From:	jhaynes@nlh.nf.ca
To:	dbazeley@mail.gov.nf.ca
Cc:	terrydale@mail.gov.nf.ca
Bcc:	rhenderson@nlh.nf.ca
Subject:	Hydro"s review of ACI possible projects on the Exploits River
Date:	Tuesday, February 1, 2005 5:21:07 PM
Attachments:	_.png Exploits Studies - Prelim Project Assessement 050201 NLH.pdf

---

Dave,

Attached is a copy of the review we have done.

This is regarded as a high level overview and reflects what we see as key issues surrounding the possible developments given the major concern we see with Environmental approval. This is a major salmon river and a free ride from DFO is unheard of and the mitigation requirements increasing all the time.

We have brought the estimates up to 2002 for all projects based on AMEC review of badger chute and then eventually to in service etc. They are not cheap and it should be noted we have included a fair contingency amount and the usual adders we would normally see in a project of this type.

Some of the key issues are

Would we ever get approval from DFO to do any or even one of these projects given the current level of development on the river and increasing tourist things?

What would be the optimized cost assuming we could do as the current quality of the estimates is desk level at best?

many more in the document and why we have added funds to cover off.

Not in the report is the fact we would expect a 2-3 year full EIS process for go. Later in that would be the final feasibility and optimization and then construction. Given the environmental issues this might be 5-6 years from go possibly more and DFO would be a major player.

On comment was that if this were gold in the sense was a huge project thousands of MW and there was potential for public outcry you might better weather the storm, but for 40-50 MW public outcry would likely be louder.

Any here s the final and a cautions approach is warranted given all the unknowns.

Exploits Studies - Prelim Project Assessement 050201 NLH.pdf

Jim Haynes

NEWFOUNDLAND & LABRADOR HYDRO

Exploits River Hydro Potential

- Red Indian Falls
- Badger Chute
- Four Mile Pond

Preliminary Project Assessment

Prepared By:

Newfoundland and Labrador Hydro
Generation Engineering

January 31, 2005

Table of Contents

1.0 Introduction

On the Exploits River, Abitibi Consolidated Inc. (ACI) has identified three potential hydroelectric projects;

- Red Indian Falls
- Badger Chute
- Four Mile Pond

These projects were studied in an inventory study by Shawmont Newfoundland Limited in 1979. The Badger Chute project was revisited in 2002 by AMEC E&C Services Limited with a brief concept and cost update.

This review is intended to investigate the project costs of the three projects based on the information presented in the previous work and to provide a critical review of the concept and work done to date. Emphasis is put on identification of additional work that would be required in order to evaluate the feasibility of developing either of the projects as well as highlighting any other issues that may arise and would have to be addressed.

2.0 Level of Study

The study process through which a typical hydroelectric project usually progresses is summarized as follows:

- Inventory (Identification)
- Desk Level Screening (Order of Magnitude Cost and Benefit)
- Pre-Feasibility (General Design and Preliminary Costing)
- Feasibility (Detailed Investigation, Preliminary Design and Detailed Costing)
- Design and Construction (Detailed Design and Final Costing/ Tendering)

Usually the goal of each step or level of study is to determine whether to proceed to the next level of study, although occasionally pre-feasibility level studies are bypassed where the projects are obviously worth proceeding further and still others would not proceed further due to obvious technical, environmental, financial or other issues.

The three projects are presently considered slightly less than Desk Level Screening Studies. It is not unusual to complete inventory and high level screening studies concurrently. The normal next step for either project is to review and evaluate the current work and decide whether to commission a more detailed level of study.

3.0 Methodology

The limited information presented in the previous inventory report was reviewed based on the recent construction experience with the Granite Canal project. This project went through the basic project planning and evaluation phases and was completed on schedule and within budget.

The 1979 direct cost estimates for Red Indian Falls and Four Mile Pond were prorated to 2002 based on the recent AMEC update. All three projects were further escalated to 2005 by current escalation rates for hydroelectric projects provided by Hydro's financial group. Indirect costs were reviewed based on Hydro's standard practice and recent experience.

Order of magnitude estimates were compiled for the aspects of these projects that require additional study (See Section 6.0), and not identified in the 1979 report.

4.0 Cost Updates and Schedule

The cost estimates presented below assume the information presented in the 1979 report is representative of the final project arrangements. Further work as outlined later in this report is required to refine the project arrangements and establish more reliable cost estimates. These estimates should only be used to determine the next level of study required should the projects receive approval by the environmental regulatory authorities.

.1 Red Indian Falls Direct Cost

The 1979 direct cost estimate was adjusted to reflect the deletion of the log chute and regulating gate and prorated to 2002. The 2002 direct cost is $75,900,000, which has been further escalated to 2005 to be $81,400,000. Note that this cost does not include allowances for further required work identified in this review (Section 6.0) and is considered desk level.

.2 Badger Chute Direct Cost

The cost of a log chute and regulating gate was removed from the original estimate. Additional costs for a substation and transmission line link were identified in the 2002 update but have not been included in this work. The direct cost for the project was shown as $52,400,000 in 2002, which has been further escalated to 2005 to be $56,200,000. Note that this cost does not include allowances for further required

work identified in this review (Section 6.0) and is considered desk level.

.3 Four Mile Pond Direct Cost

The 1979 direct cost estimate was adjusted to reflect the deletion of the regulating gate and prorated to 2002. The 2002 direct cost is $58,800,000, which has been further escalated to 2005 to be $63,000,000. Note that this cost does not include allowances for further required work identified in this review (Section 6.0) and is considered desk level.

.4 Indirect Costs

The three projects are not substantially different in concept or location and the project schedules for each are the same, therefore the indirect costs can be assumed to be the same normal percentage values used by Hydro based on standard practice and previous experience. The following values are suggested to replace those presented in the information provided:

Management & Engineering	15% of Direct Cost
Owner's Cost	4% of Direct cost
Corporate Overhead	0.5 % of Total Cost
Contingency	25% of Total Cost
Escalation & IDC	Current Hydro Rates

.5 Schedule

The 1979 study references that a 24 to 30 month construction period would be sufficient for either project. This seems reasonable; however, it is very dependent on factors such as dewatering scheme, environmental restrictions and actual start date. For planning purposes, it would be prudent at this stage to consider the construction period to be 36 months.

No indication is given for the time required for project planning, environmental approvals, permitting, engineering design or tendering. This would normally be a minimum of 1 year but due to the extensive social and environmental considerations would more likely take 2 to 3 years.

5.0 Power and Energy

The Power and Energy values presented in the original study are in the order of magnitude expected for the proposed project arrangements. Power and Energy values do not usually vary significantly as projects proceed through the various levels of study, as the hydrologic information available in the early stages is usually very good. As such, the accuracy of the evaluation of the energy available from the projects, as presented in the 1979 study, is considered fairly reliable but is highly dependant on the capacity factor (plant size) chosen.

The plants are sized to a capacity factor of about 85%. No reason is presented for this selection however it may be to satisfy the plant requirements at Grand Falls and Bishop's Falls coupled with the regulating effect of the existing large upstream storage at Red Indian Lake. The high capacity factor results in the potential under sizing of the plant and may not maximize the energy available. Additional firm and average energy may be possible, but would require further investigation and modeling (optimization) of the entire Exploits system.

The values presented in the information provided are as follows:

	Capacity	Firm Energy	Average Energy
Red Indian Falls	31.7 MW	181 GWh	236 GWh
Badger Chute	22.5 MW	129 GWh	160 GWh (Updated 2002)
Four Mile Pond	23.0 MW	134 GWh	172 GWh

Recent information for Red Indian Falls and Badger Chute, provided by SGE Acres through Abitibi Consolidated Inc., confirms the above energy values. Additional energy is available with some adjustment to plant capacities. This is highly dependant on the installed capacity and how the plant is operated. This requires further detailed study to determine the optimum arrangement and operational characteristics for each project, and thus the energy benefits available.

Additional information from flow modeling carried out by the Water Resources Division of the Provincial Department of Environment and Conservation (DOEC) indicates that the head developed by the Badger Chute project should be reduced by about 5 metres to ensure that the town of Badger is not adversely affected. This would reduce the installed capacity to about 14 MW and the average energy to about 110 GWh. This will negatively impact the financial viability of this project.

6.0 Development Concerns

The information presented for all three projects is considered to be slightly less than a desk level screening study. Further study is required to bring these projects to a level whereby the viability and value can be established. As a minimum, a pre-feasibility study is required in conjunction with a complete environmental review.

Apart from the obvious technical detail that must be established so that the total project costs can be determined, the biggest issue that must be addressed is to establish environmental impacts and the associated costs to mitigate those impacts.

The three projects are not substantially different in concept or location and the project schedules for each would basically be similar, therefore the following comments apply to all projects unless noted otherwise.

1. There is insufficient information presented to complete a proper cost evaluation of the concept presented. The study is considered slightly less than a desk level screening study.

2. There are no costs identified for further work such as pre-feasibility/ feasibility level studies or engineering investigations.

3. There are insufficient cost allowances for pre-construction environmental studies (EIS or EPR) for projects on a major salmon river. There will be issues with fish passage, fish habitat, archeological resources, socio-economics, tourism and others. The federal CEAA process will certainly be an issue and may add to the project scheduling.

4. There are no costs identified for environmental mitigation during construction other than an allowance for a fish ladder. Without a detailed environmental study, this is difficult to determine. Based on recent experience, the costs of environmental mitigation are expected to be significant.

5. There is no allowance for detailed geotechnical investigation that will be required at the next level of study and certainly prior to design.

6. There may be operational considerations with the new plants, should Hydro be the owner, due to water management both upstream (Red Indian Lake) and downstream (Grand Falls & Bishop's Falls) which are all controlled by ACI. A detailed flow regulation study will be required.

7. The assumed plant capacity factor is about 85%, which normally indicates that the plant may be sized on the low side. This may be associated with the downstream plant requirements at Grand Falls and Bishop's Falls. A study to optimize the proper plant size will be required. No allowance is provided for this work.

8. There are no costs identified for tele-control or remote operation. How the projects would be interconnected with or controlled by ECC will need investigation.

9. There are no costs identified for terminal stations and transmission links to the provincial grid. Although a cost was identified for the Badger Chute project, this will require further investigation and will likely be different for each site.

10. The allowances provided for Indirect Costs were lower than normal and should be adjusted to standard rates for Hydro projects. This will require a more detailed analysis at the next level of study when a project schedule is established.

11. The Red Indian Falls developed head has been maximized at 22.9 m, but this involves flooding of 12 km of the Buchans highway. It does not appear that sufficient funds are allocated for the associated costs considering potential engineering and environmental issues associated with construction of 12+ km of highway. This will require further study and optimization.

12. The Badger Chute project has the potential to worsen the ice/ flooding problems experienced at the Town of Badger. This will require further detailed study and possibly some "Risk Assessment" analysis. The flow modeling carried out by DOEC indicates that the head developed by this project should be reduced by about 5 metres to ensure that the town is not adversely affected. This will have major ramifications on the project layout, construction cost and available energy and will require detailed investigation.

13. The datum used in the studies is not geodetic. As part of future work, a review of the datum throughout the river should be carried out, especially at Badger Chute where small differences in water levels may have large impacts at Badger.

14. Should multiple projects proceed, there may be cost efficiencies in many aspects of the work, especially for environmental and engineering costs. This should be investigated separately.

15. It is uncertain whether either project would receive approval under the Environmental Assessment Process.

7.0 Environmental Assessment

Either of the proposed developments will trigger both the Provincial and Federal Environmental Assessment Process, which would likely be harmonized so that they can occur conjointly. The Provincial process could result in Environmental Preview Report or full Environmental Impact Statement requirements, and the Federal process could result in Comprehensive Study, Mediation, or full Panel Review requirements. Given the potential resource conflicts and environmental concerns associated with these developments full Environmental Impact Assessment and Panel Review has been included for review purposes. Depending on the recommendations of the Panel Review and the judgment of the responsible authority, the project(s) may receive approval.

The main environmental conflicts and concerns that would be considered under the project assessment are:

- Fish and Fish Habitat

  Impact on fish and fish habitat are a significant potential for each of these projects. An Atlantic salmon stocking program was undertaken by the Department of Fisheries and Oceans on the Exploits River for a number of years. Fish passage and diversion facilities have been incorporated into existing barriers to fish migration. Any new developments would have to satisfy requirements for fish passage both upstream and downstream. Flooding of shorelines and tributary streams may impact fish habitat. Mitigation or compensation for such impacts are possible, however is often costly and have uncertainties related to the degree of success. Fish mortality resulting from operation of these types of projects is also possible. There is also potential for increase in mercury levels in fish.

- Socioeconomic Factors

  Recreational boaters and anglers use the river. Their activities may be impacted by the developments. Tourism infrastructure, based partly on use of the river, may be impacted. Cabins and cottages are located along the river shoreline and will be impacted.

- Historic resources

  The Exploits River was a travel route both for aboriginal groups and early European settlers inhabiting the central part of Newfoundland. An archeological assessment will be required.

- Waterfowl and small mammal habitat

  The possible impacts on the habitat or use of the river by waterfowl and small mammals will have to be assessed.

- Cumulative Impacts

  The cumulative impact of these developments, in conjunction with the existing installations, will have to be addressed.

Although the above social and environmental concerns and required processes are common to most hydro projects, the knowledge base and obvious stature of the Exploit's River makes any development open to public and regulatory concern. This ensures that all environmental aspects of the projects will require detailed investigation and will be open to a high level of scrutiny.

8.0 Energy Cost Assessment

Preliminary cost allowances and provisions were made to evaluate the value of energy generated by the three projects. Due to the lack of information available, most of the allowances can only be considered "Order of Magnitude". These allowances and provisions are associated with the list of comments shown is Section 6.0.

The assumptions are:	2005 $
• Feasibility Study/ Field Investigation	500,000
• Environmental Studies (Environmental Impact Statement & Canadian Environmental Assessment Act (CEAA) Registration)	1,000,000
• Environmental Monitoring / Permitting	1,000,000
• Environmental Mitigation	10,000,000 *
• Transmission, Switchyard, Tele-Control - Red Indian Falls	4,000,000
- Badger Chute	500,000
- Four Mile Pond	1,100,000
• Buchan's Highway Relocation (Red Indian Falls only)	6,000,000

* Based on the environmental mitigation cost at the Granite Canal project

The effect of the reduction in head available at Badger Chute has not been evaluated, as there is insufficient information available to evaluate the change in project arrangement. A 30%+ decrease in available head will result in major changes to the powerhouse size, turbine/ generator size, spillway arrangement and size and possibly the overall project arrangement.

Using an arbitrary in-service date of December 2011, a three-year construction schedule, normal indirect cost estimates and the allowances above, estimates for Escalation and Interest During Construction costs were calculated.

Based on the above assumptions, the analysis resulted in the following total estimated project cost and unit energy cost for each project.

	Total Cost	**$/kW**	**Energy Cost ($/MWh)[1]**
Red Indian Falls	184,300,000	5,814	66.1
Badger Chute	123,200,000	5,476	65.2
Badger Chute (Revised)[2]	123,200,000	8,800	94.8
Four Mile Pond	136,300,000	5,926	67.1

1 - Constant Levelized Unit Energy Cost
2 – Using the reduced capacity and energy values

9.0 Conclusions

Based on a review of the information provided by ACI and DOEC, and in Hydro's experience, all three sites are technically feasible for hydro development. There are; however, many issues with respect to the overall project costs that will require further investigation to gain confidence in the estimated in-service costs. The sensitivity of further hydro developments on the Exploits River system is unknown but considering the varied environmental issues that need to be addressed, particularly due to salmon, it is probable that there will be a significant impact on the viability of either project and may even be enough to preclude any or all of the projects from being developed.

Hydro, based on its experience, has attempted to quantify the total project costs and provide comparative levelized unit energy costs for each project; however in the absence of a full fledged feasibility analysis, the values presented are not considered sufficiently reliable to value the resource from a development perspective and should not be used to do so.

In order to provide the least long-term energy cost based on prudent generation expansion planning, the work identified in this report must be completed to provide accurate cost estimates and get environmental approvals so that the projects identified can be assessed against other potential energy sources, such as the Island Pond Hydroelectric Development and wind power generation.