1	Q.	In reference to page 8 of Mr. Greneman's Evidence, please provide all
2		studies, documents, data, calculations and workpapers used in developing
3		Energy Allocation Factors, including an explanation of how losses were
4		calculated for each of the systems.
5		
6		
7	Α.	Energy allocation factors are developed by applying applicable energy losses
8		to forecast customer sales. See Pages 2-5 attached for the application of
9		losses to sales.
10		
11		The loss factors are shown on Pages 5 – 7, and calculated as follows.
12		Column (B) contains energy sales by voltage level, based on the load
13		forecast. Column (C) is the result of the application of losses, and starts at
14		secondary and builds up sales to generation level from the preceding
15		column, by multiplying sales by the loss percentage level for each voltage
16		class.
17		
18		Transmission and Distribution total losses are obtained from the operating
19		load forecasts. Generally speaking, losses are determined as follows:
20		
21		For the Island Interconnected system an operating history of monthly
22		energy loss rates is maintained and used to calculate median monthly
23		loss rates for forecasting.
24		
25		 For the Labrador Interconnected and L'Anse au Loup systems, an
26		operating history of annual energy loss rates is maintained and used to
27		calculate median annual loss rates for forecasting.

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	Page 2 01 o
1	• For the Island and Labrador Diesel systems, an operating history of
2	annual energy loss rates is maintained for each diesel system and used
3	to calculate median loss rates for each individual diesel system for
4	forecasting. Losses for the total Island Diesel system are an aggregate of
5	the individual systems' losses. Please see response to PUB-3 NLH for
6	further details on the load forecast.
7	
8	Distribution losses are split between primary and secondary by using Excel's
9	Goal Seek functionality to calculate primary losses based on the assumption
10	that secondary losses are estimated to be 1.57 times primary losses. The
11	1.57 was the preliminary proportion derived from the analysis included as
12	Attachment A.

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				NEWFO DIST	RIBUTION O	& LABRADOR HI	/DRO Ses					Fage 3 OI 0
		Load							I oad			
	Source:	Forecast Load	Pages 5-7	Col A*Col B	Page 8 Load	Col C*Col D	Pages 5-7	Page 8	Forecast	Col G; Col H	Pages 5-7	Col I*Col J
		Served @ Secondary	Secondary Loss Multiplier	Input to Secondary	Served @ Primary	Load Through Primary	Primary Loss Multiplier	Input to Primary	Load Served @ Transm.	Load Through Transm.	Transm. Loss Multiplier	Input to Transm.
		(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(1)	(J)	(J)
	YEAR: 2004											
	ISLAND INTERCONNECTED											
1	Newfoundland Light & Power	• -	1.0640	-	-	•	1.0399		4,741,400	4,741,400	1.0339	4,902,167
2	Abitibi Price - Stephenville	-	1.0640	-		_	1.0399	-	555,800	555.800	1.0339	574 646
3	Abitibi Price - Grand Falls	-	1.0640	-	-	· · · · · ·	1.0399	- '	130,800	130,800	1 0339	135 235
4	Corner Brook Pulp & Paper Co. Ltd. CB	-	1.0640	-		-	1.0399	-	445,000	445 000	1 0330	460.089
5	N. Atlantic Refining Ltd.	-	1.0640	. •	-	-	1.0399	-	236,200	236,200	1.0339	244,209
6	Total Industrial	-	1.0640	· •	• .	• -	1.0399	-	1,367,800	1,367,800	1.0339	1,414,178
7	Interruptible	-	1.0640	•	-	•	1.0399	· -	800	800	1.0339	827
8	1.1 Domestic	105,865	1.0640	112,644	-	112,644	1.0399	117,134	-	117.134	1.0339	121.106
9	1.12 Domestic All Electric	113,135	1.0640	120,380	-	120,380	1.0399	125,178	-	125,178	1.0339	129,422
10	1.3 Special	220	1.0640	234	-	234	1.0399	243	-	243	1.0339	252
11	2.1 General Service 0-10 kW	20,416	1.0640	21,723	-	21,723	1.0399	22,589	•	22.589	1.0339	23,355
12	2.2 General Service 10-100 kW	65,733	1.0640	69,943	15	69,957	1.0399	72,746	-	72,746	1.0339	75,212
13	2.3 General Service 110-1,000 kVa	31,603	1.0640	33,627	3,314	36,941	1.0399	38,413	-	38,413	1.0339	39 716
14	2.4 General Service Over 1,000 kVa	19,996	1.0640	21,277	4,378	25,654	1.0399	26,677	_	26.677	1.0339	27,582
15	4.1 Street and Area Lighting	3,000	1.0640	3,192	-	3,192	1.0399	3,319	-	3,319	1.0339	3,432
16	Sub-Total	359,969		383,019	7,706	390,726		406,300	0	406,300		420,076
17	Grand Total	359,969		383,019	7,706	390,726		406,300	6,110,000	6,516,300		6,737,249
		========			=======			========		=======		

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NEWFOUNDLAND & LABRADOR HYDRO DISTRIBUTION OF ENERGY LOSSES

	Source:	Load Forecast Load Served @ Secondary	Pages 5-7 Secondary Loss Multiplier	<i>Col A*Col B</i> Input to Secondary	Page 8 Load Served @ Primary	<i>Col C*Col D</i> Load Through Primary	Pages 5-7 Primary Loss Multiplier	Page 8 Input to Primary	Load Forecast Load Served @ Transm.	<i>Col G; Col H</i> Load Through Transm.	Pages 5-7 Transm. Loss Multiplier	<i>Col I*Col J</i> Input to Transm.
		(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(1)	(J)	(J)
	YEAR: 2004 LABRADOR INTERCONNECTED											
1	CFB-Goose Bay Boiler	· · · ·	1.0383	· _		_	1 0241	_	77 200	77 200	1 1997	97.440
2	IOCC Firm		1.0383	-	-	-	1 0241		247 700	247 700	1.1327	87,442
3	IOCC Non-Firm	• . ·	1.0383	-	-	-	1.0241	-	4,000	4,000	1.1327	4,531
4	Total Industrial	0		0	0	0		0	328,900	328,900		372,533
5	1.1 Domestic	8,441	1.0383	8,764		8.764	1.0241	8,975	_	8 975	1 1 9 9 7	10 166
6	1.1A Domestic All Electric	257,334	1.0383	267,189	-	267,189	1.0241	273.617	-	273 617	1 1327	309 916
.7	2.1 General Service 0-10 kW	3,963	1.0383	4,115	-	4,115	1.0241	4.214	-	4 214	1 1327	4 773
8	2.2 General Service 10-100 kW	49,045	1.0383	50,923	7,861	58,784	1.0241	60,198	-	60,198	1 1327	68 184
9	2.3 General Service 110-1,000 kVA	73,823	1.0383	76,650	11,387	88,037	1.0241	90,155	-	90,155	1.1327	102 116
10	2.4 General Service over 1000 kVA	64,946	1.0383	67,433	-	67,433	1.0241	69.055	-	69.055	1 1327	78 217
11	4.1 Street and Area Lighting	1,491	1.0383	1,548		1,548	1.0241	1,585	-	1,585	1.1327	1,796
12	Sub-Total Jurisdictional	459,043		476,622	19,248	495,870		507,800	0	507,800		 575,167
13	Grand Total	459,043		476,622	19,248	495.870			328 900			947 700
								=======	=======	=======		947,700 ========
	ISLAND ISOLATED						* .					
14	1.2 Domestic Diesel	6,660	1.0352	6.895	-	6 895	1 0222	7.047	_	7.047	1 0000	7.047
15	2.1 General Service 0-10 kW	856	1.0352	886	-	886	1 0222	906	-	7,047	1.0000	7,047
16	2.2 General Service 10-100 kW	1,001	1.0352	1,036	-	1.036	1.0222	1.059	-	1 050	1.0000	906
17	2.3 General Service 110-1,000 kVA	1,276	1.0352	1,321	-	1,321	1.0222	1,350	_	1,350	1.0000	1,059
18	4.1 Street and Area Lighting	114	1.0352	118	-	118	1.0222	120	-	120	1.0000	120
19	Total Rural	9,907		10,256	0	10,256		10,483	0	10,483		10,483
		========				=======			=======			

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			NEWFC DISTI	DUNDLAND RIBUTION C	& LABRADOR H DF ENERGY LOS	YDRO SES					Page 5 of 8
Source:	Load Forecast Load Served @ Secondary	Pages 5-7 Secondary Loss Multiplier	Col A*Col B Input to Secondary	<i>Page 8</i> Load Served @ Primary	<i>Col C*Col D</i> Load Through Primary	<i>Pages 5-7</i> Primary Loss Multiplier	<i>Page 8</i> Input to Primary	N/A Load Served @ Transm.	<i>Col G; Col H</i> Load Through Transm.	<i>Pages 5-7</i> Transm. Loss Multiplier	<i>Col I*Col J</i> Input to Transm.
	(A)	(B)	(C)	(D)	(Ē)	(F)	(G)	(H)	()	(J)	(J)
YEAR: 2004 LABRADOR ISOLATED											
1.2 Domestic Diesel 2.1 General Service 0-10 kW 2.2 General Service 10-100 kW 2.3 General Service 110-1,000 kVA 2.4 General Service over 1000 kVA 4.1 Street and Area Lighting Total Rural	21,228 4,199 8,603 1,970 2,400 300 	1.0428 1.0428 1.0428 1.0428 1.0428 1.0428 1.0428	22,136 4,379 8,971 2,054 2,503 312 	- - - - - - 0	22,136 4,379 8,971 2,054 2,503 312 40,354	1.0268 1.0268 1.0268 1.0268 1.0268 1.0268 1.0268	22,729 4,496 9,211 2,109 2,570 321 	- - - - - - 0 	22,729 4,496 9,211 2,109 2,570 321 	1.0000 1.0000 1.0000 1.0000 1.0000 1.0000	22,729 4,496 9,211 2,109 2,570 321 41,437
L'ANSE AU LOUP											
1.1 Domestic 1.12 Domestic All Electric 2.1 General Service 0-10 kW 2.2 General Service 10-100 kW 2.3 General Service 110-1,000 kVA 4.1 Street and Area Lighting	8,676 342 1,069 3,876 820 116	1.0574 1.0574 1.0574 1.0574 1.0574 1.0574	9,174 362 1,130 4,099 867 123		9,174 362 1,130 4,099 867 123	1.0358 1.0358 1.0358 1.0358 1.0358 1.0358 1.0358	9,503 375 1,171 4,245 898 127		9,503 375 1,171 4,245 898 127	1.0000 1.0000 1.0000 1.0000 1.0000 1.0000	9,503 375 1,171 4,245 898 127
Total Rural	14,899		15,755	0	15,755		16,319	0			

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NEWFOUNDLAND & LABRADOR HYDRO

ENERGY LOSSES

ISLAND INTERCONNECTED

ENERGY LOSSES

			Voltage L	evel Losses (E			
Voltage Level of Service	Voltage Level Sales (MWh)	Cumulative MWh (Incl. Losses)	% Basis	Adjustment Factor	Adjusted %	Simple Loss Multiplier	Cumulativ e Loss Multiplier
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
Input to System	_	6,737,249	0.00%	1.000000	0.00%	1.0000	1.0000
Transmission	6,110,000	6,516,300	3,28%	1.000000	3.28%	1.0339	1.0339
Primary Distribution	7,706	390,726	3.83%	1.000000	3.83%	1.0399	1.0751
Secondary	359,969	359,969	6.02%	1.000000	6.02%	1.0640	1.1440
Total	6,477,675		367,675		*.		
Total to Check Against> Less Compens. & losses->	6,477,675	6,769,300 32,051	4.31%				•
Adjusted Total>		6,737,249	3.85%				
Zero-Check>	-	-	0.00%				

LABRADOR INTERCONNECTED

ENERGY LOSSES

Voltage Level Losses (Energy)

Voltage Level of Service	Voltage Level Sales (MWh)	Cumulative MWh (Incl. Losses)	% Basis	Adjustment Factor	Adjusted %	Simple Loss Multiplier	Cumulativ e Loss Multiplier
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
Input to System	-	947,700	0.00%	1.000000	0.00%	1.0000	1.0000
Transmission	328,900	836,700	11.71%	1.000000	11.71%	1.1327	1.1327
Primary Distribution	19,248	495,870	2.35%	1.000000	2.35%	1.0241	1,1599
Secondary	459,043	459,043	3.69%	1.000000	3.69%	1.0383	1.2043
Total	807,191						
Total to Check Against> Zero-Check>	807,191 -	947,700 -	14.83% 0.00%				

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NEWFOUNDLAND & LABRADOR HYDRO

ENERGY LOSSES

ISLAND ISOLATED

ENERGY LOSSES

Voltage Level Losses (Energy)

Voltage Level of Service	Voltage Level Sales (MWh)	Cumulative MWh (Incl. Losses)	% Basis	Adjustment Factor	Adjusted	Simple Loss Multiplier	Cumulativ e Loss Multiplier
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
Input to System Transmission Primary Distribution Secondary	- - 9,907	10,483 10,483 10,256 9,907	0.00% 0.00% 2.17% 3.40%	1.000000 1.000000 1.000000 1.000000	0.00% 0.00% 2.17% 3.40%	1.0000 1.0000 1.0222 1.0352	1.0000 1.0000 1.0222 1.0582
Total	9,907						
Total to Check Against> Zero-Check>	9,907 -	10,483 -	5.50% 0.00%				

LABRADOR ISOLATED

ENERGY LOSSES

T

Voltage Level Losses (Energy)

Voltage Level of Service	Voltage Level Sales (MWh)	Cumulative MWh (Incl. Losses)	% Basis	Adjustment Factor	Adjusted %	Simple Loss Multiplier	Cumulativ e Loss Multiplier
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
Input to System Transmission Primary Distribution Secondary	- - - 38,700	41,437 41,437 40,354 38,700	0.00% 0.00% 2.61% 4.10%	1.000000 1.000000 1.000000 1.000000	0.00% 0.00% 2.61% 4.10%	1.0000 1.0000 1.0268 1.0428	1.0000 1.0000 1.0268 1.0707
Total	38,700						
Total to Check Against> Zero-Check>	38,700 -	41,436 -	6.61% 0.00%				

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NEWFOUNDLAND & LABRADOR HYDRO

ENERGY LOSSES

L'ANSE AU LOUP

ENERGY LOSSES

		-	Voltage L	evel Losses (E	Energy)		
Voltage Level of Service	Voltage Level Sales (MWh)	Cumulative MWh (Incl. Losses)	% Basis	Adjustment Factor	Adjusted %	Simple Loss Multiplier	Cumulativ e Loss Multiplier
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
Input to System Transmission Primary Distribution Secondary	- - 14,899	16,319 16,319 15,755 14,899	0.00% 0.00% 3.46% 5.43%	1.000000 1.000000 1.000000 1.000000	0.00% 0.00% 3.46% 5.43%	1.0000 1.0000 1.0358 1.0574	1.0000 1.0000 1.0358 1.0953
Total	14,899						
Total to Check Against> Zero-Check>	14,899 -	16,319 -	8.70% 0.00%				

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NEWFOUNDLAND AND LABRADOR HYDRO

PRIMARY / SECONDARY LOSS ANALYSIS

STONE & WEBSTER MANAGEMENT CONSULTANTS, INC.

Introduction

Page 2 of 4

The purpose of this analysis was to develop an estimate of secondary losses relative to primary losses for use in Hydro's cost of service study based on a review of estimates by other utilities.

Procedure

A review of primary/secondary loss estimates made by six other utility entities shows that the proportion of secondary to primary losses ranged from 53% secondary / 47% primary to 78% secondary / 22% primary. Losses by nature are difficult to quantify and ever changing. However, from these data it was observed that secondary losses were consistently higher than primary losses and within the low and high ends of the range, 60% / 40% was selected for cost of service study purposes to be representative of industry averages. Primary/secondary loss percentages for each of the six entities reviewed are contained in Table 1.

The form of the loss proportions needed for input to Hydro's Loss Model is a factor calculated as:

% secondary losses / % primary losses

where:

% _{losses} = 1-output/input to each voltage level.

Such that on a unitized basis for the 60% secondary / 40% primary case:

 $\%_{\text{primary losses}} = (1.0000 - .0400) / 1.0000 = .0400$

and,

 $\%_{\text{secondary losses}} = (0.9600 - .0600) = .0625$

and,

.0625 / .0400 = 1.5625

Page 3 of 4

Conclusion

The application of the primary/secondary loss split to Hydro's system has inherent assumptions, including: (1) Hydro has the same relative level of primary sales and technical losses (energy diversion) as the other systems that were looked at; and (2) the primary/secondary loss proportions are similar for demand and energy. In recognition of this and the fact that for cost of service purposes, the relative split between primary and secondary distribution losses is simply to recognize that it costs more to provide energy to the secondary voltage level than to primary, it is judged that this review reasonably apportions the known total distribution losses between primary and secondary.

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TABLE 1

NEWFOUNDLAND AND LABRADOR HYDRO

BREAKDOWN OF DISTRIBUTION LOSSES BETWEEN PRIMARY AND SECONDARY BASED ON AVAILABLE LOSS ESTIMATES OF OTHER UTILITIES

		Public Service Co.	Northern States		Colorado	Newfoundland	Vestinghouse
	Average	of Colorado	Power	Utah P&L	Springs 1/	Power	Analysis 2/
Voltage Level Losses as a Percent of Total Distribution Losses							
Secondary	65.0%	76.0%	66.5%	63.8%	53.5%	51.6%	78.4%
Primary	35.0%	24.0%	33.5%	36.2%	46.6%	48.4%	21.6%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
<u>USE 3/</u>							
Secondary	60.0%						
Primary	40.0%						
	100.0%						

Notes:

1/ Colorado Springs was an average of two studies for this utility

2/ Westinghouse estimate of several utilities

3/ Arithmetic average was reduced from 65% secondary to 60% secondary in recognition of lower value of secondary by Newfoundland Power.