

**NEWFOUNDLAND & LABRADOR HYDRO**  
**SUPPLEMENTARY EVIDENCE OF H.G. BUDGELL**

1 Q. What is the purpose of this supplementary testimony?

2

3 A. The purpose of this testimony is to address issues raised in the  
4 September 12, 2001 supplementary testimony of C.F. Osler with respect  
5 to the prudence of Hydro's decision in 1994 to proceed with the  
6 interconnection of the St. Anthony-Roddickton System.

7

8 Q. What specific issues will you be addressing?

9

10 A. I will address the following issues:

11

- 12 - Hydro's cost effectiveness analyses leading up to the decision to
- 13 proceed with the 1996 interconnection; and
- 14 - Hydro's estimate at the time regarding the impact of the
- 15 interconnection on the rural subsidy.

16

17 Q. Please describe the St. Anthony-Roddickton System as it existed just prior  
18 to the interconnection.

19

20 A. Prior to its interconnection, the St. Anthony-Roddickton System was the  
21 largest of Hydro's isolated power systems. The system had a total  
22 installed generating capacity of 19,600 kW, comprised of 9,700 kW of  
23 diesel generation at St. Anthony, 5,000 kW of wood fired thermal  
24 generation and 4,900 kW of diesel and hydro generation located at or near  
25 Roddickton. This capacity accounted for over 47% of the total installed  
26 generation in service on Hydro's isolated systems at that time. The system  
27 served approximately 3,800 customers or 45% of the total number of  
28 customers on Hydro's isolated systems.

- 1 Q. Please describe the transmission system from the main Island grid  
2 extending up the Northern Peninsula, as it existed prior to the  
3 interconnection of the St. Anthony-Roddickton system.  
4
- 5 A. The transmission system consisted of 300 km of 69 kV transmission line  
6 extending from Deer Lake to Flower's Cove (Bear Cove Terminal Station)  
7 and a parallel 138 kV line (158 km) from Deer Lake to Daniel's Harbour  
8 (Peter's Barren Terminal Station).  
9
- 10 Q. What methodology does Hydro employ in completing an interconnection  
11 analysis?  
12
- 13 A. A brief description of the methodology employed by Hydro is described in  
14 the response to CA-34. In 1984 Hydro decided to focus efforts only on  
15 those systems having a payback period of 15 years or less using the  
16 Holyrood marginal energy price series. This was intended so as to have  
17 funds directed to the more cost effective interconnection projects.  
18
- 19 Q. Does an interconnection alternative have to result in a payback of 15  
20 years or less to be viewed as cost effective?  
21
- 22 A. No. An alternative's cost effectiveness is established by a comparison of  
23 cumulative present worth costs at the end of the study period. The  
24 alternative with the lowest cumulative present worth cost is the preferred  
25 alternative. The 15 year payback period should be viewed only as a  
26 means of managing the risk that unforeseen events may result in  
27 deterioration of the preferred project's cost effectiveness.  
28
- 29 Q. Has the methodology that Hydro utilizes for interconnection studies been  
30 reviewed by the Board?

1 A. Yes. On several occasions since 1996, Hydro has supplied copies of  
2 interconnection studies to the Board, either in support of a capital budget  
3 proposal or in response to requests for information from the Board.  
4

5 As well, on two occasions, the Board has had a technical review  
6 completed of Hydro. The Board's consultants, G.C. Baker, P.Eng. of Hiltz  
7 and Seamone Company Limited and Quetta Inc. and Associates, carried  
8 out reviews of Hydro in 1991 and 1999 respectively.  
9

10 These consultants reviewed Hydro's methodology and criteria with respect  
11 to generation, transmission and distribution planning. Mr. G.C. Baker on  
12 page 10 of his 1991 report to the Board (Attachment I), states:  
13

14 *"Decisions on major plant additions are made on the basis of*  
15 *economic, financial, environmental and cost of service analysis.*  
16

17 *Nevertheless, planning and decision-making are always at risk*  
18 *because they must rest at least in part on assumptions and estimates*  
19 *related to future costs, load growth, economic conditions and public*  
20 *policies. Based on the planning documents reviewed, the consultant is*  
21 *of the opinion that planning techniques are accurate, adequate, and*  
22 *much the same as those employed by other large utilities."*  
23

24 Quetta Inc. and Associates, in their 1999 report which Hydro filed in  
25 response to NP-30, states with respect to Generation Planning Diesel  
26 locations on page 26:  
27

28 *"Quetta met with Hydro staff having direct responsibilities in the area of*  
29 *planning for isolated diesel generation systems. Hydro's planning*  
30 *process uses a conventional present worth evaluation comparing*  
31 *incremental investment costs and operation costs for different options.*

1           *The main economic criterion used to compare these options is the*  
2           *minimization of costs based on the discounted value of all system*  
3           *costs. Hydro has no proposed change to this methodology.*

4  
5           *Hydro uses a production cost software developed in house. Study*  
6           *inputs include; discount rate, Capital and O&M escalation, fuel price*  
7           *forecasts, Capital Costs, fuel efficiencies, O&M costs, fuel price*  
8           *forecasts. The inputs used are appropriate for such analysis. Planning*  
9           *criteria were reviewed and include reliability, minimum reserves, firm*  
10          *capacity and minimum number of units at a remote station.*

11  
12          *The foregoing described the planning process used by Hydro in this*  
13          *area. Quetta reviewed seven studies done for this part of the system*  
14          *from 1992 to 1997. These studies examined such options as*  
15          *expansions, interconnection, retrofit and automation.”*

16  
17          Particularly, with respect to *The Great Northern Peninsula Transmission*  
18          *Line Study* on page 30, Quetta stated:

19  
20                 *“The only significant transmission constructed by Hydro in recent years*  
21                 *has been the 138 kV extension/conversion from Peter’s Barren to St.*  
22                 *Anthony. These studies are well done.”*

23  
24          Q.       Has evidence been filed with the Board for this application regarding the  
25                   Interconnection of the St. Anthony-Roddickton System to the Island  
26                   Interconnected System?

27  
28          A.       Yes, the report entitled “Great Northern Peninsula Interconnection Study”  
29                   dated October 18, 1993 was filed in response to IC-203(5).

30  
31          Q.       What were the conclusions of this study?

1 A. The 1993 study concluded that while it was cost effective to interconnect  
2 the St. Anthony-Roddickton System to the Island Interconnected System,  
3 the sensitivity analysis indicated that with respect to Hydro's 15-year  
4 payback guideline, the most promising interconnection alternative was  
5 very sensitive to changes in base case assumptions. As a result, no  
6 commitment was made to construction at that time.

7

8 Q. Has there been any other evidence filed with the Board regarding the cost  
9 effectiveness of interconnection of the St. Anthony-Roddickton System?

10

11 A. Yes, the results of a comparison of an isolated and an interconnection  
12 alternative associated with the 1994 review of the interconnection project  
13 were filed in response to IC-203(6).

14

15 Q. Were these analyses reviewed by the Board previously?

16

17 A. Yes, the 1993 Report and the results of the 1994 review were filed with  
18 the Board in the 1995 referral concerning rural electrical service.  
19 Industrial Customers and Newfoundland Power participated in that  
20 referral.

21

22 Q. Would you please explain the nature and contents of the alternatives  
23 provided related to Hydro's 1994 review of the project?

24

25 A. The 1994 review was supplementary to the 1993 study and a detailed  
26 report was not deemed necessary in 1994. The methodology and  
27 assumptions outlined in the 1993 report were used in the 1994 review with  
28 a number of changes in the base data. These changes included:

29

30 • An updated load forecast for both the continued isolated alternative  
31 and the interconnected alternative;

- 1 • An updated fuel series for the St. Anthony diesel plant;
- 2 • An updated Holyrood Incremental Energy Rate based upon the 1994
- 3 fuel series; and
- 4 • The modifications to the preferred interconnection alternative from the
- 5 1993 Report as outlined in IC-203(6).

6

7 The first data file in IC-203(6) provides study parameters and the  
8 cumulative present worth to 2022 for the continued isolated alternative.

9 The second data file provides the cumulative present worth cost for the  
10 interconnection alternative assuming \$5 million in funding through the  
11 Canada/Newfoundland Infrastructure Initiative. These cases formed the  
12 basis upon which the decision was made to proceed with the  
13 interconnection of the St. Anthony-Roddickton System. With the  
14 assumptions noted, the interconnection alternative had a present worth  
15 preference of \$4.02 million (1993\$) after 15 years and a payback period of  
16 12 years. At the end of the study period the preference increased to  
17 \$14.23 million (1993\$).

18

19 Q. C. F. Osler's supplementary testimony of September 12, 2001 raises a  
20 number of questions regarding the 1994 analysis. First of all, did the 1993  
21 and 1994 cost effective analyses consider more than one continued  
22 isolated system expansion plan?

23

24 A. The continued isolated alternative used in both the 1993 and 1994 cost  
25 effective analyses is based upon the preferred expansion plan as outlined  
26 in the St. Anthony-Roddickton System Generation Expansion Study dated  
27 May 1993 (Attachment II). This study has been previously provided to the  
28 Board's consultant Quetta. The capital costs associated with the  
29 continued isolated alternative in the 1994 analysis are summarized in  
30 Attachment III. The capital cost for the extension of the 138 kV  
31 transmission system from Peter's Barren to Plum Point in 2020 is included

1 in the isolated alternative to account for the cost of advancing this  
2 extension to 1996 in the interconnection alternative. The capital costs  
3 associated with the interconnection alternative in the 1994 analysis are  
4 summarized in Attachment IV.

5

6 Q. With respect to the interconnection alternative, there was a concern raised  
7 that the 1994 analysis did not consider line losses. Is this correct?

8

9 A. No. The computer program used in the analysis assumes a single load at  
10 the end of a single transmission line for the calculation of line losses. The  
11 interconnection of the St. Anthony-Roddickton System results in  
12 incremental transmission losses along the entire Great Northern Peninsula  
13 and differing losses on each section of the transmission system due to the  
14 three separate load centers at St. Anthony, Main Brook and Roddickton.  
15 As a result, line losses were not calculated by the program but were  
16 added to the energy forecast as outlined in Section 2.2.5 of the October  
17 1993 report. In addition, all energy forecasts were reduced by 1050 MWh  
18 per year to account for the production of the Roddickton mini-hydro, which  
19 was common in all alternatives. The inclusion of line losses and netting of  
20 mini-hydro production account for the small differences that may be  
21 observed when comparing the energy figures found in IC-203(6) Schedule  
22 1, to those in the data files.

23

24 Q. Why were Operating and Maintenance (O&M) costs for the Hawke's Bay  
25 diesel plant added to the Isolated Alternative in the 1994 review?

26

27 A. The 1994 Interconnection Alternative included relocation and automation  
28 of the Hawke's Bay diesel plant. Once moved to Roddickton, the Hawke's  
29 Bay diesel plant would have a different O&M cost. As a result, Hawke's  
30 Bay O&M was added to the Isolated Alternative to account for the change  
31 in O&M costs arising because of the relocation.

1 Q. Why were O&M costs for the Peter's Barren to Plum Point line upgrade  
2 included in the Isolated Alternative for the last two years of the study  
3 period?  
4

5 A. The O&M costs for the line upgrade were added to the Isolated Alternative  
6 to account for the advancement of line O&M costs associated with the  
7 Interconnection Alternative.  
8

9 Q. Would you explain how the computer model accounts for O&M costs in  
10 the Interconnected Alternative?  
11

12 A. From 1993 to the 1996 interconnection date, the model uses the  
13 calculated O&M for the diesel plants and woodchip plant in determining  
14 total annual cost. The program assumes that following interconnection,  
15 the diesel plants and woodchip plant are shut down and removed from  
16 service, as is the case in most interconnections that Hydro has  
17 undertaken. While the program reports fixed O&M for each plant following  
18 the interconnection as shown in Tables 3 and 4 of DSL1, DSL2 and  
19 WOOD in the Interconnection Alternative of IC-203(6), the costs are not  
20 included in the total annual cost for the interconnection. Following the  
21 interconnection date, the model calculates the annual O&M cost of the  
22 interconnection based upon a line maintenance factor and an O&M  
23 escalation series. The line maintenance factor is the ratio of line  
24 maintenance cost to capital cost in the year of interconnection expressed  
25 in percent. In order to account for the O&M costs associated with the  
26 plants in standby following interconnection, it is necessary to adjust the  
27 line maintenance factor for the Interconnection Alternative.  
28

29 Q. What was the estimated O&M cost for the Interconnected Alternative in  
30 the 1994 review?

- 1 A. The estimated O&M cost for the Interconnected Alternative in the 1994  
2 review was \$999,383 in 1996 dollars. This figure included \$667,900 per  
3 year in standby plant costs, \$141,570 per year for line maintenance,  
4 \$123,936 per year in station maintenance costs and \$23,994 per year in  
5 telecontrol maintenance costs.  
6
- 7 Q. C. F. Osler in his supplementary testimony of September 12, 2001 states  
8 on page A-6 that the net savings in O&M in 2002 is \$2.062 million. Is this  
9 figure correct?  
10
- 11 A. No it is not. The O&M costs for the Isolated Alternative in 2002 were  
12 correctly stated by Mr. Osler to equal \$8.146 million. The O&M costs for  
13 the Interconnected Alternative in 2002 are found to equal \$3.818 million in  
14 ALT4 Table 4 of 4 of IC-203(6). The net savings in O&M in 2002 is \$4.328  
15 million.  
16
- 17 Q. Mr. Osler makes several references to the fact that Hydro reports average  
18 increases based upon a 30-year period, when in his opinion the period of  
19 increase is 29 years. Can you clarify this issue?  
20
- 21 A. The computer model uses the year prior to the first year of the study  
22 period as its reference for input data. As a result 1992 to 2022 provides  
23 for a 30-year period of increase.  
24
- 25 Q. In the evaluation of system incremental energy costs, did the addition of  
26 St. Anthony-Roddickton system load change the Island Interconnected  
27 System generation expansion plan?  
28
- 29 A. No. There were no changes in the generation expansion plan arising from  
30 the interconnection (see Section 3.2.4, page 26, of the 1993 Great  
31 Northern Peninsula Interconnection Study).

- 1 Q. Prior to proceeding with the project, was a sensitivity analysis conducted  
2 as part of the 1994 review?  
3
- 4 A. Yes. The alternatives provided in response to IC-203(6) formed the basis  
5 for the decision to proceed with the project assuming \$5 million in funding  
6 would be obtained. To assess the level of risk, sensitivity analysis was  
7 conducted. The results of this analysis are summarized in Attachment V.  
8
- 9 Q. Did Hydro, in proceeding with interconnection, give consideration to the  
10 impact of the St. Anthony-Roddickton interconnection on the rural subsidy  
11 and rates of Island Interconnected customers?  
12
- 13 A. Yes. Attached is a copy of Hydro's 1994 proposal for funding from the  
14 Infrastructure Program (Attachment VI). The proposal indicates an  
15 estimate of a cumulative reduction of \$65.8 million (10.1 million in 1994  
16 dollars) in rural subsidy.  
17
- 18 As well, during the 1995 referral concerning rural electrical service, Hydro  
19 provided a response to a request for information from Newfoundland  
20 Power (NP-28) originally filed with the Board in 1993, which indicated the  
21 impact of the interconnection as envisaged in the 1993 Great Northern  
22 Peninsula Interconnection Study on rural subsidy and rates (Attachment  
23 VII).  
24
- 25 Q. What was the final cost of the interconnection and how does that cost  
26 compare with the cost estimate at the time that Hydro decided to proceed  
27 with the project?  
28
- 29 A. The interconnection was completed in 1996 at a cost of \$31.4 million  
30 compared to the original estimate of \$38.4 million. Hydro received a \$5.0

1 million infrastructure grant resulting in a net cost to ratepayers of \$26.4  
2 million.

3

4 Q. Would you please summarize the supplementary testimony.

5

6 A. The decision in 1994 to complete the St. Anthony-Roddickton  
7 interconnection in 1996 was a prudent decision supported by cost  
8 effectiveness analyses and estimates of impact on rural subsidy.

9

10 Q. Does this conclude your supplementary testimony?

11

12 A. Yes.