Q. With regard to the report entitled *Plan of Projected Operating Maintenance Expenditures 2005 – 2014 for Holyrood Generating Station* dated August 2004, please, for the record, provide a copy of the same and provide the context in which this forecast is made. Specifically, what is the plan for Holyrood going forward; i.e., how does it fit with the current integrated resource plan, what is the forecast energy production from Holyrood over the next ten years, what is Holyrood's impact on Hydro's environmental initiative, and provide a cost/benefit analysis of Holyrood's continued operation incorporating the latest forecast of maintenance and capital expenses at the plant.

A. The report entitled *Plan of Projected Operating Maintenance Expenditures 2005 – 2014 for Holyrood Generating Station* dated August 2004 is attached.

Hydro, in its 2007 Capital Budget Application to the Board, is proposing to spend $3.3 million to carry out a study to assess the current condition of Holyrood and investigate future options. The results will be incorporated into an overall supply assessment to assist in ensuring a least cost, long-term solution for Hydro's customers.

Plan of Projected Operating

Maintenance Expenditures

2005 - 2014

For Holyrood Generating Station

Newfoundland & Labrador Hydro

August 2004

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INTRODUCTION

In the Decision and Order No. P. U.14 (2004) of the Board of Commissioners of Public Utilities ("the Board"), dated May 4,2004 , (the 'Order) Newfoundland and Labrador Hydro ("Hydro") is required to **"file a ten year plan of maintenance expenditures for the Holyrood Generating Station with its annual capital budget application, until otherwise directed by the Board**" (p. 64 and Paragraph 12, p. 166 of the Order).

This requirement is specifically related to system equipment maintenance costs; therefore, capital expenditures have not been included in the following report. Capital expenditures for Holyrood are submitted annually to the Board with other Hydro capital proposals as part of annual capital budget applications, and vary from year to year.

This report addresses the identified and expected operating maintenance (O&M) expenditures for the years 2005 to 2014 inclusive. With respect to the O&M expenditures it must be noted that Unit Nos. 1 and 2, as well as two of the main fuel storage tanks and other associated ancillary equipment, are in excess of thirty (30) years old. Unit No. 3 is in excess of twenty (20) years old, along with its associated equipment, including the other two main fuel storage tanks. While many components of this equipment have been replaced and additional items added through the maintenance and capital program over the years, numerous pieces of equipment and components are original equipment.

An accurate ten (10) year plan of system equipment maintenance is difficult to complete given the harsh operating environment, varied production requirements and the age of the units. This report, however, outlines for the next ten (10) years, maintenance items that are anticipated at this time. This plan, of course, will change as time progresses as the operating condition of the equipment will be continuously reviewed and, undoubtedly, events will occur that are not foreseen at this time, that will require changes in the currently anticipated annual

maintenance. As can be seen from this report, there must be variation in annual operating costs for the Holyrood Thermal plant. It is not possible to “levelize” the cost of maintaining a plant such as Holyrood where there are numerous components and systems integrated together to form a fossil fired thermal electric generating system.

MAINTENANCE PHILOSOPHY

The Board, in its Order as related to the Holyrood Thermal Plant, noted at p. 64 that **"The Board will require NLH's10 year plan of maintenance expenditures for the Holyrood Generating Station to be updated annually to reflect changing operating circumstances."**

It would be useful to first review the three main types or categories of maintenance undertaken at Holyrood.

1) Preventive Maintenance

While it is true that any plant will incur greater maintenance costs as it ages, Holyrood has used, and continues to use, up-to-date maintenance techniques and practices to maintain plant efficiency, availability and reliability. These include preventive, predictive and condition-based maintenance techniques, which are usually referred to by the overall term of "Preventive Maintenance". The basic principle underlying this approach to maintenance is timely intervention to prevent imminent or catastrophic failure, which may cause a substantial safety exposure, increase in cost or extended unavailability of the unit or system.

Preventive maintenance, in its specific sense, comprises routine inspections, checks and component replacement at specific time intervals, to prevent failures known, or reasonably expected, to occur within a definable time or operating hour interval during the life of the equipment, e.g. generator brush wear, air and oil filter replacements, etc. This also includes discarding equipment or components rather than repairing them when it is less expensive to do so.

Predictive maintenance involves routine testing of equipment to determine deterioration rates and initiating and carrying out repairs in a timely manner before a failure occurs, e.g. ultrasonic thickness checks on fluid

lines to monitor erosion wear rates, non-destructive testing of boiler and turbine components to determine fatigue, wear or corrosion rates and remaining life. Predictive maintenance items include such things as boiler and auxiliary equipment annual overhaul, among other items, wherein an assessment is made of components or subsystems that are only accessible during these overhauls.

There is also regular or continual monitoring of equipment operating parameters with a comparison of the results with optimum conditions to determine the most economic time to intervene and perform remedial work that is intended to return the equipment to optimum performance levels, e.g. air heater washes, generator winding insulation condition, oil sampling and testing, etc.

Turbine major and minor overhauls are, effectively, long-term predictive and preventive maintenance activities. A turbine major overhaul is a major disassembly, inspection and repair of the whole turbine. Since this is a very expensive and time consuming activity, the time between these overhauls is extended to minimize the recurring cost and maximize the equipment operating time, and thus useful life of the internal wearing components. Prior to 1988, these major overhauls were carried out at four-year intervals; a subsequent assessment of the risk and cost savings resulted in extending these overhauls to six-year intervals.

In 2003, a study was undertaken by Hartford Steam Boiler Insurance Company, using their proprietary program called Turbine Overhaul Optimisation Program (TOOP). This assesses the causes of failure, the risk of failure and the maintenance history of the Turbines, then proposes the optimum frequency between major overhauls. This assessment concluded that the Turbine major overhaul interval could be extended to 9 years from the major overhaul of Unit #1 in 2003, the major overhaul of Unit #2 in 2005 and the major overhaul of Unit #3 in 2007, providing that

certain upgrades of internal components are made. These recommendations have been accepted and provision for the required upgrades have been incorporated into this updated 10 year plan, see Appendix 3, 2005 , Unit 2 TOOP Project.

Turbine valve overhauls are carried out at three-year intervals, between major overhauls. This has been found necessary, due to the critical nature of the safety and reliability aspects of these valves to the turbine operation and integrity, and will continue to be maintained on this three year interval between major overhauls.

2) Corrective Maintenance

In addition to the predictive maintenance tactics outlined above, there are also corrective maintenance requirements. These include repairs to equipment as it fails or reaches the point where preventive maintenance has identified that the equipment is approaching the end of its useful service life. e.g. wear and tear on pumps, pipes and valves in the main and auxiliary systems, motor rewinds due to failed or deteriorated winding insulation, or as a result of adverse conditions (humidity, salt laden atmosphere, etc), replacement of corroded piping equipment and boiler tube failure repairs etc. In 2003, Unit #2 suffered 2 Superheater Tube failures and their analysis indicates a common tube failure mechanism problem may be developing, however, at this stage, no provision has been made for additional tube failure repairs, but may require future capital refurbishment, depending on future failures and subsequent assessment.

3) Projects

Operating projects are those major cost repairs and inspections that are required to return structures and equipment to their original condition or near original condition to maintain structural integrity, possibly extend plant life, improve efficiency, improve availability and prevent or reduce

environmental risks. Such projects include building structural steel, roof repairs/replacement, fuel oil tank and pipeline inspection and coating, replacement of vendor unsupported equipment or components, etc. A major Asbestos Abatement program is planned to commence in 2005 and would be completed over a three year period. Due to the significant cost anticipated (approaching $9M), Hydro will be applying for approval to treat this as an extraordinary repair, which will mean each annual cost will be recovered over five years, bringing the total cash flow period to eight years, 2005 to 2102.

COST VARIABILITY

Preventive maintenance costs are generally incurred annually at a constant level and do not significantly fluctuate. This does not apply to corrective maintenance costs, which are unavoidable and somewhat unpredictable due to the changing energy production demands on the units from year to year. These changing demands give rise to changes in wear rates, the majority of which cannot be monitored closely enough for reasonably accurate prediction, without incurring excessive inspection expenses. Excessive inspection may in itself introduce increased risk of failure and thus additional cost, so all must be considered in balancing the most appropriate process of inspection with accepted levels of failure. These generally balance from one year to another, but the root activity certainly changes in that it may be totally unrelated equipment that initiates the expense.

The turbine major and valve overhaul costs are cyclic in nature. With three units in the plant on a nine-year major Turbine overhaul cycle interspersed with a three-year valve overhaul, this component of the system equipment maintenance cost is one of the major causes of the observed annual fluctuations that make normalizing annual maintenance costs difficult.

Similarly, major operating projects, because of their extended maintenance intervals (years) or non-repeatability also add to the annual fluctuations of the system equipment maintenance costs.

Maintenance projects for the Holyrood Thermal plant are planned on a five-year horizon, but as with any plan, it is not ‘fixed’ or definitive, as other events will cause a shift in the prioritization of such projects. This five-year maintenance plan is regularly updated by Hydro as time progresses.

DETAILED ANALYSIS

Attached are Appendices 1 to 7, which set out the ten-year maintenance plan for the Holyrood Thermal plant, as requested by the Board. Appendix 1 is a summary and indicates the expected expenditures in each of the major equipment groupings containing system equipment maintenance (SEM) costs for the years 2005 to 2014. Appendices 2 to 7, inclusive, show the expected SEM costs categorized according to Preventive, Corrective, Overhauls and Major Operating Projects for each of the major equipment groupings containing SEM costs.

This plan was prepared using the 2005 preventive, corrective and overhaul data and the current 2005 to 2009 operating project lists from Hydro's five-year plan for the Holyrood Thermal Plant as the base data. Considerable judgment of plant personnel had to be used to prepare a forecast ten-year plan.

Hydro does not normally use any escalation in its five-year operating plan at the Plant on a regional level. This five-year plan is used for internal purposes and work planning rather than detailed financial planning. However, in the attached ten-year plan, an escalation factor has been used, the source of which is the Spring 2004 Hydro forecast. A single escalation rate was used in this exercise and assumed a 50% weighting of Labour escalation and 50% of Material escalation, and is as follows:-

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014
%	2.1	2.0	2.0	2.2	2.2	2.2	2.2	2.3	2.2

Appendices 2 to 7 list the categories of SEM costs for the years 2005 to 2014 in each of the major equipment groupings containing SEM. The categories listed are:

Preventive – Annual	These are the routine preventive maintenance activities carried out every year
Corrective	These are the expected breakdown/emergency repairs carried out during the year
Turbine – Major	These are the major overhauls now planned every nine (9) years
Turbine – Minor	These are major valve overhauls currently carried out every three (3) years, between major overhauls.
Boiler – Annual	These are boiler overhauls and carried out annually
Auxiliary Equipment	These are annual overhauls of various pieces of equipment supporting the Unit.
Operating Projects	These are non-capitalized projects, justified on the basis of Reliability, Safety, Environment or Cost Benefit Analyses.

Appendices 2, 3 and 4 (for Unit Nos. 1, 2 and 3 respectively) use all of the foregoing categories. Appendices 5, 6 and 7 are for the remaining equipment groupings of Common Equipment, Building and Grounds, and Water Treatment Plant & Environmental and use only Preventive - Annual, Corrective and Major Operating Projects.

It must be noted that the Appendices do not itemize preventive annual and corrective items. It is not practical to itemize preventive-annual items, since these are a large number of relatively small jobs. Corrective items include a large number of small value jobs, the greater of which are largely unknown until they happen; thus, it is not practical to itemize these either. Projects included in

the headings of Operating Projects, Turbine - Major and Turbine - Minor work have been itemized in the year that the work is planned for execution.

The total Project cost associated with each Appendix is shown in the bottom row of that Appendix.

Hydro's normal five-year plan identifies specific projects up to 2009. For the period 2010 to 2014, Hydro used an average per unit of the project budgets for the three units over the years 2005 to 2009 as an estimate from 2010 on with escalation. This approach was taken, as it is not practical or possible to determine specific work items, which are essentially unknown for the period of 2010 to 2014.

The fluctuating nature of the SEM Expenses is primarily caused by the large dollar value Major Turbine Overhauls, and the schedule for these and Turbine Minor Overhauls is shown below:

Unit	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
No. 1		Minor			Minor			Major		
No. 2	Major			Minor			Minor			Major
No. 3			Major			Minor			Minor	
General Cost	↑	↓	↑	↓				↑	↓	↑

SUMMARY

This Plan presents the best available information at this time for a ten-year forecast of the maintenance projects for the Holyrood Plant and is based on the 2005 system equipment maintenance budget. As with any forecast, it is subject to change depending on the operating demands of the plant, the results of inspections and assessments of changing equipment conditions.

The Plan takes into account up-to-date maintenance tactics being used and known restoration and inspection work. As can be seen from the Plans, fluctuations in the annual cost cannot be eliminated due to the Turbine Major Overhauls and Turbine Valve Overhauls every three years, between major overhauls, as well as the large but infrequent Major Operating projects, such as Fuel Oil Storage Tank painting and inspection.

APPENDIX 1

TOTAL HOLYROOD SEM[1] 10 YEAR MAINTENANCE EXPENDITURES ESCALATED (K)

	($000)										
	Base Year 2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
UNIT #1 Total SEM	1,120	1,645	1,167	1,275	1,804	1,477	1,509	3,107	1,578	1,613	
UNIT #2 Total SEM	3,240	1,159	1,365	1,701	1,445	1,477	1,885	1,543	1,578	3,248	
UNIT #3 Total SEM	1,250	1,494	3,447	1,190	1,445	1,844	1,509	1,543	1,971	1,613	
Common Equipment Total SEM	1,321	2,223	2,421	2,951	3,016	2,779	2,120	1,529	1,236	1,263	
Buildings and Grounds Total SEM	1,776	1,321	654	571	1,149	1,124	1,712	1,166	1,188	1,210	
WT Plant & Environmental Total SEM	388	232	315	340	323	376	384	253	269	275	
Total Holyrood SEM	9,097	8,075	9,369	8,029	9,182	9,076	9,119	9,141	7,819	9,222	
Total Operating Projects	3,150	3,043	3,177	2,793	3,832	3,609	3,531	2,249	1,977	2,017	

[Total 1] SEM – System Equipment Maintenance

APPENDIX 2

HOLYROOD 10 YEAR MAINTENANCE PLAN

	($000)										
Unit No. 1	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Preventive – Yearly	29	30	31	31	32	33	33	34	35	35	
Corrective	290	296	302	308	315	322	329	336	344	351	
Turbine Major Overhaul								1,564			
Turbine Valve Overhaul		338			359						
Boiler Annual Overhaul	680	694	708	722	738	754	771	788	806	824	
Auxiliary Equipment Annual Overhaul	121	124	126	129	131	134	137	140	143	147	
Operating Projects											
Air Heater Cold End Repairs		163									
Unit 1 Boiler Feed Pump East Overhaul				85							
Projects - Lump Sum for Future Years					229(1)	234	239	244	250	255	
Total - Unit No. 1	1,120	1,645	1,167	1,275	1,804	1,477	1,509	3,107	1,578	1,613	
Total Operating Projects Unit 1		163		85	229	234	239	244	250	255	

(1) 229 - Average Project Cost Per Unit 2005 to 2008 (plus escalation)

APPENDIX 3

	($000)										
Unit No. 2	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Preventive – Yearly	29	30	31	31	32	33	33	34	35	35	
Corrective	290	296	302	308	315	322	329	336	344	351	
Turbine Major Overhaul	1,350									1,636	
Turbine Valve Overhaul				352			375				
Boiler Annual Overhaul	680	694	708	722	738	754	771	788	806	824	
Auxiliary Equipment Annual Overhaul	121	124	126	129	131	134	137	140	143	147	
Operating Projects											
Unit 2 FD Fan Bearings	10										
Unit 2 Service Transformer Coolers	85										
Unit 2 TOOP Recommendations	200										
Additional Turbine Overhaul Work	250										
Replace Boiler Scanners	100										
Unit 2 Boiler Stop Valve Temp Repair	125										
Unit 2 Vacuum Pump South		15									
Air Heater Cold End Repairs			167								
Gen Hydrogen Purge Valve Relocation			31								
Replace Unit 2 Stop Valve				159							
Projects - Lump Sum for Future Years					229 (1)	234	239	244	250	255	
Total - Unit No. 2	**3,240**	**1,159**	**1,365**	**1,701**	**1,445**	**1,477**	**1,885**	**1,543**	**1,578**	**3,248**	
Total Operating Projects Unit 2	770	15	198	159	229	234	239	244	250	255	

(1) 229 - Average Project Cost Per Unit 2005 to 2008(plus escalation)

APPENDIX 4

	($000)										
Unit No. 3	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Preventive – Yearly	29	30	31	31	32	33	33	34	35	35	
Corrective	290	296	302	308	315	322	329	336	344	351	
Turbine Major Overhaul			1,406								
Turbine Valve Overhaul						367			392		
Boiler Annual Overhaul	680	694	708	722	738	754	771	788	806	824	
Auxiliary Equipment Annual Overhaul	121	124	126	129	131	134	137	140	143	147	
Operating Projects											
Unit 3 Damper Platforms	35										
North Extraction Pump Overhaul	65										
Remove Obsolete Hitass System	20										
Turbine Performance Instrumentation	10										
Purchase Turbine Packing for 2007		255									
Purchase Turbine Buckets for 2007		51									
Replace #3 UPS Batteries		12									
Unit 3 Sootblower System		2									
Unit # 3 Condenser Eddy Current Test		30									
Turbine Diaphragm Major Repair			260								
Turbine Bucket Replacement			156								
HP/IP Diaphragm Spill Strip Repairs			104								
Turbine Snout Ring Inspection			167								
Turbine Nozzle Block Repairs			104								
Unit 3 Boiler Feed Pump East Overhaul			83								
Projects - Lump Sum for Future Years					229(1)	234	239	244	250	255	
Total - Unit No. 3	1,250	1,494	3,447	1,190	1,445	1,844	1,509	1,543	1,971	1,613	
Total Operating Projects Unit 3	130	351	875	0	229	234	239	244	250	255	
Total SEM for all Three Units	5,611	4,299	5,979	4,166	4,695	4,798	4,904	6,192	5,127	6,474	
Total Project Work for Three Units	900	529	1073	244	687	702	717	733	750	766	

(1) 229 - Average Project Cost Per Unit 2005 to 2008 (plus escalation)

APPENDIX 5

	($000)										
Common Equipment	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Preventive – Yearly	168	171	175	178	182	186	190	195	199	204	
Corrective	453	463	472	482	492	503	514	525	537	549	
Operating Projects											
Asbestos Removal Program	274	928	1,518	1,844	1,885	1,622	938	321			
Luminaire Replacement	50	51									
Pipe Surveillance Program	50	51									
Plant Colour Coding	15	15	16								
Warm Air Make Up Steam Coil Replacement	200	204	208								
Hydraulic Oil System Temperature Control	12										
Install Totalizing Meters on H2 System	24										
Light Oil Temperature Controls To WDPF	10										
Motor Controls Turbine Board	4										
Pegging Steam Controls to WDPF	10										
Stage I Emergency Diesel Controls	20										
Unit 3 Fuel Oil Flow meter	16										
Plant Electrical Conduit and Lighting	15										
Painting Mechanical Equipment		51									
Install Paging System		271									
Replace UPS #4 Batteries		12									
Inspection of Seal Pits and Piping		5									
Marine Terminal Fender Repairs			31								
Projects – Lump Sum for Future Years				447(1)	457	467	477	488	499	510	
Common Equipment Total	1,321	2,223	2,421	2,951	3,016	2,779	2,120	1,529	1,236	1,263	
Total Operating Projects Common Equipment	700	1,589	1,774	2,291	2,342	2,089	1,415	809	499	510	

(1) 447 - Average Project Cost 2005 to 2007 (less Asbestos Removal, plus escalation)

APPENDIX 6

	($000)										
Buildings Grounds	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Preventive – Yearly	213	217	222	226	231	236	242	247	253	258	
Corrective	225	230	234	239	244	250	255	261	267	273	
Operating Projects											
Fuel Oil Tank Inspection and Repairs	500	209			543		567				
Coat Powerhouse Floors	20	67									
Heat Tracing and Rejuvenate Piping	80										
Landscaping/Paving	20										
Marine Terminal Major Inspection	20										
Replace 6 Concrete Light Poles	20										
Outdoor Lighting East Side of Plant	9										
Stack Repairs	50	153									
Coat Interior Liner Panels	100	102	104	106	130						
Powerhouse Roof Replacements	230	184									
Repair and Repaint Structural Steel	90	92	94								
Vegetation Control	4										
Remote Radio Control for T/H Crane	16										
Drainage Improvement North Side of Plant	7										
Ventilation Upgrade for WWTP Basins	172										
Rehabilitation of Tank Farm Pipe Supports		41									
Install Fire Rated Windows in Control Room.		26									
Projects - Lump Sum for Future Years						638(1)	648	658	669	680	
Total – Buildings and Grounds	1,776	1,321	654	571	1,149	1,124	1,712	1,166	1,188	1,210	
Total Operating Projects Buildings and Grounds	1,338	874	198	106	673	638	1,215	658	669	680	

(1) 638 - Average Project Cost 2005 to 2009 (plus escalation)

APPENDIX 7											
	($000)										
Wt Plant and Environmental	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Preventive – Yearly	54	55	56	57	59	60	61	63	64	65	
Corrective	122	125	128	130	134	136	139	141	146	149	
Operating Projects											
Replace WT Plant A Train Resin						47					
Replace WT Plant B Train Resin	42						48				
Replace WT Plant C Train Resin								49			
Replace Unit 1 Cond Polisher East Resin					65						
Replace Unit 1 Cond Polisher West Resin					65						
Replace Unit 2 Cond Polisher East Resin	60						68				
Replace Unit 2 Cond Polisher West Resin	60						68				
Replace Unit 3 Cond Polisher East Resin						67					
Replace Unit 3 Cond Polisher West Resin						67					
Mixed Bed A Resin Replacement	50								59		
Mixed Bed B Resin Replacement		51								61	
110 V Power Supply to Landfill Site				18							
Projects - Lump Sum for Future Years			131(1)	134							
WT Plant and Environmental Total	388	232	315	340	323	376	384	253	269	275	
Total Operating Projects WT Plant and Env	212	51	131	152	130	180	184	49	59	61	

(1) 131 - Average Project Cost 2005 to 2006 (plus escalation)