In reference to Schedule "B", page 46 of 82 – Trunk Feeders Rebuild Distribution Lines, at a project cost of $3,504,000, please provide the following:

Q. In reference to the joint planning study by Newfoundland Power and Hydro in reference to the Springdale feeder and the Little Bay system, please provide a copy of that report.

A. Attachment A is a copy of the joint report of Newfoundland and Labrador Hydro and Newfoundland Power regarding improvements to the Springdale/Little Bay electrical system.

SPRINGDALE / LITTLE BAY SYSTEM IMPROVEMENT

(02/07/31)

A JOINT REPORT OF
NEWFOUNDLAND & LABRADOR HYDRO
AND
NEWFOUNDLAND POWER

Executive Summary

Newfoundland Power (NP) has reviewed the condition of its Springdale feeder that supplies Newfoundland & Labrador Hydro (NLH) Little Bay system and determined that the feeder is deteriorated to the point it requires substantial upgrading or replacement. This joint planning study by NLH and NP establishes that the least cost solution is to rebuild the feeder along the road. This solution proposes that NP build the feeder at 2 phase with a neutral to St. Patricks. NLH will rebuild its 4.16 kV system to 25 kV and take supply from NP at St. Patricks. The Little Bay Substation will then be retired. The estimated cost of the project is $690,000.

Introduction

The Springdale area of the province is one of the many areas where NLH and NP systems interact. In such cases both utilities jointly plan their systems to the benefit of all customers which results in a more cost effective solution.

The need for this review comes about as a result of NP's review of the Springdale feeder, arising from a significant feeder outage earlier this year.

The SPR-03 Service Territory

The SPR-03 feeder supplies three NP customers and NLH's Little Bay service territory. This includes the communities of St. Patricks, Coffee Cove, Shoal Arm, Little Bay and Beachside in Notre Dame Bay. The area is typical of rural Newfoundland and includes a small fish plant that is not currently operating. As of 2001 there were 224 domestic customers and 24 general service customers in this service territory.

Both the load history and load forecast for the NLH area are shown in Table 1. The load history shows there has been a decline in load in the area since 1995, and the forecast projects a largely stable but slightly declining load over the near term. While the fish plant has not operated for a number of years, allowance will be made in planning the system that should it return to operation, the electrical system will be able to accommodate it.

TABLE 1

Little Bay System Load History & Forecast

Year	Peak Demand (kW)	Annual Energy (kWh)	
1995	680	2,626,180	
1996	688	2,614,480	
1997	704	2,594,640	
1998	720	2,570,160	
1999	672	2,509,040	
2000	592	2,310,960	
2001	632	2,269,200	Actual
2002	623	2,310,000	Forecast
2003	622	2,306,000	
2004	620	2,302,000	
2005	619	2,297,000	
2006	618	2,294,000	

The SPR-03 Electrical System

The electrical system supplying the SPR-03 area originates at the Springdale substation. This substation has four 25 kV feeders supplying the Springdale area. Figure 1 indicates the route that SPR-03 follows in servicing the NLH area.

The NP SPR-03 feeder begins at the Springdale substation and extends cross country towards NLH's service territory. There is a 4.1 km section from the Springdale Substation to the Davies Pond Tap. The Davies Pond tap is 0.5 km and services NP customers. Also from the Davies Pond Tap, the feeder extends 3.5 km through some rough country to where the feeder crosses the road near St. Patricks. The feeder then proceeds cross country for a further 7.0 km to NLH's Little Bay Substation. Prior to entering Little Bay substation, ownership of the electrical system changes from NP to NLH at a metering tank.

The NP portion of the feeder was initially built in 1965 as a long span 266.6 MCM ACSR single pole three phase line without neutral by The Bowater Power Company to supply the Whalesback Mine near the Little Bay substation. The mine was shut down in 1975. The line with the associated substation continued to be used to supply the local communities.

At the Little Bay Substation there is a 25 / 4.16 kV, 1.0 MVA transformer. The NLH 4.16 kV system exits from the Little Bay Substation and divides into two sections. One section

proceeds through Little Bay, on to St. Patricks. It consists of 0.3 km of 3-phase, 4.2 km of 2-phase and 2.2 km of 1-phase feeder. The second section consists of 0.4 km of 3-phase and 0.3 km of 2-phase feeder operated at 4.16 kV. The voltage is then stepped up to12.5 kV for the remaining 6.3 km 2-phase line to Beachside. A NLH system diagram for this area is shown in Figure 2.

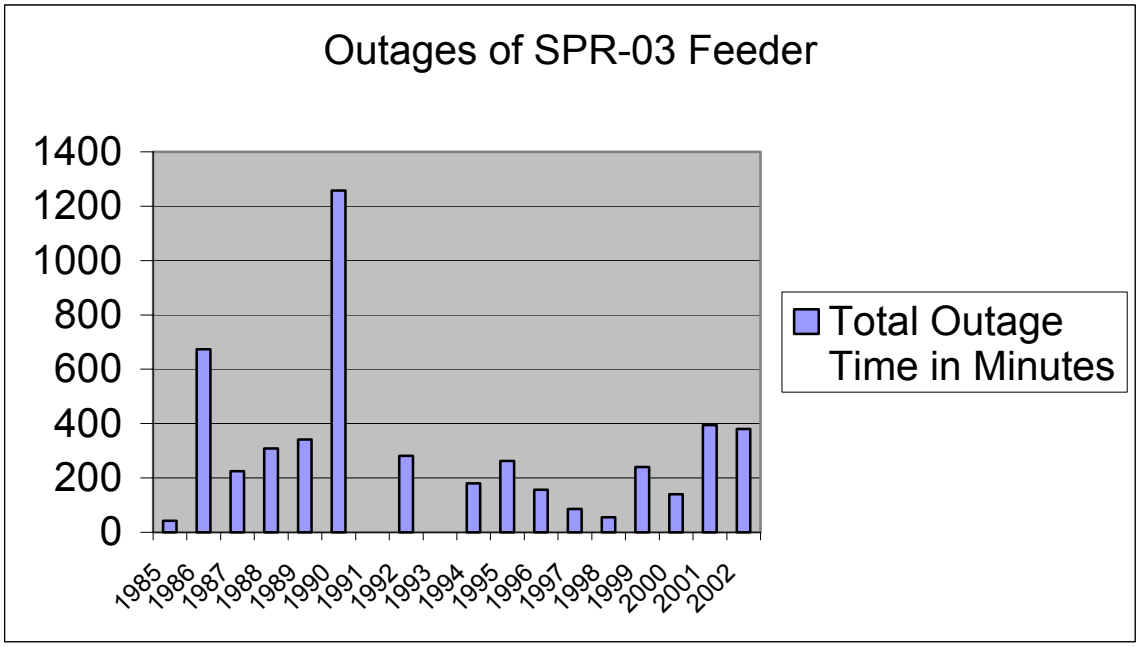
The Requirement To Rebuild Portions of SPR-03

While the line has performed reasonably well over time, it has deteriorated significantly due to age. Its location, mostly in country, makes it difficult and time consuming to locate and repair problems as they occur. As the line has no neutral, faults and insulator failures are usually not discovered until the pole is burnt beyond repair and must be replaced. The deterioration of the line makes it necessary to replace SPR-03 at this time. Figures 3 through 11 give an indication of the terrain, the construction and some of the problems associated with the NP portion of the line.

Table 2 indicates the total minutes of outage that have occurred to the portion of SPR-03 supplying the Little Bay area over the past 18 years. There were significant outages in 1990 and earlier. From 1990 until recently performance improved. However, in the past 2 years performance has begun to degrade. Of significance is the recent outage that occurred on February 11, 2002, where insulator failure removed the line from service for 380 minutes or 6.3 hours. Even though the access distance was not significant, the outage was long due to the nature of the rough terrain associated with the particular location, which is typical of many sections of the line.

Given the age of the NP section of the feeder, its recent performance and the time to repair problems, the existing situation is not considered acceptable.

TABLE 2



Alternatives To Rebuild SPR-03

In developing alternatives, rebuilding the feeder cross country was determined to be both more expensive to build and maintain, relative to building along the road. Further, the time to locate and repair a problem associated with the feeder would likely be greater with the cross country feeder. Given the higher cost and lower reliability of the line, the alternative of rebuilding the feeder across country was not further considered.

Of the alternatives considered, all include rebuilding the feeder along the road to St. Patricks at 25 kV. Although, the line can be rebuilt with the existing 3 phase configuration, two phase construction is another alternative. Beyond St. Patricks, one alternative is to build 25 kV along the road to Little Bay Substation and just energize the remainder of the system from the Little Bay step down substation, as is done now. A further alternative is to convert the load between St. Patricks to Little Bay Substation to 25 kV and not have a 25 kV and 4 kV system along the same road. This concept can be taken further and convert the whole 4.16 kV system to 25 kV, and removing the Little Bay Substation.

The following are the alternatives considered:

1) NP builds 3 phase to St. Patricks & then on to Little Bay Sub.
   NP rebuilds the feeder from Springdale substation to St. Patricks with 3 phase and neutral using 25 kV construction. It continues with this construction to the Little Bay Substation.

2) NP builds 3 phase to St. Patricks & NLH upgrades all 4.16 kV system to 25 kV
NP rebuilds the feeder from Springdale substation to St. Patricks with 3 phase and neutral using 25 kV construction. NLH converts the entire 4.16 kV portion of the existing system, from St. Patricks to the Beachside Sub, to 2-phase, 25 kV. This includes converting the Town of Little Bay to 25 kV. NLH replaces the 2.4 – 7.2 kV transformers at the Beachside Substation with 250 kVA, 14.4 – 7.2 kV transformers. NLH also removes the existing Little Bay Substation.

3) NP builds 2 phase to St. Patricks & then on to Little Bay Sub
NP rebuilds the feeder from Springdale Substation to St. Patricks along the road at 2-phase and neutral using 25 kV construction. It continues with the same 2 phase construction with neutral on to the Little Bay Substation and supplies NLH there. NLH makes modifications to its system to accommodate the 2 phase supply.

4) NP builds 2 phase to St. Patricks & NLH upgrades all 4.16 kV system to 25 kV
NP rebuilds the feeder from Springdale Substation to St. Patricks along the road at 2-phase with neutral using 25 kV construction. NP supplies the NLH system at St. Patricks instead of Little Bay. NLH converts the entire 4.16 kV portion of the existing system, from St. Patricks to the Beachside Sub, to 2-phase, 25 kV. This includes converting the Town of Little Bay to 25 kV. NLH replaces the 2.4 –7.2 kV transformers at the Beachside Substation with 250 kVA, 14.4 – 7.2 kV transformers. NLH also removes the existing Little Bay Substation.

The Alternatives are costed in the following Table 3.

TABLE 3

Alternative	**NP Capital Cost**	**NLH Capital Cost**	**Total Capital Cost**
1. NP build three phase to St. Patricks and then on to Little Bay Sub	$855,000	Nil	$855,000
2. NP build 3 phase to St. Patricks & NLH upgrade all 4.16 kV system to 25 kV	$442,000	$325,000	$767,000
3. NP build 2 phase to St. Patricks & then on to Little Bay Sub	$743,000	$66,000	$809,000
4. NP build 2 phase to St. Patricks & NLH upgrade all 4.16 kV system to 25 kV	$390,000	$300,000	$690,000

Analysis & Recommendations

Load flows calculations were done to determine the adequacy of system voltage through out the feeder for each alternative. Each provided adequate voltage.

A concern with the two phase alternatives was the ability to supply the three phase fish plant load. The plant has not operated for some time. However, the possibility exists that the plant could be re opened. An investigation has determined that the plant can be supplied three phase power from the two phase system. However, there is a possibility that the three phase motors in the plant would have to be enlarged to account for any voltage unbalance. This was not considered an impediment or a significant cost to the two phase alternatives.

It is recommended that the two phase alternative #4 proceed based on least cost and good accessibility. The metering tank would be relocated from Little Bay substation to the point at which the reconstructed feeder meets the existing NLH feeder near St. Patricks. A system drawing for the proposed system in shown in Figure 12. It is further proposed that this construction be completed in the 2003 construction season.

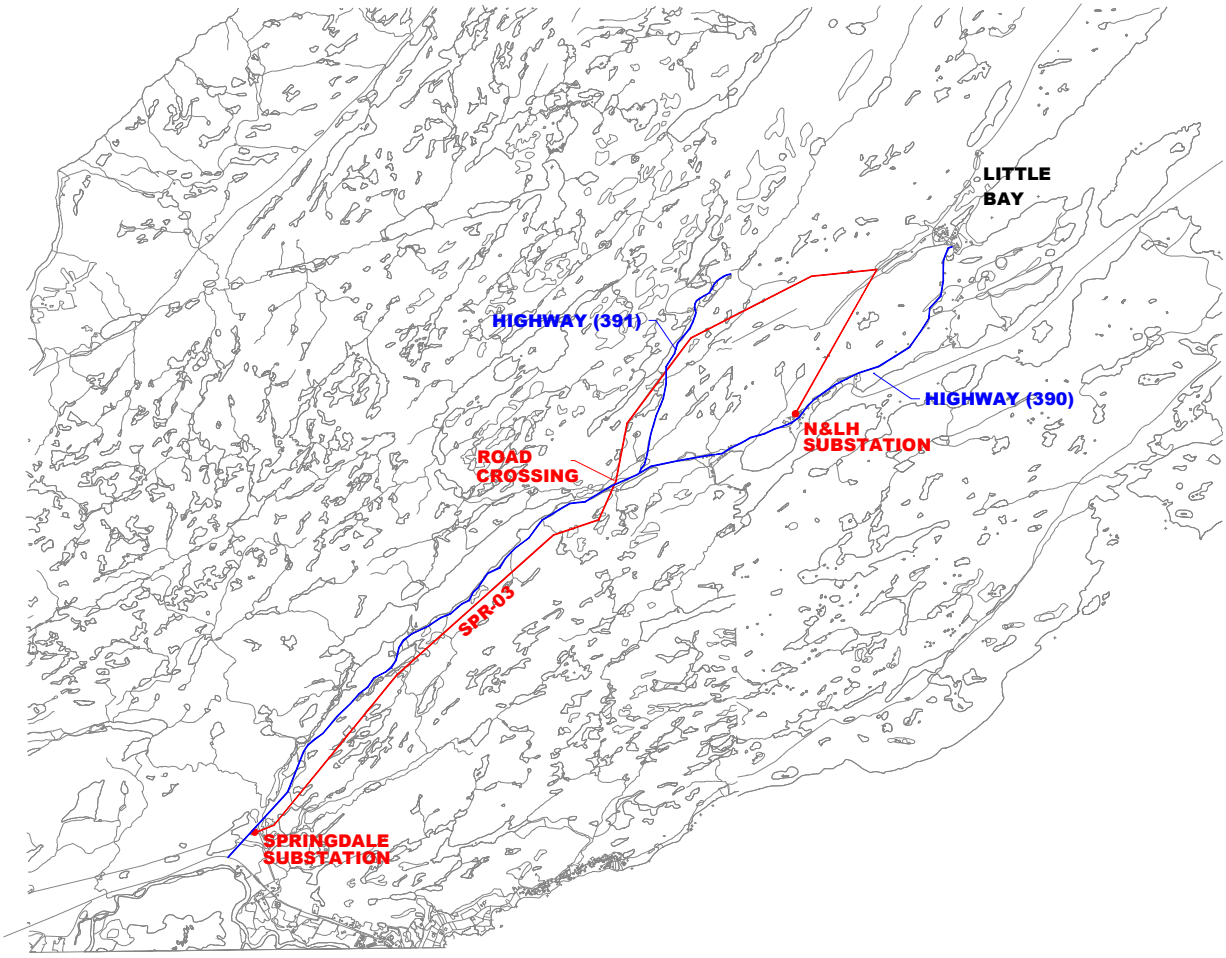


Figure 1
SPR-03 Feeder Route

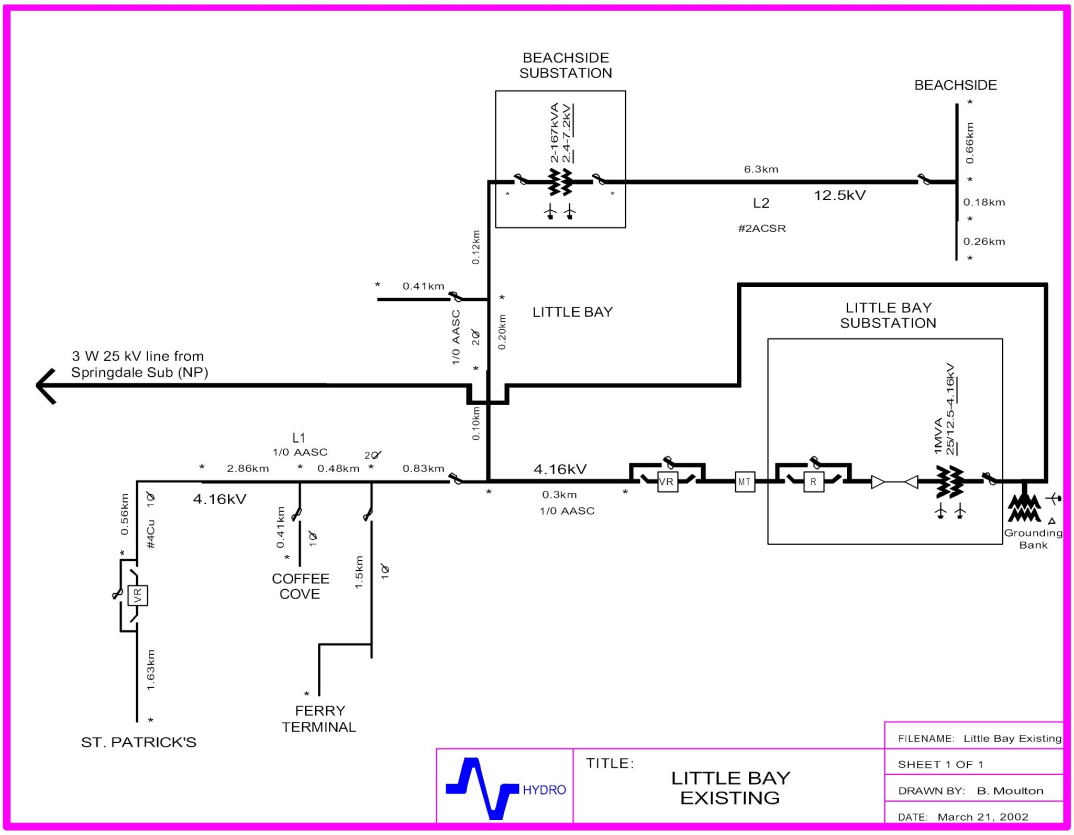


Figure 2
Existing NLH Little Bay Electrical System

Figure 3
Shows long span single pole coonstruction at one access point to the first section with rugged hills and valley terrain. Note two pole structure beyond single pole.

Figure 4
Note span length

Figure 5
Old Whalesback mine substation site

Figure 6
This and following 3 figures show a split pole with repair by bolting second pole

Figure 7

Figure 8

Figure 9

Figure 10
A second structure with a repair by bolting second pole

Figure 11
First 3 feet of pole replace in 2001. The top was completely hollow with bird's next inside

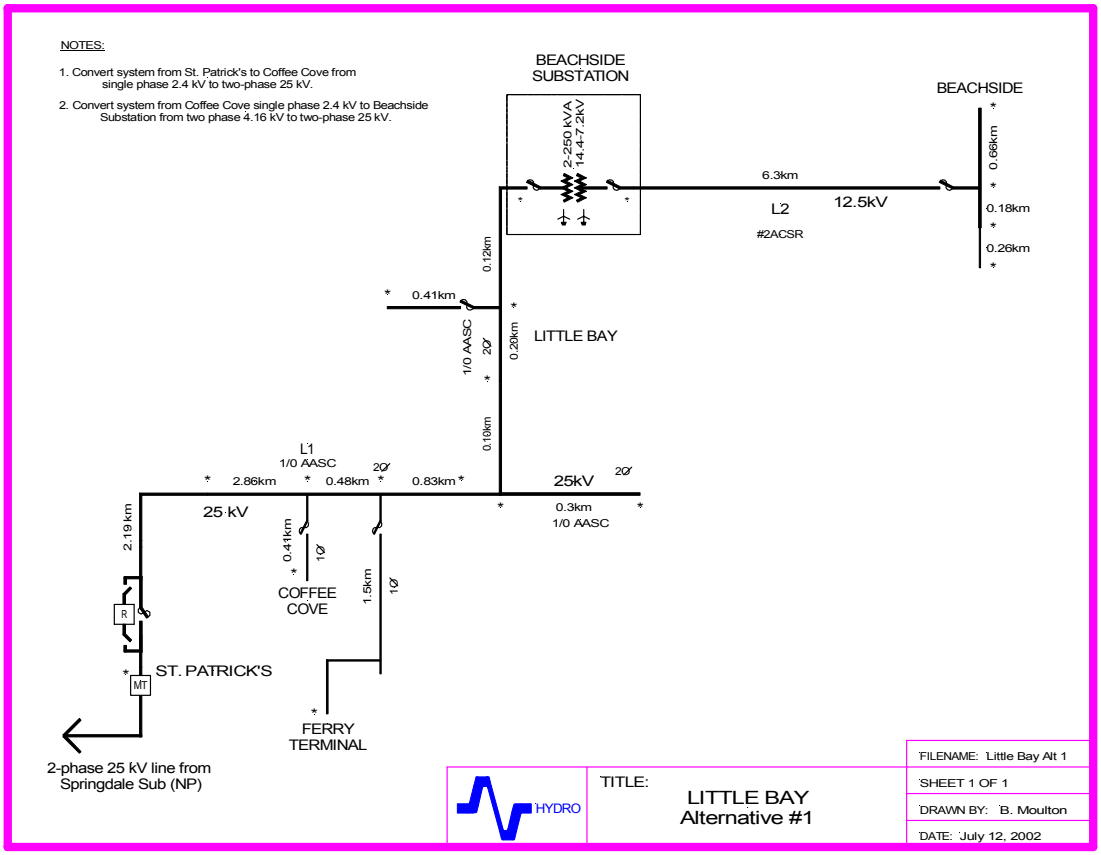


Figure 12
Proposed Little Bay System