68	67	77	76	66	67	67	77	67	71	68	67
MEAN	4.0	3.9	4.2	4.2	3.9	4.0	3.9	4.2	4.0	4.0	3.9	3.9

Responses of 'Don't know/Not applicable' have been excluded from mean calculation

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 4b:

Thinking about the potential economic activity this project could bring to New Brunswick, tell us how much you agree or disagre with the statements below.

New Brunswick suppliers should be given priority for the project.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	70	70	73	69	69	70	70	65	38	71	72	68
4	18	19	17	15	19	20	18	19	29	18	18	18
3	7	7	5	10	7	8	7	8	20	6	6	9
2	2	2	2	2	2	1	2	3	4	2	2	2
1 - Disagree	2	1	2	3	2	1	2	3	2	1	2	3
Don’t know/Not applicable	1	1	1	1	1	1	1	2	7	1	1	1
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	88	89	90	84	88	90	88	84	66	90	90	86
MEAN	4.5	4.5	4.6	4.5	4.5	4.6	4.6	4.4	4.0	4.6	4.6	4.5

Responses of 'Don’t know/Not applicable' have been excluded from mean calculation

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 4c:

Thinking about the potential economic activity this project could bring to New Brunswick, tell us how much you agree or disagre with the statements below.

NB Power and the Province of New Brunswick shouldn't take on any new debt.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	15	10	26	26	17	12	14	30	28	13	15	17
4	12	11	16	14	13	13	12	18	23	13	12	12
3	33	33	31	33	34	32	33	33	26	33	35	33
2	22	25	13	15	22	25	24	13	9	24	23	21
1 - Disagree	15	19	11	10	12	17	16	5	4	14	14	16
Don't know/Not applicable	2	2	2	2	1	1	2	1	10	3	1	1
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	28	21	43	40	30	25	25	48	51	26	27	29
MEAN	2.9	2.7	3.3	3.3	3.0	2.8	2.8	3.6	3.7	2.9	2.9	2.9

Responses of 'Don't know/Not applicable' have been excluded from mean calculation

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 4d:

Thinking about the potential economic activity this project could bring to New Brunswick, tell us how much you agree or disagre with the statements below.

Current jobs in tourism, parks, local business, etc. are more important than any new jobs this project might create.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	8	7	12	11	8	9	8	14	12	8	8	10
4	10	10	14	11	11	10	10	16	20	10	10	11
3	35	37	35	34	33	34	35	35	30	34	36	36
2	25	26	19	22	26	24	26	20	20	27	26	22
1 - Disagree	19	17	18	19	20	20	19	12	7	19	18	19
Don’t know/Not applicable	2	2	2	3	2	3	2	3	11	3	2	2
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	19	17	26	22	19	19	18	30	32	17	18	20
MEAN	2.6	2.6	2.8	2.7	2.6	2.6	2.6	3.0	3.1	2.6	2.6	2.7

Responses of 'Don’t know/Not applicable' have been excluded from mean calculation

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 4e:

Thinking about the potential economic activity this project could bring to New Brunswick, tell us how much you agree or disagre with the statements below.

A short-term economic boost is important, but the decision should consider the long-term economic impact of a rate increase on New Brunswick businesses.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	42	37	48	46	44	41	41	47	38	44	40	42
4	32	35	29	29	32	29	33	28	40	32	33	30
3	19	22	16	16	17	22	20	15	14	17	20	20
2	3	4	4	3	3	3	3	4	0	3	3	4
1 - Disagree	2	2	3	3	2	3	2	4	1	2	2	2
Don't know/Not applicable	1	1	1	2	2	1	1	2	7	2	1	1
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	74	72	76	75	76	70	74	76	78	76	73	72
MEAN	4.1	4.0	4.2	4.2	4.2	4.0	4.1	4.1	4.2	4.1	4.1	4.1

Responses of 'Don't know/Not applicable' have been excluded from mean calculation

NB Power Engagement Study

TABLE 4: SUMMARY Top Box – scores of 4 or 5 on a 5 point scale

Thinking about the potential economic activity this project could bring to New Brunswick, tell us how much you agree or disagre with the statements below.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
b) New Brunswick suppliers should be given priority for the project.	88	89	90	84	88	90	88	84	66	90	90	86
e) A short-term economic boost is important, but the decision should consider the long-term economic impact of a rate increase on New Brunswick businesses.	74	72	76	75	76	70	74	76	78	76	73	72
a) New Brunswick needs a mega project to help boost the economy now.	68	67	77	76	66	67	67	77	67	71	68	67
c) NB Power and the Province of New Brunswick shouldn't take on any new debt.	28	21	43	40	30	25	25	48	51	26	27	29
d) Current jobs in tourism, parks, local business, etc. are more important than any new jobs this project might create.	19	17	26	22	19	19	18	30	32	17	18	20

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 5a:

Keeping the cost of this project and its potential impact on power rates in mind, tell us how much you agree or disagre with the statements below.

I want my rates to be as low as possible.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	50	43	62	63	51	52	48	62	39	45	51	53
4	19	19	17	16	19	18	19	15	22	20	19	16
3	22	27	15	13	22	17	23	16	17	24	22	21
2	6	7	5	4	6	6	6	4	7	7	5	5
1 - Disagree	3	3	2	3	2	5	3	3	5	3	2	3
Don’t know/Not applicable	1	0	0	2	0	1	1	1	10	0	0	0
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	68	63	79	79	70	71	68	76	61	65	70	69
MEAN	4.1	3.9	4.3	4.4	4.1	4.1	4.1	4.3	3.9	4.0	4.1	4.1

Responses of 'Don’t know/Not applicable' have been excluded from mean calculation

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 5b:

Keeping the cost of this project and its potential impact on power rates in mind, tell us how much you agree or disagre with the statements below.

I support a large investment now if it means benefits for future generations of New Brunswickers.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	46	47	45	48	44	44	45	52	48	50	43	45
4	29	30	32	23	30	31	30	26	22	29	31	27
3	17	17	14	17	17	16	17	13	15	15	18	17
2	3	3	3	3	4	4	4	3	4	3	4	3
1 - Disagree	4	3	6	6	4	4	4	5	4	2	3	6
Don’t know/Not applicable	1	1	0	2	1	0	1	1	7	1	1	1
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	75	76	77	71	74	75	74	78	70	79	74	72
MEAN	4.1	4.2	4.1	4.1	4.1	4.1	4.1	4.2	4.1	4.2	4.1	4.0

Responses of 'Don’t know/Not applicable' have been excluded from mean calculation

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 5c:

Keeping the cost of this project and its potential impact on power rates in mind, tell us how much you agree or disagre with the statements below.

NB Power should consider the immediate costs to New Brunswickers and our province's current economic state when making their decision.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	36	28	51	50	38	35	34	49	32	35	35	37
4	29	31	24	25	28	29	29	25	33	31	29	26
3	23	26	19	15	22	27	24	18	22	22	24	23
2	8	9	6	6	7	4	8	5	3	7	8	8
1 - Disagree	4	4	1	3	4	4	4	2	2	4	4	5
Don't know/Not applicable	1	1	0	2	0	1	1	1	7	1	0	1
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	65	59	74	75	66	64	63	74	65	66	64	64
MEAN	3.9	3.7	4.2	4.2	3.9	3.9	3.8	4.2	4.0	3.9	3.8	3.8

Responses of 'Don't know/Not applicable' have been excluded from mean calculation

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 5d:

Keeping the cost of this project and its potential impact on power rates in mind, tell us how much you agree or disagre with the statements below.

NB Power should consider the environment and long-term plans even if there is a larger impact on rates now.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	37	36	35	37	38	33	37	36	57	45	32	34
4	31	33	31	27	30	32	31	32	25	28	33	32
3	22	21	21	24	22	22	22	21	11	19	24	22
2	6	6	8	6	5	6	6	5	2	4	6	6
1 - Disagree	4	3	4	5	4	4	4	5	2	3	4	4
Don’t know/Not applicable	1	1	1	1	0	1	1	1	2	1	1	1
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	68	69	66	64	68	66	68	69	81	73	65	66
MEAN	3.9	3.9	3.8	3.9	3.9	3.9	3.9	3.9	4.3	4.1	3.8	3.9

Responses of 'Don’t know/Not applicable' have been excluded from mean calculation

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 5e:

Keeping the cost of this project and its potential impact on power rates in mind, tell us how much you agree or disagre with the statements below.

Stable and predictable rates should be a top priority.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
5 - Agree	39	31	52	53	41	39	37	52	30	33	39	45
4	30	31	27	26	31	32	31	26	25	32	32	27
3	22	27	16	14	19	20	22	14	26	23	22	20
2	6	7	4	4	5	4	6	5	5	8	5	5
1 - Disagree	3	3	1	2	3	3	3	3	4	3	2	2
Don’t know/Not applicable	1	1	0	1	1	1	1	1	10	1	0	1
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
% AGREE (4,5)	69	62	79	79	72	71	68	77	55	65	71	73
MEAN	4.0	3.8	4.3	4.3	4.0	4.0	4.0	4.2	3.8	3.8	4.0	4.1

Responses of 'Don’t know/Not applicable' have been excluded from mean calculation

TABLE 5: SUMMARY Top Box – scores of 4 or 5 on a 5 point scale

Keeping the cost of this project and its potential impact on power rates in mind, tell us how much you agree or disagre with the statements below.

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
b) I support a large investment now if it means benefits for future generations of New Brunswickers.	75	76	77	71	74	75	74	78	70	79	74	72
e) Stable and predictable rates should be a top priority.	69	62	79	79	72	71	68	77	55	65	71	73
d) NB Power should consider the environment and long-term plans even if there is a larger impact on rates now.	68	69	66	64	68	66	68	69	81	73	65	66
a) I want my rates to be as low as possible.	68	63	79	79	70	71	68	76	61	65	70	69
c) NB Power should consider the immediate costs to New Brunswickers and our province's current economic state when making their decision.	65	59	74	75	66	64	63	74	65	66	64	64

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 6a:

Please tell us what's most important to you by assigning a value to each topic. You've got 100 points to share between all five. Please make sure to confirm and submit your feedback.

Cost to New Brunswickers

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
91 - 100	1	1	1	3	1	1	1	2	0	1	1	1
81 - 90	0	0	0	0	0	1	0	0	0	0	0	0
71 - 80	1	1	1	2	2	1	1	2	0	1	1	1
61 - 70	1	1	2	2	2	2	1	2	0	1	2	1
51 - 60	3	2	2	4	4	3	3	3	2	2	3	4
41 - 50	8	5	11	10	9	7	8	9	3	5	10	8
31 - 40	11	8	12	15	12	14	11	13	10	10	12	10
21 - 30	20	19	24	22	21	17	20	22	19	20	18	22
11 - 20	28	30	26	25	27	26	28	27	43	29	26	27
1 - 10	18	23	18	12	15	18	19	14	17	21	17	17
0	9	11	3	6	8	11	9	6	7	10	9	7
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
MEAN	23	20	26	28	26	23	23	27	19	21	25	25

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 6b:

Please tell us what's most important to you by assigning a value to each topic. You've got 100 points to share between all five. Please make sure to confirm and submit your feedback.

Economic Activity

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
91 - 100	0	0	0	0	0	0	0	0	0	1	0	0
81 - 90	0	0	0	0	0	0	0	0	0	0	0	0
71 - 80	0	0	0	0	0	0	0	0	0	0	0	0
61 - 70	0	0	0	1	0	1	0	0	0	0	1	0
51 - 60	1	2	1	1	1	1	1	1	0	2	1	1
41 - 50	4	3	3	6	4	4	4	4	0	4	4	3
31 - 40	8	7	10	7	8	8	8	5	10	9	7	7
21 - 30	20	20	21	20	19	17	20	19	12	20	20	20
11 - 20	32	31	35	31	33	31	32	35	39	31	30	35
1 - 10	23	25	20	21	22	26	23	23	30	23	23	24
0	11	11	10	12	12	12	11	13	9	10	13	11
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
MEAN	18	18	18	19	18	18	18	17	15	19	18	17

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 6c:

Please tell us what's most important to you by assigning a value to each topic. You've got 100 points to share between all five. Please make sure to confirm and submit your feedback.

Electricity Sources

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
91 - 100	0	0	0	0	0	0	0	0	0	0	0	0
81 - 90	0	0	0	0	0	0	0	0	0	0	0	0
71 - 80	0	0	0	0	0	0	0	0	0	0	0	0
61 - 70	0	0	1	1	0	0	0	1	0	0	0	1
51 - 60	1	1	1	1	1	2	1	1	1	1	1	2
41 - 50	4	4	4	5	4	2	4	5	2	4	4	5
31 - 40	8	8	10	8	8	9	8	8	7	9	8	8
21 - 30	23	23	25	24	24	25	23	28	20	23	22	26
11 - 20	33	32	32	32	34	31	33	29	43	34	33	31
1 - 10	19	21	17	17	18	20	20	17	20	19	20	18
0	10	9	11	12	11	11	10	11	5	10	12	10
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
MEAN	19	19	19	19	19	19	19	20	18	19	18	20

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 6d:

Please tell us what's most important to you by assigning a value to each topic. You've got 100 points to share between all five. Please make sure to confirm and submit your feedback.

The Environment

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
91 - 100	2	2	1	1	2	2	2	1	3	2	2	1
81 - 90	0	0	0	0	1	1	0	1	0	0	0	1
71 - 80	1	1	1	1	1	1	1	2	2	1	2	1
61 - 70	2	2	1	1	2	1	2	1	2	2	1	1
51 - 60	3	3	2	2	4	2	3	2	5	5	3	2
41 - 50	7	7	8	6	7	8	7	8	11	7	7	6
31 - 40	12	12	12	11	13	11	12	13	26	14	11	11
21 - 30	22	24	24	21	21	21	22	22	25	23	22	23
11 - 20	26	25	28	30	25	27	25	30	20	25	25	28
1 - 10	17	17	18	17	17	19	18	13	4	14	19	19
0	7	7	5	8	7	7	7	6	2	6	8	7
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
MEAN	25	25	24	23	26	24	25	26	34	27	25	23

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 6e:

Please tell us what's most important to you by assigning a value to each topic. You've got 100 points to share between all five. Please make sure to confirm and submit your feedback.

Community Impacts

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
91 - 100	0	1	0	0	0	1	0	0	0	0	1	0
81 - 90	0	0	0	0	0	0	0	0	0	0	0	0
71 - 80	0	1	1	0	0	2	1	0	0	0	0	1
61 - 70	0	1	0	0	0	1	1	0	1	0	1	0
51 - 60	1	2	0	0	1	1	1	0	1	1	1	1
41 - 50	2	4	0	0	1	4	2	0	1	2	3	2
31 - 40	4	7	4	2	2	4	4	2	2	4	5	4
21 - 30	11	16	7	7	8	12	11	8	11	11	11	12
11 - 20	28	27	33	30	29	23	28	32	39	30	25	30
1 - 10	35	29	36	40	40	38	35	38	31	35	37	33
0	17	13	18	20	20	13	16	19	15	16	18	16
SAMPLE SIZE (#)	**5423**	**2194**	**255**	**634**	**2050**	**290**	**4851**	**572**	**122**	**1514**	**2106**	**1681**
MEAN	14	18	12	11	11	16	15	11	13	14	14	14

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 6: SUMMARY

Please tell us what's most important to you by assigning a value to each topic. You've got 100 points to share between all five. Please make sure to confirm and submit your feedback.

	MEAN	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
The Environment	25	25	24	23	26	24	25	26	34	27	25	23
Cost to New Brunswickers	23	20	26	28	26	23	23	27	19	21	25	25
Electricity Sources	19	19	19	19	19	19	19	20	18	19	18	20
Economic Activity	18	18	18	19	18	18	18	17	15	19	18	17
Community Impacts	14	18	12	11	11	16	15	11	13	14	14	14

TABLE 7:

Anything you'd like to add?

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
Fix/replace the dam/We need the dam	34	43	24	16	28	56	36	15	17	32	33	36
Need clean/renewable energy sources	28	26	23	23	32	40	28	31	17	29	28	29
Consider economic factors/impact/Need to benefit the economy	21	23	23	19	19	17	21	17	25	25	21	19
Consider environmental impact/Do what is better for the environment	15	15	8	15	15	16	15	15	29	18	14	13
Need to keep energy costs down/Don't want to pay too much for power	9	6	16	18	10	11	9	16	4	11	9	9

NATIONAL PUBLIC RELATIONS

NB Power Engagement Study

TABLE 7:

Anything you'd like to add?

	OVERALL %	REGION					LANGUAGE		AGE			
		Area covered by CER	Northwest	Northeast	Southeast	Southwest	EN	FR	0-17	18-34	35-54	55+
Need to be self-reliant/Need enough power to sustain the province	8	9	9	6	6	5	8	6	4	9	8	7
Need to consider the impact on the local community	8	12	1	4	4	14	8	2	13	8	7	7
Remove the dam/Restore the river	7	8	6	3	7	5	7	3	4	6	8	6
Need more information/Provide more cost information for keeping vs replacing the dam	5	6	2	5	4	2	5	5	4	2	5	6
Should outsource power from other provinces (Quebec, Newfoundland)	3	2	3	5	4	1	3	5	0	3	4	4
Need better management of energy/NB Power	3	2	0	2	3	6	3	1	0	1	4	3
Survey comments	2	1	0	1	2	1	1	3	0	2	1	2
Trust the experts to make the right decision	1	1	2	2	1	0	1	1	4	1	1	1
Other	13	11	21	18	14	5	13	17	13	11	14	14
Nothing/Satisfied as is	4	4	3	7	4	2	4	8	13	6	4	3
SAMPLE SIZE (#)	**1714**	**692**	**90**	**189**	**662**	**81**	**1528**	**186**	**24**	**386**	**589**	**715**

ANNEXE C

TRANSCRIPTION DES COMMENTAIRES

C’EST LE TEMPS D’AGIR.

mactaquaction.ca

Énergie NB Power

May 17, 2016
Fredericton Stakeholder Session
Top Themes & Priorities Transcription

Fish passage and holistic view of river

- 2040 healthy river system
- Fish passage up and downstream
- Cumulative assessment of entire river system and all impoundments
- Cost of upstream/downstream fish passage
- Reduce impact on wildlife while powering NB with electricity and jobs
- Power supply is 100% green, renewable and salmon safely go up and down the river and population rebounds
- No matter what decision is made, hope that the health of ecosystem has been a top priority during the decisions making process
- Safe passage for all aquatic species up and down stream, not through turbines
- Holistic view of river and benefits/trade-offs
- Impact on hunting, fishing and trapping

Keep the dam

- Protect environmental health, damage is already done, keep the dam, maximize renewable power, reduce GHGs, make sure all supply chains are environmentally/human health responsible
- Dam stays
- Removal not an option

Transportation

- Maintenance of river crossing at current site
- Transportation
- In 2040 there'll be a new river crossing at Mactaquac

Fact-based decision/transparent process

- Transparent
- Open process/decision/procurement
- Risk!
- That it be a science/evidence-based decision from engineering to habitat
- Accountability and transparency
- Tangible details
- Need environmental impact information
- In 2040 we hope NB Power and New Brunswick have gone through an open and transparent process and full cost accounting to show costs and benefits of each option
- Establishment of effective up/downstream fish passage
- Nice to see it live out full life, we have big question – will the decision lock us in or be adaptive?
- What is role of large, centralized electricity in a smart grid?

- Have started and maintained a series of non-political decisions

Economic opportunity

- Tourism
- Economy/jobs
- Economic spinoff

Affordability

- In 2040 we have reasonable debt levels and similar rates to today
- Long-term cost-effective supply
- Benefit/cost analysis
- Economic impact on consumers
- Contractors/manufacturing/trades
- Cost of power
- Economists to consider long-term scenarios
- Fiscal consideration – best for what we can afford
- Consulting
- Stable, affordable energy rates

Renewable energy

- Less reliant on fossil fuels
- Alternative sources of renewable power
- Lessen our dependence on fossil fuels
- Keep options open to adopt newer, lower cost renewable options
- Renewables
- Max hydro
- Renewable energy dependable
- Decision made through climate change lens
- Both renewable and impact of climate change on infrastructure and nature too
- How will this decision be part of the transitioning us over to a fossil-free electricity system?
- Off fossil fuels
- Decentralized production and distribution of renewable energy source
- In 2040 we hope that widespread distribution of renewable energy and phasing out of large-scale hydro power supply
- Power supply is diversified
- Dams
- Maximize Grand Falls
- Wind, tidal, solar, geothermal
- NB has a smart grid that maximizes energy efficiency
- Operates safely and securely
- NB is a leader in energy efficiency technology

Sustainable

- Stable, economical power source
- In 2040, a sustainable choice has been implemented

May 17, 2016
Fredericton Community Dialogue Session
Top Themes & Priorities Transcription

Environmental

- Complete state of the art fish passage
- River
- Sustaining NB ecosystem
- Maintain the head pond while improving fish passage
- What happened to the catastrophic environment issue of what lies beneath the water?
- Aquatic life
- Best environment option
- State of the art fish passage
- Thriving ecosystem
- Importance of incorporating better fish passage into new design
- Environmental effects from the dam removal
- Beautiful landscape to sustain rural life population
- Environment
- Establish proper fish wildlife passage by dam
- Fish passage was enhanced or maintained
- Minimize environmental impact
- A healthy river and engaged communities

Social Impacts

- Effect on property values
- Socially the best option in health concerns is removing the dam
- Significant history of Saint John river to be understood

Green/renewable energy

- Higher building standards to capture efficiency
- Keep power house to produce clean energy
- Have it pay for itself
- Continue generating green power at Mactaquac
- More revenue, less fossil fuel
- Retain Mactaquac as renewable energy source
- We are generating power from renewables, maybe through a dam at Mactaquac, or perhaps not
- 100% renewable energy
- We still own and have the resource revenue

- Sustaining NB's future
- Renewable energy generation
- Renewable energy
- Clean, sustainable power
- Renewable power at Mactaquac for another 60 years
- Cost and sustainability of electrical power generation
- Green energy
- Sustain green power generation for the corporation
- Environment
- Reliable green power should be maintained because other green power isn't as reliable
- Hydro-electricity is the pillar of our energy source
- 2040 hope

Maintain headpond tourism

- Maintain the generating station
- The headpond has been maintained as has our property value, tourism and recreation
- Waterfront properties are still waterfront properties
- Maintain headpond
- Head pong tourism and recreation and property value
- Maintaining a dam of same kind can continue to be advantageous of managing spring flooding
- Unknown health issues in removing the dam
- Least disruption
- Maintain headpond from a recreational perspective
- Maintain the headpond for recreational and social use
- Recreational value of the headpond
- Retain real estate value
- Keep the dam and power house
- Let it pay for itself as it has since 1968
- Rehabilitate dam

Transportation

- Transportation changes

Transparent and open process

- An integrated decision making process that considers issues such as efficiencies, liability within the transmission system, climate change, the possibility of catastrophic effects for heavy rainfall
- Would like more information and feedback from NB Power on alternatives
- Avoid the bomb drop
- What to replace power from dam with?
- Distribute a detailed report with the pros and cons
- Clearly present the business case for the second option
- A decision that reflects the will of the people
- A conversation was held about NB's actual renewable power, not just the dam

- Risks were properly assessed and managed
- Before 2068 a decision can be made on the dam's future based on circumstances
- Priority 1: We need more information
- Integrated review of existing liabilities (holistic)

Economic benefits

- Minimize socio-economic impact
- Economic benefit of going ahead
- Utilization of headpond for economic tourism
- Creating new opportunities for all
- Job creation and economic growth
- The economy
- Increase export power sales

Cost, affordability and impact on rates

- Cost of fourth option and confidence?
- Cost of power?
- Financial viability of first option?
- Lower power cost
- Cost to replace power from loss of the dam
- Cost of lost energy
- Cost of each option
- Cost/benefit ratio
- All options are expensive so it would be beneficial to retain generation capacity at Mactaquac
- Cost
- Cost effective
- What are the real project option costs?
- New facility paying its own way
- How much will Option 4 cost?
- How much will replacement power cost?
- How much power will we need in the future?
- Keep the power house and have it produce efficient clean energy to pay for itself
- Where would the replacement energy come from? And at what cost?
- A stable, low-cost source of green power that our ancestors will be proud of
- Hope it is paid for
- Having the dam gives us security in pricing and supply

Other

- NB Power remain a public utility
- Improve financial position of NB Power
- Behavioural changes to reduce loads
- Security of power supply

May 18, 2016
Mactaquac Community Dialogue Session
Top Themes & Priorities Transcription

Environment

- Return river to pre-dam
- 2040: Best in environmental class
- Sediment accumulation in the headpond
- Concerns over unknown impacts of draining
- Aquatic life preservation and recovery
- Environmentally responsible
- Maintaining present ecosystem
- Environmental disaster to remove dam

Renewable energy

- Green energy
- Efficient green power with the use of headpond with bridge
- Mactaquac a symbol/model of moving to 100% renewable
- Maximum NB renewable energy self-sufficient, NB owned
- Greater reliance on other green energy. Solar, wind, tidal
- Viable renewable NB owned energy
- Clean power

Socio-economic

- Expropriation. If done, keep it fair and efficient
- We have lots of power to use and sell
- Some enduring benefits for this community (senior housing)
- Newly created Bank of NB, reducing cost by 30-40% over lifetime of project
- Green power on demand. That effects employment, use of headpond and property value
- Maintain beauty of Mactaquac waterway
- Economic impact, revenue generation, property values
- Unknown long-term cost of draining the lake
- Needs to be a return on the investment
- Keep the Dam
- Keep the lake, same shoreline
- Keep lake and value of our homes
- Green and cheap power
- Employment and tourism
- Green energy at reasonable cost. New bridge close to current location
- Maintain the headpond
- Retain the lake
- Vibrant recreational area
- Keep the dam

- Avoid disruptive social aspect of removal of headpond
- Maintain clean energy we can still afford
- Bridge location close to current location
- Sensitive to land owners
- Keep the head pond
- Green and efficient power
- Keep Mactaquac Lake
- Economic growth
- Preserve headpond
- Land owners want shore to stay the same
- Maintain headpond
- NB is a green energy leader
- What is cost?
- Bridge location, cost benefit, safe and efficient power source, new employment, make sure economic benefits stay in the community

Cost and affordability

- Competitive power rates
- Total cost
- Maintain green reliable power
- Don't purchase higher costs
- Reduce carbon costs
- Cost
- Rate of return
- Property values
- How to pay for?
- Maintain/find affordable power
- Cost benefit analysis
- We stayed in budget
- Maintaining power generation as efficiently as possible
- Cost
- Can management handle the project?
- Social impact

Reliable power

- Affordable electricity
- NB still owns the dam
- Predictable sources of energy with affordable rates
- If no dam, where does the power come from and at what cost?
- Meets future expanded electricity needs
- Do the smartest thing and generate power

Transportation

- Local transportation across the river
- Bridge at current location
- Bridge crossing close to existing dam
- Crossing in the same location
- Environmental and road access
- Access in close proximity to current bridge
- Coordinate with DTI
- Location of bridge
- Clean energy continues
- Effect on community
- Ensure we have a river crossing

Business opportunity

- Economic opportunity
- Economic sustainability and growth
- Attract new population

Decision process

- More information on fourth option
- Business case
- Decision with long-term ramifications
- Maintain headpond
- Continue to develop through scientific developments
- No political involvement
- Cost to replace green energy?
- Does NB Power have the ability to handle this size of a project?
- Investigate the viability of Option 4 further
- Prolong life of current assets
- Avoid loss of power generation
- Nobody looks back with regrets
- Whatever decision is made, build it and take it down properly

New dam

- New dam with power generation
- Rebuild new, safe, efficient, reliable economic for the future
- Repair old one, not worth it

May 19, 2016
Woodstock Community Dialogue Session
Top Themes & Priorities Transcription

Keep the dam and headpond

- Refurbish the dam would be the best option. Next best would be to rebuild the whole dam
- The dam must be kept to keep the headpond
- Leave the beautiful waterway
- Not Petitcodiac
- Much rather safe the current infrastructure

Distribution, loss of tourism and land value

- Keep the head pond and generate electricity
- Respect for land owners and displaced families who suffered in the first displacement. Do not go through that nightmare again
- Tourism, land values
- Dam would be paid for
- Sound clean environment
- Sell power for profit
- Concerns: No control over immigration
- Economic growth and population balancing small is beautiful with creating jobs and opportunities
- 40 years ago when it was built, a lot of people were hurt. We don't need to do that again

Less carbon

- Renewable resource maintenance
- New technology
- Less carbon by changing consumer habits and using new technology

Cost and affordability

- Dollars
- Money was well spent and kept power rates low
- Affordability
- Keep costs down and under control
- Clean, healthy, cost effective energy
- NB Power is debt free and a revenue generator

Decision process

- We are a model for whatever happens here (process, outcomes, etc.)
- Inclusive solution = balanced items
- A durable solution that is based on science and fact
- No political interference

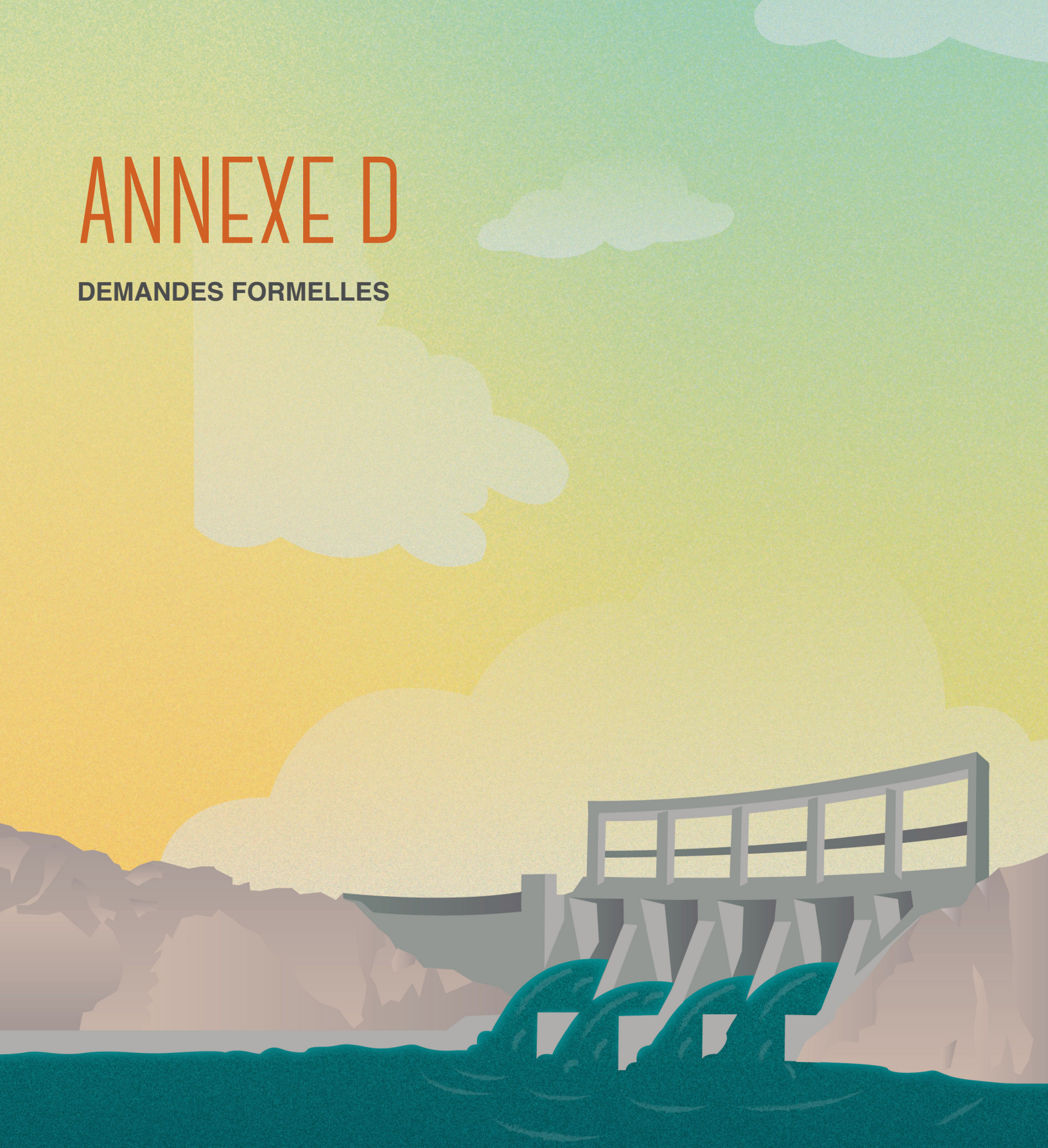
- Public was involved in the decision

Environment and fish

- Healthy river
- Fish survival
- Kids love the river
- Environmental concerns: Contaminants if drained. What's under the water?

ANNEXE D

DEMANDES FORMELLES



C'EST LE TEMPS D'AGIR.

mactaquaction.ca

Énergie NB Power

2015 01 07
Also 2016 03 13
2016 0531

New Brunswick Salmon Council
P.O. Box 533, Fredericton, NB E3B 5A6

Conseil du Saumon Nouveau Brunswick
C.P 533, Fredericton, NB, E3B 5A6

Review of the "Guidelines for the Comparative Environmental Review (CER) of the Mactaquac Project, Mactaquac, New Brunswick"

BY: The New Brunswick Salmon Council
DATE: January 6, 2014

We respectfully submit the following comments on the draft document:

- ***Page 1*** The Mactaquac generating Station is often characterized as being "run-of-the-river". It is not. Significant periods of peaking occur.
- ***Page 3*** The project location map should include the whole headpond area as well as a distance downstream.
- ***Page 8*** Table 2.1. Under Construction and Operation - "Fish Passage Facility Construction" should instead be "Construction of Fish Passage Facilities"
- ***Page 9*** "mitigation measures that are technically and economically feasible". This is misleading. Required mitigation measures may be economically infeasible in that they kill the financial viability of the Option. If no alternative mitigations are available and adequate compensation also kills the finances of that particular option, then the option should no longer be considered.
- ***Page 10*** Socio-Economic Environment VCs / Land Resource Use / Change in property Values – This topic will have to be discussed as included subsequently in Table 4.4 (Option 3 may cause substantial changes to land use and property values), but we are of the opinion that the property value changes of land along the headpond should not be considered. The owners gambled on an assumption of the headpond's presence essentially forever. Under Option 3, forever is coming quickly. Option 3 should not be required to bear the cost of the property value loss. On the other hand, the gain of property value from the re-established land should be credited to Option 3. The value was lost in 1967, and would be recouped under Option 3.
- ***Page 10*** "Fish" should be identified as a separate VC in Table 2.2 or "Water Resources VCs" could be changed to "Fish and Water Resources VCs".
- ***Page 10*** "Change in fish passage" should be included in the Key Issues column of Table 2.2. An emphasis on fish and fish passage would be reflected subsequently in Table 4.2.
- ***Page 11,12*** We question the validity of using (for the most part) qualitative assessment methodologies. This leaves room for subjective manipulation of the results. At the 2013 public open house in Kingsclear, Gaetan Thomas suggested that a full cost accounting (FCA)

would be done to select the preferred option based on least cost of power production. Since the CER is a step in the selection process, an attempt should be made to use FCA.

- ***Page 14*** Section 3.1.1 Public and Stakeholder Consultation. We request that the New Brunswick Salmon Council and its affiliate, the St. John Basin Salmon Recovery Inc. be consulted.

- ***Page 23*** Table 4.4 Changes in Traditional Use - "Option 3 may cause substantial changes to traditional land use through changes to the landscape." This is a leading statement. Option 3 would probably restore traditional resource use.

- ***General*** We wondered about the comparative fate of bedload solids and associated nutrients among the three options. It seems logical that a settling basin like the Mactaquac headpond would prevent them from entering the St. John River estuary and eventually the Bay of Fundy. The benefits and costs of this interaction should be looked at.

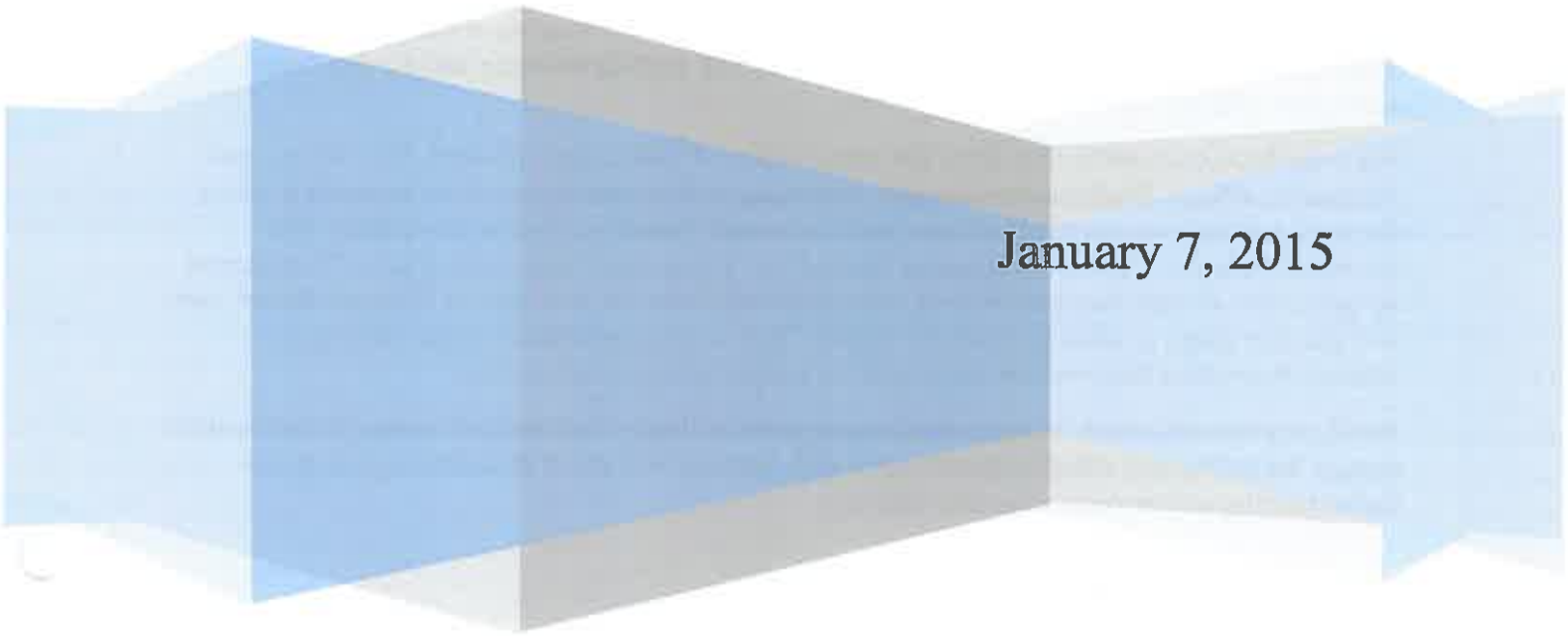
Yours Truly,

Debbie Norton,
President – NB Salmon Council

Friends of Mactaquac Lake

A Response to NB Power's Mactaquac Project: A Comparative Environmental Review (CER)

A Policy Brief



January 7, 2015

A Response to NB Power's *Mactaquac Project: A Comparative Environmental Review (CER)*

1 Executive Summary

NB Power is facing a serious policy choice around the future of the Mactaquac Generating Station and Mactaquac Lake given the destructive effects of an alkali-aggregate reaction within the cement. The policy choice is among three options: 1) repower by refurbishing the generating station; 2) maintain the dam with a new spillway as a water control structure without power generation; or 3) remove the generating station and dam and enable the river to return to a free-flowing state.

NB Power has embarked on a commendable public and stakeholder engagement process through meetings and information sessions, communications through various media, and more specifically a document entitled *Mactaquac Project: Comparative Environmental Review (CER).* This policy brief is submitted by the *Friends of Mactaquac Lake* to express our economic, social-ecological, socio-economic, and engagement concerns with the information provided so far. After describing these concerns, with support from the literature, we offer a number of suggestions and a recommendation to improve the engagement process.

Economic concerns relate to the fact that there is no mention in the CER of the issue of investment versus pure cost with respect to the three options, or any mention of the critical benefits, such as Black Start capabilities, required Reserve Capacity, Load Following flexibility, and green Renewable low unit cost electricity for New Brunswick consumers.

Social-ecological concerns revolve around the presentation of Option #3 as simply river restoration with nothing but beneficial ecological outcomes. There is no recognition of the fact that there is great scientific uncertainty over the environmental benefits of dam removal, and that in this case it involves the destruction of a dynamic and well-functioning and diverse social-ecological system; namely Mactaquac Lake.

Socio-economic concerns flow from the presentation of Valued Components, Key Issues, and Interaction effects. While socio-economic issues are well-covered, there is no indication where the hard data and information on these socio-economic issues is going to come from. The document refers to *"Other Component Studies"* or *"Other Key Component Studies"* but there is no indication of what these studies are, what they will focus on, how they will be conducted, who will conduct them, or what the budgets will be. This is in sharp contrast to the *Mactaquac Aquatic Ecosystem Study* which has a specific budget and detailed studies.

Finally we are concerned with the engagement process itself which we feel is insufficient to fully engage the public and stakeholders in a real dialogue that will result in mutual learning and understanding and an optimal policy outcome.

2 Statement of the Issue/Problem

The life of the Mactaquac Generating Station has been shortened to 67 years as the result of an alkali-aggregate reaction within the cement. The net result is that a decision has to be made as to how to proceed. Three options have been put forward (Stantec 2014): 1) repowering and refurbishment of the powerhouse and spillway; 2) retention of Mactaquac Lake but with a new spillway and removal of the powerhouse; or 3) removal of the entire structure of the station and dam and returning the river to a free-flowing state. In preparation for this NB Power has initiated a public and stakeholder engagement process through meetings, information sessions, the media, and a document entitled the *Mactaquac Project: Comparative Environmental Review (CER).*

The *Friends of Mactaquac Lake* have serious concerns about a number of issues raised by the CER document and other communications. These concerns fall under four headings: 1) economic; 2) social-ecological; 3) socio-economic; and 4) engagement..

3 Economic Issues and Concerns

We believe that the following facts need to be brought to the fore and be more fully explained in order for the public and all stakeholders to understand the reality associated with each of the three options.

3.1 Cost, Investment and Benefits

1. Option #1, Repowering, is the only one of the options that is actually an investment rather than just a non-recoverable cost; an investment in the production of low unit energy cost that is green, competitive and profitable (given market access). The cost of the investment in Repowering can legitimately be considered also as an incremental investment cost over and above the cost of the other two options.

2. Since Option #1 is the only option that will produce power, it is the only option with the following benefits: 1) the ability to conduct a **Black Start**; 2) maintenance of a necessary **Reserve Capacity; 3)** provision of a **Load Following** ability; and 4) supply of **Renewable and Competitive** energy.

4 Social-Ecological Issues and Concerns

Option #3 is referred to simply as *River Restoration* as a result of the removal of the dam and generating station. In other words, it appears as if this option is the only one that represents a positive or beneficial ecological outcome. This impression is exacerbated by the conceptual rendition (stylized pictures) of the three options. There is nothing in the information and communications provided by NB Power to suggest that Option #3 actually *"disrupts and reconfigures the existing physical environment and eliminates an entire ecosystem"* (Stanley and Doyle 2003).

4.1 Dam Removal and Restoration

There is an implied assumption in the *River Restoration* option that "*dam removal will be inherently beneficial*" (Doyle *et al* 2003) and that the river will return to its previous state in terms of geomorphology, hydrology, and ecology. This is a weak assumption given changes in the watershed landscape, new channelization, sedimentation and erosional patterns, riparian vegetation, and water flows and temperatures with climate change. Further "*The science of predicting environmental effects of small or large dam removal remains is in its infancy*" (Doyle *et al* 2003), and "*great scientific uncertainty exists over the potential environmental benefits of dam removal*" (Poff and Hart 2002). This is particularly true for large dams since the vast majority of dams that have been removed have been small dams. There is also the issue that each dam is unique in purpose, function, contribution, topography, geology, valley morphology, reservoir size, fluvial geomorphology, gradients and sediment quantity and quality (Major *et al* 2012, Duda *et al* 2011)

4.2 Mactaquac Lake - a Social-Ecological System

Mactaquac Lake is not just a headpond for providing hydraulic head to the generating station; the Lake and its' associated watershed have now evolved into a dynamic and well-functioning social-ecological system of high diversity that has attracted considerable investment in property development, cultural and recreational facilities, and livelihood opportunities. Policy option #3, therefore, will have major socio-economic, cultural, and biophysical impacts on this social-ecological system as well as the associated upstream and downstream reaches of the St. John river. **Yet there is nothing in the information and communications from NB Power that recognizes Mactaquac Lake as a diverse and productive social-ecological system whose destruction would have many negative ecological, social and economic effects.**

4.2.1 What Do We Mean by a Social Ecological System or Human Ecosystem?

The concepts of both social-ecological systems or human ecosystems arose through recognition that "*people are an integral part of ecosystems*" (Force and Machlis 1997), and that "*Resource problems are not really environmental problems. They are human problems ...*" (Ludwig *et al* 1993). The Human Ecosystem concept (Burch and de Luca 1984) is " *a coherent system of biophysical and social factors capable of adaptation and sustainability over time*" (Machlis *et al* 1997), while social-ecological systems, which evolved through work on common pool resources (Ostrom 1990, 1998, Ostrom *et al 1994,* Berkes and Folke 1998 Anderies *et al* 2004, Janssen and Ostrom 2006), have been described as complex adaptive systems that from a planning and policy perspective constitute the kind of "wicked problems" that have "*resolutely nonlinear dynamics, complicated positive and negative feedback loops, and a mind-bogglingly intricate interaction of myriad variables*" (Ford 2011).

5 Socio-Economic Issues and Concerns

5.1 Valued Components, Key Issues and Interactions.

The Valued Components, Key Issues and Interactions in the CER Guidelines cover all the socio-economic bases but there is no indication where the hard data and information is going to come

from to address these bases. The document does refer to "*"Other Component Studies"* or *"Other Key Component Studies* but there is no indication of what these studies are, what they will focus on, how they will be conducted, who will conduct them, or what the budgets will be. This is in sharp contrast to the *Mactaquac Aquatic Ecosystem Study* which has a budget of $2.3 million and lists in detail the Project Themes and the Projects.

6 Planned Engagement Issues and Concerns

Our concern with the planned engagement methods in the CER Guidelines is that they focus on information but not on true dialogue and learning between NB Power and the stakeholders and public. All appear as either passive or controlled by NB Power.

6.1 Review of Alternative Engagement Approaches

When policy comes face-to-face with the world of complex adaptive systems such as Mactaquac Lake and the associated upstream and downstream reaches of the St. John river then traditional policy analysis enters a world of uncertainty (Kinzig and Starret 2003), chaos theory (Geick 1987, Resnicow and Page 2008), complexity and unpredictability (Ford 2011), the "*ubiquity of unintended, perverse consequences"* (Hajer 2003), and the "*policymakers paradox"* (Ford 2011). Yet the history of natural resource and ecosystem research, management, planning and policy is a history of ignoring uncertainty because of a failure to recognize the role of values and beliefs, a tendency towards rationality and linear thinking, and a pervasive belief in the power of science, technology and economics to solve complex problems (Page 2008, Ludwig 2001, Kinzig and Starret 2003). In their fifth principle for effective management Donald Ludwig and his colleagues suggest that managers (and planners and policy makers) "*Confront uncertainty. Once we free ourselves from the illusion that science or technology...can provide a solution...appropriate action becomes possible."* (Ludwig *et al* 1993).

A number of approaches have been developed to deal with these challenges. Fundamentally, these approaches recognize that citizens or stakeholders must be fully engaged (as opposed to merely consulted), uncertainty must be embraced as a structural reality, and issues of values, beliefs, equity, diversity, and social justice must be included (Ludwig 2001). Scientific, economic and technological studies alone are not sufficient and will not address the challenge, and are likely to lead to highly negative unintended consequences.

6.1.1 Open Space Technology

A large number of processes have been developed over the years for facilitating change within large organizations and groups while achieving both speed and ownership in the process (Bunker and Alban 1997, Harrison 1995). These processes have been given a number of names such as Open Space Technology, Future Search, Conference Model, Large Scale Interactive Process, Real Time Strategic Change, and Participative Work Redesign.

Open Space Technology is probably the most flexible, effective, simple and inexpensive of the options. It is about making space for everyone in an organization, community, or group to express themselves, regardless of hierarchical position or status. Thus the event is easy to

organize and requires very little lead-time except for ensuring potential participants are informed and invited.

6.1.2 Adaptive Environmental Assessment and Management

Adaptive environmental assessment and management (AEAM)(Holling 1978), is based on the philosophy that management itself is a continual learning process, and not a product as expressed in a management plan. AEAM can be described most succinctly as a biological learning process that not only recognizes uncertainty but embraces it. It is based on quantitative and explicit forecasts of system response, choice of forecasts and appropriate actions, followed by monitoring of system indicators, and powerful feedback loops that lead to quantitative evaluation, error recognition, and correction (Baskerville1985). The basic premise is that since ecosystems are adaptive, environmental management must also be adaptive (Jones and Grieg 1985, IASA 1979). At the core of adaptive management is a series of workshops structured around modeling of the system to be managed (Walters 1986).

6.1.3 Scenario Planning

The scenario concept was developed initially by Herbert Kahn while working at the Rand Corporation in the 1960s (Kahn and Wiener 1967). Practical development of the approach for strategy design in an uncertain and unstable global environment was pioneered by the Royal Dutch Shell group (Wack 1985a). Scenario planning can be defined most succinctly as "*a systemic method for thinking creatively about possible complex and uncertain futures*" (Peterson *et al* 2003). It focuses more on the external environment rather than the internal structure and function of an organization, thereby changing the assumptions, models and mental images held by managers and decision-makers (Wack 1985a) in a way that results in a "*reperception of reality and the discovery of strategic openings*" and "*to rediscover the original entrepreneurial power of foresight in contexts of change, complexity and uncertainty*" (Wack 1985b). In terms of implementation or the actual process, scenario planning proceeds in a series of iterative steps that will vary with organization and situations (Schoemaker 1995, Brummel and McGillivray nd).

6.1.4 Collaborative and Deliberative Policy Development

Collaborative and deliberative policy development (Innes and Booher 1985) is about people working together in a networked process to deliberate about policy development, where deliberation has been defined as a:

> *Collective problem-solving discussion...viewed as the critical element of deliberation to allow individuals to listen, understand, potentially persuade and ultimately come to more reasoned, informed and public spirited decisions* (Abelson *et al* 2003).

An integral component of collaboration and deliberation is dialogue, in which "*the intention is not to advocate but to inquire, not to argue but to explore, not to convince but to discover*" (Notter and Diamond 1996). Policy that is developed through a contemporary networked, flexible, open and participatory approach, i.e. using collaborative processes, leads to buy-in, effective implementation and sustainability (Hajer and Wagenaar 2003, Innes and Booher 2003, Vigoda 2002).

7 Engagement Options

1. **Conduct a Socio-Economic Survey** analogous to that in the report entitled: *The Saint John River: State of the Environment Report* (Scott *et al* 2011) carried out by the Canadian Rivers Institute. This report used readily available census data from Statistics Canada and U.S. sources, but it is suggested here that this survey place greater emphasis on economic, livelihood and quality of life issues through the collection of original data.

2. **Organize an Open Space Technology session with stakeholders** to identify their priority concerns and interests with respect to the options facing NB Power and the impacts these will have on the future of the Mactaquac Generating Station and Mactaquac Lake.

3. **Implement an Environmental Assessment and Management Process** that includes stakeholders in an active role to explore various management options for Mactaquac Lake, choose an alternative future, and design an adaptive learning and feedback process for management of the Lake and its' human and natural resources.

4. **Embark on a Scenario Planning Exercise** to explore global and national trends that may impact on NB Power and its activities and business model, develop a forecast of the future state of the energy business, and determine how this may influence future plans including the fate of Mactaquac Lake.

5. **Create a Structure and Process for a Comprehensive Collaborative and Deliberative Policy Dialogue** that focuses on the future of Mactaquac Lake and that engages all relevant stakeholders in an active and meaningful role.

7.1 Critique of Engagement Options

1. **Conduct a Socio-Economic Survey.** This is a well-established and recognized process in social and socio-economic studies that can yield valuable data and information. However, it is largely data driven and requires minimal involvement by stakeholders and provides little or no opportunity for productive exchange, dialogue, and the ability to influence outcomes in and of itself unless the data are used in a collaborative context.

2. **Organize an Open Space Technology event.** Such an event should start with a clean slate so that participants can express freely and prioritize, without control or guidance, all their problems issues and concerns with respect to the issue at hand. It does provide an opportunity for simple expression of individual ideas and desires, but it does not provide an opportunity for true dialogue and learning among the participants.

3. **Implement an Environmental Assessment and Management Process.** This process is designed largely for open-ended resource management situations where the process is unconstrained by previous decisions and can result in an optimum and flexible management regime for a given set of goals and objectives. In the case of the Mactaquac Generating

Station three options have been established, and when a decision is made it is hardwired and final leaving no room for flexibility and adaptation.

4. **Embark on a Scenario Planning Exercise.** Such an exercise is really focused on the evolution of the external rather than the internal environment of an enterprise in terms of global and national trends. While this would be a valuable exercise for NB Power itself in determining alternative futures (as it has done to a limited degree in its' Integrated Resource Plan 2014), it is not suitable for general public participation in a public policy issue.

5. **Create a Structure and Process for a Comprehensive Collaborative and Deliberative Policy Dialogue.** Current trends in governance and demands for sustainability are leading to greater citizen involvement and participation in policy development and decision-making that goes well beyond simple consultation. Citizen involvement can take a number of forms, and can range across eight levels of participation. Consultation, for example, which occupies the fourth level, has been characterized as tokenism (Arnstein 1969). In a collaborative process all stakeholders are engaged fully in the process over a series of meetings and the outcomes are addressed explicitly in the final policy decisions. In this case it is the process that is paramount to ensure that NB Power has full knowledge and understanding of all the consequences of its' policy decision.

7.2 Engagement Recommendation

A combination of options 1 and 5 would provide the best policy outcome. Option 1 would provide NB Power and the participants with solid socio-economic data on which to found their discussions and dialogue, while option 5 would provide the necessary structure and environment for a positive and productive dialogue leading to an informed outcome that would address social, environmental and economic concerns and issues in a comprehensive, balanced and sustainable manner.

8 Conclusion

Mactaquac Lake, its environs, the upstream and downstream reaches of the St. John river and their constituent communities are liable to experience the greatest impact from the options and decisions facing NB Power. Yet studies to date have focused only on NB Power itself or on the aquatic organisms and the physicochemical environment of Mactaquac Lake and possible downstream impacts. People are conspicuously missing. Even the cost versus investment issues and the benefits of repowering have not been adequately presented or explained. There has been no recognition of the fact that dam removal will cause total destruction of a functioning and diverse social-ecological system, and there have been no studies defined on the very significant socio-economic impacts on local families and communities (what, who, when, how much). Nor is there any indication that plans are in place to engage stakeholders and communities around Mactaquac Lake and the upstream and downstream reaches of the St. John river in a meaningful dialogue beyond simple information provision or consultation. This paper represents a plea on the part of the Friends of Mactaquac to correct this situation and for NB Power to embark on a

true collaborative engagement process regarding the future of the Mactaquac Generating Station and Mactaquac Lake as part of its policy and decision process.

A final note. For those politicians and senior executives who are not familiar with collaboration it may appear as a loss of authority and power and an abrogation of responsibility. That is not the case. Contemporary policy, planning and decision-making that recognizes the complexity of social-ecological systems also realizes the necessity for creating a forum and environment where the experience and knowledge of a diversity of stakeholders can be fully engaged, and where true mutual learning can take place. The emphasis here is not about giving away authority and power, but of exercising these in a different way through collaboration and learning. This will ensure buy-in, a decreased probability of unforeseen consequences, and an increased probability of a just and sustainable outcome (Lenihan 2009).

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2015 02 17

Keswick Island Property Owners Association

February 17, 2015

Mr. George Porter

Our association is much in favour of the Mactaquac Power Dam remaining in the power producing status that it currently contributes. As one of the closest groups directly down river from the facility (less than 1 mile) we have less problems with the islands on natural causes than the pre Mactaquac years due to the earlier ice jams that we don't experience now. We would have many less problems if NB Power would retain the outline they set with our Association when the dam was constructed. These agreements need firmly documented and signed by both groups. There is much data stating what NB Power would do for the island chain during construction but left unsigned and many issues not adhered to. Many of these discussions are found in NB Power file # 3-422b M1#1.

Of these many issues, the cable ferry from the north side of the largest island. The constant erosion of the islands in several problem areas from heavy water fluctuation and maximum flow. Access to the islands over the bridges and causeways and the roads leading to these structures. The implementation of a 15 tonne bridge to the west end of Sugar Island. This island alone has just under a 2000 acre area. This worked in the 1970s but now it is not acceptable as industry has changed in the last 45 years, farmers can not work as they did 45 years ago.

To address these issues NB Power purchased the first cable ferry then walked away from the responsibility of maintenance and management that was not the understanding during power dam construction. NB Power needs to step up to their initial responsibility on this issue and have it documented and signed.

The erosion issue from peak flows of the power dam has pushed river aggregate closer to the islands and caused different flow patterns and in many places ripped precious pieces off the islands. We understand this will happen from time-to –time but when it does NB Power needs to be responsible and repair and protect these areas as they appear.

The access issue is not terrible with NB Power except there are two more causeways that need to be concrete capped to reduce the aggregate from eroding several times a year into the river bed. Some culverts have needed replaced for several years in these structures. The major concern here is the 15 tonne bridge. The roads and causeways will withstand the multiple tonne loads but the bridge is the weak link. Agriculture in the twenty first century has moved to economies of scale as other industries have, in order to be competitive. This weak link retards the movement of products on and off the islands increasing our costs and reducing our competitiveness. This bridge needs replaced with a causeway to complete the chain of heavy weight movements or upgraded to a common 50 tonne bridge.

NB Power suggested that "no down river farmer would be worse off than they were before the dam was constructed", but after construction with no signed documents we are now mostly and sadly forgotten.

KIPOA believe the power dam in question is a benefit to society but should not be at a cost to vulnerable groups such as ours.

David DuPlessis, vice chair, KIPOA

Brent Dunphy, chair ,KIPOA

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Mactaquac Project

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RE: Guidelines for the Comparative Environmental Review (CER) of the Mactaquac Project, Mactaquac, New Brunswick

WWF Canada is writing in response to your solicitation for comments on the Comparative Environmental Review (CER) of the Mactaquac Project as prepared for the New Brunswick Power Corporation by Stantec Consulting Ltd – project no: 121811251.

The World Wildlife Fund Canada (WWF) is an international conservation organization that has a long history of working on important issues to protect the planets species. Everything WWF does is grounded in science - we use the best available data and sophisticated modelling tools to understand ecological connections, identify pressing issues and develop effective conservation strategies. We recognize that economics drives many of the decisions people make each day and that is why it is important to understand the trade-offs and benefits from a diversity of perspectives to ensure the right choices are made for the future of habitats and species and the humans that interact with them.

The WWF Freshwater Program and the effort on the St. John River are about ensuring healthy rivers. We have been actively utilizing a number of approaches along the St. John River for the past two and half years as we work to develop a common understanding of the river, its health and an action plan that will support it, and the habitats and species that rely upon it.

Our comments on the CER are provided within the broader context of WWFs freshwater work and from the perspective of a healthy St. John River, from the headwaters in Maine (US) and Quebec to Saint John (NB), where it empties into the Bay of Fundy. The following begins with general comments regarding the process as outlined in the CER, followed by commentary on the scope of the project, methodology and then wraps-up with some input on the Valued Components (VC's).

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CER Process

The CER process appears to provide a comprehensive approach to a company driven public review of the three options for Mactaquac. This is no small task and represents a new approach for large scale projects in the region, possibly nationally. This effort brings increased expectation and attention to the authenticity, transparency and accountability for all involved. Engagement of a variety of stakeholders and rights holders is a key component of this process and requires further clarification to be truly meaningful. Public meetings, open houses, dialogue and solicitation of input through a variety of means and activities will provide the public with the opportunity to provide feedback. Unless feedback is responded to in a clear, concise and consistent manner, it doesn't qualify as meaningful engagement – it is simply receiving feedback. The development of a two-way conversation is imperative to ensuring the process is truly authentic and transparent by NB Power for the residents, stakeholders, and rights holders.

The CER process indicates that the CER report (draft) will include "Preliminary Results of Other key Component Studies". It has been indicated on a number of occasions (St. John River Community Liaison Committee and through personal communication with NB Power employees) that this will include a socio-economic analysis, yet there are no direct indications of what and how such analysis will be incorporated into the CER report. A socio-economic analysis is a significant piece of work that requires careful consideration and the hope is that it will be clear in the draft CER what components have come from the analysis or "Other Component Studies". In addition to this, it is hoped that these studies will be made public.

Scope of the CER

There is no clearly defined geographical scope identified for the CER. Reference is made to the physical location of the dam and a map of the region is included, which covers Grand Lake to Meductic (approximately). Reference is made to the headpond and it covering of an area 87 km^2 between the dam and Woodstock. It is known that the dam caused surface water inundation upriver as far as Hartland. Based on this, one would expect the scope of the CER would encompass the whole region that was physically impacted by the Mactaquac dam –the headpond and associated tributaries (Mactaquac stream, Nackawic Stream, Pokiok Stream, Eel River, Shogomoc Stream, Eel River, Bulls Creek, Meduxnekeag River (including US portion)). The downstream boundary is a little more arbitrary, although the Grand Lake / Jemseg area would appear to be sufficient, mirroring the area encompassed in the Mactaquac Aquatic Ecosystem Study. Given the nature of some of the Valued Components, i.e. those that transcend the immediate Mactaquac region, a case can be made for having the scope for the CER be the whole river and its associated watershed. Connectivity, flow, and a diversity of social, cultural, economic and historical values are associated with the whole river and as such need to be addressed at the broadest scale possible, namely the whole watershed.

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Methodological Gaps

It is not possible to tell from the report how the VC's were identified – there is no reference to a methodology, best practices or comparable regime for how the VCs were identified. As a result, it is difficult to provide a complete review.

The guidelines indicated that both qualitative and quantitative data will be used in the environmental assessment. Both are justified and need to be considered in an appropriate and balanced fashion. Further to this, it is imperative that existing standards, benchmarks, and baselines be used as appropriate references, to allow for as accurate a comparison of the VCs as possible, leading to a better understanding of the benefits and trade-offs associated with the options being reviewed. Without the appropriate baseline information it is impossible to make a determination of impact, unless extensive modelling occurs.

Given the history and cultural significance of the St. John River to the Wolastoquiyik (and other nations) it is unclear how Traditional Ecological Knowledge will be included as valued input and reflected in the VCs.

Valued Components (VCs) in the CER

There are some significant gaps in the VCs outlined in the CER. They include a lack of acknowledgement of the fishes, tidal effect, access, connectivity, uses, energy, climate change, and cumulative effects to the environment.

Some possible VCs to address the fish related values include: spawning, feeding breeding sites; populations/communities of aquatic species; and sports, commercial, subsistence and cultural fisheries

Given the proximity of Mactaquac to the upper limit of tidal effect on the St. John River, and the "appropriate" geographical scope of study, VC's around intertidal and marine habitat should be included in the CER.

Access to, and along the river for wildlife, terrestrial and aquatic species, not to mention humans (either separately or as part of the transportation VC) should be included.

The Land and Resource Use VC appears to be quite limited in scope and could be enhanced by specifically including farmland / agricultural land use as a key issue. Gravel extraction and further refinement of the "resource" category would be useful. Distinguishing between different ownerships in relations to this VC will be an important aspect of the analysis.

On the energy front, it is not obvious from the CER how future energy needs will be estimated and incorporated. There is no indication of the sustainable renewable energy potential (all forms) at a provincial, or regional scale. A VC that addresses this would identify the low impact hydropower electricity generation potential and the integration potential for other forms of renewable energy

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technologies (i.e. wind), bringing clarity to the broader energy generation situation. This can be linked with how each of the options will impact energy projections and capacity over the long-term.

Given the changing climate and our experiencing certain threats (flooding and other extreme weather events) within the watershed, all the VCs should be evaluated under a changing climate regime.

Finally, VCs are always subject to cumulative effects, both historical and potential future effects. It is therefore important to include this concept in the analysis of VCs. There are a number of instances where this has been explored recently (the Joint Review Panel for site C had some commentary on this) and as such should be incorporated into the CER.

Thank you for the opportunity to provide input on the CER. WWF-Canada looks forward to seeing this information being incorporated in the analysis. If you require further information or clarification on these comments please contact Simon Mitchell at smitchell@wwfcanada.org or (506) 238-4429. WWF looks forward to our continued involvement in the process, as we collectively work to ensure a healthy St. John River for people, species and habitats.

Best regards,

Simon J. Mitchell

Simon J. Mitchell

WWF Canada, St. John River Advisor

2016 02 22

MACTAQUAC country
CHAMBER OF COMMERCE
"Your Business Link"

February 22nd, 2016

George Porter
Project Director, Mactaquac Project
NB Power
515 King St
P.O. Box 2000
Fredericton, NB E3B 4X1

Dear Mr. Porter,

There has been a lot of interest and activity relating to the Mactaquac dam, generating station and the headpond. The Mactaquac Country Chamber of Commerce (MCCC) polled its members, and local community, to capture the perceived impact of the options being considered by NB Power on these people and their businesses.

The MCCC sent out 93 surveys and received a response from 21.5% of those surveyed. The MCCC thought it useful to share the results with NB Power.

If you have any questions or would like to discuss the results, please do not hesitate to contact the MCCC at your convenience.

Sincerely,

Melanie Sloat

Melanie Sloat
President, Mactaquac Country Chamber of Commerce

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MACTAQUAC country

CHAMBER OF COMMERCE

"Your Business Link"

Survey: Mactaquac Dam Project

Q1

Do you live on or near the headpond?

Answer Choices	Responses
0km to 2km	45.00% 9
2.1km to 5km	10.00% 2
5km +	45.00% 9
Total	20

Q2

Is your business located on or near the headpond?

Answer Choices	Responses
0km to 2km	52.63% 10
2.1km to 5km	5.26% 1
5km +	42.11% 8
Total	19

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MACTAQUAC country

CHAMBER OF COMMERCE

"Your Business Link"

Q3

Do you care about the outcome of the Mactaquac Dam Project and why do you feel this way?

Answer Choices	Responses
Yes	95.00% 19
No	0.00% 0
Indifferent	5.00% 1

Total Respondents: 20

Comments (13) -- respondents were asked to provide comments

Comment 1: The dam is now an established part of the region and to have it removed would create a mud flat that would take another 50 years to stabilize. I think it is sad that the Atlantic salmon numbers have almost disappeared, but the numbers are going the same way on the Miramichi, so perhaps the dam has had little effect on that. For the people who have purchased and built on the water, the loss of the dam would be devastating both aesthetically and financially. If the cost to remove and restore is the same as to refurbish, it's a no brainer, they must rebuild.

Comment 2: The recreational aspects of the headpond are very nice. It is nice that it is a source of clean energy, would not want to lose this.

Comment 3: Because it can drastically impact our province and the region I live and work in. Both financially and aesthetically.

Comment 4: it is inexpensive renewable energy

Comment 5: It is a land mark attraction that was instrumental in setting up business and living here some 30 + years ago

Comment 6: concerned about the environmental effect with all three options

Comment 7: Hundreds of thousands of dollars have been spent by government and private enterprise to promote the headpond as a draw for visitors to the area, scenic sporting, camping golf fishing, none of which can be done in a bog

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Answer Choices	Responses

Comment 8: Yes, it is a source of environmentally friendly power generation. Many homes have been built around the headpond since the headpond inception, and in fact we are just beginning to see tourism and boating increasing around the headpond.

Comment 9: My family is 5 the generation on river/ head pond. Dam led to total loss of husbands families farm,store,garage, owned by family in addition to my own father losing all his interval farm land. We have survived and thrived by completely rebuilding our lives and business since 1967 to take advantage of the beautiful heapond. I currently own and operate Great Bear Camping, maple sugar bush (albeit a much smaller operation than before dam), and a managed wood lot. My children and grandchildren plan to take over business in the next 2 years. Our family could not and would not start over if they drained the dam. The current economy in the province us insufficiently robust for us to start from scratch.

Comment 10: I live on head pond and enjoy its beauty and recreational value. Would be environmental disaster to drain headphone. We need the power generated by the dam. To think that removal would restore to original condition is absurd. Where would AV Nackawic get enough water to operate and disposal of waste water would be all the flow in the river.

Comment 11: Environmental, Aboriginal rights, residential and provincial business/economic related issues

Comment 12: Important for not only tourism potential of the Province but also for the environment

Comment 13: This is where I live. This is also where I work.

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Answer Choices	Responses

Q4

How important is the headpond? (Select an option and please explain)

Answer Choices	Responses
Very Important	70.00% 14
Important	25.00% 5
Somewhat Important	0.00% 0
Not Important At All	0.00% 0
Not Sure/Not Applicable	5.00% 1
Total	20

Comments(10) – respondents were asked to provide comments

Comment 1: For all the reasons mentioned in the previous reply.

Comment 2: Nature had adapted since the change after the dam was build. Emptying the headpond would be devastating for all the people living along the river.

Comment 3: How will things look here now if they let it all go? Will our beautiful scenery turn into a muddy, yucky mess? What about the sacrifices and impact to our older generation that sacrificed and gave up to make this project happen in the first place.

Comment 4: it is a beautiful recreational area, it is established land a right away is owned by the people

Comment 5: not only does the headpond create a great recreational area for all seasons, but it is a great tourist attraction. Draining the headpond would have far reaching consequences. With the silt and debris laying on the bottom rotting, the smell would be very strong when drained. Many people have built on the headpond and would find much bare ground between their property and the water.

Comment 6: The head pond has become a natural wildlife habitat for fish, game, and birds. It has

Answer Choices	Responses

established its own eco system and we should be very conscious about the destruction this part of our province.

Comment 7: As per my note above.

Comment 8: Same as in question 4

Comment 9: Housing, tourism, environment concern, power

Comment 10: I have lived here on the river for 62 years. I am six generations on this farm. We have a lot of history. We are still feeding people.

Q5

Which of the 3 options by NB Power do you feel is the most feasible?

Answer Choices	Responses
Option 1: Restoring the river. This option means draining the head pond and removing the powerhouse, spillways and the earthen dam, allowing nature to bring the river back to a natural flow.	**0.00%** 0
Option 2: Retain the headpond. Building a new spillway on the opposite side of the river from the existing ones, maintaining the earthen dam and decommissioning the existing concrete structures leaving the head pond intact. This option means there would be no ability to generate electricity at the station.	**11.11%** 2
Option 3: Repower. Repowering the station with a new powerhouse and spillway and maintaining the existing earthen dam. This would most likely mean building a new powerhouse and spillway on the opposite side of the river from the existing ones.	**88.89%** 16
Total	18

Comments(12) – respondents were asked to provide comments

Comment 1: Need for energy. We can't go back to the way things were 50 years ago

Comment 2: From my understanding all 3 options carry about the same price tag, so the ability to produce power makes the most sense.

Answer Choices	Responses

Comment 3: Love to see the continuation of the headpond. Love to see the continuation of clean energy.

Comment 4: all the investment, it may not be a disaster if SNC Lav. is not involved

Comment 5: 2 or 3 are the same from a landscape perspective 3 depends on the need for power and the other competing sources - a business decision

Comment 6: I feel it has the potential to bring it back around. Hydro electricity is still quite inexpensive.

Comment 7: With option 1 there would be only a small handful of people who are now in their 30'2 and 40's who would live long enough to see a recovery of the area. Those older than that would not see it at all. Those who remember what the river was like before the damn do not necessarily want this again, as there were some areas of swamp.. Government would lose the taxation revenues from the large homes , as the owners whose properties are so highly valued as waterfront property would not agree with the continued high assessments and property taxes There would be a decrease in population as people move from the area. Many of the properties on the head pond which would far exceed the re-appraised. value resulting from the loss of "waterfront" this would in turn lead to bankruptcies and the possibility of class action law suits between government and mortgagors / mortgagees. Option 2: There would be a revenue loss from the generating plant while continuing with the cost of maintaining the structure. a no win situation Option 3: There is an opportunity to recover some of the cost through the continued generation of clean electricity while continuing to collect property tax revenues at the same and(higher) as currently in place. Eventually

Comment 8: This choice maintains the head pond,generation of clean energy, investment in many short term and long term jobs, and is the option that is least likely to be reversed in the future. Although Option 2 maintains the head pond, it could too easily be a stepping stone to option 1 .

Comment 9: Need to do further reading and research before I decide

Comment 10: Either option 2 or 3, as long as we keep the headpond

Comment 11: Makes much more sense. this should address problem with the concrete

Comment 12: We have a new Eco system on the river. We need the power from the dam.

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MACTAQUAC country

CHAMBER OF COMMERCE

"Your Business Link"

How would each of the outcomes affect your business?

Response 1: Will be affected if people leave the area

Response 2: There would be very little impact on our business.

Response 3: Would not affect my business.

Response 4: Our property values could decrease!

Response 5: It is just common sense, to maintain independence of electricity we should shut down our windmills before we close a hydro dam

Response 6: Option 1 would remove the attractiveness of living here and thus keeping the business here

Response 7: Higher electrical costs would mean product costs rising.

Response 8: Being a distance from the headpond, it would not have a direct or immediate effect, however, it would mean a decrease in tourism which means that small businesses which rely heavily on the travelers would indeed suffer financially.

Response 9: Regulations for water, viability of Land that may be reclaimed from the headpond and question of its contamination

Response 10: Option 1 would put my family out of business. My family arrived on this land in 17 80s as United empire loyalists.

Response 11: Don't think any of the outcomes would impact my business. However one possible impact would be the type and cost of electricity (from a sustainable source)

Response 12: Not much

Response 13: We lost our best farmland in 67. It would now be a large mud flat.

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"Your Business Link"

Q7

How would each of the outcomes affect you personally?

Response 1: Affect me on a recreational level Property value will drop. Businesses that require the water will close up shop and jobs will be lost

Response 2: For the beauty of the area to recover from restoring the river to its natural state before the dam would take years, and I'm not sure it would ever get back to what it was.

Response 3: Will miss the beach, marina, the headpond.

Response 4: Option 1 would remove the attractiveness of living here and thus keeping the business here Consider moving

Response 5: I like the beauty as it is.

Response 6: Compassion, empathy for those who are in the path of destruction.

Response 7: Depreciate our home value due to loss of view and access to the water, ground originally expropriated and would we as previous landowners reclaim or would it be accessible for sale and who would end up with the land and then compete or object to our current farming community.

Response 8: Option 1 would be devastating to me personally as my reason for working hard every day is the legacy I want to leave my children and grandchildren.

Response 9: Same as previous question as I have a home based business.

Response 10: Draining the headpond would be an environmental disaster

Response 11: Not sure.

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MACTAQUAC country

CHAMBER OF COMMERCE

"Your Business Link"

Q8

Do you feel you have adequate information on each of the options for the Mactaquac Dam to make an informed decision?

Answer Choices	Responses
Yes	63.16% 12
No	36.84% 7
Indifferent	0.00% 0
Total	19

Comments(8) – respondents were asked to comment

Comment 1: I've only heard what was in the news, so there is always a lot more to the story.

Comment 2: Need more info about each option, the cost and potential impact.

Comment 3: This may be forthcoming and what information do we as citizens and businesses need and when we need information is unclear Anyone thinking of investing in anything related to the landscape/view would likely wait or go elsewhere

Comment 4: reading, watching , listening and observing

Comment 5: Any move to drain the head pond, and it's devastating impact, is easy to understand.

Comment 6: Have not yet read all the way information and positions available.

Comment 7: Have not seen the data and cost behind each option

Comment 8: Need more info.

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"Your Business Link"

Answer Choices	Responses

Q9

Do you feel that there has been adequate consultation with the public on the Mactaquac Dam Project?

Answer Choices	Responses
Yes	23.53% 4
No	64.71% 11
Indifferent	11.76% 2

Total Respondents: 17

Comments(7) – respondents were asked to comment

Comment 1: I'm not a major stakeholder, other that the electricity in my home and business, so there are many who will be impacted much more than me. My electricity will go up regardless, but at least if the generating ability is maintained, there is a means to pay for some of the expense.

Comment 2: Do not really know

Comment 3: Most people will tell you that there is never enough consultation. It could go on for years and the possibility of any government actually heeding the advice from local constituents is not great. Consultants are brought in from other areas of North America on a jet plane, paid several thousand dollars to express opinions about something in which they have no vested interest.

Comment 4: NB Power hasn't provided enough accurate financial information. Much of what we hear is from lobby groups.

Comment 5: Everyone who has built their lives here is still too scared to even ask questions or even envision the impact losing the head pond would have on our lives. Those who lived through the creation of the head pond, still find it unbelievable there could seriously be looking at draining the river after all we were forced to go through.

Comment 6: There has been one information meeting in my area and unfortunately I was away for work so I was unable to attend. Would like to see a better communication strategy and additional information sessions

Comment 7: I have more questions. Also we were lied to in the early sixths.

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2016 03 13
Also 2016 05 31

New Brunswick Salmon Council
P.O. Box 533, Fredericton, NB E3B 5A6

Conseil du Saumon Nouveau Brunswick
C.P 533, Fredericton, NB, E3B 5A6

13 March 2016

Mr. Gaetan Thomas
NB Power
515 King Street
PO Box 2000
Fredericton, NB E3B 4X1

SUBJECT: Position on future of Mactaquac dam and participation in community meetings

Dear Mr. Thomas:

The New Brunswick Salmon Council (NBSC) has reviewed the three options on the future of Mactaquac dam put forward by NB Power. We have taken a position on the issue that is consistent with our policy on hydroelectric dams and river obstructions, a long-standing policy that was adopted from the Atlantic Salmon Federation (ASF).

Given our policy, the major concerns we have for wild Atlantic salmon on the St. John River system and the documented significant effects of hydro dams on their upstream and downstream migrations, the NBSC supports Option 3: the removal of Mactaquac dam and restoration of the St. John River. Our organization, which represents a province-wide contingent of local angling and conservation groups, finds it particularly encouraging that dam removal and river restoration is on the table as an option.

We understand that during April and May, 2016, NB Power will conduct community meetings on an open and invited basis. The NBSC requests to present our position on an invited basis at these meetings.

Thank you for your time and we look forward to open dialogue as the decision-making process moves forward.

Sincerely,

Debbie Norton
President, New Brunswick Salmon Council

Cc: Hon. Donald Arseneault, Minister, Department of Energy and Mines
Ed Barrett, Chairman, NB Power

The New Brunswick Salmon Council (NBSC) is a non-profit, volunteer-based organization, dedicated to protecting wild Atlantic salmon and supporting restoration and enhancement activity on all watersheds in New Brunswick (NB). The NBSC is comprised of, and represents, 31 affiliated salmon angling/conservation organizations throughout New Brunswick.

Policy - Hydro and River Obstruction

Policy: Hydro and River Obstructions

Adopted by NBSC at the Dec. 8th, 2013 Board Meeting.
RESOLVED – November 11, 1999 (Joint Board of Directors, of ASF):
1. ASF will actively oppose at the local, provincial or state level, dams or other projects which impede natural fish passage in rivers, or which would reduce, diminish or damage existing salmon habitat.
2. The ASF will seek removal of existing dams and impoundments that harm existing and historic Atlantic salmon waters, especially those that are not economically defensible, and will promote the restoration of presently degraded sites.
3. Where it is not presently feasible to remove dams, the ASF will work cooperatively with industry partners to insure safe and efficient upstream and downstream passage is provided for salmon.
4. The ASF will join with other partners to promote energy conservation and environmentally friendly electricity generation methods as alternatives to building new hydroelectric dams.
5. The Atlantic Salmon Federation will advocate that all proposed hydro projects, and any existing hydro projects that are scheduled for re-licensing, be subjected to a full environmental review. In areas where licenses are not presently required for construction or operation of hydro dams, ASF will work to see license systems are adopted, that the licenses are issued for a fixed term, and that renewals are contingent upon an acceptable environmental review.
October 19, 1999

Message from Our President

Debbie Norton - President of the NB Salmon Council

From The Moncton ASF/NBSC Dinner March 2015

There are many avid anglers in the room tonight which will ply their talents angling for wild Atlantic salmon in 2015. Some will be successful in landing their trophy salmon and others will have not. The adventure in salmon fishing is not confined to the actual catching of the salmon but the journey that gets you to the salmon. I would encourage each and every angler to take the time to drink in the tranquility of their experience. The mist on the water, the rushing of the rapids, the pungent smell of smoke wafting from

your shore fire and yes the unforgettable thrill of the take for those that the salmon gods bestow their privilege.

There are many factors affecting the plight of our salmon. It is paramount that all unite and work diligently towards restoring wild Atlantic salmon in numbers to our native rivers. It is time that all stop laying blame. I am asking that each and everyone of us roll up our sleeves and work diligently on factors where we can make a difference.

As anglers we must insure that we continue to have the privilege to enjoy going to the river and casting on the water in anticipation of the take. We must push for the management of harvest based on abundance. We must insist on rivers staying open for angling with catch and release where necessary and we must insist on a new vision for management where currently existing rivers that are closed be reopened for catch and release angling. Ethical anglers on the water will not hurt the salmon and will go a long ways towards their protection. We are at an epic point in history in the survival of wild Atlantic salmon in New Brunswick. We can all decide to work
together and save this wonderful species of which so many of us so dearly love.
I reach out to you today and beseech you to join us in our battle to save our salmon.
You can make a conscious decision today to move forward and become part of the solution, for if we are not part of the solution, we may be part of the problem.

May the 2015 season be one where we see progress in addressing declines
and a stepping stone to the restoration of abundant numbers of salmon to their native rivers.
Good luck and bon chance with your 2015 angling experiences.

Debbie Norton, President

New Brunswick Salmon Council Inc

Turnbull, Brenda

From: Thomas Abello <tabello@TNC.ORG>
Sent: Friday, 27 May, 2016 6:09 PM
To: Mactaquac Project
Cc: Nobes, Deborah
Subject: CER Comments for the Mactaquac Dam - The Nature Conservancy and TNC Canada

Importance: High

The Nature Conservancy
Protecting nature. Preserving life.™

May 27, 2016

Mr. Gaëtan Thomas, President and CEO
Mr. George Porter, Project Manager
New Brunswick Power
515 King Street
Fredericton NB,
E3B 4X1

RE: The draft Comparative Environmental Review for the Mactaquac Generating Station.

Dear Mr. Thomas and Mr. Porter:

On behalf of The Nature Conservancy and TNC Canada, we appreciate this opportunity to provide comments in regard to the draft Comparative Environmental Review for the Mactaquac Generating Station.

The Nature Conservancy's Interest

The Nature Conservancy is a science-based organization working to impact conservation in all 50 US states and 69 countries to conserve the lands and waters on which all life depends. The Conservancy has been working across the border from New Brunswick in the State of Maine for nearly 60 years where we are the 12th largest landowner in the state, owning and managing nearly 300,000 acres. The Conservancy works throughout Maine with communities to restore rivers and streams to support healthy fish populations and with commercial fishermen in the Gulf of Maine to rebuild groundfish populations.

The Nature Conservancy has worked in Canada for nearly 40 years primarily in the Great Bear Rainforest, across the Boreal Forest, and, in partnership with US chapters, along the southern border. TNC Canada, a Canadian charity affiliated with The Nature Conservancy, was established in 2014, is headquartered in Toronto and builds on the Conservancy's long history of conservation achievements in Canada. Our mission is to conserve the lands and waters on which all life depends. We bring innovative solutions, local partnerships and

global experience to Canada's vast conservation opportunities. Recognizing that people and nature are interdependent, we believe that healthy communities and economic prosperity are integral to achieving sustainable, large-scale conservation results.

The Mactaquac Generating Station is the lowest dam on the Saint John River, the largest tributary to the Gulf of Maine. The Dam is just 70 kilometers east of the Maine border with the impoundment as close as 15 kilometers. The Nature Conservancy is the second largest landowner in the upper Saint John River watershed in Maine and has a substantial conservation investment there encompassing more than 70 miles of the river and 160,000 acres of forestland. The Conservancy has a long-term commitment to the conservation and restoration of the health, diversity and productivity of those waters for the benefit of ecological and human communities.

As the single largest source of freshwater to the Gulf of Maine, the Saint John River plays an important role in the function of that marine ecosystem as well and holds the greatest potential to affect both diadromous and offshore fisheries in the region. The Mactaquac Generating Station dam blocks 10 sea-run species that historically migrated into the Saint John River watershed, including the Atlantic salmon and shortnose sturgeon, federally-recognized endangered species in the United States, and the Atlantic sturgeon which is listed as threatened in the US. The loss of the diadromous fish species that use this system not only impacts the Saint John River itself, but also its major tributaries downstream of Grand Falls, such as the Aroostook and Meduxnekeag Rivers whose watersheds lie largely in Maine. The Nature Conservancy is actively working to identify and remove barriers to fish passage in the Aroostook and Meduxnekeag watersheds. The future of the Mactaquac Generating Station will have a significant bearing on the success of sea-run fish restoration efforts in these two rivers specifically.

The Nature Conservancy works globally with governments, industry and stakeholders to implement an approach to water-energy solutions we call "Hydropower by Design," (http://www.nature.org/ourinitiatives/habitats/riverslakes/hydropower-by-design.xml). This approach guides the Conservancy's work with interested parties to evaluate dam placement and design at a watershed scale and to collaboratively develop approaches that satisfy ecological, energy and community outcomes.

In Maine, The Nature Conservancy is working with partners including the United States government and the Penobscot Indian Nation on the Penobscot River Restoration Project, the largest river restoration project in North America. Using the principles of Hydropower by Design, a combination of targeted hydropower development and upgrades coupled with dam removals and fish passage enhancement, the existing energy output of the hydropower generation system on the lower Penobscot River was maintained while extensive portions of the ecosystem (more than 1,000 miles) have been opened to migratory fish, greatly enhancing those fish populations and the inland, estuarine and offshore ecosystems and human communities they affect.

The Nature Conservancy and TNC Canada's Recommendations:

As we understand it, New Brunswick Power is considering four options for the end of service for the Mactaquac Generating Station. They are:

- Option 1, Repowering;
- Option 2, Retain the Headpond (No Power Generation);
- Option 3, River Restoration; and

Option 4, Project Life Achievement, re-enforcing the existing dam.

Given our interest in restoring migratory fish in the Saint John River Watershed, our primary interest in the Mactaquac Generating Station decision process is to ensure that whichever option is chosen uses the best available science to address improved fish passage while taking into account non-carbon energy production and socioeconomic benefits in the watershed as a whole. To that end, the Conservancy offers our science and experience to help find an optimal outcome for energy generation and ecosystem condition, using river basin scale evaluation of potential hydropower development and aquatic ecosystem impacts. This approach is

especially appropriate when one entity has authority over all the dams on a waterway, as New Brunswick Power does on the Saint John River. As part of our interest in advancing clean energy solutions while meeting other ecological, economic, and social goals, we are interested exploring how this approach might be helpful in the Saint John watershed.

Comments on the Comprehensive Environmental Review

The Nature Conservancy and TNC Canada offer the following specific comments on the Comparative Environmental Review (CER). By further addressing these comments, we believe the strength of New Brunswick Power's final decision on the project will be improved:

- Generally speaking, the CER is short on details for each option and does not address potential alternative design choices within each of the three options presented that might offset negative effects. Further, in taking a basin scale approach (as in Hydropower by Design) further options could be explored outside of the immediate project area that could offset either power generation loss or ecosystem impacts at Mactaquac.
- It is important to note that if Option 3 were chosen there would be no barriers to fish passage as far inland as Beechwood, opening the entire Meduxnekeag River basin, which includes many kilometers of good habitat for multiple diadromous fish species. It would be helpful if the CER provided a baseline estimate of the number of kilometers of habitat that would be made accessible under Option 3.
- The CER states that currently the only species of diadromous fish for which upstream transportation is provided are Atlantic salmon and gaspereau (alewife and blueback herring). However, the Saint John River provides very important habitat for several other species of diadromous fish. The needs of Atlantic and Shortnosed Sturgeon, American Eel, Striped Bass, and American Shad in particular should also be taken into consideration. Target restoration objectives for these species should be identified for each option, along withestimates of the commercial and sport value that restoration of these species could generate.
- Fish passage both upstream AND downstream should be addressed in planning for Options 1, 2 and 4, and the costs of providing effective passage should be taken into consideration in the comparisons of various options.
- Fishery studies, as indicated for Water Resources Valued Components of the Final Guidelines document, only appear to address change in available habitat, expected mortality in the project phase, and species of concern (but does not state which species will be evaluated).
    - Will studies evaluate expected change in all fish species, populations, productivity, or use for each option?
    - Will the value (or loss) of these fisheries be evaluated for each option?
    - Will there be enhanced fish passage for each option, for which species, and if so by what means?
    - What fish passage designs are being evaluated?
    - Will the designs consider both upstream and downstream passage?
- The CER does not address the considerable habitat effects of the headpond as a barrier to riverine species. Specifically, salmon smolt swimming downstream to the sea find it difficult to navigate in such slow moving bodies of water and are extremely vulnerable in their passage through that water to predation. Similarly, how does flow management downstream of Mactaquac act as a deterrent to fish passage and how might that be impacted by the Options?
- The scale of the economic and social analysis would be more useful and informative if it extends beyond the immediate area of the dam and headpond. As an example, with greatly enhanced access to upstream habitat for multiple species, there could be major increases in sport and commercial fisheries opportunities with important economic and social values extending from the Bay of Fundy and Gulf of Maine well upstream into the watershed.

- The Mactaquac Aquatic Ecosystem Study has not yet been completed. This should provide important information relevant to the decision and may also inform the economic and social analyses. We recommend not committing to one option or another until this study is complete and there has been an opportunity for peer and public review of it.
- The CER should address how each of the options for the Mactaquac Station would affect future facility operations elsewhere in the watershed (e.g. operational changes at upstream generation stations, flow regulation, fish passage)?
- Will the CER be amended to include an evaluation of Option 4, Project Life Achievement, considering the effects this option will have on Valued Components identified for Options 1-3 for both the construction and operational phases?

Once again, we thank you for the opportunity to comment on the Comparative Environmental Review for the Mactaquac Generating Station. The Nature Conservancy and TNC Canada welcome the opportunity to continue to offer our knowledge of the status and condition of fisheries in the Maine portions of the watershed and our experience in basin-wide planning approaches to hydropower to New Brunswick Power as it continues to weigh options in this important decision making period. Please let us know if we can be of service.

Sincerely,

Kate Dempsey, State Director, The Nature Conservancy in Maine

Hadley Archer, Executive Director, TNC Canada

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Director of External Affairs

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14 Maine Street
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2016 05 31

From: Samuel Arnold [mailto:samarnold3@gmail.com]
Sent: May 30, 2016 5:36 PM
To: Nobes, Deborah
Subject: Mactaquac dam submission from SEG

WOODSTOCK

Hi Deborah Nobes:

Attached is the submission from the Sustainable Energy Group on the Mactaquac Dam Project. We trust that it will be carefully considered along with the other numerous submissions that you will have received by the May 31/16 deadline. We don't envy the job that lies ahead for NB Power!

We are pleased to have been able to take part in the public engagement process, and are looking forward to learning what the decision by NB Power will be in the coming months.

Regards,

Sam Arnold, Coordinator
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Submission to the NB Power Commission on the Future of Mactaquac Dam

Woodstock Sustainable Energy Group
May 29, 2016

Introduction

From the time NB Power made the announcement in 2013 that the Mactaquac generating station will become unusable by 2030, the Woodstock Sustainable Energy Group (SEG) has been following the research and the decision making process on the future of the dam. In addition, Transition Town Woodstock (TTW), of which SEG is a project, has taken a lead role in hosting information forums on the future of the dam in our home community.

Between May of 2014 and March of 2016, TTW hosted three Public Forums at the Woodstock campus of New Brunswick Community College, one with Gordon Yamazaki concerning the biophysical research on the river system above the dam, and two with George Porter and Deborah Nobes on the overall nature of the problem with the dam and on the process of decision making on the dam's future. These Forums have been well attended with significant audience participation during question and discussion times.

We have published information commentaries in the Woodstock Bugle-Observer and we have encouraged citizens to access the Mactaquac Project website for more information and to complete the public participation survey.

SEG's Orientation on Energy Planning

SEG's role in facilitating public engagement with the NB Power's Mactaquac Project stems from its commitment to advancing the transition to renewable energy. Representatives of SEG have held discussions with senior staff of the Power Commission on several occasions with regard to integrating the whole menu of renewable energy technologies now available into an energy transition plan for New Brunswick. SEG was invited by the Power Commission to participate in a stakeholder engagement session on long-term energy planning.

In 2011, SEG prepared a sixteen-page submission for the Energy Policy Commission that was appointed by government to develop a 10-year energy-planning scenario. SEG's submission proposed that a 30-year planning timeline be established in order to adequately take into account the full impact of the innovations in renewable energy that are rapidly developing. Our submission laid out a planning scenario for New Brunswick's transition to a highly secure, distributed generation and smart grid electrical power system based on renewable energy technology. Our

submission included elements of a financing strategy that has been proven to work well in other jurisdictions.

In the five years since we made this submission, the speed with which renewable energy technology has penetrated the field, and the rate at which its comparative costs are falling, has confirmed SEG's view of energy planning for New Brunswick.

Public Engagement on the Future of Mactaquac Dam

SEG has been studying the problem of Mactaquac dam within this context for the last three years. Considering that the dam is a source of renewable energy, rebuilding the generating station seems like a logical decision. We have heard people in our region describe this decision as a "no-brainer." Some people think it should be viewed as simply an engineering and energy supply problem and a decision should be made accordingly.

We are grateful that leadership within the NB Power understands there is a wider and more complex context of factors involved, and that they have allowed time for citizen consideration and engagement in the decision making process.

Some people in our region think the public engagement process is a sham, and the Power Commission is just setting the stage for a decision already made. We have argued against this view. We accept the public engagement process as a genuine effort to make a decision that takes all pertinent factors into account – energy planning, ecological integrity, economics and finance, and social and cultural values. Otherwise, the millions of dollars spent on biophysical and sociocultural research and on alternative option engineering studies makes no sense.

Members of SEG have attempted to consider all the factors involved with a decision on the future of the dam. However, we have been somewhat hampered in our deliberations by not having up-to-date cost estimates for each of the three options being proposed by the Power Commission. We have asked as recently as March 29th of this year for at least "ballpark" estimates on comparative costs, but were told this information was not available for release.

Cost Estimates on Decision Options

We assume that by this time the Mactaquac Project has definite cost estimates on the three options proposed, but for some reason is unwilling to release them. We recall that at the beginning of this process the estimate for reconfiguring the dam and replacing the generating station was put in the range 3 to 5 billion dollars.

We think it fair to assume the estimate has now gone higher, and this, perhaps, is the reason the figures are being withheld. If so, this is unfortunate because it compromises public engagement

and makes it difficult for a citizen's group like SEG to make a fully informed contribution to the deliberations. With all this in mind, however, members of SEG have come to a point where we can offer the following observations and considerations.

Three Primary Considerations

First, retaining the dam and building a new generating station appears to be the most expensive option. By the time a new generating station would be up and running in 2030, other forms of renewable energy technology will have certainly made huge advances in application, efficiency, and cost reduction.

Can an investment of billions of dollars be economically justified when by 2030 other renewable energy systems will be able to produce the equivalent power at a fraction of the cost? Another way to look at this is to ask: "Would it make economic sense to build Mactaquac dam today if we were starting fresh?" The answer is almost certainly "No."

From the rapidly mounting evidence, it is now increasingly clear that widespread, medium and small-scale renewable electricity generation hooked up through an interactive smart grid is the wave of the future. From our conversations with NB Power personnel, we know the Commission understands the implications of this trajectory, and what its impact will be on the business models for generating and distributing electricity.

Given these circumstances and the rate of innovation in the field, it is hard to see how retaining the dam and building a new generating station makes sense from a financial investment point of view.

Second, if the generating station is not replaced, should NB Power spend billions refurbishing and then maintaining the dam in perpetuity for the recreational benefit of keeping the headpond in place? Those who have homes and boats on the headpond, those with real estate holdings on the headpond on which they hope to capitalize, and a small group of bass fishermen would like to see it retained. But should the citizens of NB, either as ratepayers or as taxpayers, foot the bill for refurbishing the dam and maintaining this amenity for their benefit? How could such an inequitable arrangement be justified?

We have heard the question raised as to whether controlling the river flow in flood times is a sufficient rationale for retaining the dam. Again, we have to ask whether building such a dam for this purpose would now be under taken? From an investment point of view, the answer is almost certainly no. The history of Mactaquac dam as a flood control facility has not been a matter of preventing floods but a question of who gets flooded and to what extent. Rivers in this part of the world naturally flood with each spring breakup. Human settlements on floodplains have to prepare to deal with this.

We also understand that the sewage treatment facilities at Woodstock and Nackawic have been designed and built within the context of the current headpond water level, and that if the water level were lower they would have to be modified. Again, this seems an insufficient reason for retaining the headpond. Readapting sewage treatment facilities would be a onetime expense and, under the circumstances, municipalities should be provided with subsidies by NB Power and/or government to handle the changeover.

Third, if the dam is taken out and the St. John River returns to its original channel, will it once again become the beautiful and bountiful river it once was? Will the salmon return? There is some question about this. With climate change, NB rivers are becoming warmer and salmon need cold water.

But again, they might show up. Breaking news is encouraging; after habitat restoration, salmon have now returned to the Connecticut River system and are spawning for the first time in 200 years. The Connecticut is certainly warmer than the St. John. So there's a reasonable hope that the salmon would come back and an economic and cultural resource of the central valley region would begin to be restored.

The Mactaquac Project website shows that if the dam were taken out, 13,000 acres of land would again be available for human and wildlife use. Some of this land is the best agricultural land in the province and would again be available. Studies show that the river's islands and intervals under the headpond have not eroded away. They are pretty much intact.

Experience with dam removal elsewhere shows that the newly exposed land is rapidly reclaimed by vegetation. Within a year grass cover appears and the plant succession back to rich wetlands or woodlands steadily proceeds. This reclaimed land would be a good set up for the careful management of highly productive agricultural and woodland environments with accompanying livelihood and job creation potential.

Taking out the dam would be an important biophysical and geographic experiment. It seems reasonable to expect that the long-term benefits of a restored river valley would steadily accrue over time and would become a major economic and cultural success story. It would certainly be a major transition of great scientific interest.

Taking out the dam will also be enormously expensive, but the investment would at least be offset by the long-term economic potential of a restored river valley. Dams have a life expectancy. If rebuilt, another generation will have to deal with this question all over again. Why not make the best long-term decision now?

A Fourth Option

We understand that NB Power has subsequently added a fourth option to the original three for dealing with the problem of the generating station. This involves the possibility of replacing the existing facility section by section rather than building a new structure at a new location. We further understand from a recent communication that this option has now been deemed unfeasible, but that a possibility still exists of replacing the mechanical components of the generating units with technology that would extend the functional life of the current facility.

At stakeholders meeting organized by NB Power on May 17, we learned that recent research on the integrity of the dam's powerhouse indicates that structural reinforcement may also be possible, which together with mechanical component reconfiguration may extend the generating capacity of the facility longer than previously expected.

If this option is technically feasible, the question remains at what investment cost compared to other renewable energy alternatives. And if this option will only postpone the eventual shutting down of the facility, is it a smart option considering that the business case for large central generating facilities is rapidly disappearing?

A Fifth Option?

In SEG's deliberations on energy planning and the future of the St. John River, we have discussed whether the dam and generating station might be reconstructed at a lower level and smaller scale? This option has several potentially attractive features:

1. the continued production of renewable energy;
2. a facility scaled to provide local and regional electricity service within a distributed generating system;
3. the ability to repower the grid in recovery from a system shut down;
4. the opportunity to install an effective fish passage;
5. the recovery and restoration of prime agricultural land in the upper half of the valley region now flooded;
6. reducing the length of the low-oxygen, warm water zone through which migratory fish must travel;
7. the retention of a headpond in the area where the associated home owner and recreational factors are most significant.

It may be that the economics of rebuilding Mactaquac dam and generating station at any scale makes no sense when plotted against the speed of renewable energy innovation and its falling costs, but we are interested in knowing if consideration may have been given to this option.

Summing Up

Although the decommissioning and removal of Mactaquac dam may appear to be a premature loss, it can be seen in a broader perspective as the end of the era when central generation and long distance transmission of electricity was regarded as progressive. The rate of innovation in energy technology is bringing the era of big dams and central generation to an end. The removal of Mactaquac dam can be seen as a truly progressive step from the standpoint of long-term energy service planning.

In addition, the restoration of environments previously damaged by industrial usage is now also on the forefront of progressive civic and economic planning. It seems likely that the restoration of the St. John River Valley between Mactaquac and Woodstock could be promoted, and would be heralded, as a truly progressive development for New Brunswick.

With respect to its legislated mandate and with respect to increasing resilience and insuring security of service, the Woodstock Sustainable Energy Group urges NB Power to create a business model, as rapidly as it can, for promoting and facilitating the transition to a distributed generation electricity system for New Brunswick. We understand implementing this kind of planning may require the temporary sourcing of hydropower from Quebec or Labrador.

Submitted by the Woodstock Sustainable Energy Group
May 29, 2016

Sam Arnold (Coordinator), Conrad Anderson, Allison Connell, Peter Caverhill, Lillian Warne, Nancy Lovely, Keith Helmuth

SUSTAINABLE ENERGY GROUP (CARLETON CHAPTER)

Atlantic Salmon Federation  Fédération du Saumon Atlantique

Submission to Mactaquac Project: Social Impacts Comparative Review (SICR) Report

Submitted to: NB Power
Submitted by: The Atlantic Salmon Federation

Geoff Giffin
Director of Regional Programs Programs

31 May 2016

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"I saw several fishermen at the Hartland or Guimec Pool, others strung out at intervals for the next fifteen miles; and at the mouth of the Munquat - a wonderful run of water - three fishermen in waders.

Here, all along the river, was salmon fishing."

George F. Clarke – author of "Song of the Reel" and "Six Salmon Rivers and Another"

Background and Opening Comments

The Atlantic Salmon Federation (ASF) is pleased to have this opportunity to provide comment on the Social Impacts Comparative Review (SICR) in association with the decision that NB Power must make by the end of 2016 about the future of the Mactaquac Generating Station and Dam. ASF appreciates the process that NB Power has voluntarily engaged in to consult with the people of New Brunswick and to conduct extensive studies on the environmental impacts that arise within each of the three original options (i.e. rebuild, retain headpond, remove) and now the additional option of life achievement. However, we have numerous and serious concerns with the process and the findings documented in the SICR, both of which we address in this document.

ASF is an international non-governmental organization dedicated to the conservation, protection and restoration of wild Atlantic salmon and the ecosystems on which their well-being and survival depend. The broader organization is composed of 6 regional councils and many local watershed/conservation groups from Newfoundland and Labrador to Maine. In New Brunswick, the volunteer-based New Brunswick Salmon Council Inc. (NBSC) is our regional council and there are 31 affiliates, 11 of which are located within the St. John River watershed, including one on the Aroostook River in Maine. As a result of this relationship with the NBSC, as well as with the Maine Council and both their respective affiliates, ASF is composed of a substantial network of passionate groups along rivers and streams who are invested in and dedicated to protecting and restoring healthy ecosystems for wild Atlantic salmon.

ASF is keenly interested in participating in NB Power's engagement process, alongside and in support of the NBSC, the Maine Council and our affiliates. We recognize the historic importance of the SJR, and in particular its once prodigious runs of wild Atlantic salmon that supported vibrant and extensive recreational and aboriginal food fisheries in New Brunswick and into Maine. (Thrive Consulting, 2015)

Despite the fact that this salmon population has long suffered the well-documented cumulative, negative effects of many threats to its existence such as dams, aquaculture, non-native predators and poor marine survival, we also recognize that the Mactaquac decision carries enormous potential for

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assisting in the recovery of wild Atlantic salmon runs (and associated fisheries) in the SJR system, and by extension, the Outer Bay of Fundy (OBoF) complex of rivers where a SARA listing process is underway.

The federal Department of Fisheries and Oceans (DFO) concluded the same in their OBoF Recovery Potential Assessment (RPA):

"Based on available information, hydro-power generation dams (hydro dams) are considered to be the most limiting threat to OBoF salmon population persistence." *(DFO, 2014)*

While it is certainly one threat among many, the Mactaquac facility and its extensive headpond are inarguably the largest impediments to safe passage upstream and down for wild Atlantic salmon and numerous other native migratory species that form the ecological (and in some cases, cultural) foundation of the SJR, Bay of Fundy and Gulf of Maine ecosystems. Moreover, preliminary findings of the Mactaquac Aquatic Ecosystem Study (MAES) conducted by the Canadian Rivers Institute (CRI) on behalf of NB Power are suggesting that both the dam and headpond are having extensive negative impacts on endangered wild Atlantic salmon such as migration delay, disorientation and increased exposure to predators.

Therefore, the status quo for fish passage through the Mactaquac headpond and dam is no longer biologically acceptable, nor does it appear to be socially acceptable according to the consistent message we have been hearing at public and stakeholder sessions convened by NB Power. Addressing these issues in a substantive fashion will measurably improve the recovery potential of this treasured species on the St. John River system, for the benefit of aboriginal and non-aboriginal communities from its headwaters to its confluence with the Bay of Fundy.

With regard to the SICR itself, we are very disappointed that Atlantic salmon garnered only a single reference, and that the study was too narrowly focused on those communities within relative proximity to the dam and headpond. Little to no attention was paid to the many aboriginal and non-aboriginal communities throughout the St. John River watershed (on both sides of the Canada-US border) that value wild Atlantic salmon and who will also be directly and indirectly affected by the Mactaquac decision. Likewise, we are disappointed that the temporal scale of the study only included the time period since construction of the dam and, therefore, considers the current environment to be the baseline condition against which social change and social impacts are measured. This narrow temporal focus does not recognize the significant and ongoing social and economic impacts created by the construction and operation of the facility since 1968, and the potential to mitigate those impacts with the current decision.

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The remainder of this document is focused on expressing our concerns with the SICR process and report, and is divided into the following sections:

1) **ASF policy backgrounder and related resolutions**
2) **Discussion of over-arching concerns with the SICR process**
3) **Comments specific to the SICR study document**
4) **Closing Remarks**

1. ASF Policy Backgrounder and Related Resolutions

The intent of sharing our policy positions in our submission is two-fold:

1) To convey our preferred outcome for the benefit of communities throughout the watershed, and,
2) To provide context around the commentary we are providing on the SICR process and report.

ASF's general policy statement regarding hydro-dams and river obstructions is as follows:

1. ASF will actively oppose at the local, provincial or state level, dams or other projects which impede natural fish passage in rivers, or which would reduce, diminish or damage existing salmon habitat.

2. The ASF will seek removal of existing dams and impoundments that harm existing and historic Atlantic salmon waters, especially those that are not economically defensible, and will promote the restoration of presently degraded sites.

3. Where it is not presently feasible to remove dams, the ASF will work cooperatively with industry partners to insure safe and efficient upstream and downstream passage is provided for salmon.

4. The ASF will join with other partners to promote energy conservation and environmentally friendly electricity generation methods as alternatives to building new hydroelectric dams.

5. The Atlantic Salmon Federation will advocate that all proposed hydro projects, and any existing hydro projects that are scheduled for re-licensing, be subjected to a full environmental review. In areas where licenses are not presently required for construction or operation of hydro dams, ASF will work to see license systems are adopted, that the licenses are issued for a fixed term, and that renewals are contingent upon an acceptable environmental review.

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In April 2015, ASF's Board of Directors put a finer point on our position with respect to the future of the Mactaquac dam and generation facility, by passing the following resolution:

In light of:

- NB Power's consideration of decommissioning and removal of the Mactaquac Dam and headpond (and resultant restoration of free-flow) as one of the three options being studied for the future of Mactaquac,
- DFO's recognition that the Mactaquac Dam and headpond is a severely limiting threat to the existence of the endangered Outer Bay of Fundy wild Atlantic salmon population,
- ASF's existing policy, which is based on peer-reviewed best available science and clearly in support of free flow and natural fish passage wherever possible, and
- an unprecedented opportunity to assist in rebuilding and restoring recreational and aboriginal fisheries along with their corresponding social, cultural, economic and ecological benefits on the St. John River system,

ASF:

- Appreciates and supports in principle the positions adopted by our affiliates and regional councils regarding the options being considered for the future of the Mactaquac hydroelectric dam.
- Will seek meetings with appropriate officials of the Federal and Provincial governments and the President and Chairman of NB Power.
- Will work with all levels of government, NB Power, First Nations, affiliates and other watershed stakeholders to ensure that the socioeconomic, cultural and ecological importance and values of restoring wild Atlantic salmon and other native fish species to the St. John River are considered, communicated and accounted for at all stages of this process, utilizing the best scientific and technical information available.

It should be noted that the NB Salmon Council and the Maine Council, and our lead affiliate on the Mactaquac file, the St. John Basin Salmon Recovery Inc. group all passed their own resolutions expressing support for Option 3, i.e. the decommissioning and removal of the Mactaquac facility for the benefit of the ecosystem supporting native fish populations and the communities throughout the SJR watershed. Therefore, consistent with ASF's resolution on the future of Mactaquac dam, we support the common position of the two Councils and the local affiliate, I.e. Option 3 – removal.

ASF also recognizes that the decision facing NB Power is a vast and complex one, and that a "durable decision" (NB Power, 2016) is being sought that will be technically feasible, economically viable, environmentally responsible, and socially acceptable. In our opinion, the narrow view of community and time-scale used in the SICR is insufficient to determine social acceptance of the various options, and therefore compromises NB Power's ability to make a truly durable decision.

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Regardless of which option is eventually selected for moving to the approval and development stages, ASF deems the present situation with fish passage through the Mactaquac reservoir and dam to be unacceptable, and that all options, including the new fourth option of "life achievement" must include significant and tangible improvements to these fish passage problems for the benefit of wild Atlantic salmon and the other native migratory fish species in the SJR system, and therefore for the broader community affected by this decision.

2. <u>Discussion of overarching concerns with the SICR process:</u>

As stated previously, ASF is pleased that NB Power has taken the significant step to engage the public in the decision-making process that will ultimately select an option for the future of the Mactaquac facility, and in a broader sense, the future of the St. John River system and Bay of Fundy region. However, we are concerned about a number of fundamental shortcomings with the process and SICR document.

Our fundamental and over-arching concerns are:

A. **Nearly no acknowledgement of the importance of wild Atlantic salmon** – In the entire 32 page SICR document, Atlantic salmon was mentioned just once, as a "highly prized fish species" that could benefit from the removal of the dam. Historically speaking, the SJR and its network of tributaries were once home to a thriving recreational salmon fishery that provided significant social value and economic benefits to the people of New Brunswick. Likewise, Atlantic salmon supported a significant aboriginal food fishery that was central to First Nations' social and sustenance fabric.

   Restored fisheries represent significant opportunity. Recreational angling for wild Atlantic salmon creates an industry that contributes $54.7 million annually to the New Brunswick GDP, according to a Gardner Pinfold study in 2010 on the economic value of wild Atlantic Salmon. This is with all the Outer Bay of Fundy rivers (primarily comprised of the SJR system) closed to salmon angling. A restored population and fishery on the St. John would add to this, and provide long-term value to this region of the province, much of it being rural. The potential is significant, with DFO's short-term recovery target of 23,500 adult salmon to achieve the conservation minimum for priority rivers in the OBoF region and long-term target at 41,200 adults to achieve the conservation minimum for all productive habitat (DFO, 2014).

   Atlantic salmon, and the many social and economic benefits they bring with them, received almost no attention in the SICR document and therefore deserve greater focus in a social impact assessment than what has been given.

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B. **Spatial/jurisdictional scale far too limited** – the decision to be made by NB Power affects much more of the watershed, and many more of the communities than those that were selected for comparison in this study. Using the Woodstock to Oromocto definition of the "larger community" results in a narrowly focused and presented study of social impacts. The decision for the future of Mactaquac has a direct impact on the aboriginal and non-aboriginal communities throughout essentially the entire drainage downstream of Grand Falls (on both sides of the US-Canada border) because of their historical relationship with highly valued diadromous species such as wild Atlantic salmon.

For the sake of setting context as it relates to the scale of the sub-watersheds affected by the Mactaquac decision, the Tobique River drainage area of 4,330 km^2 is larger than the entire Northwest Miramichi drainage, which is 3,950 km^2. Likewise, Maine's Aroostook River (at 6,327km^2) and Meduxnekeag River (1,336 km^2), combined, have roughly the same drainage area as the Southwest Miramichi. This does not include the numerous other tributaries between Grand Falls (historically an impassable barrier for salmon) and the present site of the Mactaquac dam.

Therefore, the larger community should have been chosen to represent the full extent of the watershed and communities that will be affected by this decision. Not defining the community of interest as <u>all of those people who will be affected</u> (positively or negatively, directly or indirectly) by a decision is inconsistent with internationally accepted standards for social impact assessment. (Becker and Vanclay, 2003)

C. **Temporal scale too limited** – all comparisons made within the SICR document discuss the effect of all options relative to the present state of the river, which is the time period since 1968 when the dam started its operations. As such, most discussion about Option 3 appears biased in that it is the option that would see the most obvious change of state within the narrowly selected study area as compared to the present state. But the present situation does not represent the naturally occurring and properly functioning state of the river (at least not since the last ice age).

The short temporal window of time for the sake of comparison resulted in various instances of negative language about the nature of changes that would occur. For example, the document suggests that draining the headpond would result in a "loss of identity" for those in the selected study area (i.e. those within close range of the headpond/dam). Indeed it would <u>change</u> the identity from the present state. But it could as equally and fairly be said that Option 3 would "restore" the identity that was altered when the dam first went into operation. This bias appears throughout the SICR document.

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To the best of our knowledge, a comprehensive social impacts study was not conducted prior to the construction of the Mactaquac Dam. Consequently, we have very little hard data about the nature and extent of social impacts arising from construction and operation of the facility, but it is a safe assumption that those impacts were significant and are still being felt by many individuals and/or communities today. Failure to adequately consider social impacts is not consistent with currently accepted standards for impact assessment nor with current environmental legislation. If Mactaquac were being constructed today, it would be impossible to avoid a full and thorough assessment of social impacts. The current situation provides an opportunity to consider (and possibly remedy) some of those impacts. Limiting the temporal scale to the time period since construction of the headpond ignores this opportunity and compounds the problem by once again ignoring the social impacts that resulted from the construction and operation of the facility.

D. **The studies are data deficient** – Unfortunately, the extensive studies being conducted by the scientific experts at the Canadian Rivers Institute (CRI) will not be complete and widely available for public consumption until AFTER the consultation period has been completed on the SICR and CER processes. Ideally, the social impacts and comparative environmental reviews should have been informed by CRI's MAES studies. This would have made both documents much more valuable to the public and stakeholders in their efforts to fully assess the options for the future of Mactaquac.

E. **Lack of attention put on trans-boundary/international nature of the decision** – A large portion of the SJR drainage directly affected by the Mactaquac decision resides across the Canada-US international border in the state of Maine. The SICR made no mention of the State of Maine, nor to the fact NB Power's decision has international implications associated with it. This is closely related to point 1), which discussed the narrowly defined spatial scale that was chosen for the social impacts study. Lack of consideration of the resources associated with the SJR, including native, migratory fish species that cross into US jurisdiction is a major shortfall of the social impacts review and, again, is not consistent with internationally accepted standards for social impact assessment.

F. **Lack of regulatory context or guidance** – With a decision of this nature and magnitude, ASF feels that there has been insufficient information provided about the regulatory implications of the various options as they relate to fish and fish passage. It has remained unclear what will be required of NB Power in terms of regulatory approvals and environmental registrations as it relates to the Fisheries Act. Beyond the Fisheries Act, the Outer Bay of Fundy population of Atlantic salmon is presently undergoing a federal listing process for possible protection under the Species At Risk Act. No guidance or information has been provided by DFO or NB Power on what additional

approvals and processes would be required should an endangered listing be approved by the federal government.

Moreover, we are aware of the discretionary ministerial authorization and MOU that was struck between DFO and NB Power when Mactaquac was built that essentially gave permission to NB Power to kill fish via dam operations in exchange for compensation in the form of the Mactaquac Biodiversity Facility (MBF). Unfortunately, the MBF never found success in offsetting the mortality of smolts traversing the Mactaquac headpond and dam. Therefore, this decision point represents an opportunity to review the terms of that agreement and to right past wrongs in terms of impacts of the dam on wild Atlantic salmon and other native, migratory fish species.

In our opinion, all four options (including life achievement) must be accompanied by a review of this agreement, with the intent being the implementation of the full protection of the Act (i.e. this decision should make demonstrable, functional fish passage a mandatory component of any option that is selected to avoid or prevent "serious harm to fish").

3. Comments Specific to the SICR Document

Executive Summary (page iii)

The document states that two categories of social issues emerged:
- Construction activities (applies to all 3 options)
- Effects of drawdown (applies to only Option 3)

It is surprising that ongoing social impacts associated with construction of the facility and its operation since 1968 did not "emerge" during the course of the SICR, especially considering the dialogue and concerns we heard from numerous stakeholders at meetings hosted by NB Power and our affiliated organizations. It is obvious to us that social and economic impacts associated with loss of Atlantic salmon and other diadromous fish species are ongoing today and are of significant concern to many people in the truly broader community.

We suggest that failure to identify these ongoing social impacts and discuss the potential to begin addressing/remedying them is due to flaws in the study design as discussed above (i.e., inappropriate spatial and temporal scales) rather than lack of their existence in the community.

Executive Summary (page iv)

Regarding social issues identified that related primarily to headpond drawdown, changes to recreational uses were rightly noted, such as "beaches, boating, camping, parks and trails". However, changes to

recreational fisheries and fishery opportunities are not noted. Given the value that communities throughout the SJR watershed (and beyond) place on the recreational fishery (past, present, and future), this is too significant an issue to not be specifically highlighted.

The document states that the "majority of social issues that were limited to Option 3 were negative in direction". Would this have been the same result if the "broader community" included those in watersheds above and outside the headpond / study area? We suggest that the extremely limited purview of the study, specifically in the definition of the "study area" and "community", results in a biased view around the social issues associated with drawdown. This unfairly excludes those communities and is not consistent with best practice in impact assessment.

Section 1.1 - Study Scope (page 1)

Re: opening comment that the study is "an evaluation of the possible societal effects of the three options on the people of New Brunswick". This statement is misleading because the details of the study itself are too limited in terms of the actual affected geographical area, watersheds, communities and jurisdictions.

The geographic scope of a social impact assessment should be dictated by where the costs and benefits will be felt, not by the jurisdiction of the agency making the decision. Focusing on NB exclusively, simply because that is the jurisdiction of the agency, is a fundamental flaw in their approach. A proper social impact assessment should consider all of the potential social costs and benefits, regardless of where they occur, including across international boundaries. Such an analysis, should it occur, would be flawed if it only included the costs and benefits identified in this limited scoping study.

Section 1.1 - Study Area (page 3)

Re: definition of the "Study Area" – which is "the area most likely to be directly affected by any one of the three project options". Limiting the area to both sides of the SJR (within 500m) from Woodstock to Zealand above the dam, and down to Oromocto below, orients the study area solely around geographic/landscape boundaries and does not take into account that there are many watersheds above the dam (and the headpond) that feed into or depend on the chosen study area. These watersheds and associated communities are therefore directly linked by the native diadromous fish species that are affected by these three options (e.g. the Tobique River and its communities, the Aroostook and Meduxnekeag watersheds/communities, which are primarily across the international boundary in Maine).

Regarding the statement, "*Community, for the purposes of this study, is defined as an area in which people live and interact relative to a geographic location or feature*", what are the references for this definition? "Community" should be defined in any internationally accepted SICR/SIA as the group of

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people who will be affected, either directly or indirectly, negatively or positively, by the proposed development. The very limited definition represents a fundamental flaw in the process.

In this case, aboriginal and non-aboriginal communities used to live and interact with "features" such as diadromous fish species, most notably wild Atlantic salmon, well outside the physical study area. The very existence of highly migratory wild fish species extends the natural reach of the "affected area" beyond the limited boundaries that were chosen for this study. The three options affect the potential to recover and develop those features that these communities once depended upon through fisheries and cultural/economic connection.

The aboriginal and non-aboriginal communities of the Tobique River valley, for example, each had "close ties" to the wild Atlantic salmon that once brought great benefit to their communities, and were negatively affected by the presence of the Mactaquac dam and headpond, and the cumulative effects that it placed on the system/resource in the form of smolt mortality, disorientation, predation and migration delays.

Section 2.3 - Option 3 – River restore – No power (p.6)

Re: "Depending on the nature and amount of sediment in the headpond, it may be possible to complete Option 3 faster than the four-year schedule assumed in the CER". Our present understanding of the preliminary results of the extensive MAES studies is that the sediment depth is encouragingly low throughout much of the headpond, and that core samples are indicating that accumulated pollutant levels (i.e. metals and other contaminants) are within the natural range for this area.

It is unfortunate that the MAES findings will not be complete and released for public consideration until after the CER and SICR review periods are complete.

Section 3.1 - Access to Recreational Uses (p.7) / Preliminary List of Social Issues

There is a discussion of the "variety of uses on and around the headpond", including the statement that "the headpond is known for its active recreational fishing". What is not said is that the main stem SJR and Tobique Rivers (for example) USED to be "known for its active recreational fishing", especially w.r.t. Atlantic salmon and all the socioeconomic benefits that would have accompanied the spending by those anglers, as well as employment for guides and outfitters and premium property values that commonly accompany camps, lodges and homes on "salmon rivers". Loss of those recreational fisheries and the fish species on which they depended were significant social, economic, and ecological impacts resulting in part from construction of the dam. Restoring them represents socioeconomic opportunity.

All recreational fisheries provide economic benefit to the regions in which they occur as shown by the 2011 Gardner Pinfold study on the socioeconomic value of wild Atlantic salmon. In 2010, recreational fisheries for wild Atlantic salmon contributed $54M to the provincial GDP, and this was with open

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salmon fisheries on only half of the province's rivers (i.e. those flowing into the Gulf of St. Lawrence such as the Miramichi, Restigouche and Nepisiguit). The recreational salmon fishery in the Miramichi drainage alone resulted in $20M in spending with over 600 full-time job equivalents (FTE) in 2010. Most of these jobs are seasonal, meaning that total employment was much greater than indicated by the FTE.

The Tobique River alone is roughly half the drainage size of the Southwest Miramichi and was once home to a world-renowned public recreational fishery complete with outfitters, guides and anglers coming from within and outside NB to participate in the fishery. Rebuilding salmon stocks and re-opening fisheries represents economic opportunity for this region.

Recreational salmon angling was a foundational recreational use of the SJR system of rivers long before the presence of the Mactaquac dam, and the value – and identity – associated with that potential must not be overlooked in this decision-making process.

Comments on recreational fishery impacts:

While the recreational fishing for smallmouth bass and muskie may be negatively affected, other recreational fishing opportunities may result from the elimination of the MGS and return to a free flowing river. Over time, economic costs due to a decline in some recreational fish species due to habitat alteration could be offset by a net increase in productivity of other highly valued fish species (e.g., striped bass, Atlantic salmon) due to the removal of the dam, which is a known barrier to fish passage (CRI, 2011).

ASF acknowledges that there may be negative effects to other recreational fishing opportunities with the removal of the MGS and headpond, such as those for non-native / invasive species like smallmouth bass and muskellunge. Those fisheries do exist and provide socioeconomic benefits. However, the extent of those impacts is more closely linked to the region of the headpond itself.

Removal of the dam and restoration of natural flow could assist in recovering fisheries (over time) for a "highly valued" native anadromous fish species like wild Atlantic salmon. These benefits could come to watersheds and communities well outside the "study area".

Section 3.3 - Community Identity (p.9)

A sense of place has developed over the last 40 years for the community around the headpond in particular and for the larger community, with a population of approximately 100,000 people, from Woodstock to Oromocto. The headpond has become an area where people go to live, play and work. With the installation of the dam and the resultant flooding of the area, the Town of Nackawic was developed. It has functioned as a community with clearly defined municipal boundaries for over 40 years.

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The chosen temporal scale ("over the last 40 years") and spatial scale (Woodstock to Oromocto) completely overlooks the sense of community identity (and pride) that at one time was associated with Atlantic salmon fisheries throughout the SJR watershed. River recovery could re-establish that sense of identity only changed relatively recently in the history of this river and communities.

The SICR states:

> While there is no effect anticipated to the community structures during the Project Phase of Options 1 and 2, there will likely be a loss of identity as a result of the drawdown in Option 3.

ASF suggests that the SICR's assessment that there would be a "loss of identity" associated with the drawdown in Option 3 is too conclusive given that there is no evidence presented to indicate that it would be a "loss". This wording comes across as biased, and again far too limited in scope.

ASF acknowledges that there would be a change of identity associated with the drawdown in Option 3, but we posit that it would in fact be a **restored sense of identity** associated with the river's natural state, especially if the river restoration eventually played a significant role in the recovery of wild diadromous fish runs and associated fisheries throughout the watershed.

Section 3.5 - Exposure of Lands/Islands (p.11)

The focus of discussion in this section is on Option 3, because it represents a change from the present state. What is missing in this discussion is what the various social impacts would be if Option 1 or 2 is chosen and the lands and islands that were flooded over when Mactaquac was built remain flooded over. Because there was no such impact study conducted prior to the construction of Mactaquac (to the best of our knowledge), those impacts are "built in" to the notion of maintaining the present state of the river which is a massive change from the historic state of the river.

Section 3.12 - Property Values (p.16)

The report rightly notes that the potential effects of Option 3 on property values "cannot be estimated with certainty at this time." Indeed, there are many factors that affect property value as noted in the report, and it is fair to assume that water views and river access are components of that value.

What is not discussed in this section is the potential effect on property values that a restored river would have be it an increase, decrease or no change based on access to recreational use (such as canoeing, fishing, etc). If properties are adjacent to areas where fishing for salmon would be possible in a recovered population, it is reasonable to assume that values could see positive change over time. These potential effects on property value from restored fish populations and fisheries would not be limited to just the study area, but potentially further up into the system outside of the study area along the main stem of the SJR, as well as further afield into the Tobique, Becaguimec and Salmon rivers on the Canadian side for example, and the Aroostook and Meduxnekeag rivers on the US side.

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Section 4.0 - Discussion (p.22)

It is evident that Option 3 will likely have the greatest impact, relative to the current situation, on not only the biophysical environment but equally the social environment. The Project Phase will, similar to the activities associated with Options 1 and 2, have more dramatic effects on the immediate community. Nuisance effects will be most prevalent. The change to the headpond will be most noticeable to all communities. For Kingsclear First Nation, the possible emergence of the islands, the societal effects will be significant. For others who live and play on and near the headpond, the effect will be dramatic and potentially negative.

We acknowledge that Option 3 carries with it the "greatest impact, relative to the current situation..." but the report should also acknowledge that the impacts of Options 1 and 2 are not solely limited to the immediate community during the project phase. Rather, it should be noted and acknowledged that Options 1 and 2 extend the ongoing and very significant impacts that began only with the relatively recent construction of the dam. The effects of these impacts on fish populations, the ecosystem and the communities within and beyond the study area would continue into the future for as long as the dam and headpond remain in place.

Some of these perceived negative impacts (e.g., loss of property values) can be compensated for or mitigated against. Any efforts to weigh costs vs. benefits should also include the potential for compensation and mitigation. Just because the scoping study suggests that option 3 will have the most significant impacts, it does not necessarily mean that those impacts will necessarily occur, just that we need to be looking at ways to compensate and mitigate.

Referred to as the second largest lake in New Brunswick, the effects of a complete drawdown will be lasting and will influence the community fabric. The economic effects could have significant influence on the societal values. It is anticipated that the community structure will be altered and a loss of identity will be most notable. Although these effects are expected, opportunities will be available for other forms of recreation. Changes will occur and in time a new community identity will likely emerge. The societal cost of this, however, has not been calculated and requires further study. It should be recognized that the identification of this potential issue is the first step towards possible mitigation.

Referring to the headpond as a "lake" is incorrect. It functions neither as a "lake" nor as a "river". Rather, it is a hybrid and unnaturally functioning watershed component, arising from anthropogenic causes. Unfortunately, the findings of the MAES studies have not been finalized or released yet, but our understanding of the important work conducted by the Canadian Rivers Institute suggests that the unusual dynamics of the headpond have affected the migration patterns of native fish species.

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4. Closing Remarks

ASF commends NB Power for engaging with the public on this important decision and conducting studies to inform the decision-making process but we feel that the scope of the studies is far too narrow for NB Power to achieve its goal of reaching a "durable decision" that is socially acceptable. We are of the opinion that the present state of dysfunctional fish passage through the headpond and Mactaquac facility are increasingly being regarded by the public as unacceptable ecologically and socially.

Regardless of the option that is ultimately selected, implementing functional fish passage for the benefit of native diadromous species must be addressed as a requirement of the project going forward. Addressing barriers to migration is consistent with the North Atlantic Salmon Conservation Organization (NASCO) recommendation that maximizing freshwater production of healthy, wild smolts is a critical component of salmon management and preservation of genetic diversity (Malcolm et al., 2012), particularly when marine survival rates are a problem.

In closing, we feel that the best chance of restoring wild Atlantic salmon and bringing significant positive social, cultural, ecological and economic benefits to the communities of the greater St. John River watershed and the Outer Bay of Fundy region resides in the decision to remove the dam and restore the river's natural flow and function.

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Fédération du Saumon Atlantique

Submission to Mactaquac Project: Comparative Environmental Review (CER) Report

Submitted to: NB Power
Submitted by: The Atlantic Salmon Federation

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31 May 2016

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Background and Opening Comments

The Atlantic Salmon Federation (ASF) is an international non-governmental organization dedicated to the conservation, protection and restoration of wild Atlantic salmon and the ecosystems on which their well-being and survival depend. The broader organization is composed of 6 regional councils and many local watershed/conservation groups from Newfoundland and Labrador to Maine. In New Brunswick, the volunteer-based New Brunswick Salmon Council Inc. (NBSC) is our regional council and there are 31 affiliates, 11 of which are located within the St. John River (SJR) watershed, including one on the Aroostook River in Maine. As a result of this relationship with the NBSC, the Maine Council and their respective affiliates, ASF is composed of a substantial network of passionate groups along rivers and streams who are invested in and dedicated to ensuring healthy ecosystems for wild Atlantic salmon.

ASF is pleased to be engaged in the Mactaquac project and to have the opportunity to comment on this important file. Prior to our specific comments on the CER document, we feel it is necessary to provide background policy information to provide context to our remarks throughout this report.

Policy Backgrounder and Related Resolutions

ASF's general policy statement regarding hydro-dams and river obstructions:

1. ASF will actively oppose at the local, provincial or state level, dams or other projects which impede natural fish passage in rivers, or which would reduce, diminish or damage existing salmon habitat.

2. The ASF will seek removal of existing dams and impoundments that harm existing and historic Atlantic salmon waters, especially those that are not economically defensible, and will promote the restoration of presently degraded sites.

3. Where it is not presently feasible to remove dams, the ASF will work cooperatively with industry partners to insure safe and efficient upstream and downstream passage is provided for salmon.

4. The ASF will join with other partners to promote energy conservation and environmentally friendly electricity generation methods as alternatives to building new hydroelectric dams.

5. The Atlantic Salmon Federation will advocate that all proposed hydro projects, and any existing hydro projects that are scheduled for re-licensing, be subjected to a full environmental review. In areas where licenses are not presently required for construction or operation of hydro dams, ASF will work to see license systems are adopted, that the licenses are issued for a fixed term, and that renewals are contingent upon an acceptable environmental review.

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In April 2015, ASF's Board of Directors put a finer point on our position with respect to the future of the Mactaquac dam and generation facility, by passing the following resolution:

In light of:

- NB Power's consideration of decommissioning and removal of the Mactaquac Dam and headpond (and resultant restoration of free-flow) as one of the three options being studied for the future of Mactaquac,
- DFO's recognition that the Mactaquac Dam and headpond is a severely limiting threat to the existence of the endangered Outer Bay of Fundy wild Atlantic salmon population,
- ASF's existing policy, which is based on peer-reviewed best available science and clearly in support of free flow and natural fish passage wherever possible, and
- an unprecedented opportunity to assist in rebuilding and restoring recreational and aboriginal fisheries along with their corresponding social, cultural, economic and ecological benefits on the St. John River system,

ASF:

- Appreciates and supports in principle the positions adopted by our affiliates and regional councils regarding the options being considered for the future of the Mactaquac hydroelectric dam.
- Will seek meetings with appropriate officials of the Federal and Provincial governments and the President and Chairman of NB Power.
- Will work with all levels of government, NB Power, First Nations, affiliates and other watershed stakeholders to ensure that the socioeconomic, cultural and ecological importance and values of restoring wild Atlantic salmon and other native fish species to the St. John River are considered, communicated and accounted for at all stages of this process, utilizing the best scientific and technical information available.

It should be noted that the NBSC, the Maine Council, and our lead affiliate on the Mactaquac file, the St. John Basin Salmon Recovery Inc. (SJBSRI), passed their own resolutions expressing support for Option 3, i.e., the decommissioning and removal of the Mactaquac facility for the benefit of the river, native fish populations and communities throughout the SJR watershed. Therefore, consistent with ASF's resolution on the future of Mactaquac dam, we support the common position of the two Councils and the local affiliate, Option 3 – removal. The NBSC and the SJBSRI have submitted reviews of the CER as well. ASF supports their submissions as the local and regional organizations.

Wild Atlantic salmon are a resource on the SJR system with cultural, symbolic, recreational, and economic value. From historic First Nations use for food, social, and ceremonial purposes, to recreational angling, to a symbol of ecosystem health, Atlantic salmon on the SJR have had a rich history. Recreational angling for wild Atlantic salmon creates an industry that contributes $54.7 million annually to the New Brunswick GDP, according to a Gardner Pinfold study in 2010 on the economic value of wild Atlantic Salmon. This is with all the Outer Bay of Fundy (OBoF – primarily

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composed of the SJR system) rivers closed to salmon angling; a restored population and fishery on the St. John would add to this, and provide long-term value to this region of the province. The potential is significant, with the short-term recovery target at 23,500 adult salmon to achieve the conservation minimum for priority rivers in the OBoF region and long-term target at 41,200 adults to achieve the conservation minimum for all productive habitat (DFO, 2014). Given the multi-level value of the resource, we anticipate that NB Power will treat wild Atlantic salmon with high priority in the consideration of the Mactaquac Project.

Our comments to this document will focus on wild Atlantic salmon and its ecosystem; thus, the majority of the submission will relate to Chapter 8, Aquatic Environment. While we understand the Mactaquac decision is complex, and that its removal will not necessarily mean the recovery of wild Atlantic salmon, we cannot ignore that the dam is a major threat to OBoF salmon (DFO, 2014) and that recovery potential would be much greater with the removal of Mactaquac dam and a free flowing river scenario.

Comments on the CER Report

Overarching Concerns

The CER is written in too limited a scope in space and time. It does not compare the outcomes of each option to a natural free-flowing SJR, but rather to the current regulated state with the headpond and associated artificial habitat and ecosystem. The perspective, or baseline, should the natural state of the river and how each option interacts with that condition. The CER is written entirely qualitatively rather than quantitatively; very limited data are presented. It is difficult to compare environmental conditions associated with each option without numbers, historical trends, scientific assessments, etc. Ongoing research by the Canadian Rivers Institute (CRI) in their extensive Mactaquac Aquatic Ecosystem Studies (MAES) should have been an essential component of the CER and its absence is a major shortfall of the document. At the very least, interim findings on the state of the ecosystem and what the ecosystem may look like under each option should have been incorporated (e.g., smolt tracking studies show that the headpond substantially delays Atlantic salmon smolt during their migration). The CER repeatedly makes note that MAES will provide more detail and inform NB Power's decision. This detail needs to be part of the CER for it to be credible and useful for the public and stakeholders to assess the options NB Power has put forth for the future of Mactaquac dam.

Specific Comments

8.1.3 Area of Review - The area of review is defined as the Mactaquac headpond area upriver to the Hartland Bridge, and downriver to Gagetown (approximately 50 km downriver) to capture potential interactions with Grand Lake Meadows. Similar to the Social Impacts Comparative Review (SICR), the study area and scope of the assessment are extremely limited geographically and temporally. The CER does not take into account the effects of Mactaquac on the greater SJR

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watershed, the Bay of Fundy (BoF) and the Gulf of Maine (GoM). The SJR is the largest river system flowing into the BoF and GoM regions.

8.1.4 Key Issues – The key issues listed are changes in fish habitat, changes in fish populations, changes in species at risk or species of conservation concern. All of these relate to wild Atlantic salmon on the SJR, and in particular the upper SJR system where salmon migrate through several dams and headponds. Habitat connectivity for migratory fish is acknowledged as a key issue, and that there "may" be disruptions in movement due to the dam, leading to changes in fish populations. ASF is encouraged to see that there is at least recognition fish passage is a problem and that it needs to be improved significantly, not only for Atlantic salmon but for other migratory species that are native to the ecosystem. In fact, preliminary findings by the CRI in their extensive MAES research are demonstrating that Atlantic salmon are indeed experiencing passage issues, upstream and down, with particular problems such as smolt migration delay through the headpond. Unfortunately, these studies have not been published to inform the CER.

8.2.1 Sources of information – The CER notes that no field investigations were carried out specifically to inform the CER. Information was taken from previous studies and although the report refers to the CRI's MAES research, there is no evidence that findings from these extensive studies were incorporated into the CER. Information and comparisons in the CER are qualitative, not quantitative (in other words, there are no numbers). ASF sees the lack of science in the CER as a major shortfall and we would expect that the results from MAES (current state of the study area and possible ecosystem outcomes under each of the 3 options) would be essential to include in the CER. The lack of data results in stakeholders and the public not having the necessary information to make an informed decision or provide meaningful commentary on the CER.

Interviews with people knowledgeable on SJR ecology is listed as a source of information. Since anecdotal information was included, so should have been First Nations Traditional Ecological Knowledge (TEK) from Maliseet Nations up and down the SJR (including US side bands in the State of Maine). While we understand consultations are ongoing separately with First Nations, it would have been informative to the public to understand perspectives from TEK.

8.2.2 Description of Existing Conditions – To highlight that the scope of the study area is too narrow, there are comments such as "The headpond is the main habitat feature upstream of the Station". This, of course, is true in terms of the study area, but entirely disregards the watersheds upstream of the station, which have hundreds of kilometers of rivers and streams (i.e., wild Atlantic salmon habitat).

8.2.2.1.2 Water and Sediment Quality – The CER does not demonstrate an in-depth understanding of wild Atlantic salmon and its habitat. This is evident in statements such as, "Overall, the decline in oxygen at depth is indicative of medium to high biological productivity, which could limit the potential for the headpond to sustain certain fish species (such as salmonids

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that require cold and well oxygenated water) during summer". We do not expect, or want, the headpond to sustain Atlantic salmon. What wild Atlantic salmon require most is safe and timely passage through the reservoir to and from their primary freshwater and marine habitats.

The CER reports that no clear "hot spot" areas of contaminants have been discovered in the headpond sediment. We are encouraged by this information as it dispels the theory that the sediment is too contaminated to release downriver in a dam removal scenario (Option 3). This should make dam removal more attractive financially, socially, and environmentally.

The report discusses the rich variety of habitat in the headpond that supports a diverse ecosystem (e.g. the many productive shallow inlets and the littoral zone in general) that benefits many species, namely, smallmouth bass and muskellunge. This is reported as if it is a positive aspect, or benefit of the headpond. While we recognize these invasive species support recreational fisheries, the CER does not look at the big picture that this is artificial for the SJR system. It does, however, make note that the headpond may be limiting productivity of the ecosystem, particularly downriver of the station by limiting sediment (nutrient) movement.

General Commentary – The assessment explores the possible impacts to species in the headpond under different flow scenarios or a headpond drawdown scenario, and discusses issues irrelevant to a natural SJR. For example, there is considerable discussion on how water level changes may impact and strand algae, macrophytes, benthic invertebrates and fish in the littoral zones. The CER has not examined the big picture of aquatic habitat of the SJR and how the dam and headpond fit into that realm. The CER discusses impacts and changes relative to the current headpond state, not relative to what a natural SJR knows on the geological timescale (at least since the last ice age).

The CER constantly refers to MAES and that the research will provide up-to-date information on benthics, fish communities, sediment modeling, etc. that will inform NB Power's decision-making process. Again, MAES should also inform the CER for it to be relevant and effective, and for it to provide the information necessary to the public.

Fish Community Composition and Population Abundance – Table 8.3 lists fish species and molluscs and identifies whether they are found up or downstream of the station, if they are native, and if they are species at risk or species of conservation concern (SAR/SOCC). Atlantic salmon are identified on the list and shown to be SAR/SOCC. Adding to the detail in the CER, more specifically, the Atlantic salmon in the SJR are part of the Outer Bay of Fundy (OBoF) population, which is considered Endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and currently under review to be listed as Endangered under the Federal Species at Risk Act (SARA). What the CER does not demonstrate, and what we would like to understand, are the regulatory implications of the Fisheries Act and SARA for each of the three options of the future of Mactaquac dam. For example, will there be a Ministerial authorization

to enable the killing of fish in the future like there is for the existing dam, and what extra protection will be afforded to SAR/SOCC under each scenario?

The CER reports that "the level of fish population monitoring in the area of review is insufficient to estimate population abundances". While this may be true for most species, there has been an exact count of Atlantic salmon passing upriver of the station since 1968 (Figure 1; DFO, 2015). Estimates from pre-Mactaquac indicate that adult returns ranged between 20,000 – 30,000 (Ruggles and Watt, 1975), which declined sharply to 5,000 – 10,000 (DFO, 2015) in the years following the construction of Mactaquac dam (numbers subsequently improved but have since declined to critically low levels). Over the life of Mactaquac, there could not be a more complete population monitoring dataset in the area of review for Atlantic salmon. This should be reported on in the CER with numbers, showing the downward trend of the upper SJR Atlantic salmon run. This section of the CER does report that the most comprehensive fish population study conducted in the area of review was in 2000-2001 by Curry and Munkittrick, which suggested that "only two species were affected by the type of environment. White sucker relative abundance was greater in the headpond than in river-type environments while smallmouth bass relative abundance was lower". There is no mention of Atlantic salmon, even though there has been an exact count at the station since 1968, which comprehensively illustrates trends of upper SJR stock throughout the life of the dam.

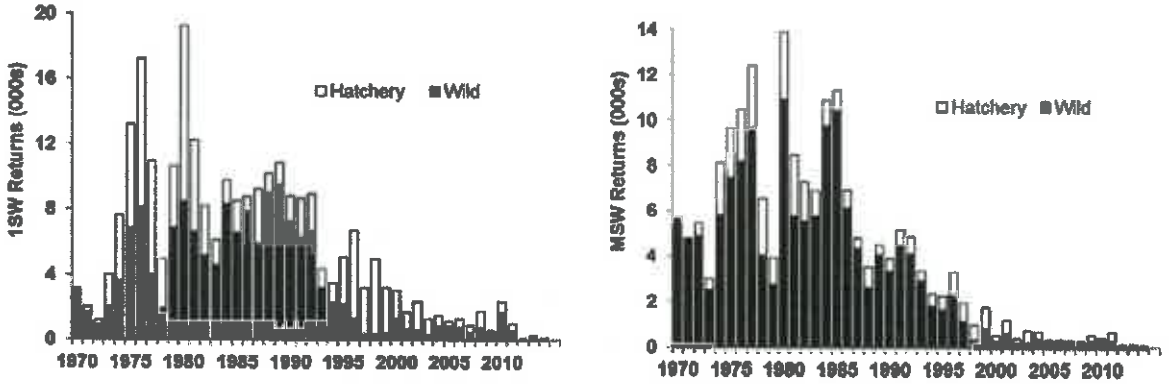

Figure 1. Estimates of 1-sea-winter and multi-sea-winter Atlantic salmon returns to the St. John River destined for upriver of Mactaquac dam 1970-2014 (DFO, 2015).

The CER mentions that returns of Atlantic salmon to the station were relatively stable until the early 1990s, even with the dam in place, implying that the dam did not contribute to the decline beginning in the 1990s. The report points out that scientists believe poor marine survival is the principal cause of declining numbers. While ASF understands poor marine survival is limiting to Atlantic salmon stocks in many rivers, particularly in the southern part of its range, we recognize that dams are a major source of mortality as well. This is described in the recent Recovery

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Potential Assessment for Outer Bay of Fundy Atlantic Salmon (DFO, 2014), which identifies **hydroelectric dams as the threat of highest concern.** With low marine survival being a present condition affecting salmon stocks, and management options in the ocean being limited, maximizing freshwater production of healthy, wild smolts becomes a critical component of salmon management and preservation of genetic diversity (Malcolm et al., 2012). This will entail addressing factors that limit productivity, such as barriers to migration (Malcolm et al., 2012).

8.2.2.2 Fish Populations (Fish Passage) – Throughout the report, fish passage and habitat connectivity are recurring topics and given a fair amount of emphasis. The report explicitly states "The station does not have infrastructure designed specifically for fish passage that aids the downstream movement of fishes from the headpond past the dam". This indicates that NB Power acknowledges the status quo for fish passage is unacceptable. While the dam itself provides a physical barrier, there is little analysis in the CER of headpond effects on migrating Atlantic salmon. ASF understands that one of the MAES studies is specifically investigating headpond effects on migrating salmon at various life stages (smolt, returning adults, and kelts). The initial findings indicate that smolt are delayed significantly through the headpond, and while some may eventually make it below the Mactaquac dam, they may not make it to the Labrador Sea during the thermal window appropriate for migration. In general, we found that headpond effects on migratory species should have been given more emphasis in the CER, and included MAES interim results on salmon tracking through the headpond.

The following statement in the report describes existing knowledge on survival rates through the dam: "There is no existing research estimating the success rate of any fish species ability to move upstream or downstream of the station...there are no data on the success rate of downstream passage by gaspereau or Atlantic salmon, but it is likely that a considerable number are not surviving." To our understanding, there are indeed data on the mortality of downstream migrating smolt through Tobique Narrows, Tinker, Beechwood and Mactaquac dams (e.g. research by DFO's John Ritter that was submitted in a MEMO to ASF's John Anderson regarding a coded wire smolt tracking study; L. Marshall, DFO, pers. comm., 1995). The results of Ritter's study indicate smolt mortality is high (27.5% through Mactaquac), particularly when cumulative effects through 3 dams/headponds is considered (46-59 % mortality).

8.2.2.3 Species at Risk and Species of Conservation Concern – The various SAR/SOCC are listed in the report and there are 6 fish species identified in the area of review. Interestingly, and not surprisingly, 5 of the 6 are anadromous, or migratory, and require habitat connectivity. This suggests that Mactaquac dam has had population level effects.

As explained previously in this submission, the Atlantic salmon in the SJR are a major component of the OBoF population, which is considered Endangered by COSEWIC and currently under review to be listed as Endangered under SARA. The CER should demonstrate the extra protection

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measures that will apply to SAR/SOCC, and the legislative implications of the Fisheries Act and SARA for each of the three scenarios of the future of Mactaquac dam.

8.3 Summary of Standard Mitigation for Aquatic Environment – This section lists mainly erosion and sediment control measures related to work during all phases (installation, operation) of the preferred option (i.e., working in the dry where possible, coffer dams to trap sediment, etc.). These measures are important and are standard engineering practise when working around watercourses. However, these are minor considerations in the long-term picture of the future of Mactaquac dam and sediment flushing is not of concern in terms of affecting species at the population level in the long term. Mitigation measures identified should have included: state of the art upstream and downstream passage (including headpond migration issues) to improve habitat connectivity, flow management to ensure environmental flows, and fish passage during construction of the preferred option (not listed at all in the report – this is a major shortfall of the CER).

8.4.1 Potential Change in Fish Habitat (construction, demolition, and operation phases of each option) – Note: the subsequent section, 8.4.2 Potential Change in Fish Populations, is repetitive with section 8.4.1; therefore, our comments here apply to section 8.4.2 as well.

There are many statements in the report exemplifying that the temporal scope of the CER is far too limited. Among these statements includes, "Long term changes to fish habitat resulting from construction and demolition are not anticipated under Option 1". If the reference point is existing conditions, then there would not be a change in fish habitat; however, if the baseline is what the SJR knows for habitat on a geological timescale, then implementing Option 1 is prolonging the major change to the ecosystem resulting from construction of the present station. This option, and Option 2, should therefore be considered with scrutiny. We argue that the reference point should always be the natural state of the river, and any change and associated effects measured against that. For example, removing the dam and returning this section of the river back to its natural state should be considered low impact because it is being restored to its natural condition.

The report notes that construction activities under any of the options would attempt to avoid sensitive biological time periods, avoiding SAR/SOCC disturbance (i.e., salmon migration periods). We agree this is important, but anticipate it will be difficult to achieve in practise.

The report describes that under Options 1 or 2, fish passage and habitat connectivity would be improved (reference point being current conditions). It notes that NB Power has consulted with fisheries regulators (DFO?) and stakeholders about fish passage approaches. We are interested to know who NB Power has consulted with in terms of regulators. Our investigations suggest DFO has not been engaged by NB Power on this file (other than for the issuance of permits for the

MAES studies) and has no plans to engage until a preferred option is chosen and a formal governmental permitting/environmental assessment process ensues.

We are confused by statements such as this in the report: "Overall, fish habitat could be enhanced under Option 1. This could affect fish populations positively, particularly those of migratory fish species". Perhaps the author means that accessibility/connectivity of fish habitat could be improved relative to the current condition.

Operation

Under Option 1 - consideration of fish friendly turbines "may" reduce fish mortality. This is not sufficient as a mitigation measure. State of the art functional fish passage systems need to be implemented if Option 1 is chosen, a component of which could be the use of fish friendly turbines. However, the implementation of vastly improved fish passage systems at the dam site does not on its own mitigate the myriad of passage issues (wrong direction of migration, delays, predation, etc.) associated with the headpond.

Under Option 2 – this option is expected to provide "safer" passage to migratory fishes than Option 1 because power generation will not occur (i.e., there will be no turbines to kill fish and flow can be manipulated to optimize attraction flow to passage structures). We agree with this; however, we find that Option 2 is a non-starter because the habitat will remain fragmented with a dam in place and there will be no power source generated for New Brunswickers. This option will only serve to satisfy a small demographic of property owners/recreationalists that use the headpond, at the environmental expense of the SJR ecosystem. As with Option 1, the implementation of improved fish passage systems at the dam site does not on its own mitigate passage issues associated with the headpond.

Under Option 3 – there is acknowledgment that this option (removal) would provide the greatest benefits to migratory species, but that the relative abundance of species that thrive in the headpond is expected to decline, and relative abundance of species that are better suited to river environments may increase. This, of course, includes wild Atlantic salmon and other species like Striped bass, sturgeon(s), brook trout, etc. There is also acknowledgement that under Option 3, newly exposed areas may require restoration to establish habitat connectivity between the SJR and tributaries (e.g., hanging culverts on submerged roads, sediment deposition blocking access to streams). ASF recognizes that there will likely be some sedimentation issues and restoration efforts required under Option 3, but expect that the area will recover and regenerate quickly, as evidenced by other dam removals in the U.S. (e.g., Elwha Dam). ASF also recognizes there may be significant work required to restore fish passage at various locations that are currently submerged in the headpond. The expertise exists to do so, and we expect that relative to the cost of removing the dam, these restoration efforts will be negligible. Option 3 is an opportunity to showcase the largest dam removal and river restoration project in the world.

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The CER notes that under Option 3, non-native species will have greater opportunity to expand their range. This is not of concern to ASF because invasives like smallmouth bass and muskellunge are already present upstream and downstream of the dam and are already expanding their range. The improved accessibility of high quality headwater habitat to Atlantic salmon under a removal scenario far outweighs the spreading of invasive species in the lower river (Mactaquac/Fredericton area) since they are already present.

The CER states that under Option 3, "The immediate change associated with headpond drawdown is the loss of habitat." Again, this is relative to the current condition and the timeframe considered is too short; the CER should also mention that there will be a gain of natural habitat that will benefit native species. Headpond drawdown should not be perceived as causing habitat loss.

8.4.3 Potential change in SAR/SOCC

Options 1 & 2 – The CER suggests that with improved passage for migratory species, that there may be restored habitat use by species such as striped bass that were believed to use the area around the current station as a spawning area prior to the dam. With better fish passage, it is a stretch to say that there may be restored habitat use by striped bass, which require a specific set of flow and other conditions to spawn. Nonetheless, improved passage is an improvement and certainly would be helpful for Atlantic salmon and other migratory species to access their spawning and rearing habitats in the headwaters.

Option 3 – the potential interactions with SAR/SOCC under a dam removal scenario are (our comments in brackets):

i. Conversion of the lake-like habitat of the headpond back into river-like habitat (this would benefit all the SAR/SOCC species identified in this report)
ii. Potential erosion and sedimentation during and after drawdown (MAES interim findings from bathymetric mapping shows that there is little sediment deposition throughout the headpond; therefore, minimal sedimentation should occur during the flushing process and its effects are not of concern in the big picture. Sediment will be transported downriver to supply the sediment deficient islands below Mactaquac and will also deposit in the natural depositional area of the tidal zone beginning 4 km below the station. Newly exposed banks will go through a period of natural stabilization and re-vegetation, a process that has occurred in a timeframe of only a few years on other dam removal projects.)
iii. Changes in water flow and sediment transport downstream (this is positive as it would restore the natural function of the river to replenish nutrients and sediment needs downstream)
iv. Changes in habitat connectivity (including fish passage) at the existing station location (no dam means the best fish passage)

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What is not listed, and should be, is that headpond effects would be eliminated for SAR/SOCC under Option 3. This is a particularly important omission given the MAES findings about the issues with passage through the headpond, particularly by wild Atlantic salmon.

8.5 Summary of Interactions Between Aquatic Environment and the Options – The summary table (Table 8.6) of potential interactions between the aquatic environment and the options identifies Option 3, removal, as having high, continuous, and permanent negative effects in terms of change in fish habitat, change in fish populations, and change in SAR/SOCC. To claim that removal will have permanent and continuous negative effects, is not consistent with the CER where substantial positive long term benefits of habitat connectivity and re-establishment of a natural river environment are identified, particularly in terms of SAR/SOCC. The exception would be for alewives, which benefit from the headpond habitat as a spawning area, and would not necessarily benefit from removal.

Table 8.7 provides a summary of additional potential mitigation and information requirements and is generally good, except that there is no mention of mitigation of headpond effects on migratory fish like Atlantic salmon.

8.5.2 Discussion – Under the discussion section, the CER notes that "Option 3 will be associated with a greater number and magnitude of interactions relative to Options 1 or 2. More extensive mitigation will also be required under Option 3. The removal of the Station will fundamentally alter the aquatic environment in the area of review." Indeed, it will be fundamentally altered relative to current conditions, as it was fundamentally altered to artificial conditions when the station was built in 1968. It would be fundamentally restored to natural conditions under Option 3 and should be perceived to require the least mitigation compared to Options 1 or 2, and have the lowest magnitude of interactions over the long-term.

The discussion goes on to describe that there are other dams and the removal of Mactaquac will only provide habitat gain of approximately 140 km of river downstream of Beechwood dam. Indeed, significant improvements are already underway on the Tobique Narrows dam as a result of the 2010 Protocol Agreement between NB Power and DFO, and it is our understanding that more are planned for Beechwood and the headwater reservoir dams in a subsequent 5-year protocol agreement. ASF commends these actions to improve passage and flow management at these other dams in the coming years. However, we contend that the gain is much more substantial with respect to removal of Mactaquac, as the other dams and smaller headponds are less of an issue for Atlantic salmon and potentially other native migratory species. Improving functional fish passage conditions at those sites is much more manageable and feasible than for Mactaquac in the Option 1, 2 or 4 (Life Achievement) scenarios.

8.5.3 Assumptions and Limitations – "Fish passage design will likely involve a trade-off between financial constraints and the need to meet acceptable regulatory objectives." This statement

leads us to believe that there is little plan or motivation to implement the best available upstream and downstream fish passage systems. However, we are encouraged that NB Power repeatedly remarks at stakeholder meetings/workshops about the importance of better fish passage (in both directions) and that significant improvements will be implemented under all scenarios, including the more recent Option 4 which is now identified as "Life Achievement".

In the final paragraph of Chapter 8, the CER notes that NB Power will consider the options in a manner that meets regulatory requirements and minimizes environmental interactions. Unfortunately, the CER is written in such a way that it compares the outcomes and impacts of the options to current conditions, rather than to the natural river conditions and geological timescale of the SJR. From the perspective of the CER, minimizing environmental interactions means choosing Options 1, 2, or 4 (Life Achievement). However, from a natural SJR and long-term perspective, minimizing interactions/environmental impact, means choosing Option 3, removal.

General Comments and Conclusions

The CER is written in too limited a scope both spatially and temporally. It does not compare the outcomes of each option to a natural free-flowing SJR, but rather to the current regulated state with the headpond and associated artificial habitat and ecosystem. The perspective, or baseline, should be gauged based on the natural state of the river and how each option interacts with that condition. The CER was written entirely qualitatively rather than quantitatively; in other words, no numbers were used. We find it difficult to compare environmental conditions associated with each option without numbers. The MAES should have been an essential component of the CER and its absence is a major shortfall of the document. It should have incorporated the MAES findings on the state of the ecosystem and what the ecosystem may look like under each option. The CER repeatedly makes note that MAES would provide more detail and would inform NB Power's decision. This detail needs to be part of the CER for it to be credible and useful for the public and stakeholders.

Closing Remarks

The Atlantic Salmon Federation thanks NB Power for the opportunity to comment on this important project, and for undertaking a process to engage stakeholders. We trust that our observations and comments will be given serious consideration.

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Original research article

Learning (or living) to love the landscapes of hydroelectricity in Canada: Eliciting local perspectives on the Mactaquac Dam via headpond boat tours

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ABSTRACT

Landscape impacts are commonly cited as barriers to new energy infrastructure, but rarely are perceptions of such impacts monitored over time. Built in the mid-1960s, the Mactaquac hydroelectric generating station in New Brunswick, Canada, is degrading, and its future is under review. We took locals on houseboats to learn how they felt about the dam, the landscape it altered, and the future of the facility. Using the concept of cultural imaginaries we observe important themes about how landscape changes are experienced, perceived and reinterpreted by local residents over time. Despite the initial trauma of construction, most residents expressed a deep sense of place, identity and appreciation of the headpond's aesthetic and recreational value, as well as its renewable energy. Our methods revealed social pressures at play: collective discussions endorsed keeping the reservoir intact, whether or not energy continues to be produced, while individuals alone were more likely to appreciate the former river, with some participants privately open to its restoration. The establishment within a generation of connection to this site of energy production suggests the value of taking a long view to understanding landscape transitions, which cuts both ways, providing possible consolation to proponents of renewable and conventional energy alike.

1. Introduction

It is increasingly clear that landscape and sense of place are key drivers of public responses to resource issues [1–3]. The energy sector certainly faces local opposition on these terms, currently for example around hydraulic fracturing, pipelines, and wind farms [4]. Conflict over natural resource use and development is common, but NIMBYism (a 'not in my backyard' perspective) and opposition to change may reduce the viability of a transition to renewable sources [5]. Renewable technologies are often characterized by low net energy gain, intermittency and dependency on specific environmental conditions, making them more prominent landscape features than conventional options [6,7]. Aspects of local support and opposition to new energy technologies are framed within this paper as expressions of cultural imaginaries and cultural landscapes [8]. Extending the idea of current reality as socially constructed [9], cultural imaginaries describe what we imagine to be possible as a terrain that includes social, psychological, and lived experience. Cultural imaginaries thus reflect the horizon of experience and condition what is acceptable practice within a society. When the concept of cultural imaginaries is applied to a landscape level, it represents *cultural landscapes* that reflect the social production of history, industrial development, sustained livelihoods and experiences that eventually become intergenerational and thus normalized.

Applied to the case of hydro-electricity development and the potential reconstruction or deconstruction of the Mactaquac Dam in New Brunswick, Canada, we explore the cultural imaginaries of landscape among local residents. We see patterns of continuity, variability and change in terms of public response to dam con-

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struction, the inundation of a headpond, and associated electricity production. Residents of any place tend to assume that they inhabit a naturally 'climax' (in successional terms) cultural landscape [10]. This happens despite the fact that such an assumption may delay effective societal transformation in the face of new challenges, in favor of petrifying established ways of doing things that are manifestations of solutions to earlier needs [11]. We are leveraging the uncommon natural experiment that this prematurely degrading dam presents: speaking about a dam headpond, and the possibility of its removal, to citizens including those who were present at its construction. Insights from our Mactaquac case study are thus widely relevant: dams are under construction as well as removal around the world, for hydroelectricity and other uses.

Renewable energy is not the only solution to climate challenges that involves water regulation. Climate adaptation is all about water [12], such as flood control infrastructure, and impoundment for reliable water supply. The rights of the domestically displaced as a result of climate impacts was discussed as part of the 2013 UN *Peninsula Principles on Climate Displacement within States* [13], but not yet expropriation for climate adaptation or mitigation measures. Many scholars have described the barriers that cultural values can pose to landscape transformation on such terms [14–16]. Perhaps, as Selman [7] implied, a sustainable energy transition depends on society not only coming to tolerate, but becoming aware that it is possible to "[learn] to love the landscapes of carbon neutrality" (p. 157). We take a human-centred approach here, demonstrating an emergent headpond aesthetic, culture and lifestyle in the face of the 'fantasy' of hydroelectricity as it was sold to locals – modernization and opportunity – and the quest for 'closure' amidst uncertainty in this instance of technology-in-place [see, for instance, Ref. [17,questions 22,67 & 75]].

In this paper our objective is to explore local assessments of the Mactaquac hydroelectricity landscape to more fully understand the dynamic and changing nature of our relations to manmade landscapes. We present an unusually fulsome methods section that articulates specific challenges in our novel field-based elicitation and focus group methodology, to inform other researchers using *in situ* methods. We collected local subjective individual and collective assessments of the Mactaquac headpond landscape, and discussed with research participants their preferred options for the future of the hydroelectric facility and the resultant headpond. Their experiences and preferences provide insight into cultural imaginaries of energy production, landscapes and climate adaptation more broadly. These imaginaries are normally understood as deeply rooted, yet atrophied and path-dependent. That is, what *was* limits and shapes what *is* and *can be*, as modern highways come to follow ancient roadways [18]. But through this study we learn that such imaginaries are indeed changeable and that a long view holds promise for resolving deep-seated public resistance to energy development.

2. Background

Energy development is controversial, whether conventional or renewable [6]. Resistance to change in such situations, even for reasons and rationales that are well accepted, is often called place-protective behavior [19,20]. A place is an inhabited landscape; it is the result of lived experience, and is bound up with individual and collective identity [21,22]. Jacquet and Stedman [23] thus propose examining local response to energy development using a "place at risk" framework, drawing from Short's [24] plea for risk approaches that include impacts of change on local social fabric. Part of this approach considers the *significance* of cultural landscapes to locals in the face of drastic change [25]. Wind energy has quite frequently been subject to such consideration [26], although installations typically impact a much smaller area than a hydroelectric dam, and change ecosystems less dramatically. This research extends to work about hydroelectric dam construction in other parts of Canada, for instance in Quebec and Labrador, where resistance to construction was often fierce [27,28], as today in the newly approved Site C dam on the Peace River in British Columbia. Fiction set amidst the anticipation or after-effects of inundation for hydroelectricity during this period of post-war rural modernization acts as shorthand for injustice and profound loss of place and identity [e.g., *Flood* (1963) by Robert Penn Warren, *The Sentimentalists* (2009) by Johanna Skibsrud, *The Winter Vault* (2009) by Anne Michaels, and even *The Town that Drowned* (2011) by Riel Nason, about the Mactaquac itself]. Yet there is very little *ex-post* analysis of large project impacts and how locals respond and adjust to these projects over time.

Drawing on the conceptual work of cultural imaginaries, a few features of this literature point to a need for understanding long timelines of change that may at times transcend single lifetimes. According to Taylor (2004) the development of cultural imaginaries is incremental. It is the slow process of incorporating knowledge and experience of individuals and groups, how they respond to change and how collective experience and collective behavior is formed; they are dynamic and emergent. Therefore, what may be a source of resistance today, over time may become less of a problem for observers as they adjust and become accustomed to a new normal. Although there is some evidence for the recalibration of experience through time in the literature on boom towns and other post-industrial settings [11,29], this theme of shifting landscapes and changing public perception is not addressed as frequently in the literature dealing with public perception of energy development. Without understanding of this potential for attachment formation to utilitarian landscapes, society will only be able to contemplate small, incremental and 'cosmetic' changes rather than large-scale transformations in the face of modern challenges.

In 1967 the construction of the Mactaquac Dam on the Saint John River, in the Atlantic Canadian province of New Brunswick, disrupted the landscape and its citizens; 40 km^2 of settlements, farms and ecosystems were submerged beneath the newly created reservoir or 'headpond' above the 55-m high hydroelectric dam. Populations of fish such as Shortnose sturgeon and Atlantic salmon declined dramatically (some say collapsed) after its construction, despite the hatchery built to remediate that risk for the latter species. As was common at the time, the dam was planned and built with a top down, hierarchical approach and a paternalistic attitude about progress, modernization, and the public good. Land was lost, livelihoods altered, cultural heritage destroyed, but all in the name of progress [30,31], similar to those affected by earlier imposed hydroelectricity projects [32,33]. Notwithstanding the local trauma at that time, in the decades that followed, the new headpond has become a cherished aesthetic and recreational amenity.

Due to chemical reactions in the aggregate (concrete) used to build the powerhouse and spillway, the dam is now facing the end of its productive life. New Brunswick (NB) Power, the public utility that owns it, has committed to decide by late 2016 whether to rebuild the concrete spillway and powerhouse (which can provide 12% of the province's electricity), remove the dam entirely, or decommission the powerhouse while leaving the earthen dam and headpond intact (Supplemental Fig. 1). Implementation of that decision would occur by 2030. Cost estimations range from CDN$2 billion (removal) to CDN$5 billion (rebuild with power) and are all confronting for a debt-ridden province even if they are accurate, cost over-runs being common in hydroelectric infrastructure projects [34,35]. In the 2014–2015 fiscal year, New Brunswick was estimated to be in debt by $12.2 billion, which represents 37.7% of its nominal GDP [36]. If the dam is removed, the equivalent generat-

ing capacity as well as its 'bootstrapping' (low energy start-up) role would have to be replaced, perhaps by electricity purchase from other Canadian provinces or even from the northeastern United States. New Brunswick's central location and transmission network connectedness is an asset for such external solutions.

Despite some growing support for the removal of dams based on environmental [37] or cultural concerns [38,39], dams may be as controversial to remove as they are to build [40]. The Mactaquac decision is an emotionally charged issue locally. While the utility has richly funded ecological studies [41] and a First Nations engagement program [42], they have not funded any substantive social scientific study. Public engagement is being handled by public relations and communications professionals. Moreover, they have released little information about the dam removal option, in contrast to the other two options (Supplemental Fig. 1). Public meetings to date have been dominated by vociferous support for the dam, but misinformation, fear and uncertainty abound.

3. Methods

We selected methods conducive to understanding how local people perceive and value the Mactaquac landscape today, why, and what they hope for its future. These methods were implemented in August 2013 upon a houseboat, as we took three groups of current and former residents of the lower Mactaquac region (Fig. 1) for a 3-h, 30 km round trip tour, to elicit feelings about the place and the future of the region. Such tactile [cf. Ref. [43]], *in situ* social research methods are increasingly used to understand how place drives public opinions and decision-making. Ideally, such methods reach beyond simple aesthetics or landscape preference – where a relationship with the site is not needed [e.g., Ref. [44]] – to help us understand how people live in a place [45–47]. Residents see places differently, thanks to lived experiences [48,49]. Researchers and planning practitioners frequently use *in situ* methods such as walking tours to prepare citizens to participate in community visioning and landscape planning [50,51]. Large landscapes require other methods, such as bus tours [47,52,53]. While such tours are frequently conceived of as expert-led educational exercises [47], they can support citizen-led goal setting, shared construction of place meanings and identity, and the breaking down of barriers between expert and lay knowledge [e.g., Ref. [54]].

3.1. Recruitment

There was space for nine participants per group, leaving room for researchers, the boat pilot and videographers. We targeted a different socio-demographic group each day, based on those we predicted to have varying opinions about the region, but the final composition was mixed:

1. Amenity migrants: those who settled in the area as adults, after dam construction ($n = 9$; all day 1);
2. Headpond children: those who grew up on or near the headpond post-dam ($n = 2$; all day 2); and,
3. Pre-dam residents ($n = 14$, only three of whom were established enough at the time of the dam own property then; 9 on day 3, 5 on day 2).

Advertising was done through flyers in gas stations, stores and other meeting places, on public radio, and referral sampling through contacts and social media. Pre-participation interviews also ensured the participants were not over-represented by organized interest groups. The novelty of the houseboat venue made for relatively easy recruitment among those who moved to the area as adults and those who knew the area pre-dam. Several of the research subjects agreed to participate only if they could come in pairs or couples, however, which may have increased redundancy in perspectives. Moreover, in some couples, one party was less vocal and deferred to the other. Recruiting participants was more difficult at the extreme ends of our demographic span of interest. For instance, all but three of the participants who knew the area pre-dam had been children or young teens at the time, thus had less at stake and potentially unreliable memories or 'inherited' opinions. More challenging was recruiting participants who grew up in the region after the dam was built, only two of whom attended.

3.2. Process

The use of the houseboat and the unique perspective from the water that resulted from this was designed to 'break the frame' of everyday experience [55] (Fig. 2). While the Mactaquac headpond is now a popular place for boating, for the majority of residents the view *from* the water to the land is not as familiar as its opposite. We also showed archival film footage of the pre-dam landscape and the dam under construction from the NB Power Commission and pre/post construction photographs as additional prompts each day. Finally, we provided maps that showed the original width and shoreline of the river before the dam layered with a view of the current shoreline. This map identified some features, such as islands, that no longer exist, and other features such as deep coves and long inlets, that resulted from the creation of the headpond. All of these props and audio visual materials were intended to stimulate thinking and discussion about the differences between the pre- and post-dam landscapes.

Each tour was comprised of two parts. First, while heading upriver, participants were given individual audio recorders and asked simply to respond to the landscape, sharing preferences, meanings, experiences and stories. We used individual audio recorders to mimic the use of diaries [44] but with more ease and comfort upon a moving houseboat. During this landscape elicitation phase, all groups were given the same instructions to spend this time speaking into their microphones alone or in pairs. Next, while heading downriver we held a videotaped focus group to explore landscape issues collectively, as well as discuss specific desires for the future of the area, particularly related to its development and energy future. *In situ* focus groups are not common, much less mobile ones as landscape passes, but are reliable sources of rich insight [44,56]. An optional 'speaker's corner' elicited personal stories for use in a short documentary, *Mactaquac Revisited* (http://vimeo.com/87082790).

3.3. Recording and transcription

Audio recording, and thus transcription and analysis, were more challenging than expected. The facilitated focus groups were held inside the boat, when traveling at slow (thus relatively quiet) speed, and were videotaped making them easy to transcribe and analyze. All participants granted permission for footage from this section to be used in the documentary.

By contrast, the landscape elicitation was subject to great variety in data quality and quantity. We put participants in control of their own audio devices, as we expected people would – over the three hours – need occasional privacy. The audio device we chose had a large button to facilitate switching on and off. Some participants did not properly operate their recording devices, resulting in relatively sparse data. Some of these individuals were audible, however, on the recorders of others nearby. Moreover, the devices were hung on neck straps, and audio quality was poor for those who left them hanging, rather than holding the devices to their mouth when speaking. Finally, the groups behaved differently each day. On Day 1, the nine participants largely spoke alone and directly into their

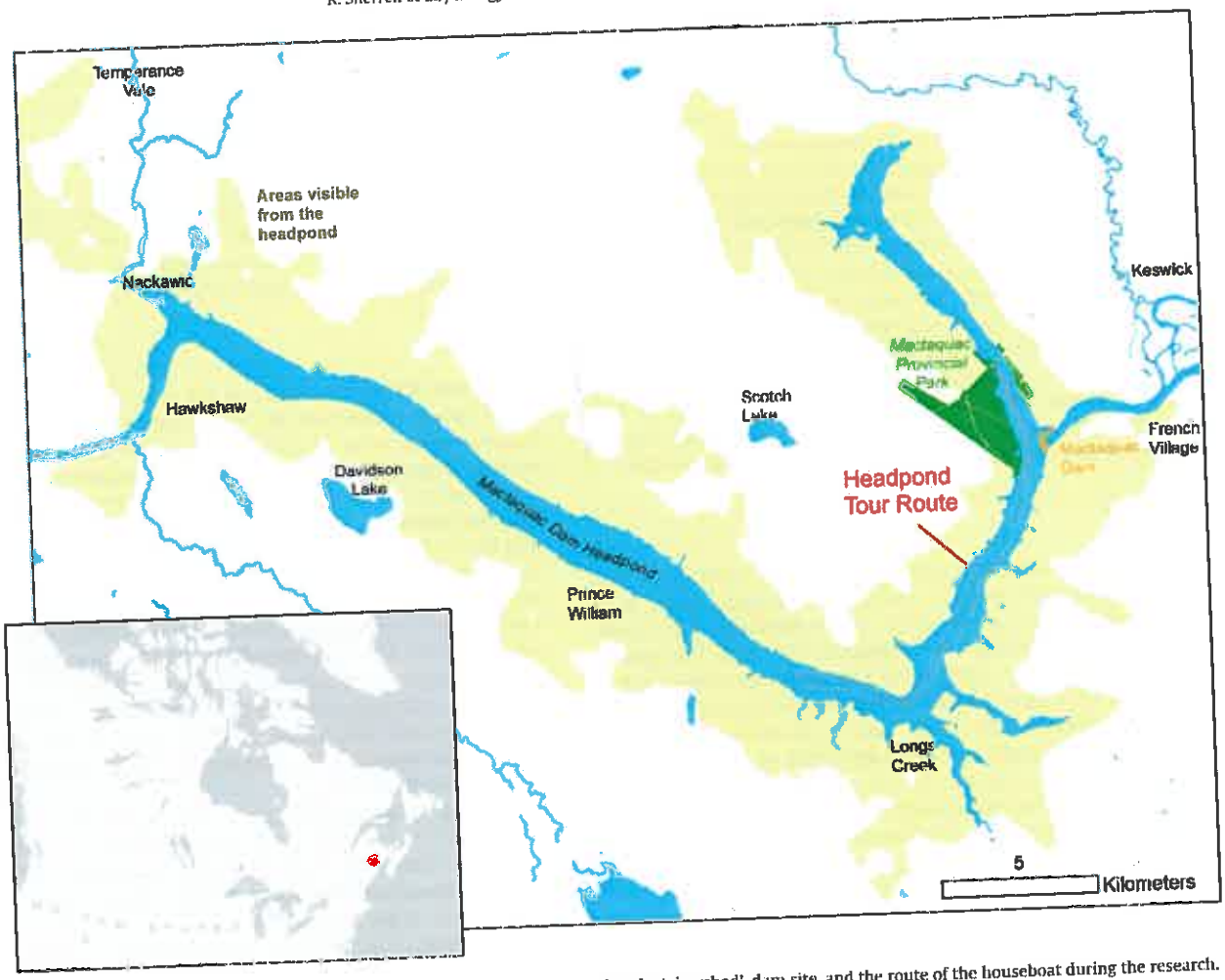

Fig. 1. The lower Mactaquac headpond, in New Brunswick, Canada, illustrating the 'viewshed', dam site, and the route of the houseboat during the research.

microphone. On Day 2, the seven participants spent a good portion of the time speaking and reminiscing in groups. Transcription of this day's audio was a painful forensic exercise that drew upon numerous recorders and sketch maps of seating arrangements to identify speakers and track content. On Day 3, the nine participants spoke mostly in pairs and groups of three.

The above issues have implications for analysis. First, we could not always identify the speaker. Second, people speak differently alone than together. Those who spoke alone typically described where they were, what they were seeing and what it looked like. By contrast, those speaking in groups pointed out things to their companion as they passed, but did not describe it (Supplemental Box 1a). Moreover, and not surprisingly, those who spoke alone into recorders stayed on track with the research exercise more than those who conversed with others. We did our best to identify individual content, and sent transcripts to all participants to give them an opportunity to make corrections.

3.4. Coding and analysis

All qualitative data was coded and analyzed using *NVivo 10* (QSR International Pty. Ltd.). The focus group (downriver) data was coded inductively within the specific questions from the facilitator. The elicitation (upriver) phase was coded using a more complex hybrid inductive–deductive coding method. Pre-designed deductive elements included coding for cohort, gender, expression type (i.e., monolog or dialog), expression content (i.e., resistance to change, dissent, etc.), expressed opinion on the dam's future, features referenced, and assigned significance. Specific anticipated sub-codes were added under these categories prior to coding. The method was also inductive, in the sense that the coding structure was left flexible enough to add specific unanticipated sub-codes as the need arose. Once preliminary coding was completed, the code structure was further refined by grouping, consistent with Beckley et al. [57] and other semi-quantitative approaches to coding [58]. Feature types were sorted into six feature-type categories: buildings, other man-made features, natural features, recreational features, transportation infrastructure, and wildlife. Significance was refined into four types: aesthetic, community, environmental, and historical. Analysis was then undertaken through a series of matrix queries (cross-tabulations to identify content coded to multiple thematic categories of interest). While we used word counts as a proxy for importance during interpretation, we do not report raw numbers because of the methodological challenges already discussed (e.g., the risk of double counting one speaker).

4. Results

In general, despite logistical challenges with the method, the houseboat trip did seem to 'break the frame' (Supplemental Box 1b), and focus the discussion on the landscape and the headpond in particular. We discuss results for the upriver (landscape elicitatic and downriver (focus group) elements separately, and synthesize these in the discussion.

Fig. 2. The houseboat *in situ* on the Mactaquac headpond: (a) looking upriver with new development in the foreground; (b) with a farm house and outbuildings, as well as sailboat; and (c) alongside the dam and provincial park beach.

4.1. Landscape elicitation

First, we evaluated the aesthetic, community, historical, and environmental significance placed on different features of the landscape by participants. Man-made features were most discussed, with buildings and nature almost tied for second place, but with less than half each of the dominance of man-made features. Within these categories, demographic cohorts saw the landscape differently: the pre-dam residents mostly told personal stories related to the land, whereas amenity migrants reflected largely on what they saw that day (e.g., houses, birds). Most statements in all but the 'wildlife' target category seemed to have 'community' significance: positive elements such as gathering places, neighbor relations and employment but also negative such as local concerns. The wildlife category, while least prevalent in terms of discussion content, had the strongest 'environmental' significance, mostly positive (e.g., biodiversity). Unlike features of 'community' significance, which were typically discussed positively, in the 'historical' category, many discussions discussed positive and negative impacts, including connections such as family history but also the period of loss and displacement around dam-building. Overall, most discussions were more positively framed, particularly those discussing features of 'aesthetic' significance, where terms such as "beautiful" and "lovely" dominated. Building and transportation infrastructure were predominantly discussed with negative environmental significance (e.g., pollution and soil erosion), but not exclusively. For instance:

> A lot of new construction that has happened over the last few years and I don't know how to say it but I like it, I'm not scared of it or offended by it I don't see it as being a problem (female Day 1 participant, amenity migrant).

Next, we sought to understand how the water body created by the dam was locally perceived. References to the "dam", "lake" and "headpond" were coded separately as they implied different perspectives on the naturalness of the landscape, and awareness of the connection to the built infrastructure of the hydroelectric dam. Also, the use of 'lake' has only been recently popularized by a local interest group, the 'Friends of Mactaquac Lake' to pressure the government to keep the dam. Some participants were involved with this group:

> Well we have started to be involved with the Friends of Mactaquac group because once we heard that the power part of the dam might have to be removed and not be replaced we felt our grandsons come now, our three little grandsons come and spend their time on our little beach or we go out on our kayak and so on and we do not want to take it away (female pre-dam participant, Day 3).

The dam dominated as a discussed feature, and it was certainly in view for much of the tour, but those referring to the resulting body of water called it a headpond three times more often than they called it a lake. Negative feelings and expressions were often associated with historical references to 'dam' and 'headpond', such as around the loss of farmland:

People no longer own the islands for that reason [raising cattle]. Years ago it was an extra place you could take your cattle, grow your crops, wouldn't need to build fences, very fertile land. A lot of those nice little islands are now under the headpond (female amenity migrant participant, Day 1).

By contrast with historical references to 'dam' and 'headpond', historical associations to 'lake' were positive. For instance:

My kids are 25 and 30 so they were probably 10 and 15 when we had our camp on the arm part on Mactaquac Lake and they very much loved the river. We utilized it in the summer and winter (female amenity migrant participant, Day 1).

Community and aesthetic significance was more often positive than negative for all three terms, and environmental significance was largely neutral (i.e., descriptive). For instance, one participant noted positive community and employment impacts:

. . . I was fortunate to be about 5 or 6 years old when the power dam was built and it was one of the most exciting times of my life. All the construction and that sort of thing. To watch the change in the community, and the positive change in the community, it is gorgeous. It has opened up a lot of opportunities that would not have been here without the dam (male pre-dam participant, Day 2).

The most negative topic of community significance was the uncertainty of what will happen to the landscape if the decision is taken to remove the dam. Positive community associations also include the strong place attachment, for instance, as one female pre-dam resident described, "Mactaquac headpond is more home to me than the way the river used to be" (Day 3). A female amenity migrant similarly described a bridge as a marker of "that place that you get there and you just know you are home" (Day 1).

Locals generally expressed a preference to retain the headpond, whether or not hydroelectric generation continues: primarily to avoid further displacement, but also for businesses that rely on it, such as King's Landing Historical Settlement, a tourist attraction created from historical buildings saved from inundation by being relocated to a higher site. One female amenity migrant observed that "King's Landing is a huge benefit to . . . not only tourists but New Brunswickers so they can learn where they came from" (Day 1). One male pre-dam resident noted:

Some of the things I have heard, I am not too interested in those happening. I have heard a lot of people think the dam should be removed and put back into its original form. Which I think is a big mistake. They have already upset a lot of people's lives back in the '60s with the land. Today there is more population, more money involved, people have spent their life savings to have a nice lot on the river (Day 3).

Perspectives did seem to vary by cohort, although with the small sample this is only anecdotal. Amenity migrants were most vocal about the future, predominantly keeping the dam (and thus the headpond) with only a minority of their audio content indicating openness to the possibility of removal: one female amenity migrant described that they "moved here because of the water" (Day 1), and another that "it would be a shame to not have this landscape around us" (Day 1). Energy concerns were most dominant among amenity migrants, who discussed it twice as much as pre-dam residents. Pre-dam residents also wished to keep the headpond, but mostly to avoid further displacement. A substantial amount of pre-dam resident content reflected interest in dam removal but it came largely from one vocal participant. Real estate value and aesthetic value was a common concern, with many expecting removal would mean, "just mud, mud and more mud" (female pre-dam resident, Day 3). A female amenity migrant had similar perceptions:

When we hear people talk about removing the dam and what that would mean to us what we understand is that if the dam wasn't there the river wouldn't be as wide and we would have just a really, really big beach on either side of the river, and not a sandy beach but a really muddy, stinky beach. So that's our perception. To us it's almost inconceivable that the government of NB would want to remove the Mactaquac Dam (female amenity migrant participant, Day 1).

Finally, it is important to note that the two types of elicitation data that resulted from different participant behavior – monolog (speaking alone into the microphone) or dialog with others – resulted in very different themes. Those speaking in dialog spoke more often about the dam's future than those in monolog. Those speaking in dialog also opined exclusively (save one) for keeping the dam, but two-thirds of those speaking in monolog discussed either a nostalgia for the old river, or (more rarely) explicit openness to seeing the river restored. Notably:

I think it would be very interesting if the dam were taken out and the river were restored, I think that would be a wonderful thing. I'm probably in a minority, and there are people on this tour who would be very upset to hear me say this so I will say this at the back of the boat with only you to hear me. But I think river restoration would be a great thing (female amenity migrant participant, Day 1).

Those speaking in monologs were also much less likely to express concern regarding the dam's future.

4.2. Focus groups

A deep ethic of place protection (i.e., keeping the landscape much in its current state) was also revealed during the focus group phase. Only one of the 25 participants preferred openly to see the dam and headpond removed: for ecological and personal reasons, and to avoid further provincial debt. Another participant emailed comments later supportive of dam removal but stated that they were not comfortable saying this in front of the larger group. The remaining participants discussed a strong symbolic but also instrumental attachment to the landscape that resulted from the dam, now that the "damage was done". In essence, the majority expressed that the naturalized landscape created by the headpond was different, and perhaps not entirely natural, but still beautiful and useful and valuable to residents of the region and beyond.

Most participants felt that the local residents should be an important stakeholder in the decision, given the sacrifice they had made, or their neighbors or families had made. There were many references to the injustice of the process (i.e., expropriation) when the dam was originally built and a sense that NB Power and government decision makers need to do a better job this time around with addressing local concerns and listening to those most heavily affected by this decision. Concerns about removal included: losses of recreation, aesthetics, property value, tourism livelihoods, as well as community ties if residents leave as a result. Additional concerns included the losses of new resident species (e.g., eagles) and renewable energy. The current features and experiences afforded by the headpond were almost uniformly valued, and considerable uncertainty was expressed about the process, viability and implications of potential river and riparian restoration. For instance, because World Wildlife Fund weighed in early, upon learning that dam removal was under consideration, to advocate for full consideration of the potential benefits of removal, many locals believe that one of the driving forces for removing the dam is to encourage the return of salmon (rather than failing infrastructure). Most participants were not convinced the fish would return in the event of dam

removal, or even that the dam caused their precipitous population decline in the first instance.

5. Discussion

Our first general insight is conceptual. Consistent with Babbitt's observations in 2002 of dam removal discourse in the US [40], the same arguments used to protest the dam's removal mirror those used to protest its construction. For instance, the voices of dissent in 1966 argued against the loss of fishing, aesthetics, property, agricultural livelihoods, rural culture, longstanding community ties and natural processes such as the ice jams each spring [30]. A newspaper advertisement at the time of dam pre-construction used what we would recognize today as an ecosystem valuation perspective: "[n]o study has been made of the great dollars and cents value of the St. John River in its natural state to the Province of New Brunswick" (Public Archives of New Brunswick File 18115), although it was hardly 'natural' after two centuries of farming on the adjacent shoreline and islands. It is not an overstatement to suggest that there was significant local trauma, including at least two local suicides, associated with the landscape change and the way that it was undertaken. Such injustice in process can be a significant hurdle to accepting new landscapes [59]. However, the irony cannot be avoided in the message we perceived: "they didn't listen when we didn't want it; we hope they will now that we want to keep it".

Today, the concerns about removal are in some ways startlingly similar: losses of recreation, aesthetics, property value, tourism livelihoods, as well as community ties if residents leave as a result. The 2015 Annual Meeting of Friends of Mactaquac Lake featured a talk by NB Chief Economist David Campbell called, "Will Mactaquac refurbishment create an economic boom for Fredericton?" (the answer was, predictably, yes). Additional concerns include losses of new resident species and renewable energy. While specific landscape features are important to sense of place, so too are the different kinds of activities and thus experiences enabled by a headpond versus a river [60]. The features and experiences of the headpond are clearly valued, and considerable uncertainty was expressed about the viability and implications of trying to restore the river, suggesting a status quo bias exists [61]. In fact, one of the themes about pre-dam conditions that arose during the elicitation phase was around the salmon, and fishing, but most were not convinced the fish would return should the dam be removed, or even that the dam caused their loss. As well, a flourishing recreational fishery around smallmouth bass has emerged in the warmer, stiller water of the headpond. Not surprisingly, amenity migrants were most vehement that the headpond stay; they had no association with the former landscape. This insight is confirmed with recent work by Keilty [62]. From these studies, we learn that local residents are highly sceptical about their capacity to adapt to change associated with headpond loss, despite demonstrated local resilience to dramatic landscape change in the past.

Taylor (2004) defines imaginaries as realms of what is normal and what is possible, which then become encoded into our everyday lived experience. Cultural landscapes, as a form of imaginary, are understood in similar ways and reflect the dynamic and changing nature of our relations to surrounding landscapes. In any typical given moment these landscapes seem unchanging and we are accustomed to the livelihoods and lifestyles that we derive from them. On the other hand, as illustrated in this study, with access to a long range local view we notice how landscapes *do* change, sometimes in dramatic ways. We also notice how people adapt and become accustomed to and even cherish these new landscapes [7], particularly when they represent new opportunities or value. For renewable energy proponents who seek to establish more sustainable low carbon energy landscape these insights can offer a sense of optimism as people might well adapt over time to new wind turbines or solar panels in their immediate surroundings. Yet this same sense of adaptation allows for the normalization of unsustainable and carbon-intensive forms of energy production. What becomes established on a landscape eventually becomes normalized. Moreover, meaning can become embodied in those utilitarian features, based on livelihoods and the identity they engender [11,63].[1] There is inertia and resistance to change, particularly when such change represents an immediate threat to local ways of life.

Our second insight is methodological. Our intent was to understand how research participants feel about this landscape and various scenarios for its future. The construction flaw that has cut the working life of the hydroelectric facility short has allowed pre-dam residents to be included in such discussions. Given the normal lifespan of hydroelectric dams, this is an uncommon event and thus a valuable research opportunity. All participants were aware of the region's past, however, even those who did not personally experience it. Despite unevenness in sampling (relative to our targets, particularly among those who grew up on the headpond and have thus a limited 'imaginary'[2]) and difficulties with data collection logistics across the three days of houseboat tours, we are able to see that the local opinion is strongly in favor of keeping the dam at any cost (with or without energy production). Opinions voiced during public discussions were almost uniform, and it was clear that a strong personality was needed to voice anything different. Yet it is also evident that in private, during those landscape elicitation opportunities undertaken alone (rather than in dialog), more locals (typically pre-dam residents) discussed the pre-dam landscape favorably, occasionally even reflecting on the potential benefits of dam removal, particularly related to fishing and river health. In such a close-knit community, however, they felt to say so publicly could make them pariahs. This is consistent with Wutich et al. [64], who found people provided less information in focus groups than on individual questionnaires about sensitive material, unless sharing perspectives would directly help them solve a problem or gain information. We did not design the experiment to test for the impact of elicitation style on content, but it was an emergent insight that speaks to the value of multiple methods. Such insights are critical for proponents of any substantial landscape change: public meetings will be inadequate to gauge local opinion as they attract an unrepresentative sample and represent sites of considerable social pressure [65]. Supplementary, confidential and potentially fun approaches must also be used, such as interviews, surveys or modified *in situ* or 'speaker's corner' elicitation opportunities.

The houseboat venue was effective at 'breaking the frame', by allowing participants to see their landscape from a unique vantage point. This new frame of reference offered participants a sense of energy, new interest, and new insight that was revealed through our field research. Although this new frame focussed discussion on the lower headpond and its immediate viewshed (areas that can be seen from it; see Fig. 1), it somewhat blinded participants to other drivers of local change. As such it is difficult to plumb the changes caused by the dam within broader cultural, economic and landscape changes. For instance, the re-routing of the Trans-

[1] Consider, for instance, the recent development of an 'Oilfield Lifestyle' clothing brand featuring a spurting oil derrick.

[2] The gaps in participation by those who grew upon the headpond, as well as those who were too elderly to participate in the boat trip, were more recently filled by Keilty [62], who stratified land-based map-elicitation interviews across four groups: pre-dam elders ($n=4$), pre-dam children (6), headpond children (5) and headpond migrants (6). We also developed an interactive ArcGIS storymap of before-after imagery to help fill the gap in 'imaginary' among those who grew up on the headpond [66].

Canada highway away from the headpond affected local tourism and development, as well as extending upriver the 'bedroom' community phenomenon by reducing commute times to the capital of Fredericton whilst increasing the amenity value of waterfront land on both sides of the river. Similarly, agricultural land abandonment and demographic aging were not explicitly mentioned, though they are key drivers of landscape and local settlement patterns. For instance, while the dam construction accelerated a local shift from agriculture to other sectors (such as pulp and paper manufacture), it is unlikely that this area would still be highly productive agriculturally had the dam not been built [31]. It is the nature of elicitation-based methods that the stimulus for discussion (the 'prompt') be designed to simplify the task of recollecting and sharing complex stories and preferences, and this often requires focus and thus sacrifice of other details [55].

6. Conclusions

This research reports on a process of *in situ* values elicitation and group discussion regarding landscape, energy infrastructure, community impacts and policy preferences regarding future energy options. The research relied on data collected during headpond boat tours that brought locals onto a waterbody created by the Mactaquac hydroelectric facility. Results reveal that the Mactaquac Dam has become a cultural landscape of considerable local attachment, despite the trauma associated with its original construction. Moreover, while the collective local imaginary struggles to imagine and accept its potential loss, individuals reveal a wider range of acceptable potential futures.

While some discussions were clearly improved by being on the water, some were not. What came under most consideration was that within view: the specific landscape and future of the headpond and its immediate 'viewscape'. Some participants also expressed utilitarian values around the 'green energy' already being produced by the dam, but little unprompted discussion emerged about energy transitions and tradeoffs more generally. Proponents of renewable and conventional energy installations can both take advice from the revealed status quo bias and general place protection sentiment here. The potential loss of this largely cherished landscape 'as is' presents a risk to most participants. They know what they would be losing, but they are very unclear what they might gain if the dam was removed.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.erss.2016.02.003.

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Supplemental Materials: Sherren et al. Learning (or living) to love the landscapes of hydroelectricity in Canada, *Energy Research and Social Science*

Supplemental Box 1: Indicative quotes from research participants illustrating the impact of methods.

a) Quotes to illustrate the differences in elicitation data depending on individual or group elicitation

Individual

I'm looking to my left, north side of the river, its beautiful, just above Mactaquac Park, lots of trees, looks very natural. Then I look to the stern and see the dam. I know there used to be a church, beautiful little church, on top of that hill that they took out and burned. I wish I had been here to see that before that landscape was changed. The river is high right now with all the rain we've had this summer.

We are going by a new subdivision, I think it is called The Cove, but I am not sure, it is on the south side across from lower Queensbury. There aren't a lot of houses right now, but there's potential. They've built a beach; there are two houses I can see across the water from where we live.

Well we are on our way up to Nackawic and it looks really quite lovely here, there's a farm and fields to my left and woods and another field to my right and it looks like a stable.

Group

A: This is a different perspective because I have never had a look at these fields, whoever farms the fields down this way.
B: A lot of those they cleared
A: At one time they were doing fields everywhere up through this and over the hills in here.
B: See some of these, whether they might have been fields and grown up with that would be part of the history but they also made them much bigger.

C: Look at the property, these people must have a ride on lawn mower, look a great big " for sale" sign, that whole property must be for sale.
D: Well the trees to the cove, because another guy owns this piece here. I think there might be another guy to the right of that. There are houses all the way up here....
C: It has really built up then since we went
D: You do not really notice it because it is in the trees but if you look in the trees you will see houses or docks. ... It has really built up. Especially in the last 10 years.

b) Quotes showing the value of the water perspective to provide new insights on a familiar place.

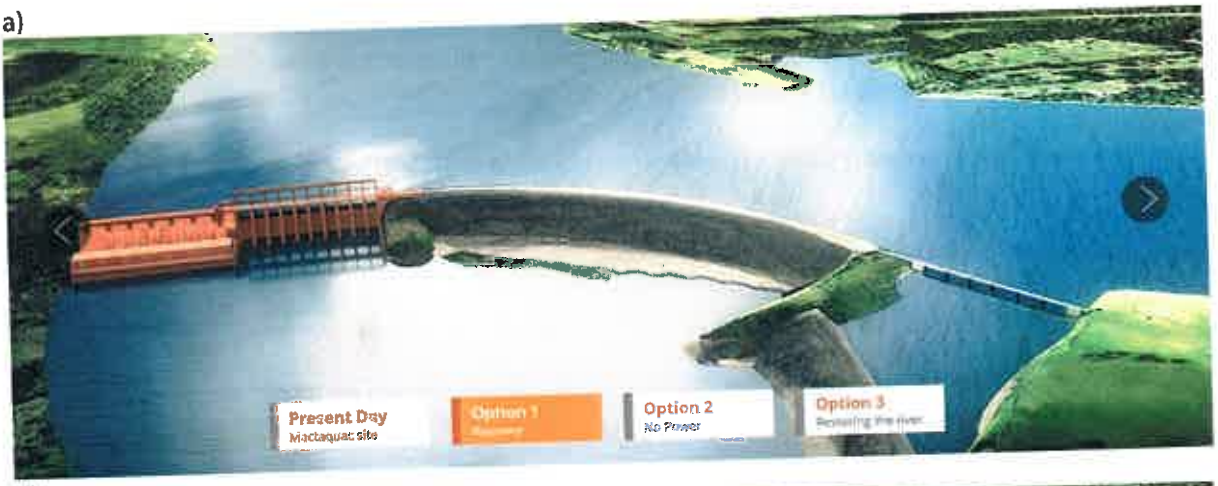
You get a very different perspective being on the water compared to the road.

Although you travel the route 105 on the Mactaquac side of the river bank as I have done for 30-odd years its interesting when you get on the water and you see banks and you see homes that you never see from the road and you never realized existed except that you know there is a driveway up there somewhere that someone must use. I find it quite interesting that a lot of these homes are really hidden in the forests around the river without people realizing they are there. ... its not till you get on the water that you really appreciate that.

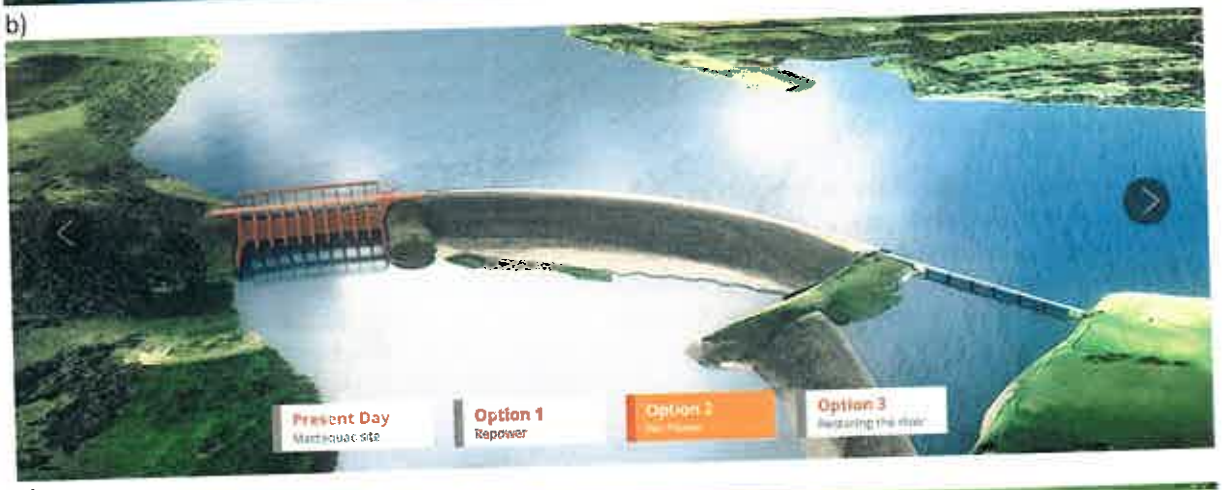
That is going up to the Mazzerolle settlement up there. It all looks different from out here; I do not see much of this side, and it all looks different from this side.

Now this is a spot that we can most certainly not see from the road.

a)



b)



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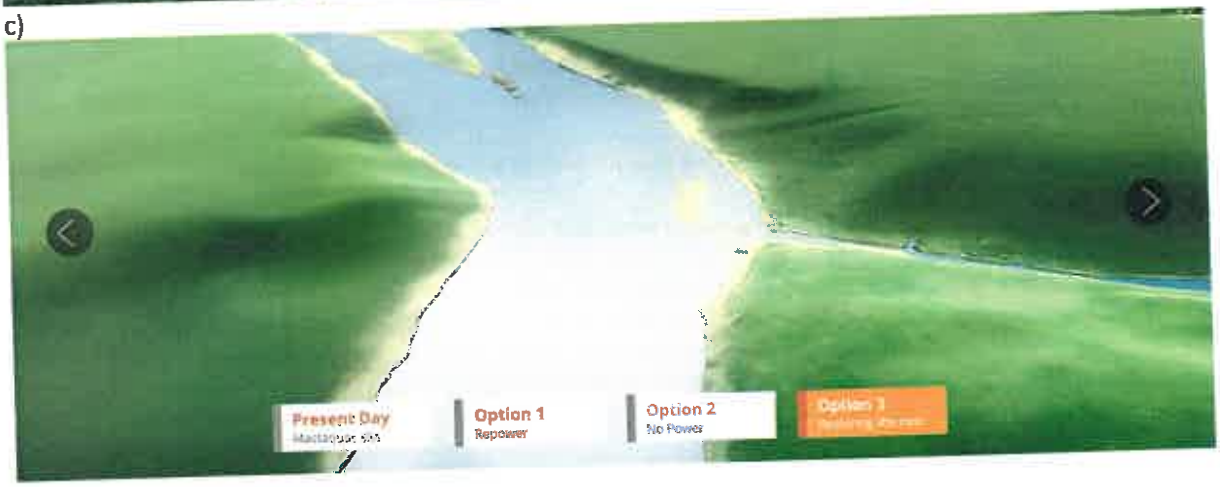

Supplemental Figure 1: Landscape visualizations provided by NB Power for their three scenarios for the future of the Mactaquac dam: a) repower, b) no power, and c) restoring the river (source: Mactaquac.ca)

NATURE CONSERVANCY CANADA | CONSERVATION DE LA NATURE CANADA

May 31, 2016

New Brunswick Power Corporation
515 King Street
Fredericton NB,
E3B 4X1

RE: The Draft Comparative Environmental Review for the Mactaquac Generating Station.

Dear Gaëtan Thomas,

On behalf of the staff at Nature Conservancy of Canada (NCC) - Atlantic Region, we appreciate the opportunity to comment on the options for the Mactaquac Dam, through the Comparative Environmental Review (CER) process.

As Canada's leading environmental charity, Nature Conservancy of Canada (NCC) protects all areas of natural diversity for the benefit of our children and future generations. We are science-based, non-advocacy and take a business-like approach to our work. For over 50 years, NCC has built its success on good partnerships, collaborating with individuals, corporations, foundations, government agencies, and local community groups. A leader in environmental science and innovation, we use creativity to conserve Canada's natural heritage.

Although most of NCC's work is focused on terrestrial and near shore ecosystems, we recognize that the health and viability of terrestrial ecosystems are inextricably linked with the health of our rivers and streams. Freshwater habitats and species contribute greatly to biodiversity; over one-third of at-risk species use aquatic environments for all or part of their life cycle. Protecting freshwater ecosystems (e.g. rivers, streams, lakes) and species are key components to NCC's mission of preserving Canada's natural spaces through land protection and stewardship. Across Canada, NCC has helped to protect over 2.8 million acres (1.1 million hectares) of ecologically significant land, including18,748 acres (7,587 ha) in New Brunswick.

NCC and partners (including the Canadian River Institute and Atlantic Salmon Federation) have already begun working directly in the region's aquatic environment with our Freshwater Ecosystem Classification project. The classification system established by this project will build a greater understanding of the health of our aquatic ecosystems by providing a standardized approach for assessing the current state of river habitat and changes over time. With this information, Nature Conservancy of Canada will develop a Freshwater Conservation Blueprint, which will help identify the best examples of representative aquatic ecosystems and species targets across the region. Sites will be assessed based on their condition (e.g. water quality, population sizes, intact watersheds), diversity (e.g. variety of species) and special features across the region (e.g. rare or at-risk species, unique habitat type). The Blueprint will be a valuable tool for conservation groups to plan and prioritize future freshwater management, restoration or research projects.

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NATURE CONSERVANCY CANADA | CONSERVATION DE LA NATURE CANADA

NCC's involvement in the Mactaquac consultation process

Nature Conservancy of Canada staff have been following and actively participating in the Mactaquac Dam consultations, both through the Mactaquac Aquatic Ecosystem Study (MAES), led by the Canadian Rivers Institute and through public forums, most recently at the Fredericton public consultation held on May 17th, 2016. We have been an active partner by providing opinions on the various options as they pertain to improving fish passage.

NCC's Recommendations and Comments on Comparative Environmental Review:

Nature Conservancy of Canada's interest in the future of the Mactaquac dam is to ensure the best available science will be used to address improved fish passage while considering the need for non-carbon energy production, and socioeconomic benefits to New Brunswickers.

- If fish passage is improved significantly (for all species in various stages of development), many tributaries between Mactaquac and Beechwood would see increased fish populations by expanding the amount of available habitat for migration, food and reproduction for all native fish. It would restore aquatic connectivity to over 4,000 km of the Saint John River including all of the tributaries in New Brunswick and Maine (from Saint John to Beechwood). Additionally, improved fish passage would improve both diadromous and offshore fisheries in the region, thereby supporting more sustainable fisheries.
- The review states that the only species of diadromous fish for which upstream transportation is provided are Atlantic Salmon and Gaspereau. The needs of other species should be considered in the options such as Atlantic and Shortnosed Sturgeon, American Eel, Striped Bass, and American Shad.
- NCC would greatly support the completion of the Mactaquac Aquatic Ecosystem Study (MAES) before any final decisions have been made. This study will provide important information to inform the costs and benefits of each option.

Nature Conservancy of Canada would like to express our continued interest in this study. We would welcome any future opportunities to offer our scientific expertise to help find a balanced outcome; one which results in energy generation and improved ecosystem function. Thank you for considering our position.

Sincerely,

Margo Morrison, RPF
Director, Conservation Science – Atlantic Region
Nature Conservancy of Canada

2016 05 31

Also 2016 03 13
2015 01 07

New Brunswick Salmon Council
P.O. Box 533, Fredericton, NB E3B 5A6

Conseil du Saumon Nouveau Brunswick
C.P 533, Fredericton, NB, E3B 5A6

May 31, 2016

Anthony Bielecki
Mactaquac Project
NB Power
515 King St,
Fredericton NB E3B 4X1

Dear Mr. Bielecki:

SUBJECT: Social Impacts Comparative Review (SICR) Mactaquac Project

The New Brunswick Salmon Council has reviewed the response prepared by the Atlantic Salmon Federation and shares their concerns on NB Power's Social Impacts Comparative Review report.

These concerns include flaws associated with focusing the scope of input to a restricted "larger community", not identifying the advantages and the disadvantages of a diversity of recreational fisheries associated with a headpond drawdown, the unavailability of many (but not all) of the MAES findings until after the CER and SICR review periods are complete, and implied loss of community identity resulting from a drawdown. Your suggestion that a drawdown would have the greatest social impact from the current situation should have been balanced by also stating that a drawdown would have the least social impact from the situation 50 years ago, pre Mactaquac Dam. The residents of the Tobique and Aroostook watersheds should have received as much focus as your chosen "larger community".

In 2013, DFO concluded that hydro dams were the most limiting threat to Outer Bay of Fundy Atlantic salmon stocks. Research conducted since then suggests that the Mactaquac dam and its extensive head-pond is the largest impediment to safe upstream and downstream passage for wild Atlantic salmon stocks. For these reasons, our Board approved a resolution in support of Option 3 (removal of the dam).

In conclusion, the NBSC agrees with the concerns identified by the ASF on your SICR report.

Yours in Conservation

PETER J CRONIN
President

The New Brunswick Salmon Council (NBSC) is a non-profit, volunteer-based organization, dedicated to protecting wild Atlantic salmon and supporting restoration and enhancement activity on all watersheds in New Brunswick (NB). The NBSC is comprised of, and represents 31 affiliated salmon angling/conservation organizations throughout New Brunswick.

St. John Basin Salmon Recovery Inc.
733 Main St. Unit 1
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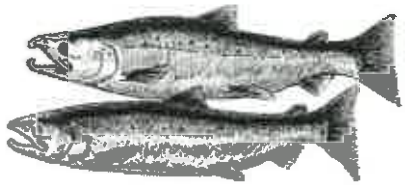


June 1, 2016

Mr. Anthony Bielecki
NB Power
515 King St,
Fredericton NB E3B 4X1

Dear Mr. Bielecki

SUBJECT: Social Impacts Comparative Review (SICR) Mactaquac Project

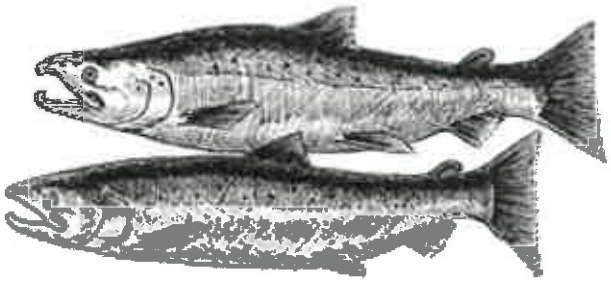
The St. John Basin Salmon Recovery Inc. (SJBSRI) has reviewed the response prepared by the Atlantic Salmon Federation on the Social Impacts Comparative Review report prepared for NB Power. This letter is to confirm that the SJBSRI shares the concerns identified in the ASF report on the SICR.

A major point on which we agree with the ASF is on the baseline time period for comparison. The SICR states that of the various options #3 will have the great social effect, and we acknowledge that this is true if the period chosen for comparison is the last 50 years. However, the construction of the dam had serious effects on society as it had existed since the time of human occupation of the region. Options 1 and 2 (and now #4, or 1A) extend the ongoing and very significant impacts that began only with the relatively recent construction of the dam. Of particular importance to the SJBSRI are the negative effects that the dam's construction and operation have had on the fish populations of the upper St. John River and the fisheries that they formerly supported.

To repeat emphatically, the SJBSRI agrees with the concerns identified by the ASF in their comments on your SICR report.

Yours truly,

Gary Spencer
President



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Comments on Sections 8 and 17 Mactaquac Comparative Environmental Review

Submitted to
NB Power, Mactaquac Project

May 31, 2016

by

PETER J CRONIN
President NBSC

GARY SPENCER
Chairman SJBSRI

Comments on Sections 8 and 17 - Mactaquac Comparative Environmental Review May - 2016

BY: John Bagnall for the St. John Basin Salmon Recovery Inc. and the NB Salmon Council
DATE: May 30, 2016
FILE: NB Salmon Council/ Mactaquac CER

Background and Opening Comments

This is a joint submission from the New Brunswick Salmon Council (NBSC) and the St. John Basin Salmon Recovery Inc. (SJBSRI). The NBSC is dedicated to the conservation, protection and restoration of wild Atlantic salmon and the ecosystems on which their well-being and survival depend. In addition, the NBSC promotes and defends the values and views of its 31 affiliate organizations, which include fish & game, environmental and First Nations groups. The NBSC is also affiliated with the Atlantic Salmon Federation many of whose policies we share. Therefore, we are composed of a substantial network of groups along rivers and streams who are invested in and dedicated to ensuring healthy ecosystems for wild Atlantic salmon.

The SJBSRI was formed from the Downstream Passage Committee of the NBSC. Its members include co-affiliates of the NBSC as well as individuals with an interest in restoring the Atlantic salmon populations of the St. John River. The SJBSRI's main goal was to lobby for and help with establishing downstream salmon passage at the Tobique Narrows Dam. Since this is becoming a reality within the next 15 months, the SJBSRI has recently undertaken other St. John River salmon restoration projects.

The NBSC, the SJBSRI and the ASF share a common policies on dams that affect Atlantic salmon, salmon rivers and other diadromous fish species. These policies as paraphrased from those of the ASF are:

- We will actively oppose dams or other projects that impede natural fish passage in rivers, or which would reduce, diminish or damage existing salmon habitat.
- We will seek the removal of existing dams and impoundments that harm existing and historic Atlantic salmon waters, especially dams and impoundments that are not economically defensible, and we will promote the restoration of presently degraded sites.
- Where it is not feasible to remove dams, we will work co-operatively with industry partners to ensure that safe and efficient upstream and downstream passage is provided for salmon.
- We will join with other partners to promote energy conservation and environmentally-friendly electricity generation methods as alternatives to building new hydroelectric dams.
- We will advocate that all proposed hydro projects, and any existing hydro projects that are scheduled for re-licensing or re-commissioning are submitted for a full environmental review.

Wild Atlantic salmon are a resource on the St. John River (SJR) system with cultural, symbolic, recreational, and economic value. From historic First Nations use for food, social, and ceremonial purposes, to recreational angling, to a symbol of ecosystem health, Atlantic salmon on the St. John River have had a rich history. Whereas much of the salmon angling water on the major salmon rivers of the Province, the Restigouche and the Miramichi are in private hands with limited public access, the fishery on the St. John River, including on its major tributaries were open for public angling. The loss of this fishery was an externalized cost of the Mactaquac development, one that could be recaptured with unimpeded fish passage at the present Mactaquac site.

Our comments to this document will focus on wild Atlantic salmon and its ecosystem; thus, the majority of the submission will relate to Chapter 8, Aquatic Environment. Our comments would also therefore relate to Chapter 17 where statements made in Chapter 8 are repeated or summarized.

8.0 Aquatic Environment

P. 8-1. "The (Study) Area is defined as a reach of the Saint John River bounded upstream at the location of the Hartland covered bridge, and downstream at the Gagetown ferry crossing between Gagetown and Scovil".
Comment: If the entire aquatic environment that is potentially affected by project options is considered, this is far too restrictive. Atlantic salmon even now access tributaries such at the headwaters of the Tobique and the Aroostook rivers. This is more than one hundred river miles upstream of Hartland. Since the existence and operation of the Mactaquac Dam have serious negative effects on this species, the upper limit of the study area should encompass the entire St. John River basin downstream of Grand Falls.

In addition, the range of the Atlantic salmon extends to the waters of the North Atlantic Ocean. As discussed subsequently, Marshall (2013) describes a situation by which Atlantic salmon post-smolts are blocked by a temperature barrier from reaching the North Atlantic by rapidly warming water that forms in late June or early July in the Gulf of Maine and the Scotian shelf. This forms a temporal thermal block that impacts salmon migration in a manner that is equally significant as a physical barrier presented by a dam. The Study Area should therefore include the entire range of the upper St. John River's Atlantic salmon population.

P. 8-2. Table 8.1.
Comment: "Fish passage" should be a key issue identified.

P.8-5. "The downstream environment below the station is a river..."
Comment: The "river" is only 4 km long before it becomes an estuary with the head-of-tide at Crocks Point.

P. 8-7. "Overall, the decline in oxygen at depth is indicative of medium to high biological productivity, which could limit the potential for the headpond to sustain certain fish species (such as salmonids that require cold and well oxygenated water) during summer."
Comment: The headpond in its pelagic region is a desert because nutrients, algae and zooplankton are flushed rapidly due to the huge upstream drainage basin. Many lakes that support landlocked salmon have low dissolved oxygen levels in the thermocline. The NB Department of Natural Resources tried unsuccessfully to introduce smelt to support a landlocked salmon fishery that would use this volume of the Mactaquac impoundment. Both the smelt and salmon introductions failed, probably because of nutrient and smelt larvae flushing.

P.8-18. "The level of fish population monitoring in the area of review is insufficient to estimate population abundances."
Comment: Every salmon that has passed through the fish collection facility at the Mactaquac Dam has been counted. The report mentions that returns of Atlantic salmon to the station were relatively stable until the early 1990s, even with the dam in place, implying that the dam did not contribute to the decline beginning in the 1990s. This is contrary to the conclusions of the Recovery Potential Assessment for the Outer Bay of Fundy Atlantic salmon (DFO, 2014): "Based on available information, hydro-power generation dams (hydro dams) are considered to be the most limiting threat to OBoF (Outer Bay of Fundy) salmon population persistence."

P. 8-19 to 8-22. 8.2.2.2 Fish passage.
Comment: 10th line "management" spelled wrong.

Comment: As implied in an earlier comment, this section should have drawn on the interim findings of the Mactaquac Aquatic Environmental Studies (MAES). The draft CER document stated that this would be one of the sources of information. This would have provided detail to and context for the often superficial and unconnected statements in the CER. Delays and disorientation among downstream-migrating salmon are mentioned theoretically in passing on pp. 8-19 and 8-20 of the CER, but should have been specifically addressed with actual data from NB Power's own studies. The MAES Atlantic salmon study demonstrated that salmon smolts are not only delayed by headpond effects, but actually often swim upstream during their migration to the ocean. Since downstream salmon migration is essentially a positive rheotactic (travelling in the direction of the current) behaviour this suggests that currents are reversing in the headpond. The smolts tracked in 2014 travelled upstream in the Mactaquac headpond 14% of the time, and of those that did travel upstream, they travelled in the wrong (upstream) direction 36% of the time. Kelts travelled in the wrong direction 24% of the time. All fish that were tracked experienced delays in transit to the estuary, with a range of 6.4 to 49.5 days. The delay averaged 2 weeks for smolts.

These long delays would affect post-smolt survival in that they are racing to meet the rapidly closing thermal window at the mouth of the Bay of Fundy and on the coast of Nova Scotia, a window through which smolts must pass to enter the high seas. Sea surface temperatures were 2C° higher in the Gulf of Maine and Scotian Shelf in 1998 compared with 1986 (Marshall, 2014). While the thermal window is open in June, by July the window is firmly shut (Amiro, 2003). The following is an excerpt from Marshall (2014) that illustrates this concept:

> "Fish (smolts) that left early and migrated rapidly reached the Gulf of Maine before mid-June, and they had an open migration path with SST <10°C through the Gulf around the southern tip of NS and along the eastern Scotian Shelf (Fig. 21a). This included most post-smolts of oBoF origin and a few of inner Bay origin that did not return. In contrast, by late June and early July, a mass of warming surface water (SST = 10–20°C) reached into the Gulf and on the Scotian Shelf (Fig. 21b). Then, from mid-July onwards, the Bay of Fundy and northern Gulf were effectively encircled by warm water with SST >20°C (Fig. 21c). This pattern suggests that the expanding area of warm surface water could have entrapped or terminated the migration of post-smolts that were late or slow."

It is no coincidence that the rising temperatures occurred suddenly with the advent of the warm phase of the Atlantic Multi-decadal Oscillation in the early 1990s nor that the decline in the Bay of Fundy's salmon populations also commenced then (Friedland, et. al., 2014).

In 2014, only 4 of 19 smolts (26%) that were tracked to the face of the Mactaquac Generating Station survived to Reversing Falls. By comparison, in 2002 and 2003, 49% (34 of 70) of Nashwaak River smolts survived to Reversing Falls. The coded wire tag study conducted by DFO in the late 1980s and early 1990s demonstrated the cumulative effects that Mactaquac had in combination with upstream dams. The existence of this work contradicts the statement on p. 8-22 that "There is no existing research estimating the success rate of any fish species ability to move upstream or downstream at the facility." Table 1 (following page) is taken from a 1995 memo from DFO's John Ritter to the Atlantic Salmon Federation's John Anderson. It presents a summary of the results of the coded wire tag study, which suggest an approximate 50% mortality of smolts during transit between the nursery tributaries upstream of three dams and the head-of-tide. This compares with a mortality rate for upper Southwest Miramichi River smolts of approximately 10% during transit to the head-of-tide on that river (Hambrook, MSA, pers. comm.). The additional mortality observed among the St. John River smolts would be related to all of the hydropower-related factors, predation, delay, turbine strike, shear forces in the units, pressure-related mortality following turbine passage, mortality caused by impacts incurred during spillway passage etc.

Table 1 DFO 1989 – 1992 Coded Wire Tag Tracking Study Results

Table. Interim summary and estimate of mortality attributable to stocking at various locations above Mactaquac.(TLM/Nov 9/92).

Row	Year rt'n	Hatch Origin	Release (yr-1) Location	No. dams	date	tagged	R'tns	% rt'n*100	Adj value	Foot note	'M' with respect to Mact	ALL YEARS Avg mort	N trials
1	1990	Mact	Arth	3	Ap 21-24	9275	13	0.140			0.652	0.509	4
2		Mact	G.F	2	Ap 24-25	9028	23	0.255			0.368	0.389	3
3		Mact	P-A	2	Ap 26	5692	16	0.281			0.303	0.303	1
4		Mact	Graft	1	May 1	5103	21	0.412			-0.021	0.237	3
5		Mact	Mig ch	0	May 4	4323	12	0.278	0.403	a	0.000		
6		S.J.	St. L	3	Ap 19-20	9545	16	0.168			0.652	0.557	4
7		S.J.	Aroost	3	Ap 25-26	9311	19	0.204			0.577	0.476	3
8		S.J	Mig ch	0	May 5	4358	21	0.482			0.000		
9	1991	Mact	Arth	3	Ap 24-25	9400	51	0.543			0.289		
10		Mact	G.F.	2	Ap 26-27	9119	42	0.461			0.397		
11		Mact	Graft	1	Ap 30	4568	23	0.504			0.340		
12		Mact	Mig ch	0	Ap 30	4717	36	0.763			0.000		
13		S.J.	St. L	3	Ap 23-24	5160	12	0.233			0.489		
14		S.J.	Aroost	3	Ap 30,Ma1	5716	19	0.332			0.270		
15		S.J.	Mig ch	0	May 7	4172	19	0.455			0.000		
16	1992	Mact	Arth	3	Ap 24	4986	28	0.562			0.508		
17		Mact	St. L	3	Ap 23	4609	22	0.477			0.582		
18		Mact	G.F.	2	Ap 25-26	8781	60	0.683			0.401		
19		Mact	Graft	1	Ap 30	4602	32	0.695			0.391		
20		Mact	Monq	1	Ap 29	4717	23	0.488			0.573	0.597	1
21		Mact	Mig ch	0	Ap 26	4815	34	0.706	1.141	b	0.000		
22		S.J.	Arth	3	Ap 25	4751	21	0.442			0.585		
23		S.J.	St. L	3	Ap 22	3976	21	0.528			0.504		
24		S.J.	Aroost	3	Ap 23	3793	17	0.448			0.579		
25		S.J.	Aroost(bl)	2	Ap 24	4267	25	0.586			0.450	0.340	1
26		S.J.	Mig ch	0	Ap 26	3753	40	1.066			0.000		

Avg mortality where releases below Mactaquac = 0.0		n trials
3 dams=	0.514	11
2 dams=	0.344	5
1 dam=	0.237	3

Monquart ignored

a - based on within-year ratio of SJ releases at mig ch and at St Leonard to Mact releases at mig ch and at Arthurette.

b - based on within-year ratio S.J. releases at mig ch and at Arth + St. Leonard to Mact releases at mig ch and at Arth + St. Leonard.

The effects on Atlantic salmon, a COSEWIC and pending SARA-listed species, suggests that Options 1 (repower) and 2 (maintain the impoundment / no repower) for the future of Mactaquac, unless they are successfully mitigated through extraordinary action, are unacceptable. Mitigation would be very costly, and may affect the finances of the project. The only environmentally and (if true cost is paid) financially-acceptable option for the future of the Mactaquac Dam and Generating Station is #3, removal.

Also omitted were conclusions from the MAES document "Proceedings of the fish passage experts workshop: global views and preliminary considerations for Mactaquac" (Linnansaari et. al., 2015). In the opening bullet of the executive summary of the Proceedings document the MAES authors quote the national and international experts who were gathered for a workshop in November-2014 as such:

"They unanimously indicated that the removal of the dam and restoration of a natural flowing river at this site (Mactaquac) is the most effective and desirable option for successful fish passage."

P. 8-28. Potential Changes in Fish Habitat / 8.4.4.1 Option 1, 4th paragraph, 6th line: "increased suspended sediment could cause disruption...due to reduced ultraviolet penetration..."
Comment: Plants use visible light for photosynthesis, not ultraviolet.

P.8-29. Operation Option 1. "In consultation with fisheries regulators and stakeholders, the management of the new facilities and fish passage capacity could further enhance the passage of multiple species... Overall, fish habitat could be enhanced under Option 1."
Comment: Habitat connectivity could be enhanced compared with its present state. It would still fall far short of what a fully connected and flowing river would provide. Generally, this section is good because it documents the requirement for passage provision in both the upstream and downstream directions for most fish species that reside in the St. John River, particularly the diadromous fishes. However, it also demonstrates a bias that is common to both the CER and Comparative Socio-Economic Review documents in that the 50 years of the existence of the dam and headpond is taken as the base case for comparison when the free-flowing St. John River has existed as the norm for virtually all of the ~10,000 years since the last ice age. Since the review of the effects prior to the construction of Mactaquac were superficial at best and deficient or inaccurate at worst, equal weight should have been given to the free-flowing river base case.

Comment: One weakness in the suggested mitigation strategies, and to be fair one that was only theoretical prior to the MAES work, would be to suggest no water storage and peak shaving during the downstream migration of diadromous species such as the American eel and the Atlantic salmon. I.e. Downstream-migrating fish should not be migrating upstream during their attempt to reach the ocean.

P. 8-30. Option 2 / Operation, 3rd paragraph. "Although water flow dynamics will differ between Options 1 and 2, the predicted interactions will be similar to existing conditions, and are not expected to affect fish species at the population level."
Comment: The "water in / water out" operation assumed for Option 2 would greatly enhance the downstream passage of salmon smolts and kelts, and, in comparison with Option 1, may have significant positive effects at the population level. Downstream passage delays through the headpond would be of shorter duration, and the turbine-passage mortality factors would be eliminated.

P. 8-32. Option 3 / Decommissioning. "However, connectivity will also be improved for non-native species, which may have greater opportunity to expand their existing range (McLaughlin et al. 2013; Rahel 2013)."
Question: What non-native species? Most non-native fish species such as smallmouth bass and muskellunge migrated from upstream. Chain pickerel might be one example, but they are already in the upland reaches of the St. John River.

P. 8-34. Changes in Fish Populations / Operation / Option 1.
Comment: Again, as with the p. 8-29 comment previous, no water storage and no peak shaving during the downstream migration of diadromous species such as the American eel and the Atlantic salmon should be a suggested mitigation. Downstream delay is a serious problem with the present operation, one that should be addressed under any proposed change at the facility.

Comment: In this section, there is no discussion of possible mortality during downstream passage in the spill. This is particularly important for large fish such as salmon kelts, which have a high terminal falling velocity in comparison with smaller smolt-sized fish. Impacting the water's surface downstream of a spillway has been demonstrated to kill fish, particularly large individuals such as kelts.

P. 8-35. Changes in Fish Populations / Operation / Option 2
Comment: Again, the "no storage and peaking" operation implicit with no power generation under this option will benefit the downstream passage of fish, and therefore it will have benefits in comparison with Option 1, but is far short of the benefits provided under the river restoration option.

P. 8-41: "fish passage changes under Options 1 or 2 are expected to be a positive interaction."
Comment: Maybe true if the present condition is the baseline. If the baseline is the natural river in the state that it has been until very recently since the last ice age, this statement is false.

P. 8-42, Section 8.5.2 / Discussion: "Fish passage will improve, which will be positive for migratory species such as Atlantic salmon. However, the Station is not the only dam on the Saint John River. Habitat gained on the mainstem of the Saint John River will be limited to the reach of approximately 140 km downstream of the Beechwood Dam."
Comment: Yes, but salmon populations were relatively healthy prior to the construction of the Mactaquac Dam. Salmon occupy the entire St. John River system downstream of Grand Falls. The removal of the Mactaquac Dam will allow expedient transport of salmon smolts and kelts to the ocean. This will partially address the cumulative impacts of multiple dams and have a positive population-level effect over this entire drainage area, not in just the 140 km reach plus tributaries downstream of Beechwood.

General Comment: The sediment concerns are, in our opinion, over-stated. The species that would be affected by suspended and settled sediments are downstream of the dam, a largely depositional area (with periodic spate-related erosion) because it is tidal. Many of the fish species there, those such as smallmouth bass and chain pickerel are non-native. The effects of suspended sediment and sedimentation are related to the intensity and duration of the events. A single intense event is often preferable to a chronic low intensity extremely long duration event. We favour a quick drawdown and dam demolition that will have huge fish habitat benefits.

17.0 Summary and Conclusions

P. 17.1 "the Mactaquac Generating Station (the Station), a 670 MW hydroelectric generating station"
Comment: Mactaquac is 670 Mw at peak capacity. It produces only 28% of this peak on an annual basis, therefore be more accurately described as a 188 Mw facility.

P. 17-4 Aquatic Environment: "In general, it is expected that positive changes to fish passage will result under Option 1 or Option 2 with the incorporation of improved design of fish passage."
Comment: Again, equates the effects of Options 1 and 2. Option 2 could be much better with no turbine passage for downstream migrants and no storage and peak shaving, an operational technique that delays the downstream passage of fish with potentially huge consequences to species at risk such as anadromous salmon. If no-peaking is included as a mitigation during times of downstream passage of fish such as Atlantic salmon and American eels, then the two options would be similar, although turbine passage may still be a problem without itself being mitigated via downstream passage facilities.

P. 17-6 Human occupancy and resource use
Comment: this is a balanced and well stated section.

General Comment: With the decline in the resource based industries in NB, the Mactaquac Generating Station is probably not needed. Through its removal, we have a chance to eliminate a serious impediment to the recovery of diadromous fish such as the American eel, the American shad and the Atlantic salmon.

The reclaimed river bottom land is extremely valuable, and should have (and may have) been mentioned as a benefit of Option 3.

The CER should have included a section on cumulative effects. For example, it is stated that the effects on fish and fish passage will only be expressed in the drainage downstream of the Beechwood Dam. However, in the case of Atlantic salmon, Mactaquac acts cumulatively with upstream dams and the ocean thermal regime to impose serious population-level effects on this COSEWIC and potentially SARA-listed species. Other potential cumulative effects of the project should have been at least listed.

The CER should have mentioned alternative projects that would replace Mactaquac's power in the event that it is actually need, projects that avoid Option 1's unacceptable and immitigable negative effects on fish and fish habitat. For example, an expansion at Grand Falls would provide additional power to replace Mactaquac's with no effects on diadromous fish. An aggressive promotion of residential solar power accompanied by closed-loop pumped storage development might completely replace Mactaquac's lost power at a lower total cost, and with private individuals paying much of the capital cost. These options were not, but should have been mentioned, at least in passing.

What the CER does not demonstrate, and what we would like to understand, are the legislative implications of the Fisheries Act and SARA for each of the three options of the future of Mactaquac dam. For example, will there be a Ministerial authorization to enable the killing of fish in the future as there is for the existing dam, and what extra protection will be afforded to Species at Risk under each scenario?

Finally, to re-emphasize, with the exception of the past 50 years., the St. John River has been free-flowing since the last ice age The effects on that base case, effects that were poorly

mitigated or largely ignored prior to Mactaquac's construction should have been given at least equal weight to the effects of dam removal on the present situation.

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Memorandum

Date: 31 May 2016

To: George Porter, Deb Nobes, and the Mactaquac Project Team

Re: Mactaquac Project process and decision

Dear George, Deb and others:

I would first like to thank you for the opportunity to share my perspectives on the Mactaquac decision. As a resident of Keswick Ridge, it is abundantly clear that people have not forgotten the lack of consultation that accompanied the construction of the original dam back in the 1960s. Times have changed and in that era there were many public takings of land (Base Gagetown, Fundy and Kouchebouquac National Parks, the Tracadie Range, etc.), but I have been encouraged by the fact that NB Power feels that significant efforts need to be made on the social license side of the ledger and that this decision needs to encompass more than technical and financial data.

This is a huge decision for New Brunswick with long lasting consequences. It is a complex issue the effects of which range from individual property values, to global efforts to curb runaway climate change. I always emphasize to my students that we are all stakeholders in multiple dimensions. In this case, for myself, I am a property owner with waterfront on the Mactaquac Arm; I am a member of one of the communities most effected by the decision and I am an elected member of the Keswick Ridge Local Service District Advisory Council. I am also the Secretary for the Steering Committee exploring the possibility of create the York Rural Community. I am a researcher who studies energy issues and public participation and public engagement initiatives, and as you know, we have been conducting work in the Mactaquac region since 2012. We have produced relevant academic papers, a short film, and presented our research to academic conferences. I am also a scholar of energy issues and a concerned, global citizen. The following comments will address my concerns from all of these different roles.

<u>Landowner</u>

As a landowner, with shorefront on the Mactaquac Arm of the Headpond, I have a slight preference for retaining the dam. I like my water view from my house, and the shoreline makes a nice destination for walks. I don't use the lake much anymore since my kids have grown and left home. I have the potential to sell shore lots, though I am not sure that I would unless I had a financial emergency.

<u>Keswick Ridge Resident and Local Service District Advisory Committee Member</u>

In this stakeholder role, I have several concerns. One is the issue of a crossing over the St. John River at or near the present location of the dam. I believe this is essential to the continued success of our community. I don't believe that Hwy 104/105 from Keswick Landing can handle thousands of extra cars per day. Mutual aid between Kingslcear and Keswick Ridge fire and emergency services would be severely disrupted.

I am a bit concerned that if a full rebuild were to occur that 5400 person years of work in a decade long window or less, could have a major detrimental effect on our community. There are many examples of the "boomtown effect" due to rapid growth or the construction phase of major projects that result in depressed prices and an overstock of housing once the construction is concluded. Jobs would be welcome in the region, but there is such a thing as too much economic activity for small rural communities that with to remain small and rural. Keswick Ridge already suffers a bit from "bedroom community" symptoms. I fear that if Sisson Brook Mine and a dam rebuild were to occur at the same time, a great deal of development pressure would appear in Keswick Ridge and that it could fundamentally change the character of our community.

Finally, one of the things that I have heard from many locals is that the community underwent a great deal of trauma in the 1960s and that in some ways they have just or are still getting over that trauma. The trauma is partly a result of the dramatic landscape change that occurred with the original construction of the dam, but it also has to do with the paternalistic treatment of local residents by government in the planning and construction process. There was little consultation, and government and power commission employees held the view that they knew what was best for all concerned. This was not unique to this place but was common practice back at that time (see Base Gagetown, NB's National Parks, etc.).

<u>Taxpayer/Ratepayer</u>

As a New Brunswick taxpayer and NB Power ratepayer I am obviously concerned about costs, as we all should be. The approximate 5 billion dollar price tag of a full rebuild gives me pause, given that we have not been able to retire much debt on other major capital projects in recent years, or at least that is my perception. I think it would have been nice to have had more financial information available to us prior to us expressing our preferences. There are few amongst us that can decide on a "best option," without knowing the costs and the financial implications for the province and for we owners and customers of NB Power. Many of these questions go back to the attempted sale of NB Power to HydroQuebec in 2009-2010. What is the value of NB Power's assets? What is a reasonable debt/asset ratio for a utility? Are our debts way out of line? Would doubling the debt cripple us? What would be the payback period for that debt and is it doable given that 70% or more of the remaining generation infrastructure of NB Power will need to be refurbished or replaced by 2045?

If the 5 billion dollar price tag is anywhere near accurate, I find this a staggering price tag given the $128 million that it cost to build the original structure. I have been told that construction

costs are higher, wages are unionized, health and safety considerations cost more money, etc. but even in constant dollars and with this subtle changes to construction costs I can't quite fathom why the costs are so much higher, 39 times higher by my estimate when the value of a 1967 dollar is $7.18 (or so the internet tells me). A more concrete description of the costs would have been desirable in order to better make a determination on the best course of action. You would not decide on a new car, used car or taking public transit without doing a cost comparison of those options and yet without financial information, even in broad strokes, we are faced with just such a choice.

As an individual, I invest conservatively but for the very long term. I think a dam rebuild, or better still, Option 4 (Life Extension) represents frugality and a solid long-term investment. Options 2 and 3 require significant outlays of capital with no opportunity for a return.

Social Scientist – Public Engagement

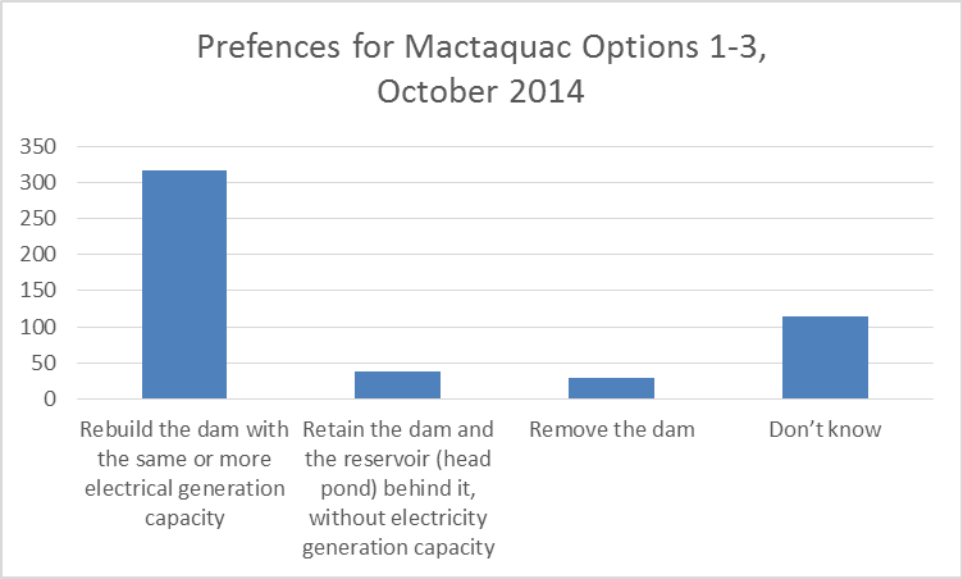
I have several interests as a scholar, but one important one is public engagement in environment and natural resource contexts. I believe I shared with George our work on public engagement tools that was written for a forestry context but which is quite translatable to other contexts. We describe and quickly identify the strengths and weaknesses of 22 public engagement methods. With that background, I would like to make some comments on the process of engagement that I have observed related to the Mactaquac decision.

One thing that continues to perplex me is the narrow range of tools used by NB Power to solicit feedback on Mactaquac, the narrow or obtuse scope of the questions asked, and the lack of province-wide input. I know that NB Power routinely engages consultants to do survey research on their behalf. It is not clear to me why a province-wide survey of New Brunswickers was not done on this issue. The Mactaquac website, while very slick and easy to use, suffers from selection bias. People self-select in order to participate. This may lead to a sample that is not representative of New Brunswickers as a whole. People in the smaller geography of the impact area are more likely to respond. Highly motivated people may respond multiple times from different IP addresses. I understand that you do have postal code data, but it is not clear whether that will be used to differentiate views between locals (near dam residents) and other provincial residents. Surveys are a great tool for providing solid, anonymous data on major decisions such as this. Granted, they are often uninformed opinions, but these are still important to gather.

In the fall of 2014, our Energy Transitions research team conducted a national energy literacy survey (n – 3000) with a New Brunswick oversample of 500. For the New Brunswick oversample, we asked specific questions about respondents' levels of knowledge about the dam and we asked them for their preference amongst the three options. The results are below.

Of the 500 in our sample, 63.4% expressed a preference for a rebuild with power generation. Only 7.6% expressed a preference for maintaining the Headpond without power generation, and 6% preferred the remove the dam option. A fairly large number, 23% said that they did not

know or did not have a preference. Kate Sherren, a member of our research team previously shared the data from the same survey about respondent's self-reported knowledge about the issue, which was low. In this context it is interesting that 77% did express a preference even though they admitted to not knowing much about the issue.



The approach taken by NB Power has been to not ask this question directly. I am not entirely sure why. Over the 2-3 years that this project has been ongoing, it would have been very interesting to observe how public opinion changed as people became more aware and knowledgeable about the issue. The approach taken by NB Power has been to ask about our concerns rather than our direct preference for options. The rationale for that approach has never been clear to me. I believe at one time Deb Nobes said, something to the effect of "we don't want to turn this into a referendum on the dam," but I am not sure what is wrong with a *non-binding* referendum type question. Even a strong result (as in our survey), coupled with low levels of perceived knowledge could be reasonably easy to ignore if cost or technical factors pointed toward a less popular option than the one chosen by a majority of the public. To never directly as the question seems to me and others suspicious.

Related to this point, the Mactaquac team knew we were conducting a mulit-method research project on Mactaquac from the beginning of the project. I won't go into great detail here, but it has been a continued source of disappointment and frustration that the Mactaquac Project team never seemed interested in receiving briefings about our work. In contrast to the close relationship the Mactaquac project has with CRI that is charged with answering various biological and ecological questions, the lack of attention to social science, especially "free" social science, seems strange to say the least. The amount of funding spent on social aspects of the project options $50K for the social impact study and perhaps a similar amount for Dr. Shawn Dalton's report seems paltry compared to the millions spent on the biophysical side of the equation. It makes me wonder if our work was viewed as not legitimate, not relevant, or

somehow biased. Our project is federally funded, peer reviewed, and involves top-notch scientists from across Canada and one from the U.S. I have spoken to or written Mactaquac Project team members on several occasions and sent in submissions regarding what a comprehensive social science research program might look like and never received much interest in exploring these issues further. At the end of the day, the decision will be one that is very social and political and economic in nature. A decision WILL (and should) include issues of the heart and place attachment, and feelings of past injustices as well as technical information, biological and ecological "facts", costing data, etc. I am not, nor have I ever suggested that NB Power should have funded *our team* to do more comprehensive social science. I just feel that more should that have been done.

Social Science Researcher Energy Issues

Most of my career has been oriented around social dimensions of forest management. However, in recent years I have become more interested in and begun to focus my research on energy issues, and energy issues as they relate to climate change. In this context, I am becoming more convinced for the need to upgrade, maintain and increase the amount of green energy coming on to the system. In order to prevent dangerous climate change, I believe we need to increase the proportion of non-emitting sources of electrical power contributing to the total energy budget of society. I consider Mactaquac a key cog in the wheel that is New Brunswick. The environmental damage from the original construction of the dam; flooded land, released methane, obstructions for salmon, etc. have already been done and functioning novel ecosystem has emerged there. I think we need Mactaquac for its ability to backstop other renewables. In short, I think it is a key feature in a workable, green energy system for New Brunswick.

Global Citizen

Along similar lines to my last comment, when I think about the planet as a whole and the challenge of climate change, I believe we need to electrify more of our energy sources, and electrify them with non-emitting sources.

Below is a summary of my preferences based on my various stakeholder hats

Stakeholder Position	Option 1 – rebuild with power	Option 2 – Maintain headpond	Option 3 – Remove the dam	Option 4 – Life extension
Landowner		X		
Keswick Resident				X
Taxpayer/Ratepayer				X
Social Sci – Public Engagement				X

Social Sci – Energy	X			
Global Citizen	X			

Ultimately, I believe we need the dam and we need it generating electricity. I think it is very unfortunate that the Life Extension option was not really on the table throughout the majority of the period of time when citizen were learning about the options and learning about the trade-offs. Without dollar figures, it is still difficult to make these important choices and trade-offs, but I would hazard to guess that the vast majority of citizens who have expressed a preference for a rebuild with power would actually be in favour of the Life Extension option. I am tremendously encouraged by the prospect of an Option 4. This is one that has only recently been made public by NB Power, but if it proves viable, I believe it could be the most elegant solution. One of my fears, and I have said this to many people, is that we will decide to rebuild the dam with power generation, but that a scenario unfolds with time delays, and cost overruns, and that ultimately by 2040, or sometime soon after the completion of the project we discover the distributed, solar, rooftop, smart grid, energy storage revolution happens, and that we did not need to invest the 5, 6 or 7 million dollars after all. I believe option 4 is the least risky and therefore the best if it proves technically feasible.

Thanks again for your attention to this long message. I structured it as I have to demonstrate that it is a complex issue even for individuals that have multiple stakes in various potential outcomes.

Best of luck with your deliberations regarding choosing a preferred option. When all the data are in, I would strongly encourage you to be as open and transparent as possible about your decision criteria, your weighting of different criteria, and how you integrated your various types of data to reach a decision. And once you have made a choice of a preferred option, don't be afraid to do subsequent public engagement to find out how people feel about it.

Sincerely,

Tom Beckley

2016 05 31
Also 2016 0329

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Mactaquac Project

NB Power

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May 31, 2016

To whom it may concern,

WWF Canada is writing in response to your solicitation for comments on the Comparative Environmental Review (CER) and the Social Impact Comparative Review (SICR) for the Mactaquac Project. This is our second correspondence to NB Power on the CER, as we provided comments on the draft guidelines. We will be revisiting a number of the key points that were raised last time, namely the scope of these assessments and the inclusion of climate change as a Valued Component (VC).

The World Wildlife Fund Canada (WWF) is an international conservation organization that has a long history of working on important issues to protect the planets species. Everything WWF does is grounded in science - we use the best available data and sophisticated modelling tools to understand ecological connections, identify pressing issues and develop effective conservation strategies. We recognize that economics drives many of the decisions people make each day and that is why it is important to understand the trade-offs and benefits from a diversity of perspectives to ensure the right choices are made for the future of habitats and species and the humans that interact with them.

The WWF Freshwater Program and the effort on the St. John River are about ensuring healthy rivers. We have been actively utilizing a number of approaches along the St. John River for the past four years as we work to develop a common understanding of the river, its health and an action plan that will support it.

Our comments on the CER and the SICR are provided within the broader context of WWF's freshwater work and from the perspective of a healthy St. John River, from the headwaters in Maine (US) and Quebec to Saint John (NB), where it empties into the Bay of Fundy.

The following begins with general comments regarding the CER and SICR processes; some key considerations; gaps in the VC's that emerged from a literature review; guidance on tools to interpreting the VCs and the inclusion of additional VC's.

We would like to first acknowledge that elements of our submission have been informed by contributors from the University of New Brunswick, the Université du Québec à Montréal, and the University of Toronto at Scarborough (UTSC) including Gebreal Shifferaw, Karen Cheung, Duhyun Cha, Kirushanthi Ratnasabapathy, Jeanny Yao, and Melissa Szopa. We would welcome the opportunity to provide further

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information or clarification regarding our submission and can connect you with the researchers we worked with for these preliminary results.

CER Process

The CER process appears to provide a comprehensive approach to a company driven public review of the three options for Mactaquac. This is no small task and represents a new approach for large scale projects in the region, possibly nationally. This effort brings increased expectation and attention to the authenticity, transparency and accountability for all involved. Engagement of a variety of stakeholders and rights holders is a key component of this process with public meetings, open houses, and solicitation of input through a variety of means and activities. This should be providing NB Power with an extensive understanding of values, issues, etc. from a broad group of interests. Unfortunately, much of this information has not been shared with the public prior to the deadline for comment on the CER and SICR, resulting in a lack of context for feedback. The current lack of public understanding of the "Preliminary Results of Other key Component Studies" negatively impacts on the ability to provide feedback on the CER and SICR.

Methodological Gaps

The CER and SICR are about mitigating the impacts of each of the options. This is an important aspect of the overall project and as NB Power has noted on numerous occasions it is important to understand the values associated with each of the options such that they can be considered. We couldn't agree with you more. But, what we disagree with is our overall ability to consider the values for options that ultimately remain fairly undefined from a social, ecological, economic, legal, political, technological and institutional perspectives. Mitchell (1989) identified these perspectives as being key components of a framework for understanding resource-based decisions. It is included here as it provides some much needed context for the Mactaquac Project, highlighting the scope, perspective and spatial components of a complex resource-based decision.

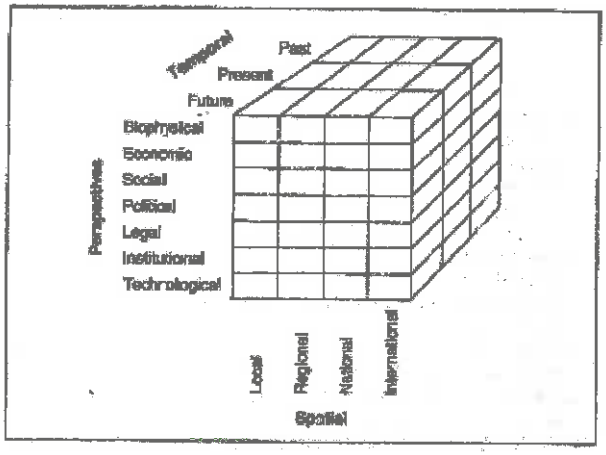

Figure 1: Key Components of resource-based decisions from Mitchell (1989)

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Understanding all aspects of the Mitchell (1989) and what the benefits and trade-offs are will further inform the discussions around the options and the decision that is made regarding Mactaquac's future. The spatial component is a topic that WWF has previously raised, as we are interested in the holistic nature of the watershed, from multiple perspectives and across multiple time scales.

Technical understanding, the economics of the options and the science, as captured by the MAES project is not in a place that can be used to inform the decision – ultimately those efforts are in progress and more time is needed for data collection, analysis, reporting and sharing for the public to understand the current situation. The data and analysis captured in The Saint John River: A State of the Environment Report (Kidd et. al, 2011) provides significant historical data from across the St. John River Watershed, which helps to address some of the past and present perspective on the river. Completing this picture and using a tool such as scenario planning and / or visioning exercises can help NB Power and the public to envision what each option looks like in to the future and the trade-offs and benefits associated with each across time and space. It is also vital at that Traditional Ecological Knowledge and perspectives be included in a meaningful and timely manner.

The Valued Components

It is not possible to tell from either report how the Valued Components (VC's) were identified – there is no reference to a methodology, best practices or comparable regime for the VCs. As a result, it is difficult to provide a complete review.

That being said, with the assistance of students at U of T we were able to compile the following list from existing literature on VC's, particularly in relation to large dam projects. This provides further insight into the scope, character and applicability of numerous VC's that are relevant to this effort.

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Valued Component	Neglected Key Issues of Concern	Applicable to Option(s): may have positive or negative implications	Reference
Atmospheric Environment	△ regional climate	1, 2	Suggested additions of key issues related to VCs are based upon Wang et al (2012), Harris et al (2012), Brown et al (2009), Becker et al (2004), and Gregory and Davis (1992).
Acoustic Environment	△ sound wrt forested landscape	1	
Surface Environment	△ downstream tributaries	1, 3	
	△ flood peak travel time	1, 3	
	△ flow pulse	1, 3	
	△ water retention time	1, 3	
Aquatic Environment	△ habitat connectivity	1, 2	
	△ abiotic conditions (i.e. oxygen level)	1, 2, 3	
	△ opportunity to thrive in the future	3	
Vegetation and Wetlands	△amount of landmass with vegetation	1, 3	
	△channel environment	3	
	△debris environment	1, 3	
	△erosion distribution	1, 3	
Wildlife Habitat	△ habitat connectivity	1, 3	
	△ type of wildflife present	1, 3	
	△ feeding habitat transfer	1, 3	
	△ emigration pattern	1, 3	
Economy and Employment	△ economy\employment (long term)	1, 2, 3	
	△ wage/compensation	3	
	△ employment type	3	
	△ extend of commuting for work	1, 3	
	△ economic diversity	1, 2, 3	
	△cost of living	1, 2, 3	
	△ regional sales tax revenue	3	
	△ regional property tax revenue	3	
	△ dryland farm income	3	
	△ fixed income rate payers and poverty	1, 3	
	△ family stability	1, 3	
Human Occupancy and Resource Use	△ land and resource use (long term)	1, 3	
	△ downstream irrigation	1, 3	
	△ migration and displacement	1, 3	
	△ population	1, 2, 3	
	△ ethnic diversity	1, 2, 3	
	△ trends in school enrollment	1, 3	
	△ home ownership	3	
	△ community values	3	
	△ level of social activities	3	
	△ customs and lifestyles	3	
	△ crime and safety	1, 2, 3	
Infrastructure and Services	△ residential utility rate	3	
	△ utility provider rate risk	3	
Transportation	△ grain transportation costs	1, 3	
	△ uncertainty of commodity transportation	1, 2, 3	
	△ highway congestion and safety	1, 2, 3	
	△ construction and maintenance	1, 2, 3	
Heritage Resources	△ culture	1, 2, 3	
	△ social cohesion	3	
Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons	△ value of remaining landmass	3	
	△ historical stability/tension	1, 2, 3	
Environmental Geology	△ stability of rock foundation	1, 2	
	△ stability of bank	1, 2	
***Climate Change	Should be considered a major VC itself and influences several other VCs.	1, 2, 3	

Table 1: Extended list of VC's as identified from literature (Yao 2016)

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The spatial context of VC's is an important consideration and has been characterized by the Ontario Ministry of Environment and Climate Change (2015) for Environmental Impact Assessments. The following table provides some valuable examples of this.

Air quality:	local or regional airshed
Water quality:	estuary, river basin, aquifer, watershed, source water protection area
Vegetation:	woodland, forest or landscape unit
Wildlife:	species habitat, including breeding and feeding areas
Marshland/wetland:	wetland area
Land (recreational use)	area surrounding a river, lake or park area; waterfront area including intertidal areas

Table 2: Spatial context of VC's from OMECC (2015)

What's most striking about this table that the ecological values are captured at a watershed scale, while human driven examples, in this case recreation, is captured at a much more local level. This would contradict the general scope of the CER, and to a lesser extent the SICR.

The guidelines indicated that both qualitative and quantitative data will be in the assessment phase. Both are justified and need to be considered in an appropriate and balanced fashion. Further to this, it is imperative that existing standards, benchmarks, and baselines be used as appropriate references, to allow for as accurate a comparison of the VCs as possible, leading to a better understanding of the benefits and trade-offs associated with the options being reviewed. Without the appropriate baseline information it is impossible to make a determination of impact, unless extensive modelling occurs.

At this time it is possible to outline some aspects of the indicators that will inform the VC's to ensure they are truly meaningful, can be measured and tracked, thereby ensuring clarity on progress for each. Cooper (2004) provides valuable guidance on the tools available to assist in the characterization of Valued Components.

Tool	Application
Impact models-networks or systems models	Detailed assessment of cause-effect relationships between valued environmental component and driving factor interactions
Trends analysis	Assesses the status of a valued environmental component and changes in the occurrence or intensity of the driving factors (stresses) over time

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Tool	Application
Indicators of change	Indicators of natural environmental quality, and where available, its thresholds or allowable targets are negotiated and established, are used to evaluate the cumulative effects of existing and future developments
Carrying capacity	Measures of cumulative effects against threshold
Indices	Habitat indices or biological diversity indices
Scenario analysis	Predicts outcomes of contrasting/potential greatest risk set of scenarios
Computer modelling	Quantifies cause-effect relationships leading to cumulative effects (e.g. air, hydrological, water quality, noise)
Spatial analysis using Geographic Information System (GIS)	Analyses landscape parameters and can identify where effects are worse. It can quantify results of actions (e.g. land cleared) and changes to landscape features (e.g. loss of woodland)
Tables and matrices	Evaluates and compares variables
Checklists	Shows impact and impact type

Table 3: Examples of assessment tools from Cooper, L.M., 2004

Climate as a VC

In our previous submission to NB Power on the CER Guidelines we highlighted the need to include climate change in a meaningful manner. This wasn't interpreted as intended and as a result we are revisiting the subject. The significance of this topic came to light at a recent workshop hosted by the New Brunswick Climate Change Research Collaborative that introduced forest practitioners to the most up-to-date climate research. Understanding the changing climate and the strategies that can be used to address them are vital and there are a numerous strategies to address this, however, the USDA (2012) approach resonates owing to its attention to connectivity, refugia, ecological functioning, etc.:

- Strategy 1: Sustain fundamental ecological functions.
- Strategy 2: Reduce the impact of existing biological stressors.
- Strategy 3: Protect forests from severe fire and wind disturbance.

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- Strategy 4: Maintain or create refugia.
- Strategy 5: Maintain and enhance species and structural diversity.
- Strategy 6: Increase ecosystem redundancy across the landscape.
- Strategy 7: Promote landscape connectivity.
- Strategy 8: Enhance genetic diversity.
- Strategy 9: Facilitate community adjustments through species transitions.
- Strategy 10: Plan for and respond to disturbance.

The inclusion of climate change is particularly important at this point in time and is another example of examining VC's at the whole watershed level. Having a clear understanding of the adaptation route is vital, as recent research from the collaborative clearly indicates that we will experience significant changes in climate in the future. Figure 2, which is based on the latest climate projections clearly indicates increased temperature and precipitation. This impacts natural, cultural, economic (energy generation for example), and other values, and as such must be understood and incorporated into the assessment process.

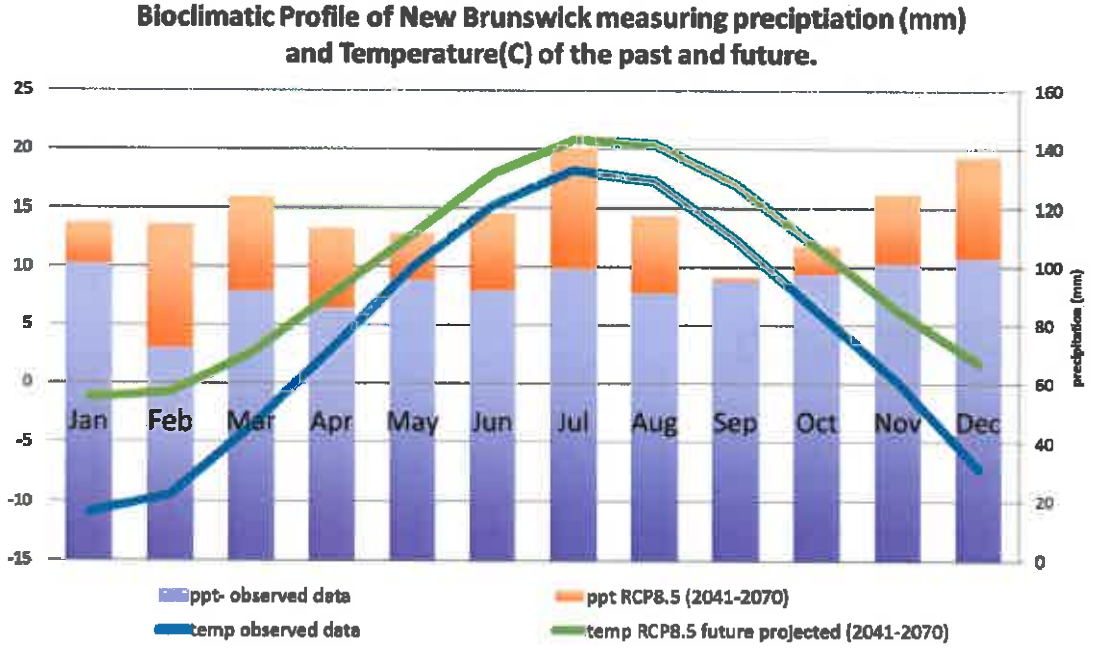

Figure 2: Bioclimatic profile for New Brunswick as derived from the latest climate projection data.

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Cumulative Effect as a VC

Finally, VCs are always subject to cumulative effects, both historical and potential future effects. It is therefore important to include this concept in the analysis of VCs. There are a number of instances where this has been explored recently (the Joint Review Panel for site C had some commentary on this) and as such should be incorporated into the CER. You will also note that a number of our references stem from the cumulative effects research, which not only highlights the importance of this approach, but also that some of the leading research on VCs is emanating from this realm.

Our input at this stage does not include specific commentary on option 4 (lifetime achievement), which was recently revived as a possibility for the future of Mactaquac. This option has not been captured in the CER or SICR, which from a process perspective creates some issues. Without knowing the scope of this option it is difficult to provide input, although we generally believe that should this option materialize it will be subjected to the same scrutiny as the existing options. Further to this, it would be expected that the significant issues will be addressed in a similar manner as anticipated for the other options, ie. fish passage, transportation issues, impacts at the local, regional, national and international level.

Thank you for the opportunity to provide input on the CER and SICR. WWF-Canada believes these pieces are quite valuable, although require much more context and understanding in order to be truly useful for mitigation purposes. Providing the public with a broader understanding of the options at multiple spatial and temporal scales, and across diverse perceptives will result in a robust solution. WWF looks forward to our continued involvement in the process, as we collectively work to ensure a healthy St. John River for people, species and habitats.

Best regards,

Simon J. Mitchell

Simon J. Mitchell

WWF Canada, Senior Specialist

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2016 05 31

COMMENTS: MACTAQUAC PROJECT COMPARATIVE ENVIRONMENTAL REVIEW

Dr. James MacLellan

Contents

ACKNOWLEDGEMENTS:

The comments contained herein are those of James MacLellan, but significant elements of the analysis are derived from contributors at the World Wildlife Fund of Canada, the University of New Brunswick, the Université du Québec à Montréal, and the University of Toronto at Scarborough. I would like to thank Simon Mitchell from WWF; Charles Bourque, Paul Peters, and Ben MacLellan from UNB; Philippe Gachon and Christian Said from UQAM; and Gebreal Shifferaw, Karen Cheung, Duhyun Cha, Kirushanthi Ratnasabapathy, Jeanny Yao, and Melissa Szopa from UTSC. This critique is of a preliminary nature, the above contributors will be provided with an opportunity to edit\review this submission for an upcoming publication. Thank You -- James MacLellan

1.0 INTRODUCTION

When it began service in 1968, the Mactaquac Dam completed a network of hydroelectric facilities along the St John River and its' tributaries that were intended to supply the people of New Brunswick's with a reliable, renewable, cheap source of energy well into the future (see Table 1). This network was to become the foundation of a modern industrial economy for New Brunswick, benefiting the welfare of all its' inhabitants. The Mactaquac Dam was at the center of this strategy, accounting for over two thirds of the productive capacity within the St John River Watershed, and a significant amount of the energy needs of the province as a whole.

Table 1: List of hydro generating stations within the New Brunswick portion of the St John River Watershed. Data derived from NBP web site as well as other internet based sources. The Mactaquac Dam is by far the largest dam and produces 1.6 Terawatts annually or 12% of the provinces annual power requirements (CERR page 2-1).

Hydro-Electric Project	Year Established	Estimated Capacity (mega Watts)
Mactaquac Dam	1968	670 MW
Beechwood Dam	1955	113 MW
Grand Falls Generating Station	1931	66 MW
Tinker Dam	1923	34 MW
Tobique Narrows Dam	1953	20 MW
Sisson Dam	1928	9 MW

Unfortunately, New Brunswick's modern industrial economy did not unfold as expected, while the dam itself limped into the 21st century. Projected to operate for at least 100 years, the concrete used to construct the dam has been subject to an alkali-aggregate reaction (CERR Page 1-5) causing its' expansion and compromising the integrity of the dam. This has resulted in a dramatic reduction in the projected life of the dam, and has subsequently forced NB Power (NBP) to develop, and seek pre-approval for a contingent set of possible futures for the St John River Watershed. NBP has identified three such possibilities or Options for the dam (see Table 2) to which we have added an implicit fourth:

1. To rebuild the dam with a new spillway and the powerhouse
2. To maintain the dam by building a new spillway but not the powerhouse
3. To decommission the dam and restore the river by removing the spillway, powerhouse, and earthen dam
4. To develop techniques to extend the life of the dam through various maintenance activities (i.e. to manage the effects of the alkali-aggregate reaction). *Although not explicitly identified as such, this option is nevertheless an effective flexible alternative to the previous three options.*

Table 2: Options for consideration in the Mactaquac Project Comparative Environmental Review. The first three Options are explicitly identified within the CER. The fourth Option is implicitly identified in the CER as well as the Terms of Reference document[i].

Option #	Mactaquac Project Options	Construction Period Initiation Date	Completion Date
1	Rebuild the dam with a new spillway and the powerhouse.	2012	2030
2	Maintain the dam by building a new spillway but not the powerhouse.	2023	2030
3	Decommission the dam and restore the river by removing the spillway, powerhouse, and earthen dam.	2026	2030
4	Develop a means of continuing operations within the current footprint beyond 2030 – i.e. develop methods for responding to the alkali-aggregate reaction.	Continual	2030 +

These options are described in detail in Section 2.0 of the '*Mactaquac Project Comparative Environmental Review Report (September 2015)*' as well as in the "*Terms of Reference for the Comparative Environmental Review (CER) of Options for the Mactaquac Project.*" They represent the starting point for a '*comparative environmental review*' (CER) that is intended to assess and evaluate the three identified Options through an evidenced-based consultative process (see Figure 1). Our task in this report is to comment on the results of that process (i.e. the ninth blue element in the CER process as seen in Figure 1) by adopting the institutional lens\perspective of our collaborator, the World Wildlife Fund of Canada. A small group of experts and students from the University of New Brunswick, Université du Québec à Montréal, and the University of Toronto at Scarborough have provided the analytical capacity to undertake this work.

In the following, we briefly review the method and results of the Comparative Environmental Review, critique the CER process, then offer a key methodological extension to the CER process (see Figure 1, as discussed in Section 3.3). Our submission to the process is ultimately intended to widen the discussion surrounding hydroelectric facilities and should be interpreted as preliminary in nature. In fact, we do not offer a preference for any of the *Options* listed in Table 2. In many respects our comments and suggestions are a simple extension of decision processes initiated by NBP. In this respect we see ourselves as highlighting the efforts of NBP and their partners, yet with a broadened socio-environmental viewpoint.

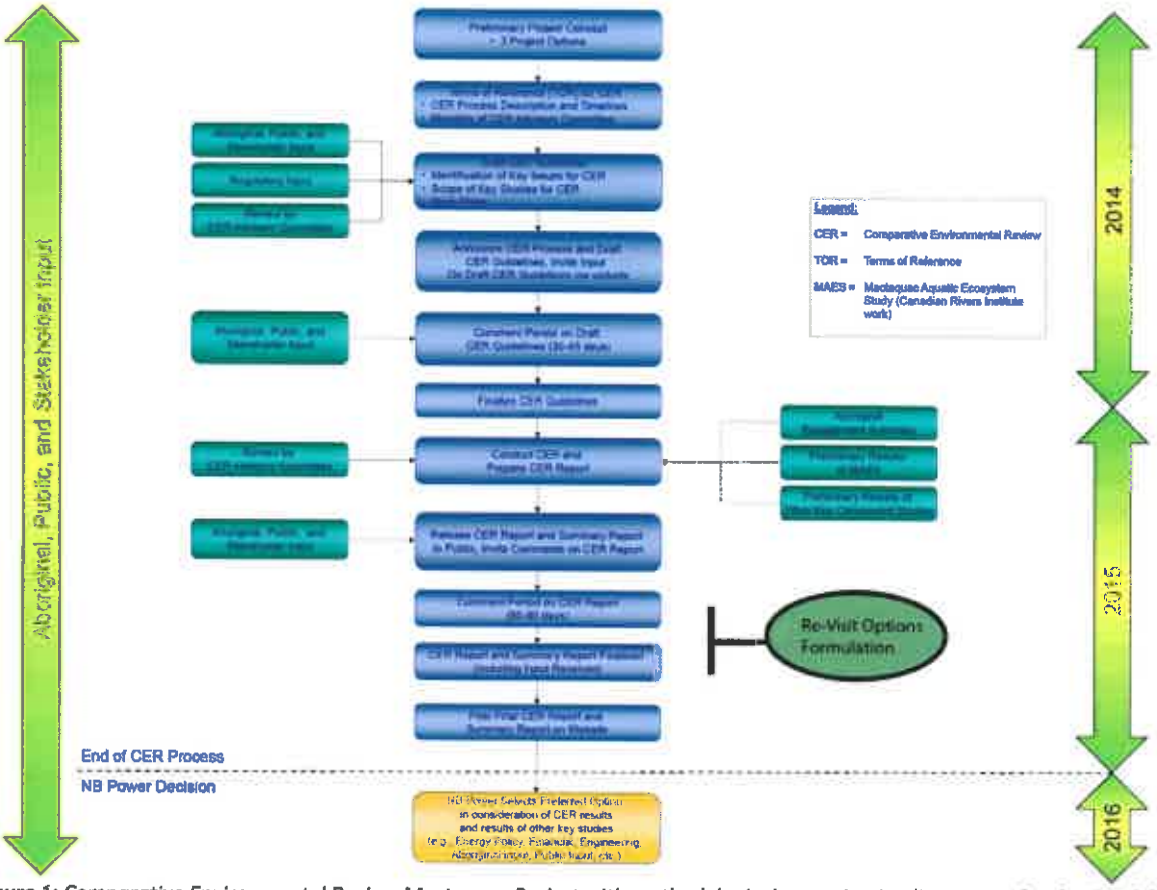

Figure 1: Comparative Environmental Review Mactaquac Project with methodological extension in olive green. See Section 3.3 in this report for a discussion of the our addition of the task: 'Option Formulation.'

2.0 METHODS DISCUSSION

In the following section we briefly layout the theoretical foundations for our critique of the Comparative Environmental Review (CER) that follows in Section 3.0. Here we suggest that while the CER is a significant enhancement of traditional Environmental Assessment procedures, it's hybridization of standard decision analytical methods *with* consultative (inclusive) methodologies, generates systemic biases that diminish the overall effectiveness of the procedure. To highlight the biases inherent to the current CER, we develop an alternative perspective that derives its' form from the inferred institutional mandate of the World Wildlife Fund. This *heuristic device*[ii] is then applied (implicitly) throughout the remainder of the critique.

2.1 CER Theoretical Dimensions

Due to the premature material failure of the dam, NBP must now decide how to respond to the shortened life cycle of the Mactaquac Dam. Proactively, they have chosen to develop their own decision protocols in the form of the *Comparative Environmental Review* (CER) process (NBP 2014) to assess future possibilities. This process is "*not part of a formal or legal environmental regulatory process. It is a unique process developed by NB Power specifically for the Mactaquac Project, and is self-driven by NB Power*" (CERR Page 3-1). As a hybrid assessment methodology it parallels methods in the environmental impact assessment field, and has been modeled on the Government of New Brunswick's environmental impact assessment process. The steps of the process are outlined in Figure 1 as replicated below (NB Power 2015):

- Prepare a Preliminary Project Concept: NBP prepared a Preliminary Project Concept. It provided high-level detail of the required components and infrastructure associated with each of the three Options.
- Develop Terms of Reference for the CER Process: NBP established Terms of Reference for the CER. They describe the purpose, objectives and methods of the CER, including the establishment of an independent CER Advisory Committee, the deliverables and key timelines. The CER process was publicly announced on November 25, 2014, and the Preliminary Project Concept and Terms of Reference were made available to the public. The CER Advisory Committee is a group of independent experts in various fields that have been selected by NBP to advise it on the conduct of the CER.
- Develop Draft Guidelines for the CER: Draft Guidelines for the CER were developed to identify the key environmental issues of concern that would be reviewed and addressed.
- Conduct Public Review of the Draft CER Guidelines: Following their review by the CER Advisory Committee, the Draft CER Guidelines were released to the public on November 25, 2014. The public comment period ended on January 8, 2015. The Guidelines were then finalized based on the input received, and released to the public in February 2015.
- Conduct the CER and Prepare a CER Report: The CER Report is based on the Guidelines and describes the existing environmental conditions, key environmental issues and potential environmental interactions of the Options with valued components (VCs). The report also identifies key mitigation required for each Option.
- Conduct Public Review of the CER Report: As further described in Section 3.2, the CER process includes a period of public communication. Opportunities for comment will be provided during presentations, workshops or open houses, in addition to online tools (e.g., website, email).
- Finalize the CER Report: Following the public comment period, the CER Report will be finalized. It will consider the comments received from Aboriginal groups, the public and stakeholders. The Final CER Report and a Summary Report will then be issued to NBP. The Final CER Report and Summary Report will also be made publicly available.

In some respects, the CER approach follows a standard decision analytical framework wherein a small set of options are considered (weighed) in the context of the utility of a single decision maker. This ideal of rational decision analysis presumes that a decision maker can: 1) specify all ends or values to be pursued (as distinct from means); 2) weigh them; 3) examine all possible sets of means to reach those ends; 4) evaluate each set of means against ends; then 5) for each set of means, calculate its overall measure based on the weighted average of its scores on achieving the different ends; and finally 6) choose the set of means with the highest weighted score (MacLellan 2008).

For complex socio-environmental problems[iii], meeting these theoretical requirements is simply not possible. Humans do not formulate ends or values in this manner; they cannot even list them, let alone compare them. Means are intimately linked to ends, and can neither be exhaustively listed. And the ability to search through a feasible set of means, if such a set were possible to define, is fundamentally limited epistemologically, methodologically, and computationally. The economist Frederik Hayek (1945) points to an even more fundamental dilemma inasmuch as we do not have access to the complete or 'total' knowledge that would be required to identify a socially *optimal* solution[iv].

[v]Rather than 'solving' such problems, Roberts (2000) suggests three coping strategies that have typically been employed to account for complexity: *authoritative*, *competitive* and *collaborative* approaches. Authoritative strategies place the problem in the hands of a few stakeholders who have the authority to define the problem and devise a solution. Alternatively, competitive strategies assume a 'zero-sum game' wherein the winner acquires the power to define and solve the problem. Thus while authoritative strategies artificially diminish the inherent level of social conflict in resolving such problems, competitive solutions harness it. Both approaches may be unsatisfactory in that they access a limited set of solutions, and typically lack a broad base of support for implementation.

Collaborative strategies on the other hand, seek win-win solutions by joining stakeholders in a collective framework to assume a 'variable sum game' which seeks to 'enlarge the pie' for all parties involved (Roberts 2000). Partnerships, and alliances (i.e. between governments, businesses, NGOs and citizen's groups) seek collective understanding of the problem and its resolution. And though more players make the process more complex, they also expand the potential for creativity by providing input into an evolving, future-oriented planning process (Conklin 2005). A diversity of mechanisms or techniques exists to facilitate such collaboration as evident in the climate change adaptation literature and expressed through a local or sectoral problem-solving orientation that highlights the unique or particular aspects of each case.

By adopting elements of the *collaborative* approach, the CER methodology represents a laudable extension of the typical rational decision framework. Not only does the CER process seek out science-based evidence to evaluate the different options it has identified, but NBP has expended a considerable amount of effort to consult with various groups and stakeholders. And yet, by not fully accounting for the subtle methodological distinctions that exist between *authoritative* and *collaborative* approaches (Roberts 2000), the CER process has presented inherently biased interpretations of the decision state space as seemingly *impartial*. More specifically they have effectively 'framed' and thereby 'constrained', the problem through an exclusionary *Option* and *Valued Components* (VC) selection process (CERR Section 3.2.2). The dramatically reduces the advantages of the *collaborative* approach which seeks to identify many perspectives, and has the potential to uncover numerous *solutions* through a fluid evolutionary process.

The uneven (i.e. biased) representation of knowledge and information is an unavoidable pitfall of environmental decision making. At a very fundamental level this 'framing' problem is a stumbling block even for human cognition as noted by Pylyshyn (1987) and Dennett (2005; 2006). From a systems perspective, it is an acknowledgement of the fact that we simply cannot obtain complete information about our environments given finite cognitive capacity and epistemological constraints (Hayek 1945). Even the formulations of individual goals are developed during an elicitation process which depends heavily upon the *framing* of the problem and the method of elicitation (Shafir 1999). Logically equivalent representations of a problem, as well as logically equivalent methods of elicitation, do not necessarily yield the same preferences, violating the normative requirements of "descriptive invariance" and "procedure invariance" (Shafir 1999).

The essential point is that we can never have a complete analysis of the problem, and NBP's analysis of their three options and associated Valued Components, could never fully reflect their impacts upon New Brunswick's social, cultural, political and natural environments. This inability to clearly define the decision state space has led many to 'qualify' the means of doing so (MacLellan 2006).

> Because logical, probabilistic and computational requirements are too onerous to reflect actual decision making, various 'bounded' models of rationality have been proposed. Compromises must be made in terms of the quality of decisions given finite computational ability, invariably leading to some form of meta-reasoning (Jordan & Russell 1999). A capacity to meta-reason provides the decision maker with the ability to decide which deliberations to undertake and when to stop and act (Russell & Wefald 1991)[vi].

To circumvent these limitations, humans have developed various psychological heuristics to aid problem solving. Tversky and Kahneman (1981) famously showed that individuals "*produce predictable shifts of preference when the same problem is framed in different ways.*" Dramatically, reversals of preferences were noted when confronted with what were effectively 'equivalent' problems. For instance, these 'context' effects can have a dramatic impact upon what individuals feel is fair with respect to a decision (Fischhoff and Kadvany, 2011). A classic example is that fewer people will *forbid* an activity, than will *not allow* it even if the outcome is the same. In our case this may have strong implications for what we, as a society, are willing to impose upon the home owners of the Mactaquac headpond. We will examine the implications of this *bias* by effectively defining our own *bias*.

2.2 Actor Operating Environments

At the basis of our CER critique (in Sections 3.0 and 4.0) is our contention that while *bias* is inevitable in complex environmental decision-making exercises, explicitly identifying sources of *bias* can lay the foundations for more novel, robust, and socially acceptable *solutions* (MacLellan 2008). It further facilitates the identification of perspectives that may be absent from such processes, without which the advantages of collaborative decision making will be greatly diminished. In the following diagram we present a simplified representation of an actor oriented view of the decision space that is confronting New Brunswick Power. This conceptualization has been borrowed from the business literature and represents a standard, institutional view of a typical actor's operating environment[vii].

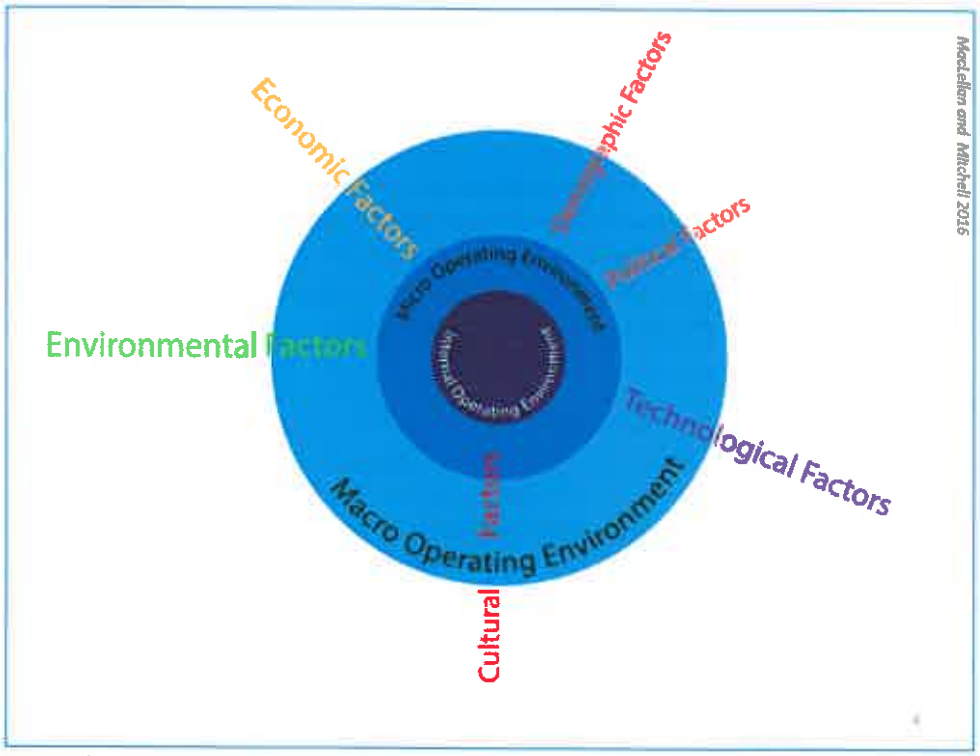

Figure 2: Institutional operating environments: 1) The internal or inner operating environment includes those system elements within the control of the institution including Labour, Materials, Machinery, Financial Capital, and Management. The External operating environment is generally outside the direct control of the organization, and it includes 2) a Micro Environment that is associated with Suppliers, Clients, Market intermediaries, Competitors, and the Public; as well as 3) a Macro operating environment that includes the Political Environment, the Cultural environment, the Technological environment, the Natural environment, the Demographic environment and the International environment.

As the primary decision-maker, the operating environment of NBP is composed of an internal or inner operating environment that includes those system elements that are within the control of the institution (see Figure 2). These include labour, materials, machinery, financial capital, and management. Not surprisingly, it is critical that a large institution be intimately aware of such internal processes[viii]. We can see these factors manifest in NBP's focus on the cost estimations of the three options, the details of which are not trivial (NBP 2016). For example, financing is outlined in the document '*Considering the Future of Mactaquac: A Discussion Paper from the Utility's Perspective*' (2016) on pages 12-13 (a.k.a. 'A Utility's Perspective'). Other *internal* factors are also inferred within this document and demonstrate

the attention to detail that we expect from a large, service focused, crown corporation. Not surprisingly, the lion's share of this expertize has an *engineering* orientation.

NBP also exists in an external environment that can dramatically impact the efficient operations of the company, but over which it has no direct control (e.g. over fuel prices for instance[ix]). This external environment is comprised of: i) a micro operating environment as associated with suppliers, clients, market intermediaries, competitors, and the public; as well as ii) a macro operating environment that includes the Political, Cultural, Technological, Natural, Demographic and International environments (see Figure 2). We can further discern the outline of NBP's micro operating environment in the document '*A Utility's Perspective*' which explicitly describes the relationship between NBP, the Province of New Brunswick, and its regulator, the New Brunswick Energy and Utilities Board (EUB), as grounded in the Electricity Act and in mandate letters from the Minister of Energy and Mines. (NBP 2016). It is from these institutions\regulations that NBP receives its operating guidelines and mandate:

> The Province of New Brunswick has given NB Power a clear mandate to provide electricity safely, reliably and with financial and environmental accountability. Specifically, NB Power is directed to provide safe and reliable service at low, stable and predictable rates for customers with definite targets for the development of renewable energy in New Brunswick. Because of this, NB Power must seek a best-cost solution that meets safety, reliability, environmental and financial goals.

This institutional mandate is further apparent in NBP's *non-negotiables* for the Mactaquac Project: 1) NBP must continue to provide safe, reliable electricity at low and stable rates. 2) NBP must operate in compliance with environmental regulations. 3) NBP will be respectful of First Nation's rights and interests. And 4) they must choose a recommendation by the end of 2016. This highlights two important facets of the CER in the context of our comments: first, the driving purpose behind the CER is to find a way to provide safe, reliable electricity at low and stable rates to the people of New Brunswick; and second, NBP alone determines the outcome of the CER process (i.e. they choose the Option to move forward with). This form of decision making represents Robert's *authoritative* approach, and follows a simple optimization format with an objective function as limited by constraints.

From such a narrowly defined perspective (i.e. the inner and external micro operating environments), the advantages of repowering the Mactaquac Dam would appear self-evident. And without a doubt, there are major advantages in maintaining a dam at Mactaquac, including those which directly respond to environmental concerns (i.e. hydroelectric power is renewable and thereby diminishes the release of greenhouse gases which negatively affects the global climate). Nevertheless, NBP felt compelled to adopt a *consultative* sensibility when considering the future of the Mactaquac Dam, thus extending the decision domain out into the macro operating environment of Figure 2. There are multiple reasons why they would choose to do so, and we strongly support their efforts. Minimally this direction cannot help but establish a more robust 'solution' for the future of the Dam.

Nevertheless, we are still left with the dilemma of what factors to focus on within the Macro Operating environment. Hayek's (1945) point about the inaccessibility of knowledge still holds true. Interestingly Hayek does suggest that we can bypass this dilemma by simply asking the right experts for the information that we need. Although we are still left with the challenge of defining who the correct experts are, modern techniques can help us in this challenge (MacLellan and Flueraru, 2015). Within this context we have identified various knowledge domains in Figure 3 for which expertise can be

acquired to inform the Mactaquac Project CER. These broader knowledge *perspectives* can be used to inform the process, offering insights that NBP, the central decision maker can access to inform their final decision.

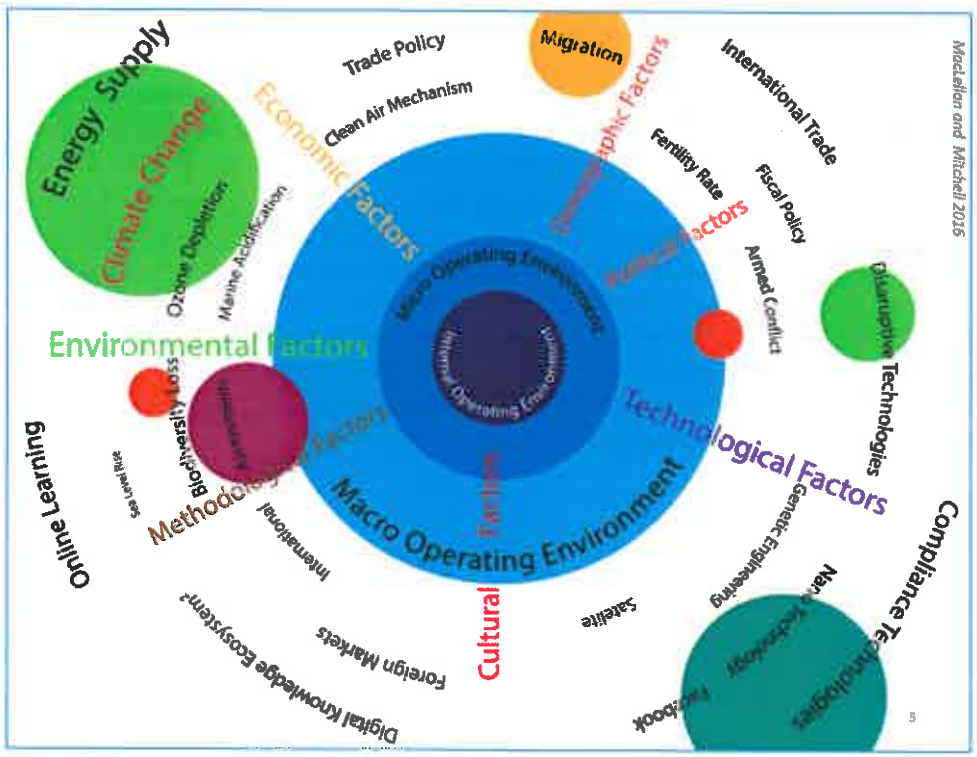

Figure 3: Institutional actor network and knowledge domains associated with the external macro operating environment of a decision maker. In this case we have highlighted those actor\knowledge domains that are associated with various external factors. In this report we have adopted the institutional perspective associated with the World Wildlife Fund which arguably is associated not only with Environmental factors but economic factors through as related to the issue of climate change.

We have modeled this perspective on the institutional presence of the World Wildlife Fund of Canada[x]. The WWF is uniquely qualified to offer a broader *perspective* to this process. In 1961 a group of conservationists crafted the *Morges Manifesto* which called for the creation of an organization to directly 'fund' conservation efforts worldwide. The Manifesto stated that while the expertise to protect the world environment existed, the financial support to achieve this protection did not. The decision was made to establish World Wildlife Fund as an international fundraising organization to work in collaboration with existing conservation groups and bring substantial financial support to the conservation movement on a worldwide scale. Since then WWF has been at the forefront of both international, and locally focused efforts to "*conserve nature and reduce the most pressing threats to the diversity of life on Earth.*" The Canadian arm of the WWF is particularly focused on five areas of interest: climate and energy, arctic, oceans, freshwater, and species.

In Figure 3 we envision the WWF as providing a perspective emanating from the left portion of the macro operating environment. Their predominantly ecological perspective is highly integrative, accounting for broader spatial and time scales, complex interconnected species relationships (webs), and global processes based in ecosystem science. Recently, WWF has also turned its attention towards the social, cultural and economic drivers at the roots of modern society's interactions with the

environment (McLellan et. al. 2014). This expansion of their perspective is derived from the realization that conservation 'solutions' are not possible without accounting for societal factors. This extended mandate can be seen in their '*Happiness Manifesto*' which states that the WWF strives for a world in which everyone has a high level of well-being, and can enjoy healthy and happy lives while using only their fair share of the planet's resources. WWF defines well-being in accordance with the UN Millennium Ecosystem Approach.

In essence we offer this heuristic *perspective* (ideal type) of the Mactaquac Project, as set against a backdrop of diminishing species population numbers, and the threat of major global and regional environmental change (McLellan 2014). Although not always evident at the local scale, when the Mactaquac Project is 'viewed' from this broader, more inclusive perspective, the importance of the St John River Watershed becomes readily apparent. Adopting this *perspective* is not the same as advocating for one of the Options, the utility of the heuristic comes rather from the perspective it offers of the decision space. This view though has important implications for the CER method in terms of expanding the 'scope' of local decision making exercises, in terms of the consideration of participants, in terms of environmental policy, in terms of ecological connectivity and inclusiveness, and in terms of the knowledge sources that are brought to bear on the problem.

3.0 MACTAQUAC PROJECT CER CRITCAL REVIEW

When confronting highly complex environmental issues, there are no simple or correct answers only decision making processes that are better informed, inclusive, and considerate of those affected (Beck 1992). In an ideal sense, it would of course be desirable to obtain complete knowledge of all possible options, available in all particular locations, under all particular circumstances, and across multiple time scales, so as to fully inform the decision process. But such *totality* is clearly not possible (Hayek 1945). Instead of a complete picture we are left with conceptual heuristics that are used to implicitly account for these limitations (MacLellan 2008a 2008c).

> The term 'ecosystem' [has been] used as a metaphor for describing the incredible complexity that exists within natural environments as well as the limitations for human manipulation. Thus Ecosystem Based management essentially becomes a process of maintaining the human\ environmental system in a desirable, stable state, despite a lack of awareness of the actual mechanisms that initiate and drive system shifts. As such, it is primarily a philosophical concept for dealing with larger spatial scales; longer time frames; and the requirement that management actions are socially acceptable, economically feasible and ecologically sustainable (Rauscher 1999).

Put into the current context, the *ecosystem* viewpoint which is inherent to the WWF perspective, acknowledges that we cannot account for all the knowledge required to identify a complete, synoptic, or best solution regarding the future of the Mactaquac Dam. But it also infers a *functional* aspect to the ecological processes under consideration; focusing only on human values and scales ensures that we will miss these important relationships[xi] and the dependencies of wildlife species on complete, connected, environments.

3.1 Inherent Expressions of Bias within CER

In its evaluation of the three options identified in Table 1, Stantec generated the report: 'Mactaquac Project: Comparative Environmental Review (CER) Report' (2015) that describes the impact of each option on what are considered to be critical societal values, or Valued Components. The CER Report describes the existing environmental conditions, key environmental issues and potential environmental interactions of the Options with valued components (VCs). It also identifies key mitigations actions required for each Option. We have created the Valued Components\Options Matrix in Table 3 below, to bring all these factors together in one place for comparison; this information is derived directly from the CER report.

In Table 3, impacts are described as 'interactions' with the three Options, providing a sense of their effect upon the critical issues. We have further generated Table 4 to synthesize the results of Table 3. To do so we have simply added up the different categories of 'interactions' for each Option. There are six outcomes for 'interactions' assessed by the authors responsible for each Valued Component; they include: 1) whether the interaction is positive or negative; 2) the amount of change that is expected; 3) the geographical extent of the interaction; 4) how long the interaction is intended to last; 5) how often the interaction occurs; and 6) whether a mitigation is recommended.

As seen in Table 4, the overall trend in terms of positive\negative interactions suggests slightly more negative interactions for Option 3, but also many more positive interactions for the option. The difficulty is how to compare such seemingly incompatible values. Similarly, it is difficult to assess the

amounts of change that are expected with the different Options. Nevertheless, we can begin to discern a strong contrast between the Options with respect to the scales that they affect. As might be expected, the impacts\interactions of Option 3 tend to occur continuously over broader spatial and temporal scales as reflected in Table 4, but the 'Key Issues of Concern' tend to be systematically biased towards local, immediate impacts.

The most glaring example of this occurs with respect to the 'Atmospheric Environment' Valued Component. There is little doubt that one of the most critical issues facing modern society is climate change (Eyzaguirre et al 2014), and yet this 'critical issue' is not accounted for in the CER process. It is seemingly replaced by an analysis that examines the region's micro climate despite the fact that projecting changes is micro climate is an inherently challenging task, and is unlikely to yield definitive results. Research suggests that the projected changes in the New Brunswick climate will have dramatic impacts upon many values being considered in the CER process. Not only will these changes result in long term long term impacts upon species distributions and migrations[xii], but an increase in extreme precipitation events is also expected (see Figure 5).

Table 3: Valued Components\Options Matrix as directly compiled from CER Report (2015).

CER Report Section	Valued Component	Key Issues of Concern	I-O Interaction (positive\negative)			I-O Interaction (amt change)			I-O Interaction (geographic extent)			I-O Interaction (how long)			I-O Interaction (how often)			I-O Interaction (mitigation)		
			Option 1[14]	Option 2[15]	Option 3[16]	Option 1	Option 2	Option 3	Option 1	Option 2	Option 3	Option 1	Option 2	Option 3	Option 1	Option 2	Option 3	Option 1	Option 2	Option 3
Section 4	Atmospheric Environment[1]	Δ air quality; dust, odour	Neg	Neg	Neg	Med	Med	Med	Area	Area	Area	Med	Med	Med	Multiple	Multiple	Multiple	No	No	Yes
		Δ greenhouse gas emissions	Neg[17]	Neg[17]	Neg[17]	Med	Med	Med	Global	Global	Global	Med	Med	Long	Multiple	Multiple	Contin-uous	No	No	Yes
		Δ microclimate			Pos/ Neg			Low			Area			Long			Single			No
Section 5	Acoustic Environment[2]	Δ sound quality, vibration	Neg	Neg	Neg	Med	Med	Med	Area	Area	Area	Med	Med	Med	Multiple	Multiple	Multiple	Yes	Yes	Yes
Section 6	Surface Environment[3]	Δ surface water flow regime	Neg	Neg	Pos/Neg	Low	Low	High	Site	Site	Region	Long	Long	Permnt	Single	Single	Contin-uous	Yes	Yes	Yes
		Δ surface water; sediment quality	Neg	Neg	Neg	Low	Low	High	Site	Site	Region	Long	Long	Permnt	Single	Single	Contin-uous	Yes	Yes	Yes
Section 7	Groundwater[4]	Δ groundwater quality	Neg	Neg	Neg	Low	Low	Low\ High	Site	Site	Area	Short	Short	Long	Single Contin-uous	Single Contin-uous	Contin-uous	Yes	Yes	Yes
		Δ groundwater quantity	Neg	Neg	Neg	Low	Low	Low\ High	Site	Site	Area	Short	Short	Long	Single Contin-uous	Single Contin-uous	Contin-uous	Yes	Yes	Yes
Section 8	Aquatic Environment[5]	Δ fish habitat (Construction \ Operation)	Neg/ Pos	Neg/ Pos	Pos/ Neg	Low\ Low	Low\ Med	High\ High	Region	Region	Region	Permnt	Permnt	Permnt	Contin-uous	Contin-uous	Contin-uous	Yes	Yes	Yes
		Δ fish mortality; populations (C \ O)	Neg/ Pos	Neg/ Pos	Pos/ Neg	Low\ Low	Low\ Med	High\ High	Region	Region	Region	Permnt	Permnt	Permnt	Contin-uous	Contin-uous	Contin-uous	Yes	Yes	Yes
		Δ spp at risk, or conservation concern (C \ O)	Neg/ Pos	Neg/ Pos	Pos/ Neg	Low\ Low	Low\ Med	High\ High	Region	Region	Region	Permnt	Permnt	Permnt	Contin-uous	Contin-uous	Contin-uous	Yes	Yes	Yes
Section 9	Vegetation and Wetlands[6]	Δ vegetation communities	Neg	Neg	Pos/Neg	Low	Low	High	Site	Site	Region	Permnt	Permnt	Long-Permnt	Single	Single	Contin-uous	No	No	Yes
		Δ spp at risk, or conservation concern	Neg	Neg	Pos/Neg	Low	Low	Med	Site	Site	Region	Permnt	Permnt	Long-Permnt	Single	Single	Contin-uous	No	No	Yes
		Δ wetland area, values			Pos/Neg			High			Region			Long-Permnt			Contin-uous			Yes
Section 10	Wildlife Habitat[7]	Δ wildlife habitat	Neg	Neg	Pos/Neg	Low	Low	High	Site	Site	Region	Permnt	Permnt	Permnt	Single	Single	Contin-uous	Yes	Yes	Yes
		Δ wildlife populations; mortality	Neg	Neg	Neg	Low	Low	Low	Site	Site	Site	Short	Short	Short	Single	Single	Single	Yes	No	No
		Δ spp of conservation concern	Neg	Neg	Pos/Neg	Low	Low	Low	Site	Site	Region	Permnt	Permnt	Permnt	Contin-uous	Contin-uous	Contin-uous	Yes	Yes	Yes
Section 11	Economy and Employment[9]	Δ economy	Pos/Neg	Pos/Neg	Pos/Neg	High\ Low	High\ Low	Med\ Med	Region Site	Region Site	Region Area	Long Short	Medium Short	Short Long	Contin-uous	Contin-uous	Contin-uous	Yes	Yes	Yes
		Δ employment	Pos/Neg	Pos/Neg	Pos/Neg	High\ Low	High\ Low	Med\ Med	Region Area	Region Site	Region Area	Long Short	Medium Short	Short Long	Contin-uous	Contin-uous	Contin-uous	Yes	Yes	Yes
Section 12	Human Occupancy and Resource Use[9]	Δ land and resource use	Neg	Neg	Neg/Pos	Low	Low	High	Area	Area	Region	Medium	Medium	Long	Multiple	Multiple	Contin-uous	Yes	Yes	Yes
		Δ navigation	Neg	Neg	Neg/Pos	Low	Low	High	Site	Site	Region	Short	Short	Long	Multiple	Multiple	Contin-uous	No	No	Yes
		Δ community			Negative			High			Region			Long			Contin-uous			Yes
Section 13	Infrastructure and Services[10]	Δ infrastructure and access	Neg	Neg	Neg	High	High	High	Area	Area	Region	Medium	Medium	Long	Multiple	Multiple	Contin-uous	Yes	Yes	Yes
		Δ public services	Neg	Neg	Neg	High	Medium	Low	Region	Region	Area	Medium	Medium	Medium	Multiple	Multiple	Multiple	Yes	Yes	Yes
		Δ fire/life safety/emergency	Neg	Neg	Neg\ Pos	Medium	Medium	Low	Area	Area	Area	Medium	Medium	Medium	Multiple	Multiple	Multiple	Yes	Yes	Yes
Section 14	Transportation[11]	Δ transportation: road infrastructure, traffic volume	Neg	Neg	Neg	Medium	Medium	Medium	Region	Region	Region	Long	Long	Long	Multiple	Multiple	Multiple	Yes	Yes	Yes
Section 15	Heritage Resources[12]	Δ heritage resources, archaeological, historic, or paleontological resources	Neg	Neg	Neg	Low	Low	High	Site\ Head-pond	Site\ Head-pond	Head-pond	Short Long	Short Long	Long	Single Contin-uous	Single Contin-uous	Single	Yes\ No	Yes\ No	Yes
Section 16	Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons[13]	Δ traditional use	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 4: Valued Components\Options Matrix, summary of interactions. This table represents a simple summation of the common 'interaction' metrics (CERR pg 3-16) for each Option across Valued Components and Issues of Concern. It has been produced to identify broad trends in the CER methodology itself; not as a means of comparison between the Options themselves.

I-O Interaction (positive\negative)			I-O Interaction (amt change)			I-O Interaction (geographic extent)		
Option 1	Option 2	Option 3	Option 1	Option 2	Option 3	Option 1	Option 2	Option 3
24 Neg	24 Neg	27 Neg	20 Low	20 Low	7 Low	14 Site	14 Site	2 Site
5 Pos	5 Pos	15 Pos	5 Med	6 Med	7 Med	5 Area	5 Area	9 Area
			4 High	3 High	18 High	7 Region	7 Region	17 Region
						1 Global	1 Global	1 Global

I-O Interaction (how long?)			I-O Interaction (how often?)			I-O Interaction (mitigation?)		
Option 1	Option 2	Option 3	Option 1	Option 2	Option 3	Option 1	Option 2	Option 3
7 Short	7 Short	3 Short	9 Single	9 Single	3 Single	N (5)	N (6)	N (2)
7 Med	9 Med	4 Med	9 Multiple	9 Multiple	5 Multiple	Y (18)	Y (17)	Y (25)
6 Long	4 Long	15 Long	9 Contin	9 Contin	19 Contin	Y/N(1)	Y/N(1)	
7 Perm	7 Perm	10 Perm						

The main point here is that there is a bias towards quantifying the local impacts of the options that are immediately affected by the dam construction, or dam removal. Even when results appear relatively neutral as with the acoustic environment, the analysis does not account for long term interactions with Option 3. Mazaris et al (2009) for example have undertaken critical work in identifying elements of the acoustic landscape in a forested environment for wildlife. One can imagine the longer term, beneficial effects of living next to a forested riparian environment not only for wildlife, but for residents as well. This bias towards the immediate impacts of construction events upon the local headpond community, can be further discerned in Table 5 which lists key issues of concern that have not been accounted for in the CER process, as derived from an extensive literature review.

A more expanded view, as epitomized by the WWF perspective, would enable recognition of a broader range of impacts. Table 5 shows additional indicators, as suggested by experts in dam evaluation, as appropriate for inclusion in the discussion of the three options. For instance, there is a lack of a comprehensive cost-benefit analysis, that accounts for non-market values such as the added benefit of land and river use by first nations groups, as well as passive-use values such as the knowledge that natural landscapes and resources are left for future generations to enjoy.

The dam is also not an isolated component of the St. John River watershed, so indicators and trends should not be evaluated in isolation of the rest of the watershed. This seems obvious in the context of environmental values, but the impact of the system of six dams upon the communities within the watershed, is not taken into account either. The case of the Mactaquac Dam was framed as a locally constrained area of concern, but its impact actually affects regional and international communities. Climate change is a global issue that is accumulated from regional effects. In fact, dams around the world contribute to 4% of global warming effects (Lima et al, 2007). The decay of organic materials, use of large amounts of cement, diversion of water out of rivers, and deforestation are major culprits.

There is also a lack of an environmental post-impact assessment of the original dam. When an infrastructure does not deliver its function for the predicted period of time, the outcomes should be evaluated at scale. What are the actual impacts of the dam in contrast to initially anticipated? How does the magnitude of the impacts change when its abridged lifetime is factored in? The inception of the dam serves as a reminder of the uncertainties that may sprout from the final decision about the Mactaquac Dam. The necessity for further decision making may arise years after the reconstruction as in this case. At that time, would stakeholders weigh the options in the same way?

Table 5: Extended list of potential 'Issues of Concern' as derived from an extended literature search (Yao (UTSC), 2016)

Valued Component	Neglected Key Issues of Concern	Applicable to Option(s): may have positive or negative implications	Reference
Atmopsheric Environment	△ regional climate	1, 2	Suggested additions of key issues related to VCs are based upon Wang et al (2012), Harris et al (2012), Brown et al (2009), Becker et al (2004), and Gregory and Davis (1992).
Acoustic Environment	△ sound wrt forested landscape	1	
Surface Environment	△ downstream tributaries	1, 3	
	△ flood peak travel time	1, 3	
	△ flow pulse	1, 3	
	△ water retention time	1, 3	
Aquatic Environment	△ habitat connectivity	1, 2	
	△ abiotic conditions (i.e. oxygen level)	1, 2, 3	
	△ opportunity to thrive in the future	3	
Vegetation and Wetlands	△amount of landmass with vegetation	1, 3	
	△channel environment	3	
	△debris environment	1, 3	
	△erosion distribution	1, 3	
Wildlife Habitat	△ habitat connectivity	1, 3	
	△ type of wildflife present	1, 3	
	△ feeding habitat transfer	1, 3	
	△ emigration pattern	1, 3	
Economy and Employment	△ economy\employment (long term)	1, 2, 3	
	△ wage/compensation	3	
	△ employment type	3	
	△ extend of commuting for work	1, 3	
	△ economic diversity	1, 2, 3	
	△cost of living	1, 2, 3	
	△ regional sales tax revenue	3	
	△ regional property tax revenue	3	
	△ dryland farm income	3	
	△ fixed income rate payers and poverty	1, 3	
	△ family stability	1, 3	
Human Occupancy and Resource Use	△ land and resource use (long term)	1, 3	
	△ downstream irrigation	1, 3	
	△ migration and displacement	1, 3	
	△ population	1, 2, 3	
	△ ethnic diversity	1, 2, 3	
	△ trends in school enrollment	1, 3	
	△ home ownership	3	
	△ community values	3	
	△ level of social activities	3	
	△ customs and lifestyles	3	
	△ crime and safety	1, 2, 3	
Infrastructure and Services	△ residential utility rate	3	
	△ utility provider rate risk	3	
Transportation	△ grain transportation costs	1, 3	
	△ uncertainty of commodity transportation	1, 2, 3	
	△ highway congestion and safety	1, 2, 3	
	△ construction and maintenance	1, 2, 3	
Heritage Resources	△ culture	1, 2, 3	
	△ social cohesion	3	
Current Use of Land and Resources for Traditional Purposes by Aboriginal Persons	△ value of remaining landmass	3	
	△ historical stability/tension	1, 2, 3	
Environmental Geology	△ stability of rock foundation	1, 2	
	△ stability of bank	1, 2	
***Climate Change	Should be considered a major VC itself and influences several other VCs.	1, 2, 3	

3.2 Extended Environmental and Social Scales

In the previous section we observed that the VCs were oriented towards the local. From our environmental 'perspective' this narrow focus is problematic insofar as the Mactaquac dam is not an isolated element in the watershed, but part of the much larger North Atlantic ecozone, which is itself part of the global environment. The dam dramatically impacts a much broader set of environmental values that are of concern not only to the communities of the headpond and recreationalists from Fredericton, but for those across the St John Watershed which extends into Quebec as well as Maine. In fact a full assessment of the impact of the dam upon the environment would include a much expanded consideration of scale.

In Figure 4, Bruce (1987) suggests that a complete analysis of the impact of such a project would address multiple temporal and spatial scales using the following criteria: i) biophysical; ii) economic; iii) social; iv) political; v) legal; vi) institutional; and vii) technological. In the current comparative assessment, only small portion of the cube would be accounted for. In essence, this framework is inherent in the perspective offered by the WWF. But, given our finite resources, we could never offer a full accounting of Bruce's social and environmental dimensions in this commentary. We can nevertheless begin to sketch out what an expanded assessment might look like.

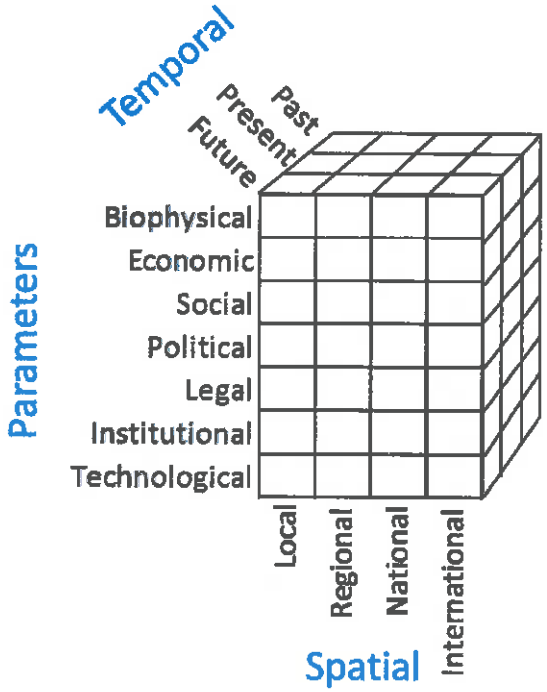

Figure 4: Adapted from Dimensions of Resource Analysis (after Krueger and Mitchell, 1977) in Mitchell (1989) Geography and Resource Analysis (second ed). Longman UK.

To begin with the most obvious omission, the dam is part of an integrated hydroelectric network that extends throughout the entire watershed. Table 1 identifies six dams that restrict the migration of aquatic species. Efforts are of course made to ameliorate the effects of the dams, but they are nonetheless strong barrier to connectivity and thus likely suppress wildlife populations. A healthy

watershed environment includes healthy wildlife populations, which we assume would benefit by removing all six dams. What is less obvious is the benefits of this more vibrant environment to communities within the watershed. In other words, if we are to fully assess the impacts of the options, we need to determine what other communities in the watershed might be positively or negatively affected.

While it is necessarily true that the communities living on the headpond will be the most immediately impacted by any changes to the status quo, the benefits of a healthy, connected, watershed will be felt by all those communities within the watershed itself. To illustrate the dramatic difference between the communities immediately adjacent to the headpond and other communities further upstream we undertook a comparative scalar analysis of the watershed socio-economic indicators. In Tables 6 we have re-interpreted the typical socio-political scales that are reported by Statistic Canada, and aligned them with the watershed itself[xiii].

Differences are immediately apparent when comparing the greater Fredericton area, with Plaster Rock for instance. We can clearly see that Plaster Rock has a much higher unemployment rate, a lower median income, and a dramatically higher dependency ratio than the rest of the watershed. Ironically, Plaster Rock is also situated upon a portion of the watershed that at one time represented prime habitat for salmon. So while the CER focus is local, we can see that there are communities in the broader watershed that might directly benefit from an environmentally healthy environment. In the current CER process, these communities are implicitly under-represented; a full analysis is currently underway.

Table 6: Economic comparison of employment and income statistics relative to the St John River Watershed which was spatially isolated through an extended GIS analysis. Preliminary analysis undertaken by G.Shifferaw, K.Cheung, D.Cho, K.Ratnasabapathy, J.Yoo, and M.Szopa, with initial support from Dr. Paul Peters.

Regional Scale	Total Population	Median Income	Labour Force Population	Unemployed Population	Unemployment Rate
Canada	32,852,325	$ 29,878	17990080	1395045	7.75%
Atlantic Regions	2,286,650	$ 26,798.25	1213,950	138865	11.44%
New Brunswick	735,835	$ 26,582	395420	43485	11%
St. John Watershed	345,855	$ 27,992.04	188830	14805	7.84%
Fredericton	55,150	$ 29,377	31555	2510	7.95%
Plaster Rock	1,105	$ 22,885	465	60	12.90%

Naturally we can also extend our perspective to look at the broader environmental consequences of the options upon the watershed as a whole, but this is challenging given the complexity of the natural environment. The analysis of the Canadian Rivers Institute is a stellar example of the type of analysis that is required to assess, and create a baseline for, the overall health of the environment. But it does not include direct projections of the sorts of changes that might be expected under the three options, nor does it account for climate change. In fact, we cannot know for certain how species will react to a drawdown of the dam. We suspect that Options 1 and 2 will cause little change. But we know that all

the options will be subject to dramatic changes in climate as inferred from Figure 5. How does one account for this?

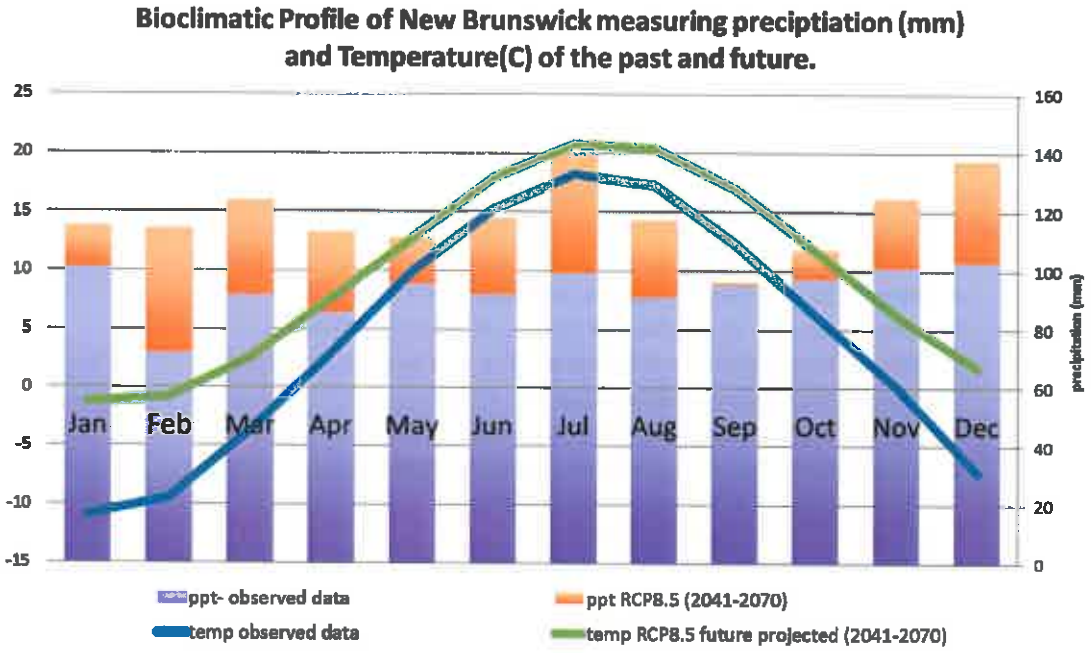

Figure 5: Bioclimatic profile for New Brunswick as derived from the latest RCP data. This is a is a visual representation of the bioclimatic profile of New Brunswick in the past and future. The X-axis represents the months of the year while the y-axis represents the temperature in C on the left and the precipitation in mm on the right. The bar graph shows precipitation using 3 different types of data. The purple horizontal bar consists of observed data; the blue bar consists of projected precipitation historic data curated by RCP and the orange bar represents RCP 8.5 projected into the future (2041-2070). The lines above depict the temperature in 3 different ways, observed temperature, projected historic temperature and projected temperature in future. The RCP 8.5 data projects an increased amount of precipitation in the future, synonymous with an increase in expected temperature for the future. Preliminary analysis undertaken by G.Shifferaw, K.Cheung, D.Cha, K.Ratnasabapathy, J.Yao, and M.Szopa, with support from Dr. Philipe Gachon and Christian Said.

There is no simple answer to this question, not only are we subject to Hayek's (1945) dilemma of total knowledge inaccessibility, but we are entering a period of rapid ecological change for which analogues do not exist. Ecologists are highly aware of the seemingly intractable interactions between species that make population projections difficult (Eveleigh et al 2007). Nevertheless, various assessment methodologies have been developed to help land management practitioners responsive to the projected changes in climate.

Recently two events occurred in New Brunswick that indicate an emerging ability to account for climatic change in management decision making. In the first instance, the Canadian Rivers Institute undertook a preliminary climate vulnerability analysis with their partners at NBCCRC, INRS, UQAM and DFO. Employing the most up-to-date climate, and hydrological models, they examined the likely impact of climate change on the Miramichi River. Results are forthcoming and will be used to help establish a salmon vulnerability model through a process of expert solicitation (See Appendix 2 for a preliminary visualization of the impact of climate change on the St John River).

In the second event, the Association of Registered Professional Foresters of New Brunswick, and the New Brunswick Climate Change Research Collaborative hosted a three-day workshop that introduced forest practitioners to the most up-to-date climate research, including two climate vulnerability frameworks. The fundamental premise of these assessments is that experts are solicited to first establish regional vulnerabilities as a basis for local decision making exercises. Once regional climate vulnerabilities are established, a broad range of adaptation options can be tailored to local conditions.

A substantial body of knowledge regarding climate change response has been generated by the scientific community, and broad trends have been noted by the Canadian Forestry Service, and the USDA (Please see Appendix 1). For instance, the USDA identifies the following ten adaptions (Janowiak et al 2014; Butler et al 2012):

- Strategy 1: Sustain fundamental ecological functions.
- Strategy 2: Reduce the impact of existing biological stressors.
- Strategy 3: Protect forests from severe fire and wind disturbance.
- Strategy 4: Maintain or create refugia.
- Strategy 5: Maintain and enhance species and structural diversity.
- Strategy 6: Increase ecosystem redundancy across the landscape.
- Strategy 7: Promote landscape connectivity.
- Strategy 8: Enhance genetic diversity.
- Strategy 9: Facilitate community adjustments through species transitions.
- Strategy 10: Plan for and respond to disturbance.

In the context of the Mactaquac Project we note the importance of enhancing species and structural diversity, increasing ecosystem redundancy across the landscape, the creation of species refugia, as well as the critical importance of increasing landscape connectivity. They also point out that connectivity along north south gradients is critical, as in the St John River. In other words, if we are to truly prepare for climatic change, the Mactaquac Dam must not only be assessed in terms of the benefits that accrue from society utilizing hydro power, but the ecological benefits of anticipating the types of ecosystem changes that are expected under a changing climate. To accomplish this though, it is clear that decision makers need to broaden their traditional 'framing' of the hydroelectric decision landscape.

3.3 Option Re-Consideration and Envisioning

When accounting for the outer operating environment that is illustrated in Figure 3, a decision maker is inevitably faced with the dilemma of what factors to consider. *"But, of course, you can never identify all the forces at play. If you could, and see their interactions, then real prediction of the future would be simple."* (Jimmy Davidson, head of group planning at Dutch Shell 1967–1976). This challenge is shared by all decision makers, although most are unaware of the full implications of this predicament. Day and Schoemaker (2005) make the point that into today's complex operating environments, businesses must become aware of their extended environments if they are to prosper. They advocate developing an extended *peripheral* vision which requires managers to ask different sorts of questions than they are used posing, so as to recognize when part of the *picture* is missing.

> When a company examines its main areas of focus, its questions are targeted and the answers precise: What is our market share? What are our profits? Have our sales volumes increased?

> What is our employee turnover? What are our rivals up to? ... But the questions used to examine the *periphery* need to be much more open-ended and the answers far less precise. [questions like] What will the demographics of 2010 look like? ... What role will governments play? (Day and Schoemaker , 2005).

Seeking a broader perspective does not come easy. External drivers are difficult to track for various reasons, but a lack of internal expertise is central to the problem. Given the volatilely of oil markets in the 1970s, Dutch Shell saw the need to develop internal capacity to identify broad industry drivers, as exemplified in their scenarios planning exercises. *"Pierre Wack, head of planning for Shell Française ... focused on telling plausible stories about the wider business context. Together with Newland he came to define the practice of scenario planning at Shell."* (Wilkinson and Kupers. 2013). These scenario planners at Shell, anticipated factors that could dramatically affect oil prices (e.g. the OPEC cartel). In one form or another, this methodological advancement is now the basis of international environmental modeling as in efforts with climate change. What seems lost to environmental communities though, is the fact that such methods were originally designed to facilitate *envisioning* exercises. In fact, this ability to ideate about the future is central to such heuristics (MacLellan 2006).

The advice of the Dutch Shell group speaks directly to addressing psychological biases of decision makers. The CER process for instance could be seen as laying the groundwork for such exercises in which communities within the St John River watershed are enabled to broadly identify the type of environment they would prefer, over the long term. The scenarios group at Shell suggests considering many perspectives:

- Break the habit, ingrained in most corporate planning, of assuming that the future will look much like the present.
- It's not about predicting the future ... make it plausible, not probable
- Tell stories that are memorable yet disposable
- You are trying to manipulate people into being open-minded.
- The value of scenarios are embedded in, and provide vital links between... organizational processes such as strategy making, innovation, risk management, public affairs, and leadership development.
- As unthreatening stories, scenarios enable Shell executives to open their minds to previously inconceivable or imperceptible developments. (Wilkinson and Kupers. 2013)

This method for *examining* the outer environment does not mean that scenarios, storylines, or narratives are not quantifiable. The requirement that scenarios are *plausible* ensures that their consideration is based upon the most scientifically up to date understanding of the causal factors involved (i.e. as with climate scenarios development). But the method does require that stakeholders and decision makers be given licence to offer narratives that expand the discussion, so as to formulate more nuanced futures. With respect to the Mactaquac Dam, this expanded discussion can be facilitated by imagining two generic options: 1) an extended drawdown of the headpond; and 2) a drawup of the headpond. Psychologically, this expanded discussion removes the barriers to decision made by framing the decision options too early in the process. It also places the extended discussion of hydroelectric power within the St John River watershed, on the table.

In the first case, by considering an extended drawdown option, we may be able to address the fundamental dilemma of accounting for the needs of the current community surrounding the headpond.

A drawdown that takes over 30 years to complete for instance, may be able to accommodate the needs of this community, while allowing for a slow green up of the exposed shoreline. By drawing down over such an extended period, the immediate needs of the community will be met (e.g. recreational opportunities will be maintained over the lifespan of the current owners), but the ecosystem will also be given a chance for restoration at scales that are not inconsistent with ecological processes. This extended option is inherently flexible and when combined with Option 4 in Table 2, permitting a much wider range of possibilities to be considered.

Figure 6: A renewable energy focus for the Mactaquac headpond. In this simplistic overview, we raise the issue of increased hydro power within the St John River watershed. Herein we roughly examined the effects of developing an earthen berm at the north end of the Mactaquac Arm with the intent of raising the headpond by 10 meters. This is not intended as a realistic proposal, but is instead a heuristic tool used to more fully highlight the key issues of concern surrounding the Mactaquac Dam. Preliminary analysis undertaken by Benjamin Maclellan, with support from Charles Bourque.

Alternatively, if our focus is on renewable energy (e.g. as part of a possible provincial climate change energy strategy) we should not dismiss the *fiction* of a potential *drawup*. In other words, we could propose a larger headpond. From a rough, preliminary review, a drawup may be technically feasible if an earthen berm is located at the north end of the Mactaquac Arm (see Figure 6). We are not suggesting that this is actual possibility, rather we seek to raise awareness of the broader implications (past and future) of hydroelectric power along the St John River. Similarly, the number and size of dams over the entire range of the watershed could be a the focus of this extended discussion. Tiber and Tullos (2013) for example examine the trade-offs between small and large hydro-projects. And Kuby et al (2005) extend the issue of dam removal towards a consideration of habitat hydropower tradeoffs.

In other words, the three options identified by NBP do not adequately define the state space of future possibilities. A small methodological extension to the current process could facilitate such an extended discussion, the results of which need not be binding[xiv] (see Figure 1).

4.0 Conclusions

We'd like to begin by commending *NBP* for undertaking the Mactaquac Project Comparative Environmental Review (CER). It represents a novel and timely effort for dealing with the highly complex social, economic and environmental issues surrounding energy infrastructure decision making. Cognizant of the challenging task NBP has set before itself, we acknowledge their extensive efforts in meeting their three core values for community engagement: *responsiveness*, *inclusion* and *respect* and encourage NBP in these efforts. Nevertheless, we also note that the CER process could be improved and it was with this in mind that this document was written. NB Power themselves note the following concerns about the process (CERR page 3-10):

- concerns over the effectiveness of the public engagement process;
- questions on the scope of the Valued Components (VCs) or key issues being considered;
- questions on the effectiveness of the CER Methodology being used and questions on the geographic areas being assessed;
- concerns over the social, aesthetic, or ecological implications of one or the other of the options;
- questions relating to the operational feasibility of one or the other of the options;
- questions relating to the greater decision-making process to be used by NB Power in the selection of a Preferred Option; and
- questions relating to the scope of other studies being completed to support the selection of a Preferred Option, and suggestions for additional considerations.

Our main contention is that the CER hybridization of standard decision analytical methods with consultative (inclusive) methodologies, generates systemic biases that diminish the overall effectiveness of the procedure. To highlight these biases we developed an alternative environmental perspective that derives its' form from the inferred institutional mandate of the World Wildlife Fund. We then implicitly applied this heuristic to the decision space as defined by NB Power and noted a bias towards locally oriented, relatively short term impacts. In the end we identified a means of extending the CER framework to account for the broader benefits of collaboration, as noted by Roberts (2000).

Our recommendations are simply that NB Power provides a mechanism for reformulating the Options, accounting for a broader environmental perspective, and the risks associated with climate change. This capacity for addressing climate change has only recently emerged in New Brunswick, but its potential to dramatically alter the decision state space that confronts NB Power is immense. We would recommend that this issue be included in an expanded version of the current exercise.

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APPENDIX 1: USDA Forest Vulnerability Tool: List of adaptation strategies and approaches

Strategy 1: Sustain fundamental ecological functions.

1.1—Maintain or restore soil quality and nutrient cycling.

1.2—Maintain or restore hydrology.

1.3—Maintain or restore riparian areas.

Strategy 2: Reduce the impact of existing biological stressors.

2.1—Maintain or improve the ability of forests to resist pests and pathogens.

2.2—Prevent introduction and establishment of invasive plant species and remove existing invasives.

2.3—Manage herbivory to protect or promote regeneration.

Strategy 3: Protect forests from severe fire and wind disturbance.

3.1—Alter forest structure or composition to reduce risk or severity of fire.

3.2—Establish fuelbreaks to slow the spread of catastrophic fire.

3.3—Alter forest structure to reduce severity or extent of wind and ice damage.

Strategy 4: Maintain or create refugia.

4.1—Prioritize and protect existing populations on unique sites.

4.2—Prioritize and protect sensitive or at-risk species or communities.

4.3—Establish artificial reserves for at-risk and displaced species.

Strategy 5: Maintain and enhance species and structural diversity.

5.1—Promote diverse age classes.

5.2—Maintain and restore diversity of native tree species.

5.3—Retain biological legacies.

5.4—Restore fire to fire-adapted ecosystems.

5.5—Establish reserves to protect ecosystem diversity.

Strategy 6: Increase ecosystem redundancy across the landscape.

6.1—Manage habitats over a range of sites and conditions.

6.2—Expand the boundaries of reserves to increase diversity.

Strategy 7: Promote landscape connectivity.

7.1—Use landscape-scale planning and partnerships to reduce fragmentation and enhance connectivity.

7.2—Establish and expand reserves and reserve networks to link habitats and protect key communities.

7.3—Maintain and create habitat corridors through reforestation or restoration.

Strategy 8: Enhance genetic diversity.

8.1—Use seeds, germplasm, and other genetic material from across a greater geographic range.

8.2—Favor existing genotypes that are better adapted to future conditions.

8.3—Increase diversity of nursery stock to provide those species or genotypes likely to succeed.

Strategy 9: Facilitate community adjustments through species transitions.

9.1— Anticipate and respond to species decline.

9.2— Favor or restore native species that are expected to be better adapted to future conditions.

9.3—Manage for species and genotypes with wide moisture and temperature tolerances.

9.4—Emphasize drought- and heat-tolerant species and populations.

9.5—Guide species composition at early stages of stand development.

9.6—Protect future-adapted regeneration from herbivory.

9.7—Establish or encourage new mixes of native species.

9.8—Identify and move species to sites that are likely to provide future habitat.

Strategy 10: Plan for and respond to disturbance.

10.1—Prepare for more frequent and more severe disturbances.

10.2—Prepare to realign significantly altered ecosystems to meet expected future environmental conditions.

10.3—Promptly revegetate sites after disturbance.

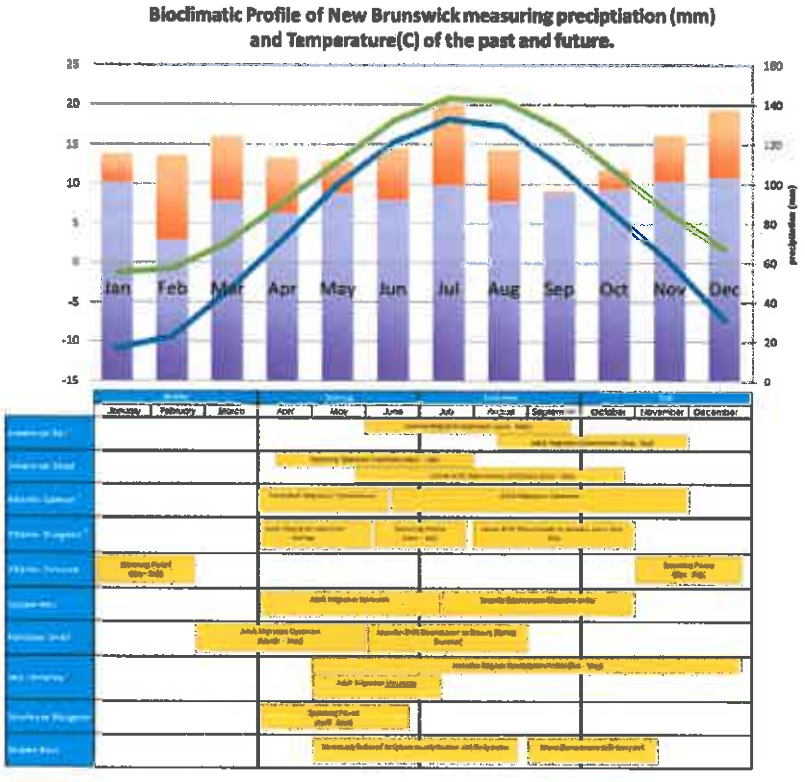
10.4—Allow for areas of natural regeneration after disturbance.

10.5—Maintain seed or nursery stock of desired species for use after severe disturbance.

10.6—Remove or prevent establishment of invasives and other competitors after disturbance.

APPENDIX 2: Climate Change Impacts Upon St John River Species Life Cycles

- In the following diagram we have superimposed the New Brunswick Bioclimatic profile developed for this exercise, upon the life cycles traits of St John River fish species (CERR Figure 8.2, on page 8-21)
- A causal glance will indicate the massive changes that are expected under a changing climate
- The bioclimatic profile for New Brunswick is derived from the latest RCP data. This is a is a visual representation of the bioclimatic profile of New Brunswick in the past and future. The X-axis represents the months of the year while the y-axis represents the temperature in C on the left and the precipitation in mm on the right. The bar graph shows precipitation using 3 different types of data. The purple horizontal bar consists of observed data; the blue bar consists of projected precipitation historic data curated by RCP and the orange bar represents RCP 8.5 projected into the future (2041-2070). The lines above depict the temperature in 3 different ways, observed temperature, projected historic temperature and projected temperature in future. The RCP 8.5 data projects an increased amount of precipitation in the future, synonymous with an increase in expected temperature for the future.
- Preliminary analysis undertaken by G.Shifferaw, K.Cheung, D.Cha, K.Ratnasabapathy, J.Yao, and M.Szopa, with support from Dr. Philipe Gachon and *Christian Said*.



ENDNOTES

[i] See "Terms of Reference for the Comparative Environmental Review (CER) of Options for the Mactaquac Project, Mactaquac, New Brunswick" -- *"As part of its due diligence, NB Power is continuing to review the projected 2030 end of service life for the Station. That work includes exploring ways to continue operations within the current footprint beyond 2030. The work done on the Station would not likely require a material change from current operations, and if this is the case, there would likely be minimal incremental upstream or downstream effects compared to current operations at the Station. Accordingly, NB Power is not subjecting these approaches to the Comparative Environmental Review, and therefore this work is not discussed further in this document."*

[ii] Such a device is called an *ideal type* as described by Weber (Burger 1987) and elaborated on by MacLellan (2006).

[iii] Such problems are identified in the planning literature as hyper-complex or wicked (Conklin 2005; Rittel and Webber 1973): a) they have no correct formulations; b) there are numerous stakeholders, and perspectives; c) there are no stopping rules; d) no criteria to judge 'goodness' of decisions exists; e) there is an inability to test decisions except by execution; and f) no enumerable or exhaustible describable set of possible solutions exists (Rittel and Webber 1973).

[iv] "The economic problem of society is ... a problem of the utilization of knowledge which is not given to anyone in totality. (Hayek 1945)"

[v] This theoretical discussion is taken directly from MacLellan (2008).

[vi] More realistic theories of rational behaviour were proposed by Simon (1982) who suggested that agents satisfice (e.g. seek alternatives that are satisfactory insofar as they meet some utility threshold). Other researchers incorporated these human limitations into decision-making including Good's discussion of Type I and Type II rationality (Good 1952; Good 1971), anytime algorithms (Horvitz 1987b), selective rationality (Leibenstein 1980) and bounded optimality (Horvitz 1987a; Russell & Subramanian 1995).

[vii] It should be noted this view represents an atomistic view of human interaction with the environment, and within society. It goes without saying that society operates at multiple levels of social aggregation which cannot be completely captured by such an approach (MacLellan 2006).

[viii] Although *institutional self-awareness* is typically assumed, large organizations are often not as aware of their inner operating environment as would be ideal. See MacLellan (2013) for a discussion.

[ix] NBP is too small an organization to have any measurable impact upon these larger drivers so for the most part it makes sense to ignore the drivers that lay behind external changes in the operating environment.

[x] As an ideal type or heuristic fiction, this 'WWF perspective' is not in any way a statement of the position of the WWF with respect to the Mactaquac Dam. In fact, we do not *represent* the WWF in any capacity. Nevertheless we have informed, and been informed by our colleagues at the World Wildlife Fund of Canada through their Living Rivers Initiative and they have been allowed to *interpret* our analysis.

[xi] In the current approach integration occurs only at a very course scale in the CER report itself (i.e. bringing all the information together in one place). Instead, heuristics, meta-reasoning, are employed to decompose or reduce these highly complex decision domains into what are hopefully their most relevant fragments. The subsequent integration of these fragments is then undertaken in a typically ad hoc manner that emerges in the final implemented solution. So while the link between different knowledge domains occurs implicitly in the actual decision (i.e. the choice by NBP of Option 1, 2, 3 or 4), a more explicit effort at integration that can account for the functional elements of ecosystem is more satisfactory.

[xii] A complete list of relevant climate change resources will be provided at a later date.

[xiii] The methodological details will be forthcoming, but essentially involve compiling Statistics Canada dissemination areas (DA) according to watershed boundaries, and then comparing these metrics across known scales.

[xiv] Refer to the method of 'brainstorming' as an example (Osborn 1957; Kerr and Tindal 2004).

ERRATA:

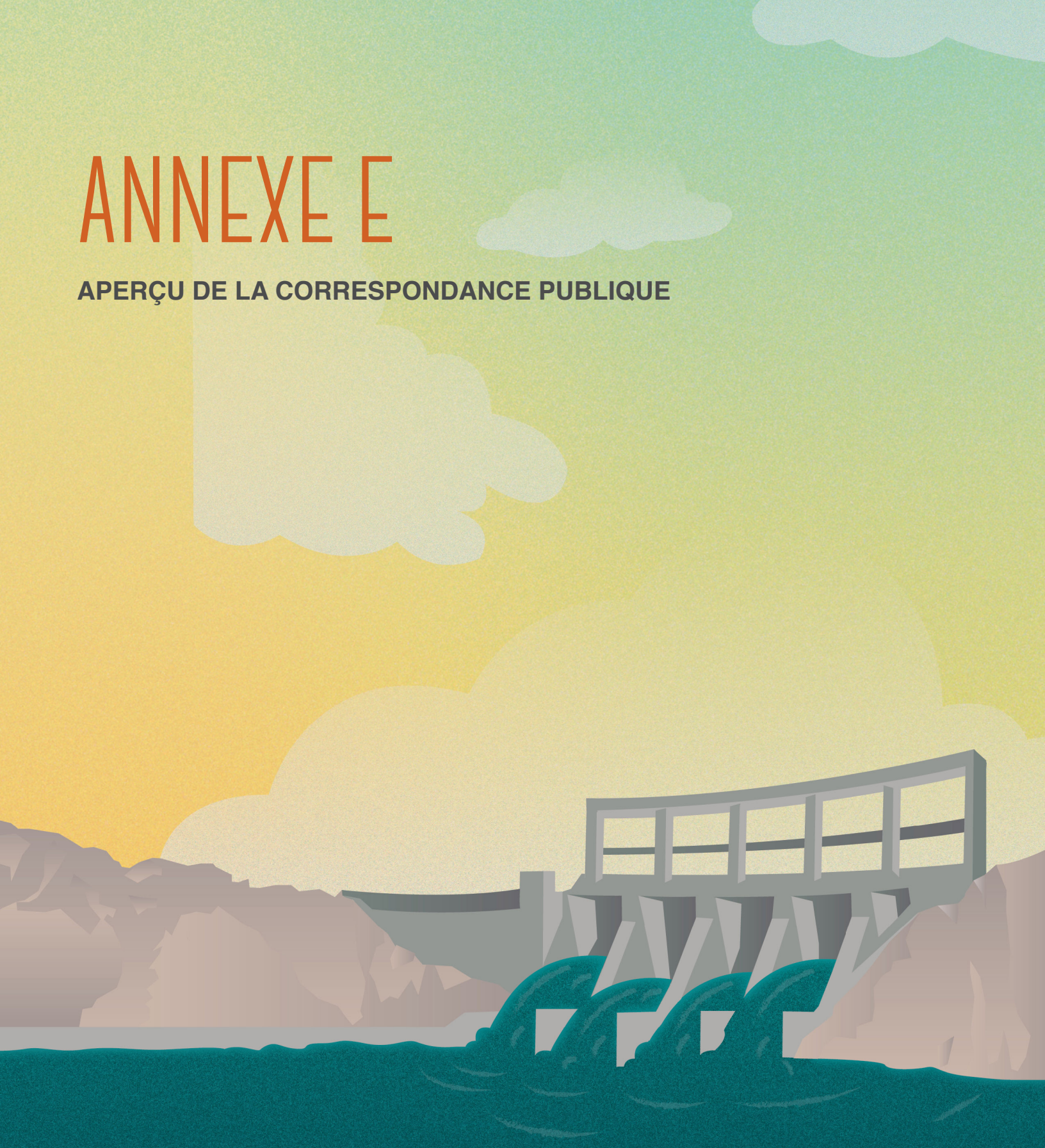
The follow corrections and extensions refer to the document: "*Mactaquac Project Comparative Environmental Review*" submitted in the spring of 2016, by Dr. J. MacLellan with substantive contributions from Simon Mitchell, Dr. Paul Peters, Dr. Charles Bourque, Ben MacLellan, Dr. Philippe Gachon, Christian Said, as well as Gebreal Shifferaw, Karen Cheung, Duhyun Cha, Kirushanthi Ratnasabapathy, Jeanny Yao, and Melissa Szopa. As mentioned this document is preliminary in nature, and was intended to generate discussion. We (i.e. MacLellan and the above contributors) will seek to publish elements of this work in the future.

- Page 6, Line 17: Although referenced in the text, the paragraph starting at this point, as well as the next paragraph are substantively derived from: *MacLellan, J.I. 2008. Brokering the Local Global Dialectic. In Linking Climate and Impact Models to Decision and Policy Making. Edited by A. Fenech, and J. I. MacLellan. Environment Canada, Toronto.*
- Page 8: The discussion of Section 2.2: Actor Operating Environments outlines a business interpretation of inner and outer operating environments. This separation of environments is well accepted within the literature and can be found through numerous sources, including those not necessarily related to business. Nevertheless, our intention in a follow up publication is to extend the discussion and reference all such sources. In lieu of an extended discussion the reader is referred to the following:
    - Simon, Herbert A. 1996. The Sciences of the Artificial. MIT Press.
    - Frantz, Gilda, 2015. The Environment: Inner and Outer. Psychological Perspectives 58(2): 117–119.
    - Day, G. and P. J. H. Schoemaker. 2005. "Scanning the Periphery", Harvard Business Review, November 2005 Issue.
    - Kell, M. 18:44:13 UTC-Macro, Operating and Internal Environments. http://www.slideshare.net/mickykell/macro-operating-and-internal-environments, accessed August 15, 2016.
    - What Is Business Environment? Definition and Meaning N.d.BusinessDictionary.com. http://www.businessdictionary.com/definition/business-environment.html, accessed August 15, 2016.
- Page 13, Lines 1-4. The sentence starting "*As might be expected …"* should be replaced with the following:
    - *As might be expected, the geographic and temporal extent of Option 3 occurs continuously over broader spatial and temporal scales versus that of Options 1 and 2 (i.e. see Table 4: I\O Interaction [Geographic Extent], and I\O Interaction: [How long?]). This bias is further reflected in the 'Key Issues of Concern' themselves, which tend to systematically represent local, and immediate impacts as inferred from Table 3.*
- Page 16, Line 14-17, and Lines 27-33. These 'points' are those of Jeanny Yao (2016) personal communication.
- Figure 5: Here the caption should read as:
    - *This figure represents the historic and projected bioclimatic profile of New Brunswick as derived from the latest RCM data. The X-axis indicates months of the year, while the y-axis represents the temperature in C on the left hand side, and precipitation in mm on the right hand side. The purple bars illustrate aggregated, observed, historical (1980 to*

2010) precipitation data for the province as a whole, while the orange bars illustrate projected changes in precipitation. Similarly, the blue line represents the mean, observed, historical (1980 to 2010) temperature, while the green line illustrates the projected temperature changes. The projections utilize data for RCP 8.5 for the period (2041-2070). These results are preliminary and solely for demonstration purposes; the reader is referred to the ETF report: Curry, A., St-Hilaire, A., Gachon, P., Cassie, D., MacLellan, J. and K. Reeder 2016. "NB Atlantic Salmon Vulnerability Under a Changing Climate" The Canadian Rivers Institute, and the New Brunswick Climate Change Research Collaborative, University of New Brunswick. for a comparative analysis of Regional Climate Modeling ensembles for the province. This more inclusive report examines seasonal differences in precipitation projections between RCMs which indicate greater variability than indicated here. This preliminary diagram was developed by G.Shifferaw, K.Cheung, D.Cha, K.Ratnasabapathy, J.Yao, and M.Szopa, with support from Dr. Philipe Gachon and Christian Said.

ANNEXE E

APERÇU DE LA CORRESPONDANCE PUBLIQUE



C'EST LE TEMPS D'AGIR.

mactaquaction.ca

Énergie NB Power

2014-12-15

From:
Sent: Monday, 15 December, 2014 9:57 AM
To: Mactaquac Project
Subject: Dam

Hi, I purchased land and built my house on the head pond. As many people, our house is built on one of the many small inlets of the main river and with one of your options to take the Dam out and return it to its natural state. This would devastate the use and decrease the value of our property. This in turn would decrease the amount that the government taxes us. Not to mention the sediment that would flow into the river for years until some sort of greenery is replaced.

My option would be to rebuild the Dam and have it generating power. We have already made the commitment to have the dam and one of the best ways to generate electricity, why would we through this away? We would never be able to get it back as it is hard to alter any waterways with the environmental impacts to work around. We as the people are not allowed to cut trees along the shores of the waterways to keep soil erosion from happening so it would not be right for the dam to be drained and let all that sediment run into the water for years. NB power may have to pay back some of the fines they issued as they would be doing the same thing only on a larger scale!!

So if you remove the Dam, who would be on the hook to replant the exposed mud and rock and clean up debris that is currently hidden under the water, NB Power? They own the land, so here is another expense attached. I am sure that there was a lot of people displaced and hard work just to get the homeowners of the land along the river when the dam was built, understand that this was to make things better for the people of NB. Don't let all that hard work go to waste!!!

Hydro power is the best way in my opinion to generate electricity. Steadier than wind, not as damaging as nuclear and does not produce heavy water, cleaner than oil or coal and not affected by world oil prices. Once built, gives us clean power for many years into the future. Now that we have that resource, let's not loose it. Currently we have given our forest away, let's not through another natural resource out the window.

Thanks!!

From:
Sent: Monday, 15 December, 2014 8:24 AM
To: Mactaquac Project
Subject: RE: Mataquac project combined with Solar Hydrogen Trends Inc

This works in tandem with Hydro Power at Peak Demand time.
Has been third party tested 3 times now. Also would create the fuel needed for clean hydrogen vehicles.
Involves or combines cavitation, electrolysis, vibration, LENR, and ultrasonic.

Ranked in the top five on peswiki right next to Blacklightpower.

http://peswiki.com/index.php/Directory:Solar_Hydrogen_Trends,_Inc.%27s_Overunity_Hydrogen

Solar Hydrogen Trends Inc. Invents Groundbreaking 100% Carbon Free, Clean Air Hydrogen Reactor

Solar Hydrogen Trends, Inc. develops innovative breakthrough technology with the world's first hydrogen reactor for production of unlimited hydrogen; reactor uses water as main fuel and is 100% carbon free! "Endless fuel from water..."

Menlo Park, CA (PRWEB) March 05, 2014 – Menlo Park based technology firm Solar Hydrogen Trends, Inc. (http://www.solarhydrogentrends.com) today announced that it has revolutionized the world of energy production with their invention of the world's first hydrogen reactor for the production of unlimited hydrogen (patent pending). The hydrogen reactor uses water as a main fuel and is 100% carbon free.

The groundbreaking technology can be used as hybrid solution for energy savings up to 95% when coupled with coal, natural gas, gasoline, biofuels, diesel power plants or incinerators (three to five times cheaper than coal power plants – two to three times cheaper than nuclear, WITHOUT hazards to the environment). In addition, the reactor can be coupled for production of amplified energy output with Hydropower, Solar or Wind farms in peak hours.

Jack Aganyan, Founder and President of Solar Hydrogen Trends commented that "This is a critical step in the development of alternative, clean air energy. As the nation continues its drive to reduce air pollution and mine more cost-effective energy production, we are excited to launch our groundbreaking hydrogen reactor, which provides a formidable solution to these green initiatives. We believe this technology is of national strategic importance. It is clean, efficient, scaleable, and can help the dollar gain back its strength."

Konstantine Balakiryan, Founder, CEO/Chief Scientist and driving force behind the seven models of the hydrogen reactor, added "With our technology, a hydrogen plant with 150 million cubic feet per day production would provide enough hydrogen to power 200 thousand homes. With only 500

watts/hour of input energy we produce 2,797 cubic feet or 79,098 liters per hour of hydrogen or 221 kWh energy equivalent – at the cost of only $1.80USD. Our hydrogen reactor technology could very well be the biggest breakthrough of our time."

How does the Hydrogen Reactor work?

The technology provides multifactorial hydrogen reactor with elevated hydrogen production due to a set of sixteen (16) physical and chemical processes, acting simultaneously on the hydrogen bonds. The technology is non-volatile and produces free flowing hydrogen which can be compressed or used to convert to another form of energy. The reactor can be used as a free standing electrically powered device that will produce unlimited amount of hydrogen at world's cheapest rates or a simple "bolt-on" solution that provides savings when coupled with energy producing technology.

Hydrogen reactor performance.

Airkinetics, a prominent EPA-certified national emissions testing specialist conducted an engineering test that measured the hydrogen reactor output at 50 ACFM with 93.1% Hydrogen content. Downloadable

report: :http://www.solarhydrogentrends.com/SHT_performance%20_test.pdf

The mini hydrogen reactor model measures: Length 32" x Width 14" x Height 20.5" and weighs 250 lbs.

From:
Sent: December-09-14 8:11 AM
To: 'Mactaquac Project'
Subject: RE: Mataquac project

Hi

The more I research what is happening in the energy world. I have to wonder if we will need a dam in about 30 years.
So what is the payback timeframe?
Also could you plan to wind up the use of the dam in 30 years as a contingent?

How hard to just pipe water to mobile resaleable generators downstream and just get by for 30 years?

Isn't Grand Falls water piped?

Tks

December 31, 2014

Keswick Ridge, NB

Dear Sir or Madam:

Re: Mactaquac Project - CER Process Public Input

In 1784, the United Empire Loyalists arrived on the Saint John River. They chose their lot numbers from a man's felt hat and set out to find their numbered lots. Since that day, nine generations of my Dutch immigrant family from Manhattan (the Yerxa family) settled along the Mouth of the Keswick River, where it meets the Saint John River. That community became known as "Mouth of Keswick". The climate here was harsh, and a bare existence was challenging, but these early Canadians persevered. Indeed, not much changed for many years, with the economy consisting of small mixed farming, and forestry work.

Technology began to change things in the 1950's. As a young woman, I took pride in working at the NBtel switchboard office in Keswick Ridge. But by the time I was married in 1956, the economy had changed very little. By the time our first son was born in 1961, we were struggling to survive, financially.

Then came the Mactaquac Dam project, in the form of one word: "hope". Up to this point, small mixed farming and forest products both resulted in terribly small pay for extremely hard work. "Hope" cam in the form of jobs; better paying jobs for hard working people. My husband was able to get work at Mactaquac. For us and all the communities around us, we got some encouragement.

We lived in a small 1958 bungalow in Keswick Ridge, but when we learned that accommodations were needed for workers, I put forward my name to host three boarders. Two labourers and an engineer showed up, and we treated them as family. We squeezed them into our tiny bedrooms, along with ourselves and our two boys. Every morning, before breakfast, homemade bread was made and a healthy breakfast served. Box lunches were prepared, and off went my husband and the other three men for their day of work at Mactaquac. Supper was at six and there was always meat in the oven for a hearty meal.

Fast forward to 2014, and we are privileged to live just five minutes from the Mactaquac Dam - it is a source of pride in what New Brunswickers can accomplish. We have benefited from the Mactaquac Park. Tourism is a vital part of the economy now, with the park, the marina, the golf course and beach. Our culture is preserved in the museum we call King's Landing (many of our family have benefited from employment there). The culture of this community revolves around infrastructure that was built to accompany the Mactaquac Dam, and it is unthinkable that it might be erased - something that we were shocked to hear is actually being considered, according to the CER option 3. This would adversely impact the socio-economic structure of the entire region.

Option 1 (Repower) is the only option for Mactaqauc. The Mactaquac Dam must stay, and it must produce power. If anything, an expansion of generating capacity should be considered, for New Brunswick to export - those are the types of options that should be considered in the CER. New Brunswickers do not want to become dependant on Quebec energy sources, as was proved in a previous election. We must maintain and expand our own infrastructure.

Options 2 and 3 of your CEP are outrageous, and unthinkable. Please begin to take up the serious work of putting a plan into action to repower mactaquac. Perhaps there could be some "hope" of bringing our children, grandchildren and great grandchildren home from Ontario and Alberta, if jobs were created. Other provinces are investing in such projects now, and New Brunswick must do the same. This takes real leadership.

Sincerely,

Resident of Keswick Ridge,

December 31, 2014

Keswick Ridge, NB

Dear Sir or Madam:

Re: Mactaquac Project - CER Process Public Input

I wanted to give personal input to the Mactaquac Project, as part of your Comparative Environmental Review Process. Part of the "environment" is the social and economical impacts on local families. I wanted you to be aware of my story, which is probably representative of many families in the Keswick Ridge area.

I was born in 1933 in Scotch Settlement, near Mactaquac. My family consisted of nine children and my parents. My first employment was on local farms (seven days a week) for very low wages, even for that era. I eventually found employment as a carpenter with a company called Fredericton Housing, in home construction.

In January of 1965, hiring began for the building of Mactaquac, a mega project in our own back yard. My father-in-law and I were hired for night work on the river, to flood the ice and build it thick enough to hold a huge Becker drill. The drill arrived from Western Canada by rail. The drill was used for core samples, to examine the geology of the Saint John River bed. There was concern about an aquifer that might make the dam unstable. An artisan well was discovered, but the decision was made to proceed, with some counteractive measures. As construction went into full operation, it became well known at the time among workers that Acres Consulting had advised NB Power not to use the in-situ aggregate for the concrete mixture. However, it was used.

I was number 66 among the men hired with Quebec contractor Dufresne (eventually re-named "Mactquac Contractor" for this project). I worked in extremely dangerous conditions as a carpenter for Dufresne, at great heights and risk. Eventually, I was offered a Carpenter Maintenance job for NB Power, for the next four years, which I took.

The construction of the Mactaquac Dam made a huge difference in the local economy, and for my growing family. Finally, in my mid-thirties, I was able to get ahead financially.

Now, looking back from the vantage point of 82 years of age, I can not imagine that anything other than Option 1 (Repower) is either logical or acceptable to NB Power and the New Brunswick Government. Option 2 (No Power) and Option 3 (Restoring the River) are short sighted and even foolish to consider as options in this CER. Both would require New Brunswick purchasing power from the Province of Quebec, which I would consider expensive at best and risky at worst. In my opinion, the only options to be considered would be different variations of Repowering (Option 1), not your current Options 2 or 3.

The province of New Brunswick needs the Repower Option 1 now, just as much as it was needed to jumpstart the economy in 1965, when I was a young man trying to find a career. Currently, my only grandson and great grandchildren live in Alberta, and one of my two sons took his engineering degree to Ontario for work in 1989. New Brunswick has failed our young people.

Surely your organization will find some forward thinking vision to repower Mactaquac and give opportunities to the next generation.

--

Keswick Ridge, NB

2016 01 07

From:
To: Mactaquac Project
Cc:
Subject: Mactaquac Project Input
Sent: Wed 2015.01.07 9:52 AM

To whom it may concern,

I am writing to express my view and concerns with the proposals being put forth for the future of the Mactaquac dam. My name is , and I am a citizen of Mactaquac and own a property on the Mactaquac arm of the river. It had always been my dream to own such a beautiful spot where I could relax and enjoy the scenery and natural beauty that the Mactaquac dam has created. Fortunately, this past fall that dream came true and I became a home owner. The thought of the removal of the dam is something that worries me greatly both from an economic and community stand point.

First, let me address my economic concerns. Visitors to the area are greatly impressed with all the area has to offer, during all four seasons. I know of many people, and personally have family that travel from Alberta each year to come and enjoy all that the area has to offer, including the provincial park, the houseboat rentals, water based recreational activities, and the natural beauty that the dam has created. All of this brings money and much needed dollars into a small community, that without would struggle. The dam also employs many of the local residents of Mactaquac with good paying jobs and keeps talented individuals in the province rather than following the growing trend of heading west for financial oppertunity. Thirdly, as a homeowner, the extreme depreciation and near de-valuement of all properties along the headpond will financially ruin many hard working New Brunsiwck tax paying individuals, like myself, who have worked so hard and strived to gain such a property.

I have lightly touched on my second point of how valuable the dam is to the community of Mactaquac in my previous points but would just like to emphasize that the dam brings recreational, social, and economic opportunities into a small community that without it, in my opinion, would largely struggle. Over the history of the dam it has become an integral part of the community an is a unifying factor to memebers of the community. With its removal it would take much that the Mactaquac area has came to be based on.

I will wrap this up by just stating my clearly obvious viewpoint that I feel the decision needs to be made to replace the dam with it's operating capabilities. While noting the high cost of the project, I feel any savings financially of the other options would only be lost with the negative ramifications that would come to the area. I am not naive, I do realize the decision has many many more avenues and areas of importance that are to be weighed in on, but I just want to express my deep belief that the reconstruction of the dam with generating capabilities is what is best both economically and socially for the Mactaquac area, and New Brunswick as a whole. Thank you for your time in reading this and listening to my opinion.

From: wordpress@mactaquac.ca [mailto:wordpress@mactaquac.ca] **On Behalf Of** NB Power
Sent: Tuesday, 29 September, 2015 9:59 PM
To: Mactaquac Project
Subject: Message from Website

Message from Website

Name::

Phone Number::

E-Mail Address::

Comment::

1. It doesn't appear that any consideration was given to the Fredericton Fault or other geologic features which might present risk to the dam from geologic/tectonic movements. Given the project is within a known fault zone, why is there no consideration for this risk?

2. There is no budget estimates in any of the published documents, yet there are constant public and media references to the costs of Option 3 being $2B and Option 1 being $5B. What is the source of these cost estimates and why are they not provided?

3. Further to the comment and question above, how can the cost of option 3 be estimated at $2B? The most costly dam removal ever recorded in North America was only $340M USD, and it removed two dams in a remote area. The estimate of $2B seems extremely high and very unlikely. Even replacement power in the form of renewable wind of equal actual output to Mactaquac would only cost $750M - $1B. Please provide clarity and details

option.

4. Why does the report never reference the actual performance of the Mactaquac Dam in terms of capacity factor - a standard industry measure and crucial detail to estimate its value? In fact, the actual performance of the dam appears to be 25%-27% capacity - a detail which greatly diminishes the apparent value of the facility. Please provide proper statistics and comparisons to other dams for the capacity factor value and report and publish it accurately.

5. Why use a 4 year project estimate for option 3 when no other dam removal project in North America has taken this long?

6. Dam removal risks and costs are well recorded, including actual environmental risks and societal risk with real recorded impacts. Why is there not further reference to other dam removal projects, their costs, risks and benefits? It seems that there is significant facts available (based on other dam removal projects) for option 3 which are not presented.

Please select a topic for your comment: Comparative Environmental Review Feedback

From: Mactaquac Project
Sent: Tuesday, 06 October, 2015 9:27 AM
To: j
Subject: RE: Message from Website

Hello :

Thank you very much for your questions and feedback. We are working on a detailed response, which we expect to send as soon as possible.
Meanwhile, please join us for one of our open houses that will take place this month.

With kind regards,
Kerstin Schlote

2015 10 07

From: wordpress@mactaquac.ca [mailto:wordpress@mactaquac.ca] **On Behalf Of** NB Power
Sent: Wednesday, 07 October, 2015 8:42 PM
To: Mactaquac Project
Subject: Message from Website

Message from Website

Name::

Phone Number::

E-Mail Address::

Comment::

after reading your cer report
I found that it covered everything except the impact opt 3 would have on the the 5000 plus homeowners with water frontage upstream of the dam and how it will devalue or in some cases totaly devistate homes that are sitting on top a bluff that would have a minimum 135 ft drop straight down
who is going going to compensate these home owners as these water fronts will totally disappear and become a liability and safety hazard
some of the most expensive realestate and tax revenue lies here
why is there no talk about this

Please select a topic for your comment: General Comment

2016 10 14

From: wordpress@mactaquac.ca [mailto:wordpress@mactaquac.ca] **On Behalf Of** NB Power
Sent: Wednesday, 14 October, 2015 3:29 AM
To: Mactaquac Project
Subject: Message from Website

Message from Website

Name::

Phone Number::

E-Mail Address::

Comment::

I think you should take a serious look at the prototype Solar Thermal Chimney Generator that was built in Manzanares, Spain in about 1980 .
The plant had a collector with a radius of 122 m, and the chimney had a diameter of 10m with the height of 194.6 m.
It is given as an example in, "2007-Zhou-Simulation of a pilot solar chimney thermal power generating equipment.pdf"

I think that once one test unit has been built and studied,
an array of hexagonal walled chimneys that share as many common walls as practical,
will prove to be superior to a hydroelectric dam.
No silting, no flooding. No large external rotating blades to kill birds.

The Chinese government claims to have built a generating project in Mongolia
which uses a greenhouse to concentrate solar heat and a heat storage system of sand
to keep generating power overnight. That project may actually exist

12/28/content_21629085.htm"

Please note that this solar chimney system works on thermal differential,
so extremely cold weather will not stop power generation as long as the equipment does not break.

It might be worthwhile to construct a set of scaled down prototypes,
to see just how small and short a chimney can generate usable power.
I suggest that you first try a test of a 1 meter tall 50 cm diameter chimney,
then an array of 10 by 10 chimneys, each 1 meter tall 50 cm diameter.
I dont expect a unit that small to be useful but it would provide some base measurements.
Then scale the test up until 1 chimney produces enough power to be usable in an array.
Several chimneys would be connected to a single turbine generator,
If this system can be scaled down to an array of aproximately 20 meter tall chimneys,
with each having about a 1 meter cross sectional width,
with a hexagonal shape, most sharing common walls would offer lower cost and eliminate the need for external support cables.

then construct an array of chimneys as wide and deep as it is tall.
Then construct more where and when necessary.
This will pretty much avoid the NIMBY problems.
These are not my ideas or inventions.
Caution, there is a fraudulent Australian solar thermal chimney project.

Please select a topic for your comment: General Comment

From: Mactaquac Project
Sent: Friday, 16 October, 2015 12:46 PM
To:
Subject: Your comment

-----Original Message-----
From: Mactaquac Project
Sent: Friday, 16 October, 2015 10:23 AM
To:
Subject: RE: Mactaquac Project Feedback

Hello

Thank you for your time today. This is the link to the contact form on our project website: http://www.mactaquac.ca/contact/ Please don't hesitate to contact us if you have any questions.

Have a nice weekend,
Kerstin Schlote

****

From: wordpress@mactaquac.ca [mailto:wordpress@mactaquac.ca] **On Behalf Of** NB Power
Sent: Wednesday, 28 October, 2015 4:50 PM
To: Mactaquac Project
Subject: Message from Website

Message from Website

Name::

Phone Number::

E-Mail Address::

Comment:: General Comment ,My opinion re; Mactaquac renewal:
With the existing structure in place and little perceived change/impact to the present environment we should move forward and invest in the future upgrades to the power station to the greatest extent possible. The

investment and a suitable "green " energy source would far outweigh any other negative factors associated with the development.

For what it is worth this " consultation process " is a unfortunately just a public realtions exercise and a tremendous waste of time and money . Get on with it !!

Please select a topic for your comment: General Comment

This email was built and sent using Visual Form Builder Pro.

****

From: Mactaquac Project
Sent: Thursday, 29 October, 2015 8:51 AM
To:
Subject: RE: Your comment

Hello

Thank you very much for your time and feedback. Your comments are important and will be considered prior to NB Power recommending a preferred option for the station in late 2016.

Please revisit our project website, mactaquac.ca, to find additional research and reports on the project and other ways to get involved.

With kind regards,
Kerstin Schlote

2015 11 11

From:
Sent: Wednesday, 11 November, 2015 4:09 PM
To: Mactaquac Project
Subject: Mactaquac Project

I am assuming the cost for each option would be approximately the same.

If so, I support option one.

I support option one because it remains a clean important supply of electricity and because all the sacrifices and displacements have been completed. This will also reduce the requirement of more environmentally clean energy which the Province will no doubt be forced to produce in the future.

I would rather see the nuclear plant decommissioned before Mactaquac similar to what is being done in China and several other countries.

Bathurst, N. B.

From: Mactaquac Project
Sent: Thursday, 12 November, 2015 10:41 AM
To:
Subject: RE: Mactaquac Project

Hello

Thank you very much for your time and feedback.

Your comments are important and will be considered prior to NB Power recommending a preferred option for the station in late 2016.
Please revisit our project website, mactaquac.ca, to find additional research and reports on the project and other ways to get involved.

With kind regards,
Kerstin Schlote

2015 11 26

From:
Sent: Thursday, 26 November, 2015 12:43 PM
To: Mactaquac Project
Subject: input on the future of Mactaquac dam

Hi,

In your response to your request for input (inserted with my power bills) on the Mactaquac dam here are my thoughts.Please let me know if this option is being considered

I would suggest refurbishing and retaining the asset and using it in conjunction with Wind and other alternative energy . By using the Hydro dam's headpond as a large energy storage system like a water based battery. NB Power could use excess energy from wind ,solar,etc by pumping water into the headpond for use later when needed by driving the generators existing at the hydro station.

See the IEEE Spectrum article below which describes this approach being used by Norway and Denmark.

"Norway's hydropower reservoirs make up nearly half of Europe's energy storage capacity. European grid operators need energy storage to cope with an ever-mounting, always-shifting torrent of wind power. See the connection? So does Norway. In December, engineers will energize a new subsea power cable that will begin to bridge the gap between need and opportunity, greatly expanding European power systems' access to Norway's hydropower-rich power grid."

Source:

http://spectrum.ieee.org/green-tech/wind/norway-wants-to-be-europes-battery

Best Regards,

From: Mactaquac Project
Sent: Friday, 04 December, 2015 9:32 AM
To:
Subject: R... ...put on the future of Mactaquac dam

2015 12 07

Mon 2015-

To N.B. Power A/C 57 5 166

Regarding we have a
Big Decision To Make.

I want to say I lived in the
Fredericton area for many years from
1956 until 1986
my family and I have enjoyed the
inland fish from the mentioned...
I feel it would be a large job
To Remove this and put the land back
the way it once was.
The park at the head of this Also
is beautiful.
Would it be Possible to Remove
the difficult Sections of this By
doing Section After Sections or does
it All have to be done & Replaced
in one Big operation?
There has been a lot of families
That had to find new Properties
and Build new Homes (when Built)
This has been a good Source
of Energy and with no negative
effect on Our environment
Please try to make the
right decision on this
Situation

Fredericton N.B

2015 12 16

From: wordpress@mactaquac.ca [mailto:wordpress@mactaquac.ca] **On Behalf Of** NB Power
Sent: Wednesday, 16 December, 2015 11:20 AM
To: Mactaquac Project
Subject: Message from Website

Message from Website

Name::

Phone Number::

E-Mail Address::

Comment:: I am wondering if you could make your survey available for people that live in the other half of the upstream watershed in the U.S. (so our zip codes don't work in the current survey). We have interests because of river restoration work we've invested in for the past 5 years that lack the eels, sea lamprey and Atlantic salmon currently barred from coming upstream or safely downstream because of the dam and the impoundment.

Please select a topic for your comment: General Comment

This email was built and sent using Visual Form Builder Pro.

From: Mactaquac Project
Sent: Thursday, 17 December, 2015 9:32 AM
To: 'j
Subject: RE: Message from Website

2015 12 16

From.
Sent: Wednesday, 16 December, 2015 2:11 PM
To: Mactaquac Project
Subject: Mactaquac Project by NB Power

As I am not a US citizen, I am unable to fill out the survey on your website regarding the Mactaquac Project.

However, having worked in Maine on fish-passage related issues since 2004, including the removal of 2 dams on the Penobscot River in the past 3 years, I would like to express my opinion that the dam and powerhouse be removed, and the river restored to as near natural conditions as possible. Anadromous fish populations are in decline throughout North America, and the removal of dams has been identified as among the most effective, if not THE most effective, mechanism for restoring those populations.

Turners Falls, MA

From: Mactaquac Project
Sent: Thursday, 17 December, 2015 9:44 AM
To:
Subject: RE: Mactaquac Project by NB Power

Hi

Thank you for reaching out to us.

We realize that there is an interest in the Mactaquac Project outside of New Brunswick and welcome any feedback on the project. While our online survey Mactaquaction has been designed for Canadian postal codes, specifically for New Brunswickers, there are number of other ways you can get involved:

- Feel free to send us any ideas and comments to this email or through the online contact form.
- We also invite you to comment on two draft reports available on our website, the Comparative Environmental Review, which looks at how each option might impact people, the environment and the economy, and the Social Impact Comparative Review,

20160104 4 January 2016

President of NB Electric Fredericton

We don't have a big decision to make. The decision is already made for us. What are our choices?

(1) We could go nuclear and add one more nuclear plant to generate hydro. But the waste it produces is hard to get rid of it. The waste will last 100 years and more until it is no longer dangerous to human and the environment.
(2) We could sign a contract with Emera (N.B. hydro) which to me would be the worst of transaction. They are a disaster waiting to happen and their power is very costly.
(3) The cheapest option would be to sign a longtime contract with Quebec Hydro for our power they are the current leader in generating power and they are very reliable.
(4) We could also fix the dam but in doing so we should add more generating capacity to it. We should ask Hydro Quebec how to fix it. They are world leaders in that field.
They have a pioneer track record in building a proved close electric capacity. We should not hesitate to seek their expertise.

If you can find expertise that would excel those, by all means, we want the best for New Brunswick electric generating capacity. We want experts that are reliable.

Those are the alternatives that you could pursue in your quest to repair N.B. hydro electric capacity,

Those suggestions were made without prejudice at your innition.

Since we all want the best for N.B. Hydro and the environment the window to act is very small. We have to shut down Coleson and Belledune power plant.

Sincerely yours,

2016 04 05

Message from Website

Name::

Phone Number::

E-Mail Address::

Comment::

To whom it may concern,
I am a senior student at Nackawic High School. I am writing an article on the dam for my journalism class. I was wondering if you would be able to answer a few questions for me.
What formed your decision to not rebuild?
What were the obstacles going to be with a full rebuild?
With the other two options, which one are you more leaning towards? Why?
If the dam is taken out or stops providing energy, how do you plan to replace the energy?
Thank you,

Please select a topic for your comment: General Comment

2016 03 18

From: wordpress@mactaquac.ca [mailto:wordpress@mactaquac.ca] **On Behalf Of** NB Power
Sent: Friday, 18 March, 2016 2:56 PM
To: Mactaquac Project
Subject: Message from Website

Message from Website

Name::

Phone Number::

E-Mail Address::

Comment:: Incentive to home an business owners to make there own power by either wind or solar or water were possible. I would chose option 3 no power restore river

Please select a topic for your comment: Social Impact Comparative Review Feedback

This email was built and sent using Visual Form Builder Pro.

From: Mactaquac Project
Sent: Monday, 21 March, 2016 4:05 PM
To: '
Subject: RE: Message from Website

Hi

Thank you very much for your email.

2016-04-08

To:
cc
Subject: RE: Message from Website

Good day,

Your comments are important to us and appreciated.

Thank you for taking time to email us & please revisit our project website at http://www.mactaquac.ca/ for more information & ways to get involved.

Regards,

Brenda Turnbull
Mactaquac Project

From: wordpress@mactaquac.ca [mailto:wordpress@mactaquac.ca] **On Behalf Of** NB Power
Sent: Friday, 08 April, 2016 6:57 PM
To: Mactaquac Project
Subject: Message from Website

Message from Website

Name::

Phone Number::

E-Mail Address::

Comment:: I think the only viable option is to repower the dam. We have already flooded huge areas and returning the river will produce a generation of problems. Re mediating the river would cost a lot of money, and could river current turbines replace the lost power? Ice damage in the spring could cause all sorts of problems for that sort of turbine. Lets not use the same concrete! I have seen Roman concrete that is still in good condition after nearly 2,000 years. Just my 2 cents.

Please select a topic for your comment: General Comment

2016 04 16

From: wordpress@mactaquac.ca [mailto:wordpress@mactaquac.ca] **On Behalf Of** NB Power
Sent: Saturday, 16 April, 2016 12:00 AM
To: Mactaquac Project
Subject: Message from Website

Message from Website

Name::

Phone Number::

E-Mail Address::

Comment:: I think it should either be restored or maintained at the least. Removing the dam would upset an environment that has already adapted. Breaking the dam will also affect those people who own houses and land before and after the dam, leaving some new brunswickers looking to sell and leave the province because of it.

Please select a topic for your comment: General Comment

From: Mactaquac Project
To:
Cc:
Subject: RE: Message from Website
Sent: Tue 2016/05/17 4:12 PM

Good day

Thank you for your feedback & taking time to email us.

Your comments have been noted & please revisit our project website at http://www.mactaquac.ca/ for further updates.

With kind regards,

Brenda Turnbull
Mactaquac Project

From: wordpress@mactaquac.ca [mailto:wordpress@mactaquac.ca] **On Behalf Of** NB Power
Sent: Tuesday, 17 May, 2016 9:51 AM
To: Mactaquac Project
Subject: Message from Website

Message from Website

Name::

Phone Number::

E-Mail Address::

Comment::

hi
with everything in place already , it is a no brainer to me to continue generation of clean power

don't sell out to foreign interests , get pension funds etc ; our own money investing in our own projects

all due respect , no special interest groups , no special treatments or deals
keep costs reasonable and do something good for future generations

don't sell clean power , rather close dirty or risky plants

this is for the common good of the people of NB

Please select a topic for your comment: General Comment

From: wordpress@mactaquac.ca [mailto:wordpress@mactaquac.ca] **On Behalf Of** NB Power
Sent: Tuesday, 31 May, 2016 10:50 PM
To: Marketing&Communications
Subject: Message from Website

Message from Website

Name::

Phone Number::

E-Mail Address::

Comment::

General

#1 Throughout the review, the negative impacts associated with changes that occur as a result of Option 3 are described (e.g., p.11 - Option 3 results in "a reduced ability to achieve missing from effluent discharges in the headpond") whereas Options 1 and 2 are merely described "not result[ing] in a substantive change to the existing flow regime...." (p.10). This practice gives a biased overall impression of Option 3 as negative.

#2 Generally there is no objective assessment of greater / lesser environmental implications of the impacts described in the CER . The short term, minimal Green House Gas emissions of dam removal and the complete lack of sufficient passage and connected catadromous fish habitat are given equal weight in the

are included for relatively minimal environmental concerns e.g.; noise from construction / demolition (here again a short term and minimal impact) is labeled as an "important consideration." The concluding statement of the CER: "All three of the Options have positive and negative attributes from an environmental and social standpoint" underline this lack of comprehensive comparative analysis.

#3 In describing Options 1 and 2 (p 12) in the context of fish passage for catadromous fish, there is the implication that improved fish passage will result in improvements in fish populations. Given fish passage is essentially nonexistent; any change can be considered an "improvement." The more fundamental question, which is not resolved or even discussed in the CER, is to what extent adding fish passage will benefit diadromous fish populations both in their fresh and marine environments.

This last point is emphasized by the results of the Canadian Rivers Institute Report "Proceedings of the Fish Passage Expert Workshop: Global Views and Preliminary Considerations for Mactaqac". This workshop looked at fish passage both up and downstream. The summary of Dr. Alex Haro's presentation includes the statement "traditional engineering solutions have a poor history of functional fish passage." Dr. Paul Kemp's presentation similarly notes that "fish passage science is still struggling with passage solutions that rarely work, i.e. they exist but are rarely functional." Dr. Kemp further states "even the most effective fish passage solutions may not fully compensate for the impact of an impoundment (reservoir) on ecological connectivity." This level of analysis should have been included in the report

By Section

1) Area of Review: This study should take into account all current and historic catadromous fish habitat in the St. John River including several tributaries partially located in the State of Maine; the Eel, Meduxnekeag, Prestile, and Aroostook Rivers. The larger regional and international socio-economic and environmental implications should also be addressed in any analysis including the Bay of Fundy, Gulf of Maine and North Atlantic ranges of historic populations of St. John / Wolstoq catadromous fish.

2) Key Issues: Use of land and resources by aboriginal persons should be expanded to include - implications to historical uses prior to construction of the dam and - aboriginal communities in Maine and along the Bay of Fundy. Examination of current uses only establishes a prejudicial value to current over historical uses, which is particularly problematic given construction of the Mactaquac dam contributed substantially to a disruption of historical uses.

3) Heritage Resources: This section acknowledges the "deep connection of the Wolalstoquiyik to the St. John River" in the context of archaeological resources. Those sections that address the implications of Options 1, 2 and 3 on the environmental and natural resources important to aboriginal people (see comment on Key Issues) should as well. Here again, initial impacts of building the dam (a circumstance of Options 1 and 2 continue) on archaeological resources are not described, whereas, negative impacts resulting from Option 3 are. (see general #1 comment above). This appears biased, as return of the river to its channel would bring the most benefit to Heritage Resources

	4) Current Use of Land and Resources for Traditional Purposes by Aboriginal Purposes This discussion is particularly troubling, as it appears to be lacking any input from the people in question. The language indicating that Option 3 may not result in the restoration of catadromous species and dam removal may impact current aboriginal uses of natural resources creates the appearance of bias toward Options 1 and 2. Again, Option 3 would be most beneficial to aboriginal uses of the natural resources.
Please select a topic for your comment:	Comparative Environmental Review Feedback

2016 05 3

From: wordpress@mactaquac.ca [mailto:wordpress@mactaquac.ca] **On Behalf Of** NB Power
Sent: Tuesday, 31 May, 2016 10:54 PM
To: Marketing&Communications
Subject: Message from Website

Message from Website

Name::

Phone Number::

E-Mail Address::

Comment::

The complete lack of description of the injustices perpetrated on the Wolastoqewiyik / Maliseet People as a result of the construction of the Mactaquac Dam in this history is shocking given the nature of the decision it is supposed to inform. So too is the absence of any description of modern day Maliseet First Nations in Chapter IV. Current Conditions in Area of Mactaquac Dam.

The emphasis on the Mactaquac Dam region itself is problematic as it diminishes and/or ignores significant social ecological implications of areas beyond this region. The disposition of the Mactaquac Dam has major implications for the entire St. John Watershed, the Bay of Fundy, the Gulf of Maine and the North Atlantic especially regarding restoration and management of their common resources: catadromous fish.

	and properly highlighted presentation of the precipitate decline of Atlantic Salmon and other catadromous fish in the St. John River, the role the Mactaquac Dam has played in this decline and the extreme difficulty even impossibility of restoring these species unless the Mactaquac Dam is removed (i.e. Option 3 is chosen).
Please select a topic for your comment:	Social Impact Comparative Review Feedback

2015 10 15

-----Original Message-----
From: [redacted]
Sent: Thursday, 15 October, 2015 5:58 PM
To: Mactaquac Project
Subject: Mactaquac Dam

Hi,

You could shut the dam and stop producing electricity. So you could save 3 to 5 billion dollars. I don't know if this can be done let the dam shut without any repairs.
With the money saved,
you could give a grant to every client of NBpower let say $ 8,000.00 and they could install solar panels for their house.

Have a nice day

Envoyé de mon iPhone

From: Mactaquac Project
Sent: Friday, 16 October, 2015 12:48 PM
To: [redacted]
Subject: Your comment

Hello [redacted],

Thank you very much for your time and feedback. Your comments are important and will be considered prior to NB Power recommending a preferred option for the station in late 2016.

Please revisit our project website, mactaquac.ca, to find additional research and reports on the project and other ways to get involved.

With kind regards,

Kerstin Schlote

2015 12 23

From: wordpress@mactaquac.ca [mailto:wordpress@mactaquac.ca] **On Behalf Of** NB Power
Sent: Wednesday, 23 December, 2015 11:04 AM
To: Mactaquac Project
Subject: Message from Website

Message from Website

Name::

Phone Number::

E-Mail Address::

Comment::

A few comments on Section 8 of the CER:

A big effect of the headpond is to delay salmon smolts as they exit the river. Conditions are warming and this leads the smolts to encounter warmer water near the mouth of the Bay of Fundy than they normally would. (See Larry Marshall's review of Inner Bay of Fundy salmon marine habitat that applies as well to aspects of the outer Bay salmon.) This water is associated with increased predator abundance. No peaking should be allowed from May through June to get the smolts out of the headpond. Better mitigation would be to go with Option 3.

Another cause of mortality is the predation of smolts as they approach the dam. Structures such as this are a predatory gauntlet. This is and will be extremely difficult if not impossible to mitigate - perhaps with truck and transport from the Tobique and/or Beechwood. Better mitigation would be to take the dam out.

Option 2 is considered to have lower downstream mortality for fish than Option 1

height can kill fish, particularly larger ones that achieve a critical velocity before striking the water below. This can be mitigated with proper spillway design, but probably the best option would be #3,

Please select a topic for your comment: Comparative Environmental Review Feedback

This email was built and sent using Visual Form Builder Pro.

From: Mactaquac Project
Sent: Wednesday, 23 December 2015 11:18 AM
To: [redacted]
Subject: RE: Message from Website

Thank you very much for your time and feedback.
Your comments are important and will be considered prior to NB Power recommending a preferred option for the station in late 2016.

Please revisit our project website for more research and reports in addition to our studies.

With kind regards,
Kerstin Schlote

2016 01 01

From:
Sent: Thursday, 07 January, 2016 11:53 AM
To: Mactaquac Project
Subject: Mactaquac dam problem

Hi;
I find it hard to believe the cement is bad at Mactaquac dam, but it must be true. I worked there through construction of the dam from start to finish and I noticed standards were high for cement before it was poured and after it hardened. Tests were done by qualified NBEPC men and outside contractors hired for hardness tests. Who erred? I was employed as a qualified pipe welder on the first 3 penstocks and scroll cases. Every inch of weld was xrayed for defects. I can understand steel rebar rusting and expanding to split cement but not cement going bad on its own in such a short time. I also welded on the gates, lubricating piping for the generator shafts and construction of the fishgates at the dam site plus as a welder/pipefitter at Beachwood, Sisson Lake, Dalhousie oil and Newcastle Creek coal burning plants. Very nice jobs to be a part of. NBPower missed out not selling to Quebec Hydro on their first offer due to a few near-sighted vocal NBers with a spite on Quebec. I have no solution to the future of the dam. Wish I did. Good luck ., Allison, NB

From: Mactaquac Project
Sent: Thursday, 07 January, 2016 1:53 PM
To:
Subject: RE: Mactaquac dam problem

Hi

Thank you very much for your time and feedback.
Your comments are important and will be considered prior to NB Power recommending a preferred option for the station in late 2016.

With kind regards,
Kerstin Schlote

2016 03 04

From: wordpress@mactaquac.ca [mailto:wordpress@mactaquac.ca] **On Behalf Of** NB Power
Sent: Saturday, 26 March, 2016 4:19 PM
To: Mactaquac Project
Subject: Message from Website

Message from Website

Name::

Phone Number::

E-Mail Address::

Comment::

The Mactaquac conundrum
We are told t hat it needs to be rectified in some form by 2030 .
The Options are as I see it

To fix it.

To leave it in place but not as a generating facility.

To remove it completely thus draining the head pond.

Mactaquac is the second largest generator in the system at 668 kwh producing12% of provincial annual demand after
Coulson Cove is the largest 972 Kwh which because of its high energy cost (heavy oil)is only used at peak demand times
Wind electricity from the 3 existing wind farms is 294 kwh About 5% of total demand, less than half of Mactaquac.. All 3 are owned by Public companies that sell to NB Power and is subsidised with Federal and Provincial funds.
They can 't be regarded as base load due to the

What are the alternatives for base load

A second nuclear unit. or.

Conversion of Coulson cove to natural gas so that it can be used economically year round instead of peak load

Twinning the coal fired Belldune unit which uses imported coal or

Develop a bi directional tidal powered unit in the Bay of Fundy or

Develop a new Natural gas fired unit close t to the existing LNG terminal. or

Import power from Hydro Quebec or possibly from Nova Scotia as the result of the on going development. At Muskrat Falls in Labrador on a long term basis

If we choose the fix it option ,which apparently is plausible but fairly expensive (3 to 5 billion dollars)
We wouldn't be faced with all the social disruption of wells going dry ,the unknown environmental consequences of draining the head pond,,the destruction of recreational facilities ,the loss of water supplies to several municipalities which use the head pond for their source ,the inevitable fight over the reclaimed land. The existing dam has had considerable effects on the lower river system in mitigating ice jams and flooding in the spring.

If we choose the The leave in place option
We have to find a new source of base load power(see options above)
There is also the possible problem of a catastrophic dam failure in the future with possible devastating consequences
If we choose the fix it option we would need temporary(3 years minimum) replacement power very possibly available from Hydro Quebec or Muskrat Falls .All of the other options would have to be costed .
An advantage would be the replacement of more efficient and or more turbines to increase the output of a revamped Mactaquac.
In my opinion the revamping of Mactaquac is possibly the best option and would provide a medium term boost in economic activity when

matter the duration .However I feel that the information given by NB Power to date has been very inadequate and limited in its scope To limit these meetings to just three communities is criminal ,we all are customers of NB Power and will ultimately bare the costs .As owners of NB Power we all should have an input on any decision when more comprehensive facts, costs and analysis are made available.
Yours truly

Please select a topic for your comment: General Comment

This email was built and sent using Visual Form Builder Pro.

From: Mactaquac Project
Sent: Tuesday, 29 March, 2016 1:43 PM
To:
Subject: RE: Message from Website

Hello

Thank you very much for your time and feedback. Your comments are important and will be considered prior to NB Power recommending a preferred option for the station later this year.

We recently published a discussion paper that identifies factors that NB Power will examine in the business and technical analysis of the future of Mactaquac Generating Station. We also invite you to fill out our online survey, mactaquaction.ca, and share the link with your family and friends. We want to hear from New Brunswickers about what's important to them as we consider the path ahead.

With kind regards,
Kerstin Schlote