PUB 5.0

(RE: p. 15 of 66) Gas Turbine Relocation ($1,674,000)
(RE: p. 21 of 66) Modifications to Accommodate Gas Turbine ($480,000)
(RE: p. 54 of 66) Communications for Gas Turbine Relocation ($102,000)

PUB 5.1

Q. **Provide the SAIFI and SAIDI statistics for each of the past five years (1996 to 2000), and to June 30, 2001 for the Bonavista North area that will be serviced by the relocated gas turbine. Show, by year, how these compare to the company totals. How many of these outages were directly related to weather conditions?**

A. The following table lists the SAIFI and SAIDI statistics due to loss of supply for each of the past five years (1996 to 2000), and to June 30, 2001 for the Wesleyville area as well as the company totals.

	Bonavista North Area		Total Company	
Year	SAIFI	SAIDI	SAIFI	SAIDI
1996	6.7	14.7	2.2	2.2
1997	2.9	5.9	2.3	2.2
1998	4.8	11.0	3.9	4.4
1999	5.8	17.2	2.9	2.6
2000	1.7	2.7	1.7	1.5
2001	0.0	0.0	0.2	0.2

Information on the relationship of weather conditions to outages is not readily available for all outages. However, from the information currently available it is estimated that at least 10% of the interruptions in the period from 1996 to 2000 were a direct result of the weather conditions.

PUB 5.2

Q. **Provide the SAIFI and SAIDI statistics for each of the past five years (1996 to 2000), and to June 30, 2001 for the Burin area that has been serviced by the gas turbine located at the Salt Pond Substation. Show, by year, how these compare to the company totals. How many of these outages were directly related to weather conditions?**

A. The following table lists the SAIFI and SAIDI statistics due to loss of supply for each of the past five years (1996 to 2000), and to June 30, 2001 for the Salt Pond area as well as the company totals.

Year	Salt Pond Area		Total Company	
	SAIFI	SAIDI	SAIFI	SAIDI
1996	5.6	1.7	2.2	2.2
1997	3.8	3.7	2.3	2.2
1998	9.0	2.2	3.9	4.4
1999	2.0	0.2	2.9	2.6
2000	4.0	2.2	1.7	1.5
2001	0.0	0.0	0.2	0.2

Information on the relationship of weather conditions to outages is not readily available for all outages. However, from the information currently available it is estimated that at least 17% of the interruptions in the period from 1996 to 2000 were a direct result of the weather conditions.

PUB 5.3

Q. Describe the circumstances under which the gas turbine was used to provide emergency generation over the past five years. In each of the three cases, how long was emergency generation in use before the regular system was restored?

A. The circumstances under which the Salt Pond gas turbine was used to provide emergency generation on three occasions over the past ten years are as follows:

- December 8th, 1992 - loss of Newfoundland and Labrador Hydro (NLH) infeed from Sunnyside - 231 minute outage, unit operated for 269 minutes
- July 2, 1997 - fault on 138kV bus at NLH Sunnyside Substation - 82 minute outage, unit operated for 110 minutes
- December 8, 1997 - loss of NLH infeed to Sunnyside Substation (TL202 & TL206) - 67 minute outage, unit operated for 87 minutes

PUB 5.4

Q. Provide a copy of the study undertaken to evaluate the various options for improving the reliability of service to the Bonavista North area.

A. A copy of the study undertaken to evaluate the various options for improving the reliability of service to the Bonavista North area is attached.

GAS TURBINE RELOCATION

Project Cost

$1,674,000

Nature of Project

This project is necessary to complete the relocation of a gas turbine from the Salt Pond Substation to the Wesleyville Substation. The work includes the dismantling, transportation and reassembly of the generating unit, as well as construction of a building to house the unit at the new location.

Customer Impact

This project will provide increased electrical system reliability to customers in the Bonavista North area by providing a backup source of energy during outages on the single radial transmission line serving the area. The project will not materially affect the reliability of service to customers in the Burin area.

Project Justification

The Bonavista North area is currently served by a single radial transmission line. This line has experienced higher than average annual SAIFI and SAIDI statistics for the past five years (an average of 3.59 outages and 9.06 hours respectively). The reliability statistics are impacted by the nature of the environment in this area and the fact that approximately 30% of the transmission line is remotely located making access to the line for repairs difficult and service restoration time longer. The Company has explored various options for improving the reliability of service to the area. These options include constructing a second transmission line to serve the area, installing a new source of generation, and relocating an existing generator. Of the three alternatives the least cost option is the relocation of an existing generator. The estimated cost of a second transmission line is approximately $7.0 million, while the cost of a new generator is estimated to be approximately $8.0 million.

The Company will ensure this project is completed at the lowest possible cost consistent with reliable service. All material and contract labour will be obtained through competitive tendering.

Future Commitments

None.

Executive Summary

Transmission-related outages make up a substantial portion of the total outage statistics in areas served by long radial transmission lines. A significant improvement in the reliability of service to these areas can be achieved by locating generation facilities on such radial lines.

A single radial transmission line historically served the Burin Peninsula. When Newfoundland & Labrador Hydro completed a second transmission line to this area in 1990, the need for local generation was greatly reduced. A review of operating records for the 13.4 MW Salt Pond gas turbine (GT) shows that on only 6 occasions over the past 10 years has the unit been operated to provide emergency generation for a transmission-related outage (3 of these instances were scheduled outages). Based on historical data, relocating this unit would increase SAIDI and SAIFI by an estimated 1.1 hours and 0.5 instances respectively for approximately 3,700 customers on the Burin Peninsula. The Salt Pond GT could be much better utilized if it were located in an area presently served by a single radial transmission line.

A review of transmission-related SAIDI and SAIFI reliability statistics indicated that the areas with the greatest need for transmission line improvements or local generation are Wesleyville, Twillingate, Trepassey and Old Perlican. As an aid in determining the site at which the Salt Pond GT would provide the greatest benefit, the cost per minute of reduction in customer outages was calculated for relocating the GT to each of these areas. This cost was also calculated for other possible solutions for the reliability problems in these areas. The other alternatives considered were: paralleling the existing transmission line with a second line, locating new stationary diesels in the area, and purchasing new mobile diesel generating units. The analysis indicated that relocating the Salt Pond GT is the most cost effective solution to the transmission reliability problem in each of the areas studied with the exception of Old Perlican. Of these areas, locating the unit in Wesleyville will provide the greatest overall benefit with a ratio of $0.613 per customer minute of outage reduced.

Another important factor considered in deciding where to relocate the Salt Pond GT was matching the load in the area with the capacity of the unit. The Trepassey and Old Perlican areas presently have 11.2 and 10.9 MVA of peak load respectively. However, the Salt Pond GT would be oversized with respect to the loads in the Trepassey and Old Perlican areas and there are options are available for improving reliability in these areas.

It is therefore recommended that the Salt Pond Gas Turbine be relocated to Wesleyville. It is recommended that environmental registration and equipment design/ordering be completed in 2001. However, the GT should not be taken out of service in Salt Pond until June 2002 with project completion in November 2002. The total capital cost of this project is estimated to be $2,906,000. Of this amount, $650,000 will be required to be spent on unit upgrades within the next year or two regardless of the relocation.

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Appendices

1 Introduction

Long radial transmission lines currently serve a number of areas within Newfoundland Power's (NP) service territory. The reliability of service to these areas is presently of concern, as indicated by the SAIDI and SAIFI statistics provided in Tables 1 and 2 in Appendix A. NP has studied the available alternatives for improving reliability to these areas. These include: paralleling the existing radial transmission line with a second line, installing a new source of generation at the end of the transmission line, or relocating an existing generator that may be underutilized at its present location. With regard to the last option, NP has identified its two gas turbine units at Salt Pond and Greenhill on the Burin Peninsula as currently being underutilized.

2 Gas Turbine Utilization on the Burin Peninsula

The Burin Peninsula is one area which until 1990 was also served by a single radial transmission line. To ensure reliability of service, NP had installed local generating capacity on the Burin Peninsula totaling 41.3 MW. This generating capacity is comprised of three hydro plants and two gas turbines. In late 1990, a second Burin Peninsula transmission line (TL219) was completed by Newfoundland and Labrador Hydro (NLH) to provide additional security and voltage support for the power supply to this area. TL219 significantly reduced the need for local generation on the peninsula for reliability purposes.

The Salt Pond and Greenhill gas turbines (GT) provide the bulk of NP's local generating capacity on the Burin Peninsula. The Salt Pond GT has a demonstrated capacity of 13.4 MW (nameplate capacity of 14.7 MW) and the Greenhill GT has a demonstrated capacity of 22.5 MW (nameplate capacity of 25 MW). From 1991 to 2000, these GTs have both been operated together on only 6 occasions to provide emergency generation for this area. Of these 6 starts, 3 have been in response to scheduled outages.

Based on this information, the generating capacity provided by these GTs is not being fully utilized from a reliability perspective. Relocating one or both of these units could provide much greater reliability benefits to areas served by long radial transmission lines.

Although the GTs have rarely been called upon since the completion of TL219, there have been circumstances whereby the presence of these units has prevented or mitigated an outage on the Burin peninsula. To evaluate the impact of relocating either of the GTs, operating data for the 1991-2000 period was collected and matched with customer interruption reports. Depending on the reason given for unit operation, and whether or not one or both of the gas turbines were operating, an estimate was made of the expected increase in customer minutes of outage on the Burin peninsula should one of the GTs be relocated.

The impact of relocating the Salt Pond unit on Burin area reliability is relatively slight. Approximately 3,700 customers will see an increase in SAIFI of 0.5 (or 1 additional

outage every 2 years) and an increase in SAIDI of 1.1 hours. Relocating the Greenhill GT would affect approximately 6,100 customers with a similar increase in SAIFI of 0.5 and an increase in SAIDI of 0.8 hours. These impacts assume that only one of the GTs is relocated and that the past 10 years of data is representative of future operating conditions. As shown in Appendix A, the customers served by Salt Pond substation have experienced relatively few outages (SAIFI=3.1) and outages of a relatively short-duration (SAIDI=2.1) on the transmission system since 1990.

3 Project Decision Criteria/Alternatives

Initially, consideration was given to seven areas presently served by transmission lines greater than 30 km in length. The list of seven areas, together with general information regarding the load and service reliability for each area is provided in Tables 1 and 2 in Appendix A.

Based on the SAIDI and SAIFI statistics for each area and considering the size of the Salt Pond unit and the number of customers that would benefit from the relocation, it was determined that the Placentia, Port Aux Basques and Baie Verte areas would not be considered for relocation of the GT.

The remaining four areas selected for further study included:

- Wesleyville
- Twillingate
- Trepassey
- Old Perlican

This report will investigate the potential benefits of locating one of the Burin GTs to one of these four areas presently served by a single radial transmission line. As the Greenhill GT is larger and more problematic to relocate, this study will focus on relocating the Salt Pond GT to an area that is presently without backup generation. However, for comparative cost purposes, relocating the Greenhill unit has been included as an alternative option for areas with higher load

3.1 Alternatives to Salt Pond GT Relocation

The alternative solutions to reliability problems in these areas include: paralleling the existing radial transmission line with a second line, locating a new stationary power plant at the end of the transmission line, or purchasing mobile generating capacity which could supply the local loads in these areas in the event of transmission line faults. Relocation of the larger Greenhill gas turbine was also considered as a possible alternative for the two sites having peak loads greater than the capacity of the Salt Pond unit (Wesleyville and Twillingate). The purchase of smaller capacity stationary generating units was also considered as an alternative for the areas where peak loads are currently substantially less than 13 MVA (Trepassey and Old Perlican).

The costs of paralleling the existing transmission lines were based on budgetary estimates provided by the Electrical Engineering group of Power Systems. These estimates assumed a standard cost of $75,000/km of 66 kV transmission line. The line lengths used assumed that the new line would be constructed along the same corridor as the existing line for each area.

The cost estimates for new diesel generation were based on budgetary quotes provided by generating suppliers. For the Wesleyville and Twillingate sites, new (out-of-the box) generating units providing 13 MW of capacity were considered. This alternative was also considered for the Trepassey and Old Perlican sites. However, at these latter two locations, smaller refurbished units were also evaluated as a possible alternative to the GT relocation. The refurbished units are less expensive in terms of $/kW, but the estimated asset lives are shorter and the reliability of such units may require further investigation should this alternative be pursued. The substation modifications, civil works and controls/auxiliaries estimates for all generation alternatives were based on the estimates prepared for the GT relocation. System benefits of new sources of generation were considered in the analysis by way of NP's capacity credit. As the need for new generation is not anticipated until 2007, no capacity credit was included in the analysis before that time.

Upgrading of the existing radial transmission line was not considered as an alternative in this study as such efforts would not be expected to positively impact reliability as much as the other alternatives being considered. Also, quantifying the benefits of the upgrading option would be difficult and therefore comparisons with other options would not be meaningful. Regardless of any decision to install local generation in these areas, NP is committed to continued upgrading and maintenance on the existing radial transmission lines to all these areas.

3.2 Reductions in Customer Minutes of Outage

For each of these areas, an estimate of the reduction in customer minutes of outage that could be realized through additional generation or transmission initiatives was calculated using historical interruption data. The data available covered the period January 1990 up to and including August 2000. The estimates were based on the assumption that all unscheduled transmission related outages exceeding 15 minutes would have been prevented if a gas turbine had been located at the end of the line in question. In addition, all scheduled transmission related outages and all scheduled NLH related outages would not have occurred.

Estimates of the reduction in customer minutes of outage vary for the transmission alternatives when compared with the generation options. This is due to the fact that the benefits for the generation alternatives are calculated considering a time lag (assumed to be 15 minutes) in responding to unscheduled outages. This lag would not occur in the case of a transmission line back-up. In addition, outages due to the loss of NLH infeed would not be alleviated with the transmission option. Reductions in these outages were not considered to be a benefit of this alternative as was the case for the generation

alternatives. The analysis has not considered the possibility that both transmission lines could fail in a single event. Neither has the capacity of the transmission line to serve loads greater than that estimated for the generation alternatives been valued. To some extent these study limitations will offset one another.

3.3 Economic Analysis

All costs used in the project justification and comparison of alternatives are incremental. The cost of any facility/system upgrades that would have been conducted within the next five years, regardless of decisions arising from this study, have been subtracted from the cost estimate for the appropriate alternative (after adjustments for timing differences). This applies primarily to the GT relocation alternative. Incremental operating costs were also used for the justification, which are shown as net of any quantifiable operating savings which would be realized.

Using a revenue requirement analysis, the present worth value of each of the alternatives was determined. The analysis accounted for the differences in asset lives, depreciation rates and CCA categories of the various assets. Copies of the revenue requirement analysis output spreadsheets are contained in Appendix B of this report.

The resulting present worth values were then levelized over a sixty year period and divided by the estimated reduction in customer minutes of outage per year. The resulting numbers provides a useful comparison of the costs and benefits of each option and is an important tool in determining which alternative is the best value for the money invested. A breakdown of the calculation of the Levelized Cost per Customer Minute can be found in Appendix D.

3.4 Alternative Sites

Wesleyville

The radial transmission line to Wesleyville originates at Gambo substation and serves 4 substations located at Hare Bay, Trinity, Greenspond, and Wesleyville. The 1999 peak loads at these substations were 2.9 MVA, 2.4 MVA, 0.8 MVA and 10.1 MVA respectively, for a total of 16.2 MVA. The 13.4 MW Salt Pond GT does not have the capacity to supply this entire load at peak. However, it is assumed that the total load from all of these stations could be carried for 82% of the year, and at all stations except Hare Bay for the entire year.

The Greenhill GT was also considered as an alternative at this site. This 22.5 MW unit would be capable of serving the entire load for this line at all times of year.

The potential annual reductions in customer minutes of outage at each station are provided in table 3-1. This table also provides the estimated benefit provided by a parallel transmission line and the various generation options.

Table 3-1

Sub.	SAIFI Improve.	SAIDI Improve.	Reduction in Customer Minutes of Outage per Year			
	Relocate Salt Pond GT			Relocate Greenhill GT	New 13MW Diesel	Parallel Transmission Line
WES	4.3	8.8 hrs	885,900	885,900	885,900	926,800
GPD	4.2	8.2 hrs	110,600	110,600	110,600	116,700
TRN	3.6	5.9 hrs	234,800	234,800	234,800	249,300
HBS	3.3	2.9 hrs	135,400	143,100	135,400	150,200
Burin	(0.5)	(1.1 hrs)	(255,700)	(315,100)	-	-
Total	-	-	1,111,000	1,051,600	1,366,700	1,443,000

The capital and operating cost estimates for the Wesleyville site for each alternative are provided in table 3-2. These costs are based on the assumption that the GT or new generation would be located at the existing Wesleyville substation site. The estimated costs per minute of reduction in customer outages by implementing each alternative are also provided in this table. More detail regarding the cost estimates for each alternative is provided in Appendix B of this report.

Table 3-2

Alternative	Expected Life of Asset	Initial Incremental Capital Cost	Net Operating Cost per Year	Levelized Cost per Customer Minute
Relocate Salt Pond GT	15	$2,256,000	$52,000	$0.613
Relocate Greenhill GT	15	$2,800,000	$52,000	$0.704
Transmission Line	29	$7,225,000	$90,000	$0.740
New 13MW Stationary Diesel	28	$8,300,000	$108,000	$0.939
New 13MW Mobile Diesel	28	$8,740,000	$108,000	$0.983

Twillingate

The radial transmission line to Twillingate originates at Clarke's Head (where transmission line 142L terminates) and serves 4 NP substations located at Summerford, Twillingate, Indian Cove (off SUM-01 feeder) and Boyd's Cove. No NP load is served by the Boyd's Cove substation but TL254, which serves NLH customers on Change Islands and Fogo, originates from this station. For the purposes of this study, no distinction has been made between NLH customers in Fogo and other NP customers as NP transmission lines serve all of these customers. The 1999 peak loads at these substations were 8.1 MVA (including Indian Cove), 7.2 MVA and 6.5 MVA respectively, for a total of 21.8 MVA. The 13.4 MW Salt Pond GT does not have the capacity to supply this entire load at peak. However, it was assumed that the total load from all of these stations could be carried for 62% of the year, and at Twillingate and Summerford substations for 87% of the year.

The Greenhill GT was also considered as an alternative at this site. This 22.5 MW unit was assumed to be capable of serving the entire load along this line at all times of the year.

The potential annual reductions in customer minutes of outage at each station are provided in table 3-3. This table also provides the estimated benefit provided by a parallel transmission line and the various generation options.

Table 3-3

Sub.	SAIFI Improve.	SAIDI Improve.	Reduction in Customer Minutes of Outage per Year			
	Relocate Salt Pond GT			Relocate Greenhill GT	New 13MW Diesel	Parallel Transmission Line
TWG	4.6	7.2 hrs	691,700	691,700	691,700	759,900
SUM	2.6	2.8 hrs	444,600	444,600	444,600	492,900
IND	2.6	3.5 hrs	74,000	74,000	74,000	80,500
Fogo	1.3	1.1 hrs	78,700	78,700	78,700	94,600
Burin	(0.5)	(1.1 hrs)	(255,700)	(315,100)	-	-
Total	-	-	1,033,300	973,900	1,289,000	1,427,900

The capital and operating cost estimates for the Twillingate site for each alternative are provided in table 3-4 below. These costs are based on the assumption that the GT or new generation would be located at the existing Twillingate substation site. The estimated costs per customer minute of outage reduced by implementing each alternative are also provided in this table. More detail regarding the cost estimates for each alternative is provided in Appendix B of this report.

Table 3-4

Alternative	Expected Life of Asset	Initial Incremental Capital Cost	Net Operating Cost per Year	Levelized Cost per Customer Minute
Relocate Salt Pond GT	15	$2,225,000	$55,500	$0.661
Relocate Greenhill GT	15	$2,885,000	$55,500	$0.776
Transmission Line	29	$6,430,000	$80,000	$0.664
New 13MW Stationary Diesel	28	$8,385,000	$111,500	$1.008
New 13MW Mobile Diesel	28	$8,825,000	$111,500	$1.054

Trepassey

The radial transmission line to Trepassey originates at Blaketown substation and serves 3 substations located at St. Catherines, Riverhead, and Trepassey. The St. Catherines substation was completed in 2000, and therefore interruption data for the load served by this station is limited. The analysis conducted as part of this study considered only Trepassey and Riverhead substation data. The actual benefits attributable to the Trepassey alternatives should exceed these estimates due to the fact that some of the load now served by St. Catherines was previously served by Blaketown substation and therefore would not have been included in this analysis. The 1999 peak loads at the Riverhead and Trepassey substations were 5.8 MVA and 3.7 MVA respectively. The estimated 35% of the Blaketown 02 feeder load transferred to St. Catherine's would add approximately 1.7 MVA to this 1999 peak for a total of 11.2 MVA.

The Salt Pond GT would have excess capacity in handling this entire load at peak and with negligible (or even negative) annual load growth, this unit would be oversized for the load it would be serving in this area for many years. This is undesirable from the perspective of underutilization of generating resources and the transmission losses associated with transporting energy great distances to larger load centers. In addition, such load mismatches may give rise to system capacity concerns should an outage occur on the transmission line coincident with a system peak.

The potential annual reduction in customer minutes of outage at each station is provided in table 3-5 below. This table also provides the estimated benefit provided by a parallel transmission line and the various generation options.

Table 3-5

Sub.	SAIFI Improve.	SAIDI Improve.	Reduction in Customer Minutes of Outage per Year		
	Relocate Salt Pond GT			New Diesel Generation	Parallel Transmission Line
TRP	3.4	15.9 hrs	651,100	651,100	652,000
RVH	2.9	8.9 hrs	629,500	629,500	622,500
Burin	(0.5)	(1.1 hrs)	(255,700)	-	-
Total	-	-	1,024,900	1,280,600	1,274,500

The capital and operating cost estimates for the Trepassey site for each alternative are provided in table 3-6 on the following page. The estimated costs per minute of reduction in customer outages by implementing each alternative are also provided in this table. More detail regarding the cost estimates for each alternative is provided in Appendix B of this report.

Table 3-6

Alternative	Expected Life of Asset	Initial Incremental Capital Cost	Net Operating Cost per Year	Levelized Cost per Customer Minute
Relocate Salt Pond GT	15	$2,150,000	$64,000	$0.669
Refurbished 10MW Diesel	23	$6,000,000	$120,000	$0.808
Transmission Line	29	$7,595,000	$95,000	$0.882
New 13MW Stationary Diesel	28	$8,310,000	$120,000	$1.017
New 13MW Mobile Diesel	28	$8,750,000	$120,000	$1.063

Old Perlican

The radial transmission line to Old Perlican originates at Hearts Content substation and serves 2 substations located at New Chelsea and Old Perlican. The 1999 peak loads at these substations were 3.3 MVA and 7.6 MVA respectively, for a total of 10.9 MVA. Although 4.3 MW of hydroelectric generation is available at New Chelsea, this generation is not located at the terminus of the line and it does not have the capacity to serve the entire load in this area for the majority of the year.

The Salt Pond GT would have excess capacity in handling this entire load at peak and with very small annual load growth, this unit will be oversized for the load it would be serving in this area for many years. This is undesirable from the perspective of underutilization of generating resources and the transmission losses associated with transporting energy great distances to larger load centers. In addition, such load mismatches may give rise to system capacity concerns should an outage occur on the transmission line coincident with a system peak.

The potential annual reduction in customer minutes of outage at each station is provided in table 3-7 below. This table also provides the estimated benefit provided by a parallel transmission line and the various generation options.

Table 3-7

Sub.	SAIFI Improve.	SAIDI Improve.	Reduction in Customer Minutes of Outage per Year		
	Relocate Salt Pond GT			New Diesel Generation	Parallel Transmission Line
OLP	4.0	15.5 hrs	1,534,400	1,534,400	1,539,600
NCH	2.0	7.5 hrs	398,100	398,100	383,000
Burin	(0.5)	(1.1 hrs)	(255,700)	-	-
Total	-	-	1,676,800	1,932,500	1,922,600

The capital and operating cost estimates for the Old Perlican site for each alternative are provided in table 3-8. The estimated costs per minute of reduction in customer outages by implementing each alternative are also provided in this table. More detail regarding the cost estimates for each alternative is provided in Appendix B of this report.

Table 3-8

Alternative	Expected Life of Asset	Initial Incremental Capital Cost	Net Operating Cost per Year	Levelized Cost per Customer Minute
Relocate Salt Pond GT	15	$1,800,000	$66,500	$0.384
Refurbished 8MW Diesel	23	$5,000,000	$122,500	$0.537
Transmission Line	29	$3,660,000	$55,000	$0.291
New 13MW Stationary Diesel	28	$7,960,000	$122,500	$0.652
New 13MW Mobile Diesel	28	$8,400,000	$122,500	$0.683

3.5 Decision Criteria

From the analysis of the Levelized Cost per Customer Minute statistics, it is clear that for most of the areas considered, the lower cost option is achieved by relocating the Salt Pond GT. The exception is the Old Perlican area, where the parallel transmission line alternative has been determined to be the lower cost option to improve reliability.

If the Salt Pond unit is relocated, the load to be served at the destination chosen should be matched with the size of the unit. Loads for these areas are included in Tables 1 and 2 of Appendix A and have been expressed in terms of the 1999 peak load. Load growth in all of the areas is considered very small, and in the case of some areas (such as Trepassey) loads have been declining in recent years. The demonstrated capacity of the Salt Pond unit is 13.4 MW. Therefore, the unit is significantly undersized with respect to the existing peak load it would serve in the Twillingate area, assuming no load growth in this area. Conversely, the Salt Pond GT is significantly oversized with respect to even the peak loads in the Trepassey and Old Perlican areas unless load growth accelerates significantly in these areas. While the total peak load in the Wesleyville area is greater than the Salt Pond GT capacity, this location does provide the best "fit" for the unit.

The Greenhill gas turbine (demonstrated capacity of 22.5 MW) would seem to provide a better fit for the Twillingate area, should local generation be further considered at this site. This option was not extensively considered as part of this study as NP's mechanical engineering group has indicated that this unit would provide a much greater technical challenge (and hence a much greater risk) to relocate. For the Twillingate and Wesleyville sites, the Greenhill unit was considered for comparative purposes. As may be seen from the benefits attributed to this alternative, the Greenhill GT does not appear to provide further reductions in customer outage minutes at Twillingate as the locations of the transmission line faults prevent additional generating capacity from being utilized. Capacity in excess of the Salt Pond GT's 13.4 MW does provide a very slight benefit to

the Wesleyville line (a reduction of 7,700 customer minutes of outage annually at Hare Bay substation).

3.6 Environmental Concerns

Environmental issues surrounding this project present a risk in terms of feasibility, cost and schedule. These risks stem mainly from the decision to relocate the Salt Pond GT. The environmental risks do not change substantially with the choice of the unit's destination, although the Twillingate site is located within a protected public water supply area. There are primarily two categories of environmental risks associated with this project: risks associated with the environmental assessment process and risks related to the unit's emissions.

The relocation project would require registration as an undertaking under the Environmental Assessment Act. Within 45 days following registration, the minister will respond to the company with an indication of what, if any, further environmental assessment will be required. Previous experience with the proposed Port Aux Basques GT in 1992 would indicate that no further environmental assessment will be required for a project of this type. This is supported by an opinion recently received regarding the project from Jacques Whitford environmental consultants. However, should an Environmental Impact Statement be required, the project would be delayed as much as 2 years and the costs of preparing such a document would be in the range of $100,000 to $200,000.

In addition to this risk, relocation of the Salt Pond GT may subject the unit to closer scrutiny by the Department of Environment and Labour from an emissions perspective. Informal discussions with this department have indicated that the standards to which the unit is subjected would not change regardless of its location, although application of these standards are somewhat influenced by site and operating conditions. Modeling will be required to determine if the effects of unit operation meet Provincial regulations. If the cost of adding emissions reduction technology were to be added to this project, this could represent a significant increase in the cost estimates prepared. However, it should be recognized that continued operation of this unit (even in Salt Pond) may require such modifications in the future.

4 Recommendation

Based on the analyses conducted and the additional considerations discussed above, it is recommended that the Salt Pond Gas Turbine be relocated to Wesleyville. This project provides the most economical means of improving reliability to this area, while not materially impacting reliability on the Burin peninsula. With the exception of the Old Perlican area, the Wesleyville GT site provides the best "bang for the buck" in service improvement expressed as levelized annual cost per customer minute of outage reduced. Better alternatives are available for improvement in the Old Perlican area and it would not make sense to locate a unit as large as the Salt Pond GT to this area.

In implementing the recommendation to relocate the Salt Pond GT to Wesleyville, it is suggested that the project schedule be developed to allow sufficient time to properly address likely public concerns and environmental issues. The uncertainty surrounding these issues dictates that completion of the project not be scheduled until late 2002.

5 Detailed Project Cost Estimates/Schedule

5.1 Capital Costs

The capital costs of the recommended alternative (relocation of Salt Pond gas turbine to Wesleyville) are detailed in Appendix B and described briefly in the following sections. It should be noted that the total capital cost estimate differs from that used in the project justification due to the inclusion of several related projects which have been identified as requiring completion regardless of the GT relocation. Specifically, these items include replacement of the governor and control logic ($500,000 budgeted in 2002) and replacement of the air intake enclosure ($150,000 budgeted in 2002).

5.1.1 Mechanical

The mechanical estimate for this project includes disassembly, transport, reassembly and commissioning of the unit and all appurtenant mechanical equipment. This includes relocation of the fuel storage tanks, which were replaced in 2000. The only major mechanical component that will not be relocated is the air intake enclosure, which as noted above will be replaced in coordination with the relocation project. Contractors will conduct the majority of the mechanical work with supervision and commissioning conducted by NP staff. Also included in the mechanical estimate is $80,000 to cover the cost of an auxiliary power unit (APU) at the Greenhill gas turbine. Presently, the Salt Pond unit (which has an APU) is used to AC start the unit at Greenhill. The Greenhill APU will be needed to maintain and enhance the dependability of that unit in emergency circumstances.

The costs of any enhanced emissions control or monitoring equipment required as a result of the relocation have not been included in these estimates.

5.1.2 Civil

The civil works estimate for this project includes all necessary site work at the Wesleyville substation, unit and building foundations and the purchase and erection of a new GT enclosure. The cost of dismantling and transport of the existing enclosure at Salt Pond would be approximately equal to that of purchasing a new structure. Therefore, the project will involve the purchase of a new building for the Wesleyville site, allowing the existing Salt Pond structure to remain for the use of operations staff in Burin.

The civil estimate also includes site work and fencing for the Wesleyville substation modifications as well as site work and foundations for new equipment at Gambo, Hare

The civil estimate also includes site work and fencing for the Wesleyville substation modifications as well as site work and foundations for new equipment at Gambo, Hare Bay, Trinity and Greenspond substations. The civil budget also includes an allowance for environmental consulting and works of $50,000.

5.1.3 Electrical

The electrical works associated with the Salt Pond GT relocation project includes design, purchase, installation and commissioning of new unit governor, sequencing system and fuel valve, in addition to new exhaust gas and vibration monitoring equipment. The estimate also includes the costs of relocation of all other GT auxiliaries.

5.1.4 Substations

The substation capital cost estimate includes the purchase, installation and commissioning of a breaker, switch and PTs at Wesleyville substation. The estimate includes purchase, installation and commissioning of a new switch at Trinity substation and miscellaneous modifications to Gambo and Hare Bay substations. This estimate also includes motorizing existing switches and configuring for remote control at these substations.

5.1.5 Communications

The communications estimate includes relocation of the existing Salt Pond GT RTU, in addition to installation/modifications to RTUs at Wesleyville, Trinity, Hare Bay and Gambo substations to provide for remote operation of this unit.

5.2 Operating Costs

Operating costs are detailed in Appendix C. As with the capital costs, the operating cost estimates used in the project justification reflect only the increased cost of operating the unit in Wesleyville. The estimated long-term operating costs of the unit if located in Salt Pond were subtracted from the total operating cost to arrive at the cost difference used in the justification portion of this report. These costs were based on recent historical operating costs (ie. 1999 and 2000) for parts/labour and Salt Pond GT fuel consumption data for the past 10 years.

Estimated operating costs for the Wesleyville GT consider additional labour required for unit maintenance and operation and the additional fuel consumption due to increased unit operation.

For the most part, the unit controls, substation equipment and communications infrastructure will be upgraded as needed to ensure that the need for human intervention in unit operation is minimized. However, it is simply not possible to eliminate the need for manned operation entirely. Operation of this unit in Wesleyville will be more costly

than the current situation in Salt Pond due to the proximity of the unit location at present to the area office in Burin.

The ability of the District crew in Wesleyville to handle this workload will be limited to weekly fuel dips/reconciliations and visual inspections as needed. Some additional operating duties could be handled by the District crew in the event of scheduled unit operations provided adequate training was conducted. During most unscheduled outages this crew would usually be required to conduct repair work on the line and therefore would be unavailable to operate the gas turbine. Electrical maintenance staff from Gander or Rattling Brook will be required to travel to Wesleyville. This increased workload at Gander may require upgrading a current temporary electrical maintenance position to full-time status. Mechanical maintenance will have to be handled by (at least) monthly visits from the existing staff in Burin. An allowance for training costs has been built into the capital cost estimates, as necessary. Employee relocation costs, if necessary, have not been included in these estimates. No job losses are anticipated in the Burin area as a result of the relocation. It has been assumed that any reduction in labour utilization in the operation and maintenance of generating facilities can be fully transferred to other aspects of NP's operation in the Burin area.

Fuel consumption was determined based on projected operating hours/loads from the reduction in customer minutes of outage analysis. A long-term fuel price per litre of $0.35 was assumed.

Also included in the operating cost estimate is $10,000 for a leased NewTel communications circuit.

5.3 Linkage with Distribution Automation Project

The distribution automation planned for the feeders served by 115L and 116L has a synergistic relationship with the Salt Pond GT relocation project, although both projects may be justified independently. Distribution automation will multiply the benefits provided by the gas turbine at Wesleyville by permitting better management of the load to be served. As the capacity of the Salt Pond gas turbine is less than the combined peak load of all substations on the Gambo-Wesleyville line, in some circumstances (particularly during cold-load pick up) this load will need to be sectionalized. The distribution automation project will permit much greater flexibility in this regard.

Conversely, the distribution automation project will benefit from the relocation of the Salt Pond GT to Wesleyville as coordinating work to coincide with the relocation effort can offset some of the costs of this project. As the substations along this line were scheduled for distribution automation in 2002, this will simply involve ensuring that the activities under each project are scheduled to coincide appropriately. For instance, the purchase, installation and configuration of RTUs at the substations along this radial transmission line have been included in the relocation costs as described in Section 4.1.4. Provided the equipment selection and installation considers the needs of both projects, some overall savings should be realized.

No adjustment to the budgeted costs of the GT relocation project has been made to account for this synergy. However, as each of these projects progress it is essential that the respective project managers maintain the lines of communication to maximize any potential savings.

Appendix A
Reliability Statistics

Table 1

1990 to 2000 Reliability Data (Est.)

Area Served	Radial Line Length (km)	1999 Peak Load (MVA)	No. of Customers	Total Line				Terminal Substation		
				Existing Generation (MW)	Avg Ann Customer Hours of Outage	SAIFI	SAIDI (hrs)	No. of Customers	SAIFI	SAIDI (hrs)
Port Aux Basques	149	25.9	5228	15.7	49,720	9.5	9.5	1995	3.7	11.1
Trepassey	87	11.2*	1624	1.4	21,850	4.4	13.5	683	5.5	17.8
Wesleyville	79	16.2	3339	-	48,550	5.5	8.0	1669	6.4	9.0
Baie Verte	67	12.1	999	-	4,250	2.4	4.2	999	2.9	4.2
Twillingate	64	21.8	5721	-	29,550	4.1	5.1	1603	5.7	8.7
Old Perlican	44	10.9	2539	4.3	43,250	3.7	16.5	1654	4.3	16.4
Placentia	42	15.6	3095	-	25,750	4.9	8.3	1191	7.2	12.9
Salt Pond	-	-	-	-				1731	3.1	2.1

Table 2

1990 to 1999 Reliability Data (Est.)

Area Served	Radial Line Length (km)	1999 Peak Load (MVA)	No. of Customers	Total Line				Terminal Substation		
				Existing Generation (MW)	Avg Ann Customer Hours of Outage	SAIFI	SAIDI (hrs)	No. of Customers	SAIFI	SAIDI (hrs)
Port Aux Basques	149	25.9	5228	15.7	21,540	2.9	4.1	1995	1.8	4.0
Trepassey	87	11.2*	1624	1.4	29,020	5.1	17.9	683	6.4	22.6
Wesleyville	79	16.2	3339	-	28,910	4.3	5.1	1669	4.4	6.2
Baie Verte	67	12.1	999	-	5,000	2.7	5.0	999	2.7	5.0
Twillingate	64	21.8	5721	-	36,420	3.3	6.4	1603	4.3	8.4
Old Perlican	44	10.9	2539	4.3	28,240	5.0	11.3	1654	6.1	14.8
Placentia	42	15.6	3095	-	13,800	4.0	4.5	1191	5.2	6.9
Salt Pond	-	-	-	-				1731	1.7	1.2

* Includes estimate of load transferred from Blaketown substation.

Salt Pond GT Relocation - Estimates

Location	**1**	**1=**	**Wesleyville**
		2=	**Twillingate**
		3=	**Trepassey**
		4=	**Old Perlican**

WAICOC = **8.42%**

	Total Capital	Budgeted	Incremental Capital
Civil	515000		515000
Mechanical	696000	150000	546000
Electrical	875000	500000	375000
Substations	480000		480000
Communications	190000		190000
IDC	50000		50000
Contingency	100000		100000
Total	2906000	650000	2256000

Salt Pond GT Relocation - Estimates

Location	**2**	**1=**	**Wesleyville**
		2=	**Twillingate**
		3=	**Trepassey**
		4=	**Old Perlican**

WAICOC **8.42%**

	Total Capital	Budgeted (w/timing adj.)	Incremental Capital
Civil	510000		510000
Mechanical	590000	81166	508834
Electrical	913000	562000	351000
Substations	553000		553000
Communications	175673		175673
IDC	50000		50000
Contingency	76567		76567
Total	2868240	643166	2225074

Salt Pond GT Relocation - Estimates

Location	3	1=	Wesleyville
		2=	Twillingate
		3=	Trepassey
		4=	Old Perlican

WAICOC 8.42%

	Total Capital	Budgeted (w/timing adj.)	Incremental Capital
Civil	510000		510000
Mechanical	590000	81166	508834
Electrical	913000	562000	351000
Substations	500000		500000
Communications	155666		155666
IDC	50000		50000
Contingency	74567		74567
Total	2793233	643166	2150067

Salt Pond GT Relocation - Estimates

Location	**4**	**1=**	**Wesleyville**
		2=	**Twillingate**
		3=	**Trepassey**
		4=	**Old Perlican**

WAICOC **8.42%**

	Total Capital	Budgeted (w/timing adj.)	Incremental Capital
Civil	510000		510000
Mechanical	590000	81166	508834
Electrical	913000	562000	351000
Substations	170000		170000
Communications	137400		137400
IDC	50000		50000
Contingency	72740		72740
Total	2443140	643166	1799974

Salt Pond GT Relocation Project
Transmission Estimates

Location	1	1=	Wesleyville
		2=	Twillingate
		3=	Trepassey
		4=	Old Perlican

WAICOC 8.42%

	Total Capital	Budgeted (w/timing adj.)	Incremental Capital
Civil	10000	0	10000
Mechanical	0	0	0
Electrical	5925000	0	5925000
Substations	1072000	0	1072000
Communications	177548	0	177548
IDC	40000	0	40000
Contingency	0	0	0
Total	7224548	0	7224548

Salt Pond GT Relocation Project
Transmission Estimates

Location	2	1=	Wesleyville
		2=	Twillingate
		3=	Trepassey
		4=	Old Perlican

WAICOC 8.42%

	Total Capital	Budgeted (w/timing adj.)	Incremental Capital
Civil	10000	0	10000
Mechanical	0	0	0
Electrical	4800000	0	4800000
Substations	1404000	0	1404000
Communications	175673	0	175673
IDC	40000	0	40000
Contingency	0	0	0
Total	6429673	0	6429673

Salt Pond GT Relocation Project
Transmission Estimates

Location	3	1=	Wesleyville
		2=	Twillingate
		3=	Trepassey
		4=	Old Perlican

WAICOC 8.42%

	Total Capital	Budgeted (w/timing adj.)	Incremental Capital
Civil	10000	0	10000
Mechanical	0	0	0
Electrical	6525000	0	6525000
Substations	864000	0	864000
Communications	155666	0	155666
IDC	40000	0	40000
Contingency	0	0	0
Total	7594666	0	7594666

Salt Pond GT Relocation Project
Transmission Estimates

Location	4	1=	Wesleyville
		2=	Twillingate
		3=	Trepassey
		4=	Old Perlican

WAICOC 8.42%

	Total Capital	Budgeted (w/timing adj.)	Incremental Capital
Civil	10000	0	10000
Mechanical	0	0	0
Electrical	3300000	0	3300000
Substations	173000	0	173000
Communications	137400	0	137400
IDC	40000	0	40000
Contingency	0	0	0
Total	3660400	0	3660400

Salt Pond GT Relocation Project
New Stationary Diesels Estimate

Location	1	1=	Wesleyville
		2=	Twillingate
		3=	Trepassey
		4=	Old Perlican

WAICOC 8.42%

	Total Capital	Budgeted (w/timing adj.)	Incremental Capital
Civil	510000		510000
Mechanical	5725000	0	5725000
Electrical	843000	0	843000
Substations	944000		944000
Communications	177548		177548
IDC	100000		100000
Contingency	0		0
Total	8299548	0	8299548

Salt Pond GT Relocation Project
New Stationary Diesels Estimate

Location	**2**	**1=**	**Wesleyville**
		2=	**Twillingate**
		3=	**Trepassey**
		4=	**Old Perlican**

WAICOC **8.42%**

	Total Capital	Budgeted (w/timing adj.)	Incremental Capital
Civil	510000		510000
Mechanical	5725000	0	5725000
Electrical	843000	0	843000
Substations	1031000		1031000
Communications	175673		175673
IDC	100000		100000
Contingency	0		0
Total	8384673	0	8384673

Salt Pond GT Relocation Project
New Stationary Diesels Estimate

Location	3	1=	Wesleyville
		2=	Twillingate
		3=	Trepassey
		4=	Old Perlican

WAICOC 8.42%

	Total Capital	Budgeted (w/timing adj.)	Incremental Capital
Civil	510000		510000
Mechanical	5725000	0	5725000
Electrical	843000	0	843000
Substations	976000		976000
Communications	155666		155666
IDC	100000		100000
Contingency	0		0
Total	8309666	0	8309666

Salt Pond GT Relocation Project
New Stationary Diesels Estimate

Location	4	1=	Wesleyville
		2=	Twillingate
		3=	Trepassey
		4=	Old Perlican

WAICOC 8.42%

	Total Capital	Budgeted (w/timing adj.)	Incremental Capital
Civil	510000		510000
Mechanical	5725000	0	5725000
Electrical	843000	0	843000
Substations	645000		645000
Communications	137400		137400
IDC	100000		100000
Contingency	0		0
Total	7960400	0	7960400

Salt Pond GT Relocation Project
New Mobile Diesels Estimate

Location	1	1=	Wesleyville
		2=	Twillingate
		3=	Trepassey
		4=	Old Perlican

WAICOC 8.42%

	Total Capital	Budgeted (w/timing adj.)	Incremental Capital
Civil	210000		210000
Mechanical	6505000	0	6505000
Electrical	843000	0	843000
Substations	934000		934000
Communications	177548		177548
IDC	70000		70000
Contingency	0		0
Total	8739548	0	8739548

Salt Pond GT Relocation Project
New Mobile Diesels Estimate

Location	2	1=	Wesleyville
		2=	Twillingate
		3=	Trepassey
		4=	Old Perlican

WAICOC 8.42%

	Total Capital	Budgeted (w/timing adj.)	Incremental Capital
Civil	210000		210000
Mechanical	6505000	0	6505000
Electrical	843000	0	843000
Substations	1021000		1021000
Communications	175673		175673
IDC	70000		70000
Contingency	0		0
Total	8824673	0	8824673

Salt Pond GT Relocation Project
New Mobile Diesels Estimate

Location	3	1=	Wesleyville
		2=	Twillingate
		3=	Trepassey
		4=	Old Perlican

WAICOC 8.42%

	Total Capital	Budgeted (w/timing adj.)	Incremental Capital
Civil	210000		210000
Mechanical	6505000	0	6505000
Electrical	843000	0	843000
Substations	966000		966000
Communications	155666		155666
IDC	70000		70000
Contingency	0		0
Total	8749666	0	8749666

Salt Pond GT Relocation Project
New Mobile Diesels Estimate

Location	3	1=	Wesleyville
		2=	Twillingate
		3=	Trepassey
		4=	Old Perlican

WAICOC 8.42%

	Total Capital	Budgeted (w/timing adj.)	Incremental Capital
Civil	210000		210000
Mechanical	6505000	0	6505000
Electrical	843000	0	843000
Substations	966000		966000
Communications	155666		155666
IDC	70000		70000
Contingency	0		0
Total	8749666	0	8749666

Salt Pond GT Relocation Project
New Mobile Diesels Estimate

Location	**4**	**1=**	**Wesleyville**
		2=	**Twillingate**
		3=	**Trepassey**
		4=	**Old Perlican**

WAICOC **8.42%**

	Total Capital	Budgeted (w/timing adj.)	Incremental Capital
Civil	210000		210000
Mechanical	6505000	0	6505000
Electrical	843000	0	843000
Substations	635000		635000
Communications	137400		137400
IDC	70000		70000
Contingency	0		0
Total	8400400	0	8400400

Greenhill GT Relocation - Estimates

Location	**1**	**1=**	**Wesleyville**
		2=	**Twillingate**
		3=	**N/A**
		4=	**N/A**

WAICOC **8.42%**

	Total Capital	Budgeted (w/timing adj.)	Incremental Capital
Civil	660000		660000
Mechanical	944000	0	944000
Electrical	913000	509000	404000
Substations	452000		452000
Communications	177548		177548
IDC	50000		50000
Contingency	112155		112155
Total	3308703	509000	2799703

Greenhill GT Relocation - Estimates

Location	2	1=	Wesleyville
		2=	Twillingate
		3=	N/A
		4=	N/A
	WAICOC	8.42%	

	Total Capital	Budgeted (w/timing adj.)	Incremental Capital
Civil	660000		660000
Mechanical	944000	0	944000
Electrical	913000	509000	404000
Substations	539000		539000
Communications	175673		175673
IDC	50000		50000
Contingency	111967		111967
Total	3393640	509000	2884640

Salt Pond GT Relocation Project
Refurbished Stationary Diesels Estimate

Location	**3**	**1=**	**N/A**
		2=	**N/A**
		3=	**Trepassey**
		4=	**Old Perlican**

WAICOC **8.42%**

	Total Capital	Budgeted (w/timing adj.)	Incremental Capital
Civil	510000		510000
Mechanical	3450000	0	3450000
Electrical	843000	0	843000
Substations	941000		941000
Communications	155666		155666
IDC	100000		100000
Contingency	0		0
Total	5999666	0	5999666

Salt Pond GT Relocation Project
Refurbished Stationary Diesels Estimate

Location	4	1=	N/A
		2=	N/A
		3=	Trepassey
		4=	Old Perlican

WAICOC 8.42%

	Total Capital	Budgeted (w/timing adj.)	Incremental Capital
Civil	510000		510000
Mechanical	2800000	0	2800000
Electrical	843000	0	843000
Substations	610000		610000
Communications	137400		137400
IDC	100000		100000
Contingency	0		0
Total	5000400	0	5000400

Appendix D
Operating Cost Estimates

Wesleyville
Operating Costs

Alternative	Costs						Benefits			Net
	Labour/Parts	Fuel	Telecomm	Total	Current	Incremental	Generation	Capacity Credit	Total	
Relocation	75000	30000	10000	115000	60000	55000	3000	0	3000	52000
New Stationary Diesels	75000	30000	10000	115000	0	115000	7000	147000	154000	-39000

Twillingate
Operating Costs

Alternative	Costs						Benefits			
	Labour/Parts	Fuel	Telecomm	Total	Current	Incremental	Generation	Capacity Credit	Total	Net
Relocation	75000	35000	10000	120000	60000	60000	4500	0	4500	55500
New Stationary Diesels	75000	35000	10000	120000	0	120000	8500	147000	155500	-35500

Trepassey
Operating Costs

Alternative	Costs						Benefits			Net
	Labour/Parts	Fuel	Telecomm	Total	Current	Incremental	Generation	Capacity Credit	Total	
Relocation	75000	47000	10000	132000	60000	72000	8000	0	8000	64000
New Stationary Diesels	75000	47000	10000	132000	0	132000	12000	147000	159000	-27000

Old Perlican
Operating Costs

Alternative	Costs						Benefits			Net
	Labour/Parts	Fuel	Telecomm	Total	Current	Incremental	Generation	Capacity Credit	Total	
Relocation	75000	50000	10000	135000	60000	75000	8500	0	8500	66500
New Stationary Diesels	75000	50000	10000	135000	0	135000	12500	147000	159500	-24500

Salt Pond GT Relocation Project
Levelizing Worksheet

Time Horizon (years)	60
Weighted Average Cost Of Capital	8.44%

Wesleyville Site

Alternative	Relocate SPT	Transmission	Stationary Diesel	Mobile Diesel	Relocate GRH
NPV (Y60)*	$8,001,212.00	$12,552,000.00	$15,090,000.00	$15,789,000.00	$8,702,000.00
Levelized**	$680,568.54	$1,067,650.29	$1,283,527.96	$1,342,983.62	$740,176.29
Cust Minutes	1111062	1443009	1366747	1366747	1051600
$/CM	$0.6125	$0.7399	$0.9391	$0.9826	$0.7039

Twillingate Site

Alternative	Relocate SPT	Transmission	Stationary Diesel	Mobile Diesel	Relocate GRH
NPV (Y60)*	$8,035,000.00	$11,138,000.00	$15,276,000.00	$15,976,000.00	$8,888,000.00
Levelized**	$683,442.49	$947,378.02	$1,299,348.78	$1,358,889.50	$755,997.12
Cust Minutes	1033329	1427951	1289014	1289014	973900
$/CM	$0.6614	$0.6635	$1.0080	$1.0542	$0.7763

Trepassey Site

Alternative	Relocate SPT	Transmission	Stationary Diesel	Mobile Diesel	Refurbished 10MW
NPV (Y60)*	$8,062,000.00	$13,212,000.00	$15,303,000.00	$16,003,000.00	$12,169,000.00
Levelized**	$685,739.06	$1,123,788.69	$1,301,645.35	$1,361,186.08	$1,035,073.01
Cust Minutes	1024873	1274457	1280558	1280558	1280558
$/CM	$0.6691	$0.8818	$1.0165	$1.0630	$0.8083

Old Perlican Site

Alternative	Relocate SPT	Transmission	Stationary Diesel	Mobile Diesel	Refurbished 8MW
NPV (Y60)*	$7,572,000.00	$6,582,000.00	$14,813,000.00	$15,513,000.00	$12,189,000.00
Levelized**	$644,060.55	$559,852.95	$1,259,966.84	$1,319,507.57	$1,036,774.17
Cust Minutes	1676847	1922608	1932533	1932533	1932533
$/CM	$0.3841	$0.2912	$0.6520	$0.6828	$0.5365

Notes:

* NPV Y60 value taken from Appendix A, Cumulative Net Present Worth in Year 60 of each alternative.

** Levelized value calculated from annual payment required over study time horizon to match NPV Y60 value.