Q. For each generator, please provide Hydro's number of forced outage hours per year for the past 10 years (as available) to support the probabilities of outage used in the model.

A. Please refer to attached report *Forced Outage Rates – 2005 Update* - February 2005.

FORCED OUTAGE RATES
2005 UPDATE

System Planning
February 2005

HYDRO
THE POWER OF COMMITMENT

1. INTRODUCTION

The Forced Outage Rates (FOR) used as a basis for STRATEGIST modeling are derived from the Canadian Electrical Association's (CEA) Annual Report on Generation Equipment Status. This report presents statistics on the performance of generating units on an annual and on an average performance basis over a five year period. This update is based on statistics from CEA's 2003 Report. The average performance data from 1999/01/01 to 2003/12/31 are used in the development of FOR input data into STRATEGIST. The tables containing the pertinent data to each class of generating unit discussed below are presented in Appendix A of this report.

2. HYDRAULIC UNITS

For the Hydraulic Units, the Derating Adjusted Forced Outage Rate (DAFOR) is the value used to model the FOR in STRATEGIST. DAFOR is the ratio of the equivalent forced outage time to equivalent forced outage time plus total equivalent operating time.

2.1 Existing NLH Hydraulic Units

FOR data for existing NLH hydro units are based on the actual operating history of the units. The Generating Unit Performance Report section of the Newfoundland and Labrador Hydro, 2003 Generating Equipment Status Report presents the operating experience of NLH's facilities. The weighted average value (DAFOR) is used to model the FOR in STRATEGIST.

2.2 Future NLH Hydraulic Units

Since future hydro units owned by NLH are expected to be maintained in the same manner as NLH's existing hydro units, the FOR is modeled in STRATEGIST the same as the existing NLH hydro units.

2.3 Other Hydraulic Units

The FOR for NP, DLP, AP and NUG hydraulic units are based on the Canadian average rate (DAFOR) of all reporting units in the 5 – 23 MW, or 24 – 99 MW classification, as appropriate. This data is presented in the CEA Report in Table 6.1.2.

* Due to the ongoing review by CEA of the provision of benchmarking data in regulatory settings, Hydro is not in a position to provide CEA composite data at this time.

3 THERMAL UNITS

3.1 Existing Holyrood Steam Units

The FOR for the Holyrood Steam Units are also modeled using the DAFOR. Table 6.2.2 of the CEA Report presents the Canadian average performance data for fossil units of all fuel types. The 100 – 199 MW classification is used to represent the Holyrood units.

* Due to the ongoing review by CEA of the provision of benchmarking data in regulatory settings, Hydro is not in a position to provide CEA composite data at this time.

3.2 Combustion Turbine Units

For the Combustion Turbine Units, the Utilization Forced Outage Probability (UFOP) is the value used to model the FOR in STRATEGIST. The UFOP represents the probability that a generating unit will not be available when required. This best models the intended service of these peaking units. Table 6.3.2 of the CEA Report presents the Canadian average data for combustion turbine units. The "All Units" classification is used to model the FOR for all combustion turbines on the system.

* Due to the ongoing review by CEA of the provision of benchmarking data in regulatory settings, Hydro is not in a position to provide CEA composite data at this time.

3.3 Diesel Units

NLH stopped reporting statistics on diesel unit outages after 1986. Therefore, the last comprehensive five year statistic for Diesel Unit operating performance would be found in the 1986 CEA Report. Since the Hawke's Bay and St. Anthony diesels operate as standby/peaking units, the average UFOP of the Hawke's Bay units from Table 45 is used to model FOR in STRATEGIST.

3.4 Future Thermal Units

The FOR used for future thermal units are modeled the same as comparable existing units. Units in NLH's portfolio of future alternatives that will be unique to the system (i.e. no similar unit existing on the system) are described below:

Combined Cycle Combustion Turbine - A FOR of 5% is modeled in STRATEGIST. This value is drawn from the "Holyrood Generating Station, Combined Cycle Plant Study Update", November, 2001.

Labrador Infeed - A FOR of 0.89% is modeled in STRATEGIST based on Shawmont Report SMR – 18 – 81.

Appendix A

- Forced Outage Data from CEA Report
- Forced Outage Rate Summary & Comparison to Previous Update
- Impact of FOR changes on System LOLH
- Source Data:

    NLH Hydraulic Generating Unit Five Year Data (copy from CEA Report)

FORCED OUTAGE RATES
2003
CEA ANNUAL REPORT
GENERATION EQUIPMENT STATISTICS

I. Main Hydraulic Units

Unit	DAFOR (%)
Bay D'Espoir - 1	0.27
Bay D'Espoir - 2	2.78
Bay D'Espoir - 3	0.32
Bay D'Espoir - 4	0.92
Bay D'Espoir - 5	0.70
Bay D'Espoir - 6	0.70
Bay D'Espoir - 7	0.53
Hinds Lake	1.28
Upper Salmon	1.23
Cat Arm 1	0.32
Cat Arm 2	0.92
Paradise River	1.89
Granite Canal	1.23

Source: NLH Operating Experience from 1999 - 2003.

II. Other Hydraulic Units (Existing & Future)

* Due to the ongoing review by CEA of the provision of benchmarking data in regulatory settings, Hydro is not in a position to provide CEA composite data at this time.

III. Fossil Fuel Units

* Due to the ongoing review by CEA of the provision of benchmarking data in regulatory settings, Hydro is not in a position to provide CEA composite data at this time.

IV. Gas Turbine Units

* Due to the ongoing review by CEA of the provision of benchmarking data in regulatory settings, Hydro is not in a position to provide CEA composite data at this time.

V. Diesel Units

Unit	UFOP (%)
Hawke's Bay	1.18
St. Anthony	1.18

Source: NLH Operating Experience from 1982-1986. Table 45.
Taken from 1986 CEA Annual Report since NLH stopped reporting Data after 1986.

VI. Future Thermal Units

* Due to the ongoing review by CEA of the provision of benchmarking data in regulatory settings, Hydro is not in a position to provide CEA composite data at this time.

FORCED OUTAGE RATES
SUMMARY SHEET

UNIT	(I) DAFOR %	(I) UFOP %	(II) FOR %	(III) Planning %	COMMENT
Bay D'Espoir 1	0.27			0.91	
Bay D'Espoir 2	2.78			0.91	
Bay D'Espoir 3	0.32			0.91	
Bay D'Espoir 4	0.92			0.91	Weighted Average based on Bay D'Espoir units & Hinds Lake, Upper Salmon, Cat Arm and Paradise River.
Bay D'Espoir 5	0.70			0.91	
Bay D'Espoir 6	0.70			0.91	
Bay D'Espoir 7	0.53			0.91	
Hinds Lake	1.28			0.91	
Upper Salmon	1.23			0.91	
Cat Arm - 1	0.32			0.91	
Cat Arm - 2	0.92			0.91	
Paradise River	1.89			0.91	
Granite Canal	1.23			0.91	
				0.91	
Future Hydro : ISPD	*			0.91	
Gas Turbine		*		*	
Holyrood	*			*	
Diesel (Standby)		1.18		1.18	
Lab. Infeed (Gull Is. to Sol. Pd.)			0.89	0.89	
NP Hydro				*	
DLP Hydro				*	
A/P Hydro				*	

(I) CEA Annual Report ; Generating experience over 5 yr. period.

(II) Shawmont Report ; SMR - 18 - 81

(III) As used in Strategist

* Due to the ongoing review by CEA of the provision of benchmarking data in regulatory settings, Hydro is not in a position to provide CEA composite data at this time.

FORCED OUTAGE RATES
SUMMARY & COMPARISONS

Unit	March 2004 Update		February 2005 Update	
	CEA Statistics	As Used for Planning	CEA Statistics	As Used for Planning
Bay D'Espoir 1	0.69	1.00	0.27	0.91
Bay D'Espoir 2	2.37	1.00	2.78	0.91
Bay D'Espoir 3	0.21	1.00	0.32	0.91
Bay D'Espoir 4	0.83	1.00	0.92	0.91
Bay D'Espoir 5	1.49	1.00	0.70	0.91
Bay D'Espoir 6	1.37	1.00	0.70	0.91
Bay D'Espoir 7	0.56	1.00	0.53	0.91
Hinds Lake	1.21	1.00	1.28	0.91
Upper Salmon	1.16	1.00	1.23	0.91
Cat Arm - 1	0.42	1.00	0.32	0.91
Cat Arm - 2	0.94	1.00	0.92	0.91
Granite Canal		1.00	1.23	0.91
Paradise River	2.01	1.00	1.89	0.91
Future Hydro : IP	-	1.00	-	0.91
Gas Turbine	*	*	*	*
Holyrood	*	*	*	*
Diesel (Standby)	1.18	1.18	1.18	1.18
CCCT	--	5.00	--	5.00
Lab. Infeed (Gull to Sol. Pd.)	0.89	0.89	0.89	0.89
NP Hydro	*	*	*	*
DLP Hydro	*	*	*	*
AP Hydro	*	*	*	*

* Due to the ongoing review by CEA of the provision of benchmarking data in regulatory settings, Hydro is not in a position to provide CEA composite data at this time.

IMPACT OF FORCED OUTAGE RATE CHANGES ON SYSTEM LOLH

Existing System

	OLD	NEW
YEAR	LOLH	LOLH
2004	0.89	0.88
2005	1.10	1.08
2006	1.49	1.47
2007	1.73	1.71
2008	2.02	1.99
2009	2.64	2.61
2010	**3.30**	**3.26**
2011	4.10	4.06
2012	10.02	9.94
2013	11.70	11.61
2014	13.96	13.86

** Basis for comparison drawn from "2004 Base Case - May 25.SAV"

GENERATING UNIT PERFORMANCE REPORT GA - RP40

FOR UTILITY: Newfoundland And Labrador Hydro
FOR PERIOD: 1999-01-01:00:00 TO 2004-01-01:00:00
EXTERNAL CAUSES: Excluded

Hydraulic Generating Unit

UNIT HOURS (H)	ABNOF (%)	SYN.CD FACTOR (%)	OP TIME (H)	OP FACTOR (%)	NO. FORCED OUTAGES	TOT F.O.T. (H)	MAX F.O.D. (H)	MEAN F.O.D. (H)	FOR (%)	DAFOR (%)	TOT EQ. OUT.TIME (H)	ICBF (%)	FAIL RATE	ATTEMPTED STARTS	SUCCESSFUL STARTS	MOF (%)	POF (%)
Bay D'Espoir																	
Bay D'Espoir - 01																	
43,819.71	14.59	0.00	33,248.73	75.88	10	88.36	22.06	8.84	0.27	0.27	4,177.13	9.53	1.58	626	626	0.64	8.69
Bay D'Espoir - 02																	
43,815.23	56.24	0.00	13,395.45	30.57	22	383.70	128.23	17.44	2.78	2.78	5,776.86	13.18	7.85	1199	1197	0.87	11.44
Bay D'Espoir - 03																	
43,822.63	3.51	0.00	37,942.07	86.58	16	105.64	24.08	6.60	0.28	0.32	4,358.98	9.95	1.39	129	127	2.14	7.52
Bay D'Espoir - 04																	
43,814.71	57.19	0.00	15,586.57	35.57	19	145.05	28.55	7.63	0.92	0.92	3,171.83	7.24	2.25	1307	1305	1.50	5.40
Bay D'Espoir - 05																	
43,815.20	44.42	0.00	21,573.85	49.24	16	151.58	30.31	9.47	0.70	0.70	2,779.65	6.34	2.44	1234	1232	1.96	4.04
Bay D'Espoir - 06																	
43,815.64	46.40	0.00	20,868.48	47.63	15	146.32	42.68	9.75	0.70	0.70	2,621.23	5.98	2.52	1191	1189	0.88	4.76
Bay D'Espoir - 07																	
43,821.60	0.08	5.56	41,470.69	94.64	7	217.39	194.16	31.06	0.52	0.53	2,315.71	5.28	0.84	36	36	0.30	4.49
Hind's Lake																	
Hind's Lake - 01																	
43,814.98	33.36	0.00	27,017.98	61.66	25	345.60	80.68	13.82	1.26	1.28	2,190.28	5.00	4.21	1296	1292	0.94	3.25
Godaliech																	
Godaliech - 01																	
43,820.22	8.54	0.00	37,527.31	85.64	42	428.50	95.66	10.20	1.13	1.23	2,587.04	5.90	7.70	532	528	1.67	3.17

GENERATING UNIT PERFORMANCE REPORT GA - RP40

FOR UTILITY: Newfoundland And Labrador Hydro
FOR PERIOD: 1999-01-01:00:00 TO 2004-01-01:00:00
EXTERNAL CAUSES: Excluded

Hydraulic Generating Unit

UNIT HOURS (H)	ABNOF (%)	SYN.CD FACTOR (%)	OP TIME (H)	OP FACTOR (%)	NO. FORCED OUTAGES	TOT F.O.T. (H)	MAX F.O.D. (H)	MEAN F.O.D. (H)	FOR (%)	DAFOR (%)	TOT EQ. OUT.TIME (H)	ICBF (%)	FAIL RATE	ATTEMPTED STARTS	SUCCESSFUL STARTS	MOF (%)	POF (%)
Cat Arm																	
Cat Arm - 01																	
43,822.15	3.21	4.94	38,898.04	88.76	17	88.48	29.00	5.20	0.23	0.32	3,552.30	8.11	3.38	162	162	1.18	6.65
Cat Arm - 02																	
43,822.37	1.88	3.30	40,045.85	91.38	24	321.22	82.90	13.38	0.80	0.92	3,004.02	6.85	3.94	134	133	0.77	5.24
Paradise River																	
Paradise River - 01																	
43,819.38	43.77	0.00	22,171.35	50.60	29	427.31	64.45	14.73	1.89	1.89	2,467.38	5.63	6.72	647	639	0.90	3.75
Granite Canal																	
Granite Canal - 01																	
3,698.13	14.02	0.00	2,616.97	70.76	13	251.40	218.58	19.34	8.76	9.16	574.60	15.54	23.43	86	81	8.26	0.16

Hydraulic Generating Unit: 13