Q. [Account 363] – Please state the Company's policy regarding its plans to phase out any type of street light and the corresponding underlying reason and projected dates of retirements.

A. In 2009, Newfoundland Power commenced a planned 3-year project to replace its remaining mercury vapour ("MV") street light fixtures with more energy-efficient high pressure sodium fixtures. Attachment A is a copy of the report *Energy Efficient Street Lights* submitted in support of that program in the Company's 2009 Capital Budget Application.

While the phase-out of MV street lights was largely concluded in 2011, a small number of the MV street lights have not yet been replaced. Any planned replacements of MV street lights that are not yet completed will be addressed in the near term as part of the annually recurring Street Lighting capital budget project.

The Company has no current plans to phase out any other types of street lights.

ENERGY EFFICIENT STREETLIGHTS

June 2008

ENERGY EFFICIENT STREETLIGHTS

Convert Mercury Vapour Streetlights
To High Pressure Sodium

June 2008

Prepared by:

Jack Casey, P.Eng.

NEWFOUNDLAND POWER
A FORTIS COMPANY

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1.0 Introduction

Newfoundland Power ("the Company") maintains approximately 56,000 streetlights providing street and area lighting throughout its service territory, including approximately 7,000 Mercury Vapour (MV) streetlights. These MV streetlights are not as energy efficient as the High Pressure Sodium (HPS) streetlights that have replaced the MV units as the Company standard. Through normal attrition approximately 538 MV streetlights are replaced each year. At the current replacement rate it will take approximately 13 years to remove all of the remaining 7,000 MV streetlights from the distribution system. This study examines the feasibility of converting the remaining MV streetlights to HPS at an accelerated rate.

In 1982 Newfoundland Power's street lighting standard was changed from MV to HPS streetlights. The change was justified on the improved efficiency of the HPS lamps, with the HPS lamp providing higher light output at lower wattages and associated energy savings.

There has been no MV streetlight fixtures purchased since the standard was changed in 1982. Replacement lamps and some components have been purchased, and limited repairs have been completed on existing fixtures. Therefore all remaining MV streetlight fixtures were purchased prior to the 1982 change in standard. At an age in excess of 26 years, these fixtures have an in service life greater than what would normally be expected.

2.0 Energy Savings

Energy efficient streetlights provide the same quality of area lighting while consuming less electricity. For example, 175 watt MV lamps may be replaced by more efficient 100 watt HPS lamps to realize energy savings of more than 35% while providing the same light output. Table 1 identifies the energy and demand savings achieved from replacing a MV streetlight with the appropriate HPS streetlight.

Table 1
Energy Savings

		Mercury Vapour Lamps	
Lamp Size	**175 Watts**	**250 Watts**	**400 Watts**
Loading Watts	200	283	445
KWH per Year	840	1,189	1,869
		High Pressure Sodium Lamps	
Lamp Size	**100 Watts**	**150 Watts**	**250 Watts**
Loading Watts	130	191	303
KWH per Year	545	802	1,273
		Savings	
Energy savings[1] (KWH)	294	386	596
Demand Savings (Watts)	70	92	142

[1] Calculated based upon 4,200 hours of operation per year.

3.0 System Savings

There are approximately 7,000 MV street lights remaining in service. Collectively, they have the potential to reduce the energy consumption attributable to street lighting by 2,184 MWh on an annual basis. During time of system peak, replacing these 7,000 street lights with the more energy efficient HPS lamp, would remove approximately 0.5 MW from the system peak. Table 2 identifies the estimated energy and demand savings associated with replacing the MV streetlights with HPS streetlights.

Table 2
Estimated Energy and Demand Savings

MV Lamp Size	Quantity	Energy Savings (MWh)	Demand Savings (kWs)
175 watts	5,900	1,734	413
250 watts	980	378	90
400 watts	120	72	17
Total	**7,000**	**2,184**	**520**

4.0 Economic Analysis

In order to estimate the financial benefit associated with a more energy efficient form of street lighting, an incremental cost of electricity must be selected. Recent marginal cost studies suggest that energy costs at the Holyrood Thermal Generating Station is a good proxy for the marginal cost of electricity on the system. Based upon most recent fuel pricing projections, an estimate of the 25 year levelized cost of energy[2] from the Holyrood facility is 12.84¢/KWh.[3] More recently Newfoundland and Labrador Hydro has entered into power purchase agreements with two wind energy proponents. Under these agreements wind energy will be purchased for approximately 6.7¢/KWh[4].

To evaluate the economic impact of the proposed streetlight replacement, a comparison of the cumulative present worth revenue requirement for two alternatives was considered.

Option 1 is the “status quo” alternative where the remaining 7,000 MV streetlights are replaced through normal attrition at the rate of 538 per year. This rate reflects the average annual replacements over the period 2001 to 2007. At the rate of 538 streetlights per year, it will take approximately 13 years to remove all MV streetlights from the system.

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2 Incremental energy from the Holyrood thermal generating station is estimated at 10.63 cents per kWh for 2009 (based upon $67.00 per barrel of No. 6 fuel from Hydro’s fuel price projection dated March 31, 2008), with associated levelized cost of 12.84 cents per kWh over 25 years and 13.90 cents per kWh over 50 years.

3 The 25 year levelized cost was selected for comparison purposes because it more closely approximates the anticipated life expectancy of a street light.

4 Response to Request for Information PUB 1.0 NLH, Newfoundland Power’s application for approval of capital expenditures supplemental to its 2008 Capital Budget to connect two 27 MW wind farms to the Island Interconnected System.

Option 2 is the planned replacement of all 7,000 MV streetlights over a 3 year period commencing in 2009. The decision to complete the work over 3 years was based upon managing the Company's workforce and contractors effectively, in concert with the other distribution work included in the 5 year capital plan.

Appendix A includes the present worth analysis for the two alternatives. Option 1 has a cumulative present worth cost of $1,522,000 over the period from 2009 to 2030[5]. Option 2 has a cumulative present worth cost of $896,000 over the same period. Selecting Option 2 over Option 1 provides a net present worth ***benefit*** of approximately $626,000.

The present worth analysis shows that the project is economic when compared to the alternative of replacing MV streetlights through normal attrition.

Using the present worth benefit analysis provided in Appendix A, and taking into account the net energy savings over the period from 2009 to 2030, the levelized cost of energy saved through this project is 5.65¢/KWh. This levelized cost of energy compares favourably with the 25-year levelized cost of energy from the Holyrood Thermal Generating Station and the power purchase price for the proposed wind energy projects.

Table 3 shows the cost breakdown for the 3-year project.

Table 3
Project Costs 2009-2011
(000s)

Year	Budget
2009	$806
2010	$581
2011	$581
Total	**$1,968**

5.0 Concluding

Converting the remaining 7,000 mercury vapour streetlights with high pressure sodium streetlights is technically and economically feasible. Replacing mercury vapour streetlights with the more energy efficient high pressure sodium streetlights is consistent with improved energy efficiency.

The economic analysis indicates that the project as proposed provides a net cost benefit of approximately $626,000 over the life of the equipment when compared to the current process of replacing streetlights through normal attrition. Also, the levelized cost of energy saved compares favourably with other sources of energy on the Island Interconnected System.

[5] The period 2009 to 2030 was selected to represent the reasonable life expectancy of the street lights.

Appendix A

Present Worth Analysis

Present Worth Analysis

Option 1
Replace 7,000 MV Streetlights Through Attrition
(538 units per year)

Weighted Average Incremental Cost of Capital	**7.27%**
Present Worth Year	**2008**
Depreciation Rate	**20years @ 8% CCA**

Year	Capital Cost	Capital Revenue Requirement	Operating Costs	Operating Benefits	Net Benefit	Present Worth Benefit	Cumulative Present Worth Benefit
2009	134,500	14,657	121,333	21,569	-114,421	-106,667	-106,667
2010	136,652	31,630	114,469	43,139	-102,960	-89,477	-196,144
2011	138,702	48,565	107,249	64,708	-91,105	-73,809	-269,953
2012	140,782	65,401	99,786	86,278	-78,910	-59,596	-329,549
2013	143,176	82,207	92,257	107,847	-66,616	-46,902	-376,451
2014	145,610	98,963	84,443	129,417	-53,989	-35,435	-411,886
2015	148,085	115,648	76,336	150,986	-40,998	-25,085	-436,971
2016	150,602	132,242	135,859	172,556	-95,545	-54,498	-491,469
2017	153,313	148,741	128,426	194,125	-83,041	-44,156	-535,625
2018	156,073	165,130	120,681	215,695	-70,116	-34,756	-570,381
2019	158,882	181,392	112,615	237,264	-56,743	-26,221	-596,602
2020	161,742	197,512	104,220	258,834	-42,899	-18,480	-615,082
2021	164,653	213,475	95,487	280,403	-28,558	-11,469	-626,551
2022		210,999	86,405		-297,404	-111,340	-737,891
2023		205,416	153,930		-359,346	-125,412	-863,303
2024		199,618	156,701		-356,319	-115,928	-979,230
2025		193,667	159,522		-353,189	-107,121	-1,086,352
2026		187,503	162,393		-349,897	-98,931	-1,185,282
2027		181,143	165,316		-346,460	-91,320	-1,276,602
2028		173,491	168,292		-341,783	-83,982	-1,360,584
2029		158,160	171,321		-329,481	-75,472	-1,436,056
2030		143,071	261,607		-404,678	-86,415	**-1,522,471**

Present Worth Analysis

Option 2
Replace 7,000 MV Streetlights in 3 Years
(2009, 2010 and 2011)

Weighted Average Incremental Cost of Capital	**7.27%**
Present Worth Year	**2008**
Depreciation Rate	**20years @ 8% CCA**

Year	Capital Cost	Capital Revenue Requirement	Operating Costs	Operating Benefits	Net Benefit	Present Worth Benefit	Cumulative Present Worth Benefit
2009	581,000	63,316	86,667	93,548	-56,434	-52,610	-52,610
2010	590,296	136,631	44,027	187,096	6,438	5,595	-47,015
2011	599,150	209,786	0	280,644	70,858	57,405	10,390
2012		216,241	0	280,644	64,403	48,640	59,030
2013		212,030	0	280,644	68,614	48,309	107,339
2014		207,628	0	280,644	73,016	47,924	155,262
2015		203,208	0	280,644	77,436	47,380	202,642
2016		198,510	339,649	280,644	-257,515	-146,884	55,758
2017		193,557	345,762	280,644	-258,675	-137,547	-81,789
2018		188,369	351,986	280,644	-259,711	-128,738	-210,527
2019		182,965	0	280,644	97,679	45,138	-165,389
2020		177,361	0	280,644	103,283	44,493	-120,897
2021		171,575	0	280,644	109,069	43,801	-77,096
2022		165,621	0	0	-165,621	-62,004	-139,100
2023		159,511	384,826	0	-544,337	-189,974	-329,073
2024		153,259	391,753	0	-545,012	-177,318	-506,392
2025		146,876	398,804	0	-545,680	-165,504	-671,895
2026		140,372	0	0	-140,372	-39,689	-711,584
2027		133,758	0	0	-133,758	-35,256	-746,840
2028		122,236	0	0	-122,236	-30,035	-776,876
2029		78,171	0	0	-78,171	-17,906	-794,782
2030		35,719	436,012	0	-471,731	-100,733	**-895,515**

Notes:

Capital Cost

The capital cost of both alternatives is calculated using $238 per streetlight, inflated by the appropriate number of years, then multiplied by the quantity of streetlights to be replaced in the given year.

Capital Revenue Requirement

The capital revenue requirement includes depreciation cost, return on rate base and taxes.

Operating Costs

Costs associated with maintaining the 7,000 streetlights. The estimate is based upon the cost to replace lamps on a 7 year cycle. It includes both Mercury Vapour ("MV") lamps and High Pressure Sodium ("HPS") lamps.

Operating Benefits

Energy savings associated with the difference in energy consumption between MV and HPS streetlights, estimated at 12.84¢/KWh.

Net Benefits

The net benefit is calculated as the operating benefit less the operating cost and the capital revenue requirement.

Present Worth Benefit

The calculated present worth of the net benefit in 2008 dollars.

Cumulative Present Worth Benefit

The cumulative present worth benefit for the particular year is the sum of the present worth benefit for the year and the preceding years in 2008 dollars.