Q. RE: P. B-137 Replace VHF Mobile Radio System $2,914,800

PUB 22 NP
Ref: NP 2005 Capital Projects, Replace/Upgrade Communications Equipment and PUB Decision PU-29-2003, Replace VHF Mobile Radio System (B71). It is understood that the proposed NH MRS would meet the operational requirements of NP. Has NP completed a determination and analysis report regarding adoption of the new Hydro VHF system as detailed in point 3 of the Board decision? If so, please provide a copy.

A. Newfoundland Power has completed its analysis of the potential adoption of the new Hydro VHF system, and has made its determination based on the results of a review of Newfoundland Power's and Hydro's mobile communication requirements arising out of Order No. P.U. 29 (2003).

Newfoundland Power's technical and operational requirements for mobile radio communications are currently being met by its existing conventional VHF system. The VHF system proposed by Hydro has additional features to accommodate its technical and operational requirements. These features are not necessary to meet the requirements of Newfoundland Power.

Background
In Order No. P.U. 29 (2003) (the "Order"), the Board declined to grant approval of Hydro's proposal to replace its VHF mobile radio system as described in Hydro's 2004 Capital Budget Application. In lieu of approving Hydro's capital expenditure proposal, the Board outlined a process whereby Newfoundland Power and Hydro would cooperate in a review of their respective mobile communication requirements.

The "co-operative process" outlined in the Order contemplated the confirmation of Newfoundland Power, in writing to the Board, and to Hydro, whether the VHF replacement project and its technical specification as described by Hydro would meet Newfoundland Power's future operational requirements for a VHF radio system. The process also required a net present value calculation comparing the remaining life expectancy of Newfoundland Power's existing VHF system against adopting Hydro's proposed VHF system at 2, 3 and 5 years out. Newfoundland Power would also be required to confirm its participation in the new system once its existing system had reached the end of its useful life.

The Co-operative Process
In late 2003, Newfoundland Power engaged Provincial Consultants Ltd. ("Provincial") to provide it with expert advice in relation to the co-operative process outlined in the Order. Provincial assisted Newfoundland Power with the detailed engineering assessment of its functional requirements associated with mobile communications. Provincial also reviewed the various alternatives identified by the Board in the Order, and prepared a formal cost-benefit analysis comparing those alternatives.

Provincial's report, entitled *VHF Mobile Radio System Alternatives for Newfoundland Power* and dated September 29, 2004, summarizes their review of the identified alternatives and includes calculations of the net present value of Newfoundland Power's costs associated with those alternatives. A copy of the report is provided in Attachment A.

In the meantime, Hydro engaged Custom Systems Electronics Limited ("Custom Systems") to provide Hydro with expert advice in relation to the co-operative process outlined in the Order. Custom Systems' report, entitled *Mobile Radio System Replacement - Summary of Findings* and dated August 2004, is filed in this proceeding as Section G, Appendix 4, of the Application.

From the time the experts were engaged, Newfoundland Power's and Hydro's personnel responsible for telecommunications, together with the respective experts, coordinated their efforts and shared pertinent information in the preparation of the engineering assessments of mobile communication requirements and the cost benefit analysis of the options identified in the Order.

Alternatives Analysed

The Order identified the following alternatives for providing mobile communication service to Newfoundland Power and Hydro:

1. Newfoundland Power and Hydro share Hydro's proposed new VHF mobile radio system, with Newfoundland Power joining the new system at 2, 3 or 5 years out;
2. Newfoundland Power and Hydro continue to provide separately for their own mobile communication requirements; and
3. Newfoundland Power provides mobile communication service to Hydro through an expansion of Newfoundland Power's existing VHF mobile radio system.

In their report, Provincial provided net present value calculations of Newfoundland Power's estimated costs associated with all of the identified options. These costs were then combined with the net present values of Hydro's costs as provided in Custom Systems' report to provide an estimate of the total cost to electricity consumers of the various alternatives.

The Order identified a requirement for an analysis of the cost benefits to Newfoundland Power and to Hydro of (i) extending Hydro's VHF system to allow for the implementation of a common system at a future date or any other reasonable alternative that will allow the replacement of both systems and; (ii) accommodating Hydro on Newfoundland Power's existing VHF system. Custom Systems' report indicates that it is not technically possible to expand Hydro's existing system to meet Newfoundland Power's mobile communication requirements. The cost of expanding Newfoundland Power's existing system to accommodate Hydro's requirements was estimated for the purposes of the co-operative process; however, for the reasons noted at page 5 of Attachment A, the analysis assumed that Newfoundland Power's existing equipment would be upgraded at the same time. In any event, Custom Systems' report indicates that this option is not acceptable to Hydro.

Least Cost Option

Of all of the alternatives analysed by Provincial and Custom Systems, the lowest cost is achieved through the continuation of the status quo, with a separate mobile radio system for each utility, and the provincial Department of Transportation & Works sharing the cost of Hydro's system. The combined costs to be incurred by Newfoundland Power and Hydro under this scenario are less than the combined costs under any of the other analysed alternatives.

Newfoundland Power manages its VHF mobile radio system with a view to maximizing the life of the system and delaying its replacement as long as it is feasible to do so. The system, which was installed in the mid-1980s, is in good working condition, and continues to provide service that is adequate for Newfoundland Power's requirements. As noted in Provincial's report, Newfoundland Power's mobile radio system will not require replacement before 2011. In Newfoundland Power's view, and particularly in light of the results of the cost benefit analysis, it is not in the interest of consumers in the province to retire this utility asset before the end of its useful life.

Based on all of the foregoing, Newfoundland Power intends to maintain its existing VHF mobile radio system until it has reached the end of its useful life. When the system is nearing the end of its useful service, Newfoundland Power will then assess whether a replacement mobile radio system is necessary to meet its mobile communication requirements. At that time, Newfoundland Power will assess all available options, including Hydro's VHF system, to determine the least cost alternative. Given the recent pace of technology development, particularly in telecommunications, other options may also be available. A commitment by Newfoundland Power to invest in another VHF radio system at this time would be premature.

VHF Mobile Radio System Alternatives
for
Newfoundland Power

Provincial Consultants Ltd.
September 2004

VHF Mobile Radio System Alternatives
For
Newfoundland Power

Prepared for: *Newfoundland Power Inc.*
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Provincial Consultants Ltd.

Version: *2.1*
Date: *29-September 2004*

Record of Changes

Version	Purpose	Issued By	Issue Date
1.0 (Draft)	Customer Review	FH	06-Aug-04
1.1 (Draft)	Add Appendix E and Editing	FH	16-Aug-04
1.2 (Draft)	Include NPV for NL to join NLH system in 2008 and 2009. Edit changes	FH	2-Sep-04
2.0 (Final)	Modify NP's NPV analysis for consistency with method used by NLH to derive its results, and to include NLH's results.	FH	17-Sep-04
2.1	Edit changes.	FH	29-Sep-04

Table of Contents

Acronyms

AT&T	American Telephone and Telegraph Company
CBC	Canadian Broadcasting Corporation
DTMF	Dual Tone Multi-Frequency
DTW	Department of Transportation and Works (Provincial Government)
ECC	Energy Control Centre (Newfoundland and Labrador Hydro)
MRS	Mobile Radio System
NLH	Newfoundland and Labrador Hydro
NP	Newfoundland Power Incorporated
NPV	Net Present Value
PUB	Public Utilities Board
PSTN	Public Switched Telephone Network
PTT	Push To Talk
SCADA	Supervisory, Control and Data Acquisition
SCC	System Control Centre (Newfoundland Power)
TCH	Trans Canada Highway
VHF	Very High Frequency
VoIP	Voice over Internet Protocol
WAN	Wide Area Network

1. Summary and Conclusions

The purpose of this document is to establish the Newfoundland Power costs associated with alternatives for providing VHF radio services within the Newfoundland electric utility business. It forms part of a process outlined by the Public Utilities Board (PUB) in P.U. 29 (2003) to determine the most economical means for Newfoundland Power to meet its mobile communication needs[1].

Background: Currently, Newfoundland Power and Newfoundland and Labrador Hydro operate their own separate mobile radio systems for their respective needs in the province of Newfoundland and Labrador. In 2003 Newfoundland and Labrador Hydro sought PUB approval of capital expenditures to replace its present system on the basis that it is outdated. Although Newfoundland Power indicated that its own system was adequate for the foreseeable future, the PUB in P.U. 29 (2003) ordered both Newfoundland and Labrador Hydro and Newfoundland Power to work cooperatively in researching technical options to seek the most economical means to meet the mobile communication needs of both utilities.

Alternatives: This report presents the following alternatives with costs analyzed on a NPV (Net Present Value) basis:

1. Status Quo: Newfoundland Power will continue to operate its own system, independent of Newfoundland and Labrador Hydro. Included in this scenario is replacement of all present equipment when it has reached the end of its service life – 2011 used for study purposes.
2. Expand NLH System for NP: Newfoundland and Labrador Hydro will include provision in the design of its new system to accommodate Newfoundland Power's requirements at a future date – 2008, 2009 and 2011 used for study purposes. Two scenarios were considered:
   - ***2A*** *Newfoundland and Labrador Hydro's system is shared with Newfoundland Power and with the province's Department of Transportation and Works (DTW).* This scenario is used in the cost comparison below.
   - ***2B*** *Newfoundland and Labrador Hydro's system is shared only with Newfoundland Power.*
3. Expand NP System for NLH: Newfoundland Power will expand its existing system to accommodate Newfoundland and Labrador Hydro's requirements in 2006. Although no specific provision for accommodating DTW is included, this could be achieved in a manner similar to that currently used by DTW to access NLH's existing system.

NPV Results: The following table combines NP's NPV results (Col. 'A') for Alternatives 1, 2A and 3 above with complementary results (Col. 'B') presented in NLH's *Mobile Radio System Replacement* report that was filed with the PUB in August 2004. (Note, values are negative since they represent costs or output cash flows):

Alternatives		**Col. 'A'** **NP NPV** ($000)	**Col. 'B'** **NLH NPV** ($000)	**Col. 'C'** **Total NPV** ($000)
1	Status Quo (NP Alone & NLH/DTW Alone)	- 4,475	- 7,448	- 11,923
1	Status Quo (NP Alone & NLH Alone)	- 4,475	-14,895	- 19,370
$2A_{(08)}$	Expand NLH/DTW System in 2008 for NP	- 7,171	- 6,858	- 14,029
$2A_{(09)}$	Expand NLH/DTW System in 2009 for NP	- 6,883	- 6,942	- 13,828
$2A_{(11)}$	Expand NLH/DTW System in 2011 for NP	- 6,357	- 7,090	- 13,447
3	Expand NP System for NLH	- 5,240	- 9,660	- 14,649

[1] PUB P.U. 29 (2003), Page 33, Item 3 includes the following directive:
"As part of this exercise a determination and analysis must be carried out on the cost benefits to Newfoundland Power and to Hydro of (i) extending Hydro's VHF system to allow for the implementation of a common system at a future date or any other reasonable alternative that will allow the replacement of both system and; (ii) accommodating Hydro on Newfoundland Power's existing VHF system."

Conclusions

1. From NP's perspective (Col. 'A' in preceding table), the most economic choice for NP is to retain its present system (Alternative 1) and to replace it in 2011 for only its own needs.
2. Expanding NP's system for NLH (Alternative 3) does not offer economic value for NP. Functionally, Alternative 3 is the same as Alternative 1 for NP. The higher NPV (-$5,240,000 vs. -$4,475,000) is due to earlier replacement of the present system (2006 instead of 2011) and includes cost for a higher level of maintenance consistent with that required by NLH.
3. Use of NLH's system by NP (Alternative 2A which also includes cost sharing by DTW) is more costly for NP. However this alternative does offer some operational advantages over NP's present system, including:
   - There are more sites for NP's use, 30 compared to 24 at present, which will provide coverage improvements to some areas.
   - It includes higher priority maintenance, hence improved service availability.
   - The system has the capability for NP, NLH and DTW to integrate their operations (i.e. talk to one another) during emergencies.

   Contributing significantly to the higher cost of this alternative for NP is the need to add 13 sites to NLH's original design in order to meet NP's coverage requirements.
4. If DTW does not participate in Alternative 2, cost to NP will be approximately 40% greater as indicated by the results for Alternative 2B in Section 5 of this report.
5. From the perspective of the overall electric utility business (Col. 'C'), Alternative 1 is also the most economic for NP and NLH combined, but only if DTW contributes to the cost of NLH's new system.
6. Without DTW's participation, the combined NPV results shown for Alternative 2 (Col. 'C') will increase dramatically (similar to that for Alternative 1 without DTW). Alternative 3 with a combined NPV of -$14,649,000 then appears economically attractive. However, NP's system cannot meet all of NLH's functional requirements, and for this reason Alternative 3 is technically unacceptable.

2. Alternative 1 - Status Quo

The status quo alternative provides for Newfoundland Power to continue to operate its existing radio system for the foreseeable future, or for as long as the current equipment can be relied upon to provide a level of service adequate for NP's needs. Due to the age of the present equipment, some dating as far back as 1984, it is expected that replacement of the system will be required by the 2011 timeframe. This replacement could be in any of several forms depending on which is the most cost effective – some options being:

1. Replacement with equipment that is functionally equivalent to the present and that will continue to be owned by NP (this is the option that is further considered in this Section).
2. Replacement by a system that is shared with other users (Section 3 considers this type of an option).
3. Replacement by some new wireless service – e.g. 'push to talk' cellular - that may become commercially available in the future, provided the service can adequately meet NP's operational requirements.

Background: A review[2] of NP's present system, including interviews with employees and visits to some radio sites, was conducted in early 2004 to assess the need for mobile radio communications at Newfoundland Power and to determine the effectiveness of the present system in meeting this need. Findings were as follows:

1. Newfoundland Power's present radio system adequately meets its mobile communication requirements from a functional and operational perspective. The system though is supplemented by the limited use of satellite phones, particularly for communication in some remote locations such as the Sandy Lake dam site.

[2] Results documented in report entitled Newfoundland Power VHF Mobile Radio Requirements, February 24, 2004.

2. For the foreseeable future, Newfoundland Power will continue to need reliable mobile radio communication throughout its service territory.
3. Other than for voice communication, no additional use is anticipated for the mobile radio system.
4. Site infrastructure (i.e. towers and buildings) is in good condition and is capable of another 10 years of service life.
5. Radio repeaters and power supplies are also in good condition and are capable of another five to ten years of service. However, some replacements may be necessary as spare parts for older units become unavailable.
6. Radio system usage is considerably less now than in the past because most employees also use cellular telephones. At the present time, cellular coverage in some areas is not as good as the radio coverage. Also, cellular systems tend to "block" in emergency situations, when communications is most critical. Therefore, cellular is not felt to be sufficiently reliable as the only means of mobile communication for Newfoundland Power.

Description: A technical overview of the present system is contained in Appendix A.

Costs: Table 2.1 lists the capital and operating costs for NP to continue operating its present system, including cost to replace the core infrastructure in 2011. A more detailed breakdown of the costs is contained in Appendix A.

Table 2.1: Alternative 1 (Status Quo) Cost Summary

Cost Type	2006 - 2010	2011	2012 - 2021
	($000/Yr)	($000)	($000/Yr)
Capital	70	2,064	70
Operating	256	256	256

Assumptions:

1. The existing system, specifically radio repeaters, antennas, power equipment and emergency power units, will continue to be operated until 2011.
2. Mobile radio communications will continue to be required beyond the 2011 timeframe for Newfoundland Power to continue to effectively serve its customers.
3. In 2011 the present infrastructure will be upgraded and replaced with new equipment to provide functionality equivalent to the present system. No new mobile radios, other than replacements due to attrition, will be required since the new equipment will be of the *conventional* type and compatible with existing mobiles.

3. Alternative 2 – Expand NLH System to Accommodate NP

This alternative provides for NP to retire its present radio system at a future date and utilize NLH's planned new VHF system. Separate NPV results are included based on NP joining NLH's system in 2008, 2009 and 2011.

Description: NLH's proposed new system will be of the *trunked mobile* type that offers several advantages over the *conventional* mobile systems like that currently used by both NP and NLH. Two prominent features are:

1. *Trunked* systems are specifically intended for multiple *user group* applications whereby each group share*s* the same radio channel(s) but has voice privacy from each other. *User groups* can be separate organizations (e.g. companies or government departments) or separate divisions within an organization.

2. *Trunked* systems offer *roaming* capability, i.e. a mobile call can automatically transfer from one site to another if the second site is more suitable (stronger signal). This eliminates the need for the mobile user to manually select the correct radio channel for a specific area.

Moving from a *conventional* to a *trunked* mobile radio system will also require the replacement of all mobiles currently used by NP and NLH. This also applies to the provincial government's Department of Transportation and Works (DTW) who also uses NLH's present system.

It is proposed that DTW will also use NLH's new system and hence will constitute one *user group.* NLH and NP will constitute two other *user groups.* In actual practice though, each *user group* will be divided, most likely on a geographic basis, into sub-groups.

With NP's participation, the system will consist of a total of 52 radio sites. Appendix D lists the specific sites.

Impact to NLH:

1. 13 additional sites must be added to the original design of NLH's system to provide coverage to parts of NP's operating territory that are outside of NLH's coverage area.
2. Additional channel capacity will be required at five sites that serve urban areas to handle the increased radio traffic that NP is expected to generate in emergency (e.g. storm) situations. These five sites will be equipped with two radio repeaters (two channels) while all other sites will have only one channel.

Impact to NP:

1. NP will discontinue the operation of its radio system and dispose of all sites that are rendered redundant by NLH's system. However, thirteen of NP's present 24 sites must be retained to serve areas that are outside of NLH coverage footprint.
2. NP will be required to upgrade or replace its present inventory of *conventional* radio terminal units - approximately 360 mobiles, handhelds and base stations - with *trunked mobile* units suitable for use with NLH's system at a cost of $847,000.
3. Operation of the new radio system will be considerably different from NP's present system and therefore employees will need to be trained to use the new equipment.
4. With 30 sites, compared to 24 at present, the system will offer coverage improvement for areas, including Swift Current, Bay L'Argent, and New World Island, where VHF mobile calling is limited at present.

Options: Two scenarios have been presented regarding NP's participation (on a percentage basis) with NLH:

- Alternative 2A: Cost of NLH's system is shared three ways:
  i. NLH at 34.4%
  ii. NP at 24.6%
  iii. DTW at 41.0%
- Alternative 2B: Cost of NLH's system is shared two ways:
  i. NLH at 58.3%
  ii. NP at 41.7%

Costs: Tables 3.1 and 3.2 show the capital and operating costs applicable to NP for the two scenarios (2A and 2B above) based on NP joining NLH's system in 2011. If NP joins NLH's system earlier than 2011 – i.e. 2008 or 2009 – the costs in Tables 3.1 and 3.2 remain the same, but the applicable timefames must be adjusted accordingly. A more detailed breakdown of the costs is contained in Appendix B.

Table 3.1: NP Costs – Alternative 2A (NLH, NP, DTW)

Cost Type	2006 - 2010	2011	2012 - 2020
	($000/Yr)	($000)	($000/Yr)
Capital	70	3,860	50
Operating	256	388	388

Table 3.2: NP Costs – Alternative 2B (NLH, NP)

Cost Type	2006 - 2010	2011	2012 - 2020
	($000/Yr)	($000)	($000/Yr)
Capital	70	5,452	30
Operating	256	629	629

Assumptions:

1. NLH will own and maintain all core infrastructure comprising the radio system, and will be responsible for all leases - sites, circuits, etc.
2. NP will continue to be responsible for the site infrastructure that it owns at Torbayman's Pond, Gambo Hill, Jonathan's Pond (building and power only), Pine Tree, Peter's River and Port aux Basques (building and power only).
3. Other than the sites listed above, NP's only other ownership and responsibility will be for the terminal devices – i.e. radios and accessories – that it needs for its employees.

4. Alternative 3 - Expand NP System to Accommodate NLH

This alternative is being investigated in response to the PUB's Order P.U. 29 (2003) which specifically states that an analysis be performed regarding the accommodation of NLH on NP's existing VHF system.

To accommodate NLH, Newfoundland Power's system will require considerable expansion as outlined below to meet the additional coverage requirements of NLH. Also, as NP does not have, nor does it plan to acquire, the workforce to design, build and maintain a mobile radio system, all necessary resources for these efforts will be outsourced. Therefore, for the purpose of this study, NP obtained a budgetary cost proposal from Aliant Inc. to supply and maintain the core radio and network equipment that will be needed.

As well as expanding the system for NLH, NP's existing equipment will also be upgraded at the same time – i.e. in 2006. This represents a five year advancement in the replacement of NP's equipment, compared to the timeframe proposed in alternatives 1 and 2, and is being undertaken for the following reasons:

1. So that the complete system will be technologically equivalent for both users. This will facilitate overall operation, maintenance and administration – i.e. common operating and maintenance procedures and spares.
2. Upgrade will be needed at some sites that are owned by NP in order to accommodate NLH equipment.
3. Replacing bulky equipment with new compact gear at the NP owned sites will negate any requirement for building extensions to accommodate NLH and should reduce space-leasing costs at Aliant's sites.
4. Some economies of scale can be realized by performing all work concurrently thus avoiding the additional costs normally incurred for the start up and administration of a second project.

Description:

The system will employ *conventional* mobile radio technology, rather than a *trunked* architecture as in NLH's system per alternative 2. The choice of *conventional* vs. a *trunked* system was chosen here for the following reasons:

1. A shared conventional system would be functionally and operationally similar to the systems that NP and NLH currently use.
2. A conventional system is a lower initial cost alternative to the *trunked* system proposed by NLH (Alternative 2). In addition to the lower fixed plant costs, all of the present mobiles radios will not need to be replaced.
3. Replacing and expanding NP's present system with a *trunked* system would make Alternative 3 essentially the same as Alternative 2, Option B (i.e. without DTW participation). Therefore the overall costs would be similar to those in Table 3.2, except NP would own the system.

Appendix C contains a more detailed overview of NP's proposal.

Impact to NP:

1. 28 new radio sites (22 leased from Aliant and 6 owned by NLH) must be added to NP's present system to provide coverage for NLH in areas that are outside of NP's service territory. Of the 52 sites in total (28 new + 24 present), 28 will be used only by NLH, 13 by both utilities and 11 only by NP.
2. The system will consist of two sets of radio equipment – i.e. two RF layers, one utilizing 24 sites for NP and the other with 41 sites for NLH. This will provide each with capacity equal to that which they have at present. The switching function though will be combined using VoIP that Aliant is currently in the process of installing for NP's present system.
3. The system will be compatible with NP's existing mobile radio units.

Impact to NLH:

1. Since the system is of the *conventional* type it will not offer all of the operating features that NLH had requested.
2. The 41 sites proposed for NLH's use are not all exactly the same as in Alternative 2 (NLH's system) because NP's proposal is centred round using NP owned sites and Aliant sites. For any cases where the resulting variance in the estimated coverage may be unacceptable to NLH, NLH may choose an alternative site – e.g. one of its own microwave sites – for the location of it's repeater, and any cost impact to NLH will be adjusted accordingly.
3. This alternative does not accommodate DTW.
4. Functionality and operation will be similar to NP's present system.
5. The system will be compatible with NLH's present mobile radio units.

Costs: Table 4.1 summarizes the capital and operating costs. Additional cost details are contained in Appendix C.

Table 4.1: Costs Specific to NP - Alternative 3 (Expand NP System for NLH)

Cost Type	2006	2007 - 2020
	($000)	($000/Yr)
Capital	1,901	70
Operating	300	300

Table 4.2: Costs Specific to NLH - Alternative 3

Cost Type	2006	2007 - 2020
	($000)	($000/Yr)
Capital	1,984	0
Operating	856	836

Table 4.3: Total Costs (NP + NLH) - Alternative 3

Cost Type	2006	2007 - 2020
	($000)	($000/Yr)
Capital	3,885	70
Operating	1,156	1,136

Assumptions:

1. Present radio frequency assignments used by NP and NLH will continue to be used.
2. Newfoundland Power will own and maintain the core infrastructure comprising the system, including that at sites that are outside of NP's operating territory.
3. Newfoundland Power can utilize Newfoundland and Labrador Hydro's existing radio infrastructure - e.g. sites and circuitry - that it would like to include in the design of the system.
4. Newfoundland Power and Newfoundland and Labrador Hydro will each own and be responsible for the procurement and maintenance of all mobile radio units used by their respective employees.

5. Net Present Value Analysis

Study Parameters

- 15-year study period, 2006 - 2020
- All costs are shown in 2004 dollars
- Annual inflation is applied at 2% beginning in 2005
- NP's cost of capital: 8.52%

End of Study Treatment

No special end of study treatment is used as it is assumed that all alternatives will be equivalent (e.g. at end of useful life) by 2020.

Analysis Results (with DTW participation)

Following are the NPV results applicable to NP for the three alternatives (values are negative since they represent costs or output cash flows):

Alternative	Description	NPV ($000)	Notes
1	Status Quo (upgrade in 2011)	- 4,475	1
$2A_{(08)}$	Expand NLH System in 2008 for NP	- 7,171	2
$2A_{(09)}$	Expand NLH System in 2009 for NP	- 6,883	2
$2A_{(11)}$	Expand NLH System in 2011 for NP	- 6,357	2
3	Expand NP System for NLH (2006)	- 5,240	3

Notes:

1. $4,475,000 represents the net present value (2005 dollars) of the costs contained in Table 2.1 for NP to continue to operate a VHF radio system for its own needs during the period, 2006 – 2020.
2. NPVs for Alternative 2A are based on costs contained in Table 3.1, which also include DTW's participation in the system.
3. $5,240,000 represents the net present value of the costs specific to NP (Table 4.1) for NP to upgrade and expand its system for both companies. Although the costs that are specific to NLH (Table 4.2) will also be incurred by NP, these will be passed on to NLH and therefore have not been included in NP's NPV analysis.

Analysis Results (without DTW participation)

Without DTW contributing towards the cost of NLH's system, the NPV results applicable to NP would be as follows:

Alternative	Description	NPV ($000)
$2B_{(08)}$	Expand NLH System in 2008 for NP	- 10,191
$2B_{(09)}$	Expand NLH System in 2009 for NP	- 9,644
$2B_{(11)}$	Expand NLH System in 2011 for NP	- 8,645

Appendix E contains the worksheets used to enter cost data and perform the NPV calculations for each analysis.

6. Conclusions

1. From NP's perspective, the most economic choice for NP is to retain its present system (Alternative 1 with NPV of -$4,475,000) and to replace it in 2011 for only its own needs.
2. Expanding NP's system for NLH (Alternative 3) does not offer economic value for NP. Functionally, Alternative 3 is the same as Alternative 1 for NP. The higher NPV (-$5,240,000 vs. -$4,475,000) is due to earlier replacement of the present system (2006 instead of 2011) and includes cost for a higher level of maintenance consistent with that required by NLH.
3. Use of NLH's system by NP (Alternative 2A which also includes cost sharing by DTW) is more costly for NP. However this alternative does offer some operational advantages over NP's present system, including:
   - There are more sites for NP's use, 30 compared to 24 at present, which will provide coverage improvements to some areas.
   - It includes higher priority maintenance, hence improved service availability.
   - The system has the capability for NP, NLH and DTW to integrate their operations (i.e. talk to one another) during emergencies.

   Contributing significantly to the higher cost of this alternative for NP is the need to add 13 sites to NLH's original design in order to meet NP's coverage requirements.
4. If DTW does not participate in Alternative 2, cost to NP will be approximately 40% greater as indicated by the Alternative 2B results.

Appendix A

Alternative 1 Details

(Status Quo)

Contents

Appendix A

Alternative 1 Details

(Status Quo – Retain Existing System)

General Description

Alternative 1 provides for NP to continue to operate its current radio system until the end of its useful life and then upgrade the radio site infrastructure as follows:

- Replacement of all 26 radio repeaters with new that is functionally equivalent to the present ones.
- Replacement of existing antennas.
- Replacement of dc power plant equipment and standby generators at the NP owned radio sites/buildings.
- Replacement of radio link circuits where leased circuits (telecom lines) are not available (or are not currently not being used).

Figure A-1 shows NP's service territory and the location of its present radio sites. Figure A-2 illustrates the circuit layout of the present system.

In effect then, when the system is upgraded/replaced, it will continue to function as it is at present, serving only NP's needs.

Costs

Capital and operating costs for NP to continue to meet its own mobile radio communication requirements for the 2006 – 2020 are contained in Tables A-1 to A-3:

1. **Table A-1** summarizes the capital and operating costs to upgrade the current infrastructure (new power equipment, radio equipment, etc.), as well as ongoing (yearly) expenditures to do capital upgrades (i.e. replace NP mobile units and do tower upgrade work).
2. **Table A-2** contains a breakdown of the capital cost upgrade the system as follows:
   - 26 new radio repeaters,
   - Replacement of antenna systems,
   - Replacement of power systems at all NP owned sites, and
   - Replacement of radio link circuits at sites where leased circuits (telecom lines) are not available (or are not currently being used).
3. **Table A-3** contains a breakdown of the recurring operating expenses.

Table A-1 Date: 5-Aug-04

Cost Summary - Retain Status Quo & Replace in 2011

Description	2006 - 2010	2011	2012 - 2020
	($000)	($000)	($000)
Capital Costs			
Infrastructure Replacement (Table A-2)	---	1994	---
Mobile Radios	30	30	30
Tower Upgrade	40	40	40
TOTAL Capital Costs	**70**	**2064**	**70**
Annual Expense (Table A-3)	**256**	**256**	**256**

Table A-2 Date: 5-Aug-04

Capital Cost Details (Infrastructure) - Retain Status Quo & Replace in 2011

			2011 Expenditures ($000)					
			NP Specific (Infrastructure Upgrade)					
	Name	Owner	Radio Repeater	Repeater Antenna	DC Pwr & Battery	Emerg Gen	Radio Link/Ant	NP Total
1	Torbayman's Pond	NP	55.0	25.0	17.0	18.0	---	115.0
2	Whitbourne	NP	20.0	10.0	17.0	18.0	---	65.0
3	Clarenville (Shoal Harbour)	Allstream	20.0	10.0	---	---	---	30.0
4	Gambo Hill	NP	20.0	10.0	17.0	18.0	33.0 (3)	98.0
5	Jonathan's Pond	Aliant	20.0	10.0	17.0	18.0	60.0 (3)	125.0
6	Rattling Brook	NP	20.0	10.0	17.0	18.0	60.0 (3)	125.0
7	Sandy Brook	NP	20.0	10.0	17.0	18.0	33.0 (3)	98.0
8	Sheffield Lake	Aliant	20.0	10.0	---	---	---	30.0
9	Corner Brook	Aliant	20.0	(1)	---	---	---	20.0
10	Pine Tree	NP	20.0	10.0	17.0	18.0	---	65.0
11	Red Rocks	Aliant	20.0	(1)	---	---	---	20.0
12	Cape Broyle	Aliant	20.0	(1)	---	---	---	20.0
13	Peter's River	NP	20.0	10.0	17.0	18.0	25.0 (4)	90.0
14	Placentia	CBC	20.0	10.0	17.0	---	---	47.0
15	Heart's Content	Allstream	20.0	10.0	---	---	---	30.0
16	Marystown	Aliant	20.0	10.0	---	---	---	30.0
17	Lamaline	Aliant	20.0	10.0	---	---	---	30.0
18	Grand Bank	NP	20.0	10.0	(2)	---	---	30.0
19	Lockston Hill	Aliant	20.0	10.0	---	---	25.0 (4)	55.0
20	Lumsden	Aliant	20.0	(1)	---	---	25.0 (4)	45.0
21	Baie Verte	Aliant	20.0	10.0	---	---	---	30.0
22	Deer Lake	Aliant	20.0	(1)	---	---	---	20.0
23	Port aux Basques (Flagstaff)	CBC	20.0	10.0	17.0	18.0	---	65.0
24	Rose Blanche	Aliant	20.0	(1)	---	---	---	20.0
Subtotal			515.0	195.0	170.0	162.0	261.0	1303.0
Misc. (Cables, H/W, Etc.) - 10%			51.5	19.5	17.0	16.2	26.1	130.3
Contingency (15%)			85.0	32.2	28.1	26.7	43.1	215.0
Eng Design & Project Mgmt (10%)			65.1	24.7	21.5	20.5	33.0	164.8
Loading - IDC,etc. (10%)			71.7	27.1	23.7	22.5	36.3	181.3
TOTAL								**1994**

Notes

(1) Antenna owned by Aliant and shared with (or leased to) NP.

(2) Grand Bank radio is powered by battery at Greenhill turbine station.

(3) Replacement of existing Gambo Hill - Jonathan's Pond - Rattling Brook - Sandy Brook point-to-point with new.

(4) Base station for off-air pickup of adjacent VHF repeater site.

Table A-3 Date: 5-Aug-04

Operating Costs - Retain Status Quo & Replace in 2011

Description	2006 - 2020
	($000)
Radio Licences	29
Circuit Rentals	82
Building & Tower Rental	58
Radio Eqpt Rental	14
Radio Mtce	10
Tower Inspection (Avg. per Year)	10
NP Administration	20
Subtotal	223
Contingency (15%)	33
TOTAL	**256**

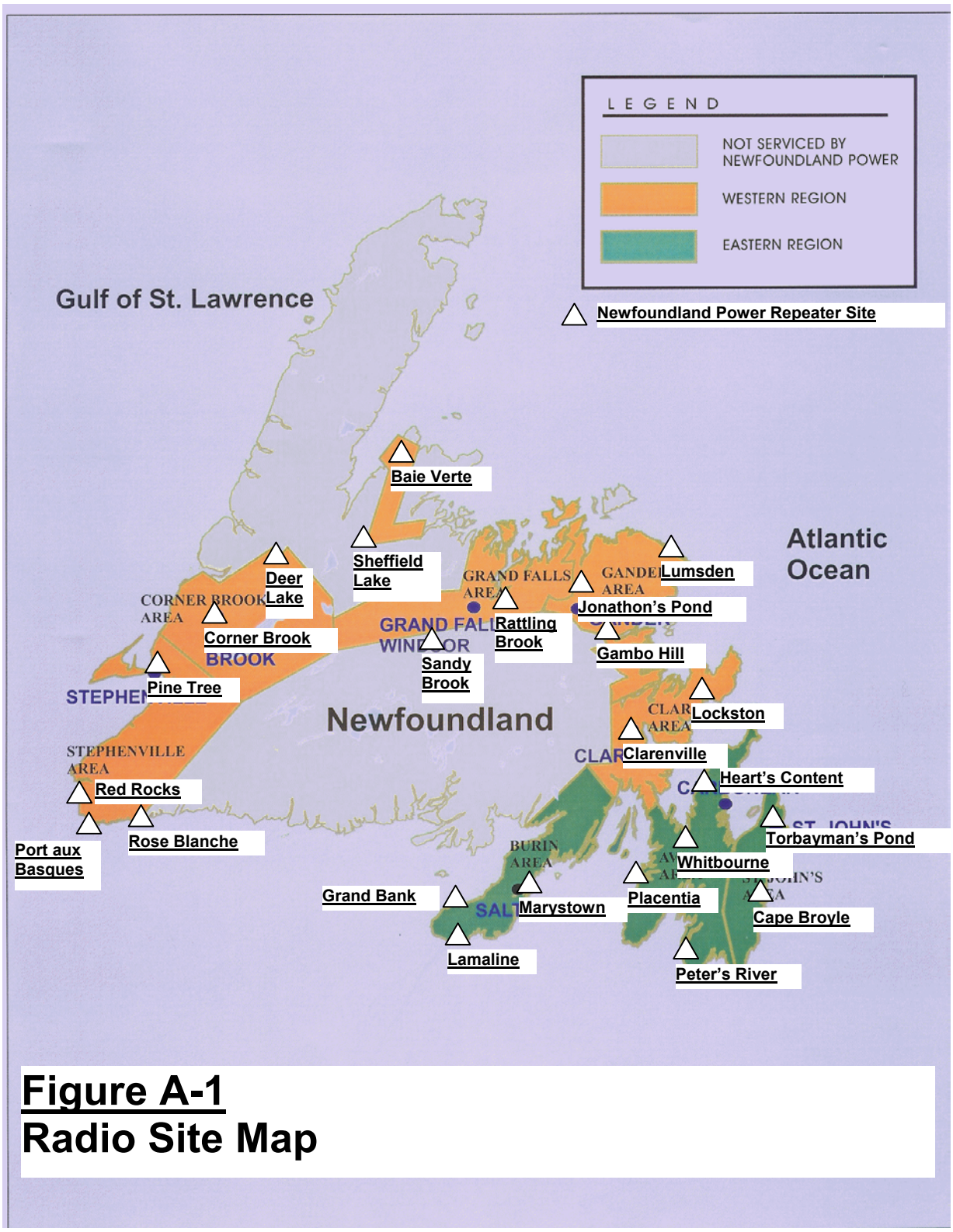
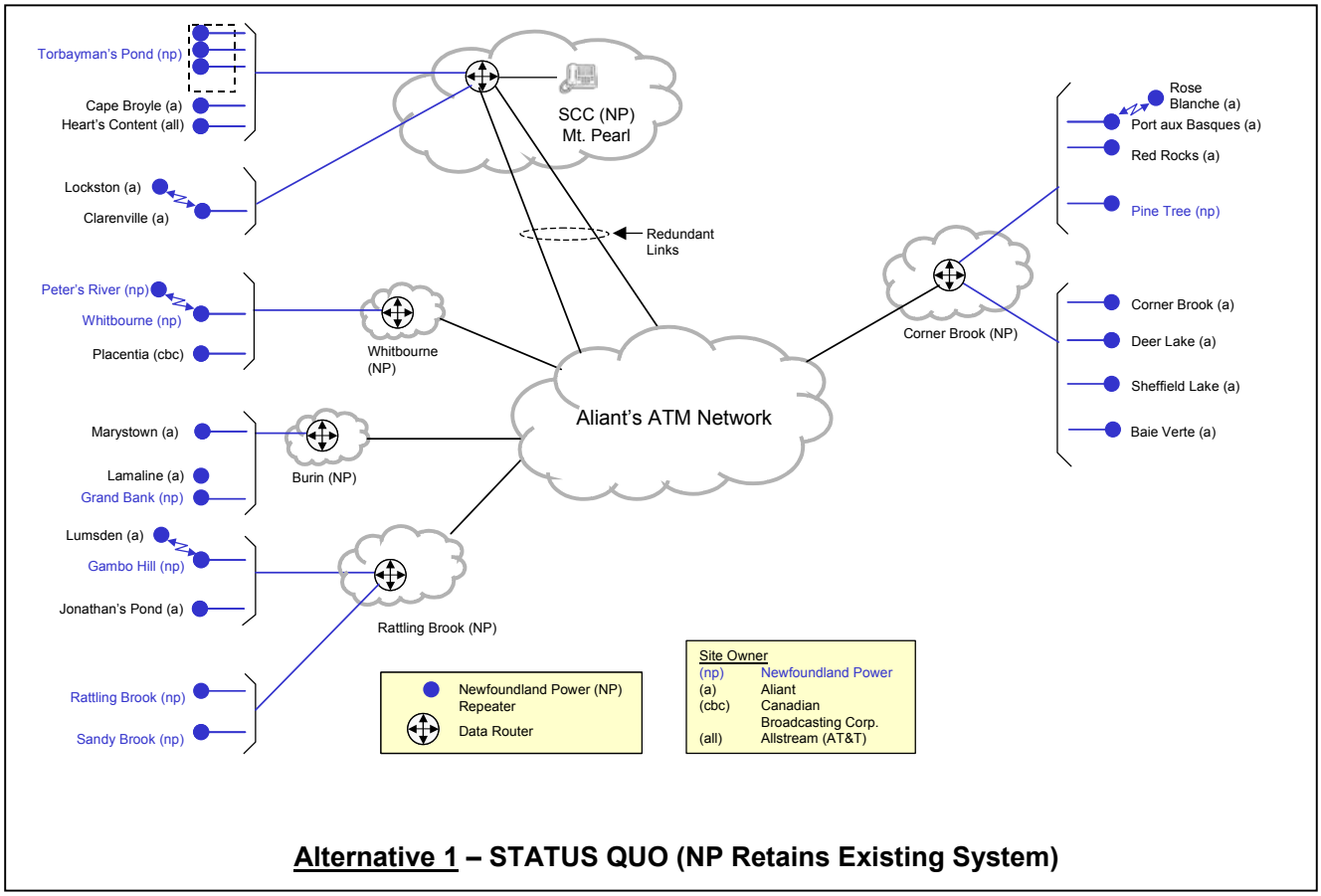


Figure A-1
Radio Site Map

Figure A-2 System Layout (Existing NP System)



Alternative 1 – STATUS QUO (NP Retains Existing System)

Functional Description

This functional description is based on a document[3] that was prepared as a guide for Aliant Inc. to implement VoIP as a replacement technology for the Redcom switch that currently performs the switching functionality for the present radio system. As this work is still in progress, some changes may be necessary where the final operating details may vary from the description contained herein. Overall though, the functionality should be the same, but some operating procedures may be modified.

1.0 INTRODUCTION

The Newfoundland Power VHF radio system provides wireless voice communications to various mobile workers throughout the operating territory on the island portion of the province. The system is divided into nine areas corresponding to the operating areas of the Company. Within each area users can voice call other users anywhere regardless of which repeater they are tuned to. To make calls outside the area DTMF tones are used to complete switching necessary to establish links with remote areas or the System Control Centre (SCC).

Traffic is carried between the area and the radio switch located at the SCC using the corporate WAN. Four wire E&M interfaces are provided on the WAN routers located at various offices. The table below identifies the office where the various radio system interfaces are established.

Radio System Area	**Interface Point**
Stephenville & Port aux Basques	Corner Brook Service Building
Corner Brook & Baie Verte	Corner Brook Service Building
Grand Falls	Rattling Brook
Gander	Ratting Brook
Clarenville & Bonavista	System Control Centre
Burin	Salt Pond Office
Whitbourne & Peters River	Whitbourne Office
Carbonear	System Control Centre
St. John's	System Control Centre

VHF repeaters (radio sites) within an area are linked together via point-to-point radio and/or leased 4 wire E&M voice circuits. The E&M signalling is used to remotely key transmitters at linked repeater sites. This allows a signal inbound at one repeater site to be rebroadcast at other repeater sites. Ultimately all area radio systems are terminated at the network switch, located at the System Control Centre (SCC) in St. John's.

The connection of the SCC telephone system to the network switch enables the monitoring of calls from any Norstar key system multi-line telephone set in the SCC. The system offers the mobile radio user the flexibility to communicate with the SCC, another mobile and/or base station anywhere within the area, or other areas networked on the system. At present, the VHF radio system consists of 24 radio sites divided into nine areas. A tenth area exists as an emergency channel in the St. John's operating area.

The following diagram displays the network topology for the VHF radio system. The system is divided into nine areas corresponding to the operating areas of the Company plus the St. John's emergency channel.

[3] Document entitled, *Newfoundland Power Mobile Radio System Functionality*, January 2004 by Jack Casey of Newfoundland Power Inc.

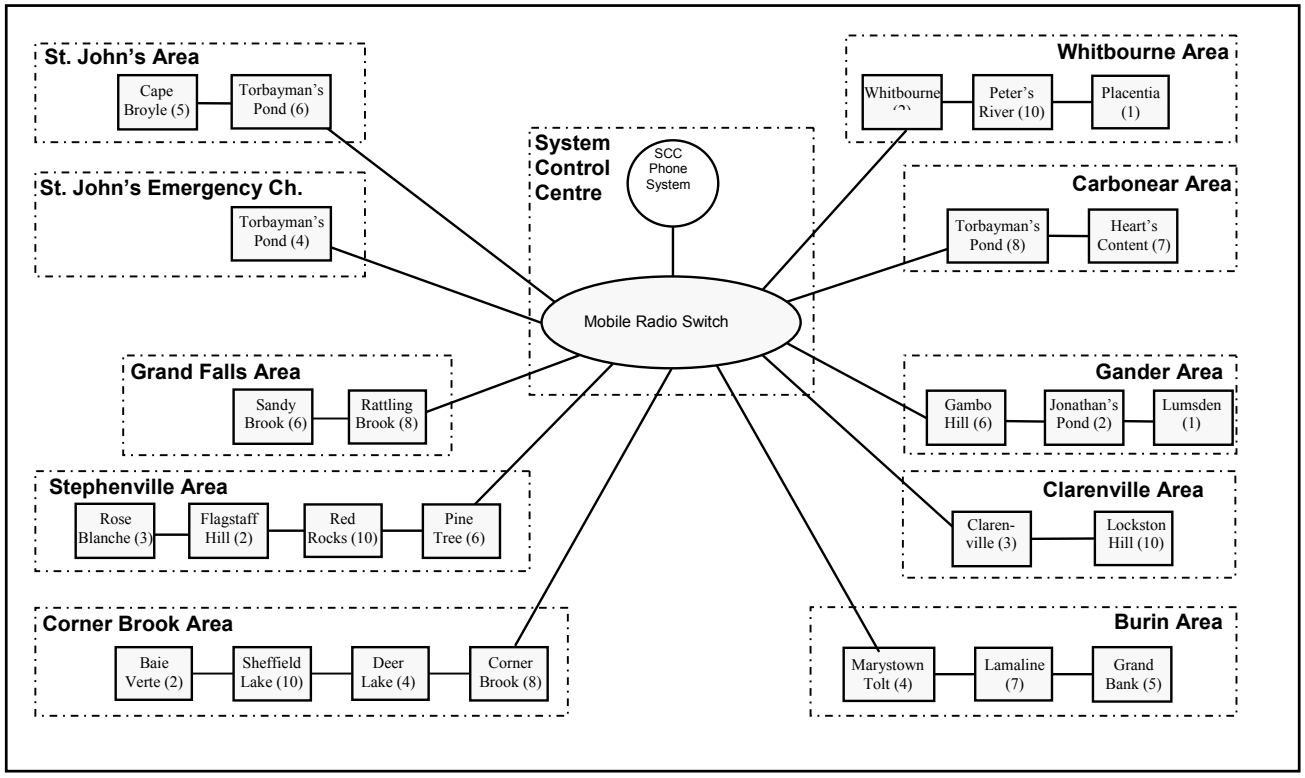


Figure 1 - VHF Radio System Overview

2.0 SWITCH FUNCTIONS

The radio switch incorporates the necessary network functions into the overall system design.

System Control Centre Access

The radio operator can access the system control centre by either one of the following three methods:

- Entering the code #438 on the DTMF microphone will ring the telephone set on the SCADA operators desk
- Entering the code #458 on the DTMF microphone will ring the telephone set on the dispatchers desk
- Entering the code #911 on the DTMF microphone will ring the emergency line on multiple telephone set in the SCC

Access to Other Areas

The radio operator can access other areas by entering the appropriate DTMF code on their radio microphone. The table below lists the various link access codes. The radio switch detects these codes and the links are established.

AREA	ACCESS CODE
St. John's (6) + St. John's (4)	**#901**
Bonavista + Burin	**#905**
St. John's (4) + Bonavista	**#908**
St. John's (4) + Burin	**#909**
Gander + Bonavista	**#914**
Gander + Burin	**#915**
Gander + Grand Falls	**#916**

AREA	ACCESS CODE
Grand Falls + Corner Brook	**#917**
Corner Brook + Stephenville	**#918**
Grand Falls + Stephenville	**#919**
St. John's (6) + Whitbourne	**#920**
St. John's (4) + Whitbourne	**#921**
St. John's (6) + St. John's (4) + Whitbourne	**#923**
Bonavista + Whitbourne	**#924**
Burin + Whitbourne	**#925**
Whitbourne + Carbonear (7,8)	**#927**
Carbonear (7,8) + Bonavista	**#928**

Entering the code #* on the DTMF microphone will reset the switch if there is any difficulty making or terminating a connection.

Telephone System Access

The system provides for the ability for allow telephone lines in the Newfoundland Power Centrex group (restricted to St. John's only) to access the VHF Mobile Radio system. To use this facility, dial ***79** from any Centrex telephone and a second dial tone will be presented. Dial the access code for the area in which you wish to connect with and a tone will be heard indicating the user has connected to the radio system. Telephone access codes for each area are listed in the table below.

When using the telephone to speak over the radio system some issues must be kept in mind. The telephone operates in full duplex mode while the radio system is only half duplex. What this means that if the radio operator is speaking on the radio, he will not be able to hear anything spoken by the telephone user. Therefore when using the telephone access feature, both the telephone user and the radio operator should finish each transmission with the word "**OVER**".

AREA	ACCESS CODE	MONITORING CODE
St. John's Channel 6	**60**	**571**
St. John's Channel 4	**61**	**572**
Carbonear	**62**	**576**
Bonavista	**63**	**574**
Burin	**64**	**575**
Whitbourne	**65**	**581**
Gander	**66**	**580**
Grand Falls	**67**	**582**
Corner Brook	**68**	**583**
Stephenville	**69**	**584**

3.0 AREA RADIO SYSTEM DESCRIPTIONS

St. John's Area

The St. John's area VHF radio system consists of two VHF repeaters, one repeater located at Torbayman's Pond (Trans Canada Highway near the Donovan's Industrial Park) and the second repeater at Aliant's site in Cape Broyle. The channel 6 repeater at Torbayman's Pond and the channel 5 repeater at Cape Broyle are permanently linked together. These repeaters are connected to the network switch at the SCC via a leased 4-wire E&M voice circuit.

A second repeater is also located at Torbayman's Pond. This repeater operates on channel 4 and is available for emergency use in the St. John's area.

Carbonear Area

The Carbonear area VHF radio system consists of two VHF repeaters, one repeater located at Torbayman's Pond (Trans Canada Highway near the Donovan's Industrial Park) and the second repeater at AT&T's site on the Hearts Content Barons. The channel 8 repeater at Torbayman's Pond and the channel 7 repeater at Hearts Content are permanently linked together. These repeaters are connected to the network switch at the SCC via a 4-wire E&M voice circuit on a T1 link leased from AT&T.

Whitbourne Area

The Whitbourne area VHF radio system consists of three VHF repeaters, one repeater located at Whitbourne and the second repeater at Peter's River and a third at CBC's site at Point Verde. The channel 2 repeater at Whitbourne is linked to the channel 10 repeater at Peter's River and the channel 1 repeater at Point Verde using on air RA repeater. These repeaters are connected to the network via a leased 4-wire E&M voice circuit from the Whitbourne radio site to the Whitbourne office. Connection to the radio switch at the SCC is via the corporate network.

Clarenville and Bonavista Area

The Clarenville area VHF radio system consists of two VHF repeaters, one repeater located at Aliant's cell site at Lockston and the second repeater at AT&T's site at Steele's Mountain Clarenville. The channel 10 repeater at Lockston and the channel 3 repeater Clarenville are permanently linked together using on air RA repeater. These repeaters are connected to the network switch at the SCC via a 4-wire E&M voice circuit on a T1 link leased from AT&T.

Burin Area Radio System

The Burin area VHF radio system consists of three VHF repeaters, one repeater located at Aliant's Marystown Tolt site, the second repeater at Aliant's Lamaline site and a third at Greenhill substation. The channel 4 repeater at Marystown Tolt is linked to the channel 7 repeater at Lamaline and the channel 5 repeater at Greenhill using on air RA repeater. These repeaters are connected to the network via a leased 4-wire E&M voice circuit from the Marystown Tolt radio site to the Salt Pond office. Connection to the radio switch at the SCC is via the corporate network.

Gander Area Radio System

The Gander area VHF radio system consists of three VHF repeaters, one repeater located at Aliant's Jonathan's Pond site, the second repeater at Newfoundland Power's Gambo Hilltop site and a third at Aliant's Lumsden cell site. The channel 2 repeater at Jonathan's Pond is linked to the channel 6 repeater at Gambo Hilltop using a UHF point to point radio link. The channel 1 repeater at Lumsden is linked to the network using on air RA repeater. These repeaters are connected to the network via a 4-wire E&M voice circuit from Newfoundland Power's office at Rattling Brook.

Grand Falls Area Radio System

The Grand Falls area VHF radio system consists of two VHF repeaters, one repeater located at Rattling Brook Hilltop site, and the second repeater at Sandy Brook site. The channel 8 repeater at Rattling Brook is linked to the channel 6 repeater at Sandy Brook using a UHF point to point radio link. These repeaters are connected to the network via a 4-wire E&M voice circuit from Newfoundland Power's office at Rattling Brook.

Corner Brook Area Radio System

The Corner Brook area VHF radio system consists of four VHF repeaters at Aliant sites located, at Corner Brook, Deer Lake, Sheffield Lake and Baie Verte. The four repeaters are connected together by a multi-drop circuit from Aliant and delivered to the maple Valley Corner Brook office on a 4-wire E&M circuit. Connection to the radio switch at the SCC is via the corporate network.

Stephenville Area Radio System

The Stephenville area VHF radio system consists of four VHF repeaters, two at Newfoundland Power sites at Pinetree Ridge and Flagstaff Hill and two at Aliant site located at Red Rocks, at Rose Blanche. Three of the repeaters are connected together by a multi-drop circuit from Aliant and delivered to the maple Valley Corner Brook office on a 4-wire E&M circuit. The Rose Blanche repeater is an RA configuration that picks up the Flagstaff repeater on the air. Connection to the radio switch at the SCC is via the corporate network.

1.0 SYSTEM FEATURES

The following are essential features that are frequently used:

Area repeaters permanently linked together

The ability for radio operators to voice call other mobile users anywhere within the existing operating areas provides for a simple means of communications between work crews.

Access to SCC

The ability for radio operators to selectively call the System Control Centre using their DTMF microphone to dial #438 to reach the SCADA Operator, #458 to reach the Dispatcher and #911 for emergencies will be maintained.

Access to Operational voice handsets SCC

The existing radio/telephone sets at the SCC provide access to both the telephone and radio systems. Each SCADA Operator and the Dispatcher have the capability to access all telephone lines (incoming and outgoing) and radio trunks. The sets have a dial by name feature that is hierarchical in nature to allow for easy selection based upon job function and employee location. The operator gets an acknowledgement tone in the earpiece when the connection is made through to the repeater.

Voice logging

The existing radio/telephone sets at the SCC are connected to a digital voice logger. This logger records all conversations with the staff at the SCC make on the telephone or radio systems.

The following are features that are not frequently used, and therefore are not considered essential to the operation of the system:

Area repeaters linked to remote areas

The ability for radio operators to link their area radio system to a remote area radio system is used infrequently. This feature is used in times of trouble when supervisors are looking for updates from crews working in an area remote from the supervisor's location. This feature should be maintained in some form if possible, but can be implemented differently from what is currently in place.

Telephone system access

The current functionality where a Centrex telephone line can access the VHF radio system is used infrequently. Some Head Office staff to attempt to communicate with an employee in a VHF radio equipped vehicle using this feature. Usually the first attempt to communicate with the employee is by cellular telephone. This feature is useful in the event that the cellular system is unavailable due to poor coverage of cellular system congestion. While it would be inconvenient, it would be possible to have the staff at the SCC relay messages via the VHF radio system for office staff.

VHF radio paging

With the advent of cellular telephones the use of the VHF paging system has been discontinued.

VHF radio switch reset

The design of the existing system was intended to provide a simple user interface for the mobile radio user. An all encompassing "fix all" code of #* was implemented to reset the switch and trunks. This feature was most frequently used by radio operators to terminate an inter-area radio call rather than wait for the connection to time out. While the #* code itself is not essential, a reset of some type must be maintained.

4.0 VHF FREQUENCY ASSIGNMENTS

The following table lists the VHF frequencies that are presently being used.

CHANNEL	TRANSMIT (MHz)	RECEIVE (MHz)	REPEATER SITE
1	166.560	160.725	**Placentia – CBC** **Lumsden - NTC**
2	158.520	157.620	**Baie Verte - NTC** **Flagstaff - CBC** **Jonathon's Pond - NTC** **Whitbourne**
3	161.325	164.760	**Clarenville - AT&T** **Rose Blanche - NTC**
4	158.370	157.680	**Deer Lake - NTC** **Marystown Tolt - NTC** **Torbayman's Pond**
5	160.485	163.125	**Cape Broyle - NTC** **Grand Bank (Greenhill)** **Millertown - NTC**
6	159.630	158.250	**Gambo Hilltop** **Pinetree Ridge** **Sandy Brook** **Torbayman's Pond**
7	159.390	160.260	**Hearts Content - AT&T** **Lamaline - NTC**
8	158.430	159.180	**Corner Brook - NTC** **Rattling Brook** **Torbayman's Pond**
9	159.940	159.940	**Vehicle to Vehicle**
10	158.940	159.810	**Lockston Hill** **Peter's River** **Red Rocks - NTC** **Sheffield Lake - NTC**
11	160.485	160.485	**Vehicle to Vehicle**
12	158.520	158.520	**Vehicle to Vehicle**

Appendix B

Alternative 2 Details

(Expand NLH System for NP)

Contents

Appendix B
Alternative 2 Details
(Expand NLH System for NP)

Description

This alternative entails the expansion of NLH's proposed VHF radio system, that it plans to have operational in 2006, to also meet NP's coverage requirements in the future when NP's present system has reached the end of its useful life.

As well as serving the needs of NLH and NP, it is planned that the provincial Department of Works Services and Transportation (DTW) will also use this system. This though is subject to DTW obtaining approval to fund its share of the cost of the system. For this reason, two cost sharing scenarios are presented for this alternative:

1. **Alternative 2A:** NLH, DTW and NP share the capital and operating costs.
2. **Alternative 2B:** Only NLH and NP share the capital and operating costs.

Breakdown of each participant's share of the costs, on a percentage basis, is as follows:

Alternative	NP	NLH	DTW	TOTAL
2A	24.6%	34.4%	41.0%	100%
2B	41.7%	58.3%	---	100%

Costs

The following tables contain only costs that are specific to NP:

1. **Table B-1** summarizes the capital and operating costs for NP to participate in the system with NLH and DTW (2A above). Costs include NP's share of the "joint" system and other costs that are specific only to NP – e.g. upgrades at sites that NP will continue to own.
2. **Table B-2** summarizes the capital and operating costs for NP to participate in the system with only NLH (2B above).
3. **Table B-3** indicates the disposition of the radio sites that NP currently uses:
   - NP will retain the sites that it owns and which will be integrated into NLH's system.
   - NP will upgrade the infrastructure – antennas and power - that it owns and which also will be integrated into NLH's system.
   - Sites currently leased by NP but which also will form part of NLH's system will be leased by NLH (the NP leases will be terminated).
   - Any sites that will no longer be needed will be discontinued.
   - Removal costs are also shown.
4. **Table B-4** shows the cost for NP to replace all of its mobile radios with units compatible for operation with NLH's system.
5. **Table B-5** contains a breakdown of the recurring operating expenses that will be additional to its shared of NLH's operating cost.

Table B-1 Date: 9-Aug-04

Alternative 2A Cost Summary - Utilize NLH System in 2011 (with DTW)

Description	2006 - 2010	2011	2012 - 2020
	($000)	($000)	($000)
NP Capital Costs			
24.6% Share of NLH's Cost (Note 1)	--	2263	--
Project Start-up & Management (Note 1)	--	225	--
Site Upgrade - 6 NP Sites (Table B-3)	--	505	--
Mobile Radios (Table B-4 for 2011 amount)	30	847	30
Tower Upgrade	40	20	20
Total Capital	**70**	**3860**	**50**
NP Operating Expense			
24.6% Share of NLH's Expenses	--	348	348
NP Own Expenses (Table B-5)	256	40	40
Total Operating Cost	**256**	**388**	**388**
NP Removal Costs (Discontinued Sites)	**--**	**81**	**--**

Note 1: The amounts shown (2263K in Table B-1 and 3835K in Table B-2) for the NP share of the capital cost are based on NP's participation in 2006, however since it is expected that NP's participation will be at a later date (i.e. 2011), an additional cost of 225K is included for the start up and administration of a new project to complete the NP phase of the system.

Table B-2 Date: 9-Aug-04

Alternative 2B Cost Summary - Utilize NLH System in 2011 (w/o DTW)

Description	2006 - 2010	2011	2012 - 2020
	($000)	($000)	($000)
NP Capital Costs			
41.7% Share of NLH's Cost (Note 1)	--	3835	--
Project Start-up & Management (Note 1)	--	225	--
Site Upgrade - 6 NP Sites (Table B-3)	--	505	--
Mobile Radios (Table B-4 for 2011 amount)	30	847	30
Tower Upgrade	40	40	--
Total Capital	**70**	**5452**	**30**
NP Operating Expense			
41.7% Share of NLH's Expenses	--	589	589
NP Own Expenses (Table B-5)	256	40	40
Total Operating Cost	**256**	**629**	**629**
NP Removal Costs (Discontinued Sites)	**--**	**81**	**--**

Table B-3 Date: 5-Aug-04

Disposition of NP Sites and Related Costs (Alternative 2 - Utilize NLH System in 2011)

	Existing NP Site	Owner	Disposition (2011)	Equipment & Site Removal Costs	Replace Power & Antennas
				($000)	($000)
1	Torbayman's Pond	NP	**NP to Retain**	**1**	**45**
2	Whitbourne	NP	Retire, Use NLH site at Chapel Arm	**12**	**0**
3	Clarenville	Allstream	**Discontinue**, Use NLH site at Shoal Harbour	**4**	**0**
4	Gambo Hill	NP	**NP to Retain**	**1**	**45**
5	Jonathan's Pond (Aliant)	NP Bldg	**NP to Retain**	**1**	**45**
6	Rattling Brook	NP	Retire, Use NLH site at Notre Dame	**12**	**0**
7	Sandy Brook	NP	Retire, Use NLH site at Sandy Book	**12**	**0**
8	Sheffield Lake	Aliant	NLH to Lease	**4**	**0**
9	Corner Brook	Aliant	NLH to Lease	**1**	**0**
10	Pine Tree	NP	**NP to Retain**	**1**	**45**
11	Red Rocks	Aliant	NLH to Lease	**1**	**0**
12	Cape Broyle	Aliant	NLH to Lease	**1**	**0**
13	Peter's River	NP	**NP to Retain**	**1**	**45**
14	Placentia	CBC	NLH to Lease	**1**	**10**
15	Heart's Content	Allstream	**Discontinue** (assumes coverage from other sites will be adequate)	**4**	**0**
16	Marystown	Aliant	NLH to Lease	**1**	**10**
17	Lamaline	Aliant	NLH to Lease	**1**	**10**
18	Grand Bank	NP	**NP to Retain**	**1**	**10**
19	Lockston Hill	Aliant	NLH to Lease	**1**	**10**
20	Lumsden	Aliant	NLH to Lease	**0**	**0**
21	Baie Verte	Aliant	NLH to Lease	**1**	**10**
22	Deer Lake	Aliant	**Discontinue**, Use NLH sites at Blue Grass & Boone Bay	**1**	**0**
23	Port aux Basques (CBC)	NP Bldg	NLH to Lease	**1**	**45**
24	Rose Blanche	Aliant	NLH to Lease	**0**	**0**
	Subtotal			**64**	**330**
	Misc. - Cables, h/w, etc. (10%)			**--**	**33**
	Contingency (15%)			**10**	**54**
	Eng. Design & PM (10%)			**7**	**42**
	Loading - IDC,etc. (10%)			**--**	**46**
	TOTAL			**81**	**505**

Table B-4 Date: 28-Jul-04

Mobile Radio Costs (NP Only)

(Alternative 2 - Utilize NLH System in 2011)

Product	Base Price	Config. & Install	Total/Unit	Qty	**Total** ($000)
Mobile Radio	$1,117	$400	$1,517	260	394
Handheld (Portable)	$1,683	$200	$1,883	75	141
Base Station	$2,008	$1,800	$3,808	25	95
Mobile Radio - Spare	$1,117	--	$1,117	10	11
Handheld (Portable) - Spare	$1,683	--	$1,683	5	8
Base Station - Spare	$2,008	--	$2,008	2	4
User Training Session	$5,000		$5,000	3	15
Subtotal					669
Contingency (15%)					100
Loading - IDC,etc. (10%)					77
TOTAL					**847**

Table B-5 Date: 9-Aug-04

Operating Costs (In addition to expenses billed by NLH)

(Alternative 2 - Utilize NLH System in 2011)

Description	**2006 - 2010**	**2011**	**2012 - 2020**
	($000)	($000)	($000)
Radio Licences	29	--	--
Circuit Rentals	82	--	--
Building & Tower Rental	58	--	--
Radio Eqpt Rental	14	--	--
Radio Mtce	10	10	10
Tower Inspection	10	5	5
NP Administration	20	20	20
Subtotal	223	35	35
Contingency (15%)	33	5	5
TOTAL	**256**	**40**	**40**

Appendix C

Alternative 3 Details

(Expand NP System for NLH)

Contents

Appendix C

Alternative 3 Details

(Expand NP System for NLH)

Description

The intent here is to utilize existing Newfoundland Power infrastructure supplemented by facilities belonging to Aliant Inc. and Newfoundland and Labrador Hydro (NLH). New radio repeaters will be provided at all sites – two repeaters at sites that both NLH and NP will use and one repeater at sites which only either NLH or NP require. Switching infrastructure employing VoIP (Voice over Internet Protocol) will be augmented where necessary to add the NLH repeaters to NP's present network and to interconnect to NLH's WAN. Also, power systems at existing NP owned sites will be upgraded with new battery plants and emergency generators.

NP will be responsible for the system maintenance, performed under contract to Aliant Inc.

Radio Sites and Coverage: Table D-1 (Appendix D) lists the radio sites that will comprise the system (Alt. #3) and shows which sites will be used by each company. Of the 52 sites, only 13 will be used by both, 11 used by only NP and 28 used by only NLH. Changes with respect to the present systems and possible impact on coverage are outlined below:

1. **Newfoundland Power**:
   - 23 of the 24 present sites will continue to be used.
   - The site at Clarenville will be moved from Allstream's (formerly AT&T Canada) radio site to Aliant's site that is located nearby.
   - NP's coverage will remain essentially the same as at present.
2. **Newfoundland and Labrador Hydro**:
   - 24 of the 29 present sites will continue to be used.
   - NP sites at Torbayman's Pond, Gambo, Sandy Brook and Pine Tree will replace the present sites at Kenmount Hill, Gambo, Red Cliff and Stephenville.
   - Sunnyside will replace the present site at Serrated Hills.
   - 13 sites will be added - three NP, two NLH and eight Aliant – primarily to provide additional coverage that NLH requires.
   - The re-located sites will change NLH's existing coverage to some extent and NLH will need to assess this in light of the effect it could have on its operations. ***Note: NLH can substitute other sites (Table D-1, Appendix D) that it may feel are more suitable for its needs.***

Radio Repeater Equipment

1. The system will consist of two RF equipment layers (like the separate systems at present):
   - *NP Layer:* 24 sites (26 repeaters) using present frequency assignments and continuing to operate as presently configured (Appendix A).
   - *NLH Layer:* Comprised of 41 sites using present frequency assignments. It is assumed that present frequencies can be re-used at the new sites being added for NLH.
2. Conventional repeater, i.e. non-trunked, PTT operation will be employed with DTMF signalling for calling outside a *repeater area* (NLH), or a *radio system area* (NP) and for accessing the ECC (NLH) or SCC (NP).
3. NP and NLH will share antennas at sites that both use.
4. New radio repeaters and circuit interface equipment will be provided for NLH and for NP at all sites.
5. RF filtering equipment will be retained at all existing sites and new filters provided at new sites.
6. All existing NP antennas will be replaced but existing NLH antennas will be retained.

7. NP system operation and functionality will remain as at present.
8. NLH system operation and functionality will be similar to NP's including the following:
   - Calling within each *repeater area* using PTT.
   - Calling between *repeater areas* using a DTMF (key pad) dialling plan for set up and disconnect.
   - Calling between a *repeater area* and the ECC (also using DTMF dialling)
   - Calling from any *repeater area* to the PSTN.

Switching Function

1. All mobile radio switching functions for both NP and NLH will be performed within NP's data network using VoIP technology that is currently being installed on NP's system by Aliant.
2. Each NLH *repeater area* will be individually addressable.
3. Existing router nodes within NP's system will be used as connection points for the NLH repeaters on the island of Newfoundland and a new router node added for the Labrador sites - Figure C-1.
4. Connections will be provided between NP's and NLH's respective WANs – at two points in St. John's for redundancy, and at Deer Lake. Both the NP and NLH WAN networks will contain redundant call managers dedicated for the mobile radio functionality.

Backhaul Facilities

1. Separate circuits will be used to connect each radio repeater to the nearest router node in NP's network (Figure C-1).
2. NP's existing configuration of *radio system areas* will be retained.
3. Each NLH radio repeater will be individually addressable.
4. NLH facilities will be used to complete the backhaul to the NLH sites (e.g. Godaleich Hill) where Alaint does not have facilities.

Terminal Devices

1. Both NP and NLH will continue to use radio units – mobiles, handhelds and base stations – of the type that they currently use. Each company will be responsible for the purchase of their own radio units.
2. Existing VoIP telephones will be retained at the NP SCC and new provided for NLH at St. John's (ECC) and at Deer Lake.

Costs

It is anticipated that all the costs identified in tables listed below will be incurred by NP and shared between the two companies on the basis outlined in Table C-4:

1. **Table C-1** is a summary of NP's share of the capital and operating costs to upgrade its current infrastructure (new power equipment, radio equipment and antennas), as well as ongoing (yearly) expenditures to do capital upgrades (i.e. replace NP mobile units and do tower upgrade work).
2. **Table C-2** is a summary of NLH's share of the capital and operating costs for NP to upgrade its current infrastructure (new power equipment, radio equipment and antennas) and to do the expansion necessary to accommodate NLH.
3. **Table C-3** is a summary of the total costs (Table C-1 and Table C-2) for NP to upgrade and expand its infrastructure for both NP and NLH over the period 2006 – 2020.
4. **Table C-4** shows how, on a percentage basis, it is proposed to share the one-time infrastructure cost (in 2006) between NP and NLH:
   - Cost of radio repeaters and VoIP network is divided on a proportional basis according to the number of radio repeaters that each will use – i.e. NP has 26 repeaters, NLH will have 41, therefore NP's share is 38.8% (26/(26+41) x 100%) and 61.2% for NLH.

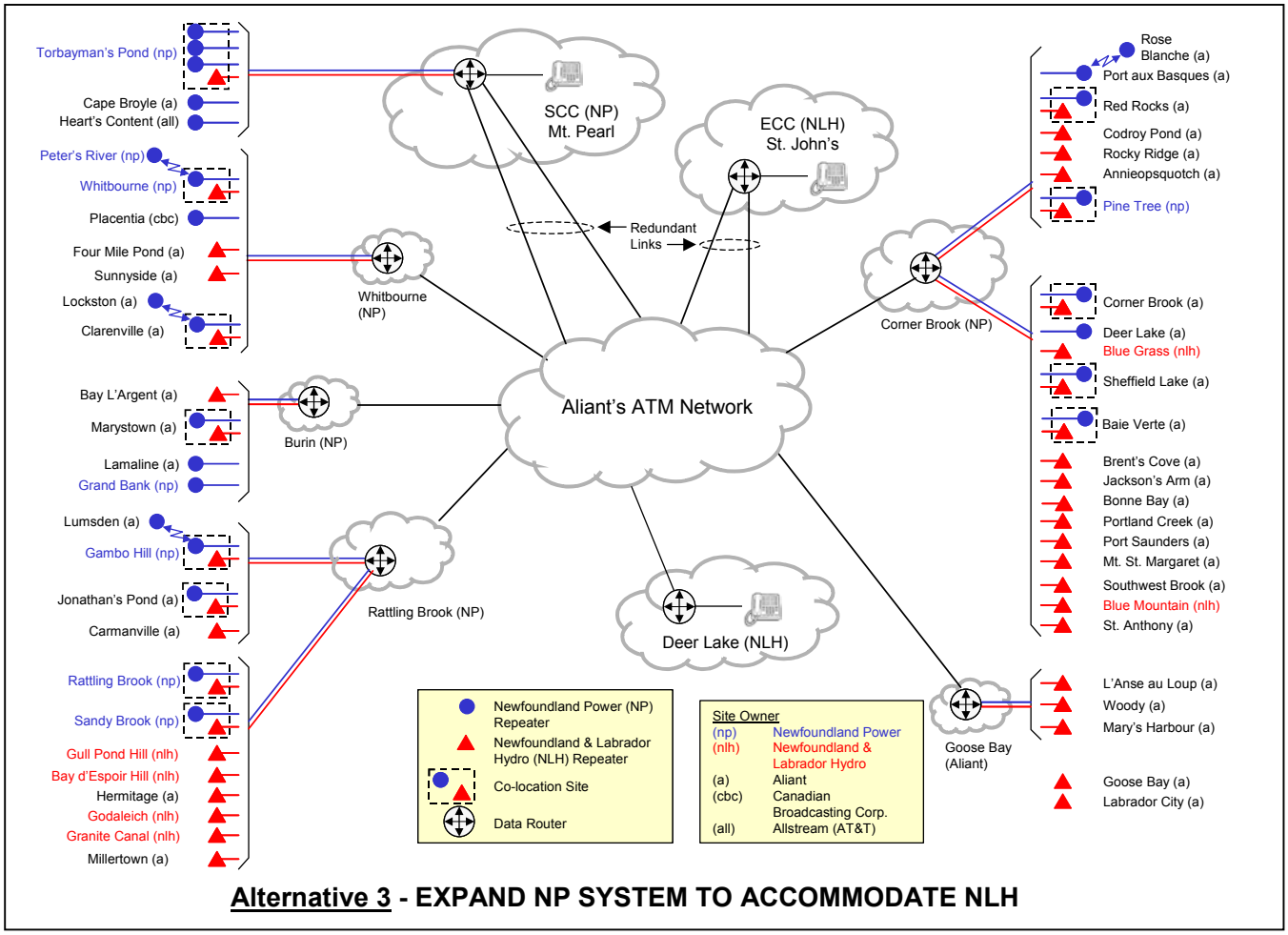
- Cost of upgrading infrastructure at the 13 NP sites that are also used by NLH is also divided on a proportional basis – NP has 15 repeaters and NLH will have 13, therefore NP's share is 53.4% (15/(15+13) x 100%) and 46.6% for NLH.
- NP will assume 100% of the cost to upgrade the infrastructure at the 11 sites used only by NP.

5. **Table C-5** shows the capital costs for the following:
   - $1664K (budgetary quotation from Aliant Inc.) includes 26 new radio repeaters for NP, 41 new radio repeaters for NLH and expansion NP's VoIP network to accommodate NLH.
   - Replacement of antennas at existing NP sites,
   - Replacement of power systems at all NP owned sites, and
   - Replacement of radio link circuits at NP sites where leased circuits (telecom lines) are not available (or are not currently being used).
6. **Table C-6** lists the operating expenses to support the portion of the system that is dedicated to NP's use.
7. **Table C-7** lists the operating expenses to be incurred by NP to support the portion of the system that is dedicated to NLH's use.

There are some costs specific to NLH that will be additional to the above and payable directly by NLH, including:

- Purchase, installation and maintenance of radio units for use by NLH.
- Radio licence fees for the frequency assignments that will be used exclusively by NLH.

Figure C-1 System Layout (Expand NP System)



Alternative 3 - EXPAND NP SYSTEM TO ACCOMMODATE NLH

Table C-1 Date: 03-Aug-04

Cost Summary (NP Component)

Expand NP System for NLH in 2006

Description	2006	2007-2020
	($000)	($000)
Capital Costs (NP Component)		
Infrastructure Upgrade/Replacement (Table C-5)	1831	--
Mobile Radios	30	30
Tower Upgrade	40	40
Total Capital (NP Component)	1901	70
Total Operating (NP Component - Table C-6)	300	300

Table C-2 Date: 03-Aug-04

Cost Summary (NLH Component)

Expand NP System for NLH in 2006

Description	2006	2007-2020
	($000)	($000)
Capital Costs (NLH Component)		
Radio Repeaters & Network (Table C-5)	1984	--
Total Capital (NLH Component)	1984	0
Total Operating (NLH Component - Table C-7)	856	836

Table C-3 Date: 03-Aug-04

Cost Summary (Total)

Expand NP System for NLH in 2006

Description	2006	2007-2020
	($000)	($000)
Total Capital	**3885**	**70**
Total Operating	**1156**	**1136**

Table C-4 Date: 03-Aug-04

Capital Cost Sharing (Infrastructure) - Expand & Upgrade NP System in 2006

Description	Total Cost	NP Share		NLH Share		Total	
		%	Amt	%	Amt	%	Amt
	($000)		($000)		($000)		($000)
Radio Repeaters & VoIP Network	**2548**	38.8%	988	61.2%	1559	100.0%	**2548**
Site Upgrade (Shared Sites)	**912**	53.4%	487	46.6%	425	100.0%	**912**
Site Upgrade (NP Only Sites)	**355**	100.0%	355	0.0%	0	100.0%	**355**
TOTAL	**3815**		**1831**		**1984**		**3815**

Table C-5 Date: 03-Aug-04

Capital Cost Details (Infrastructure) - Expand & Upgrade NP System in 2006

Site Particulars				**2006 Expenditures** ($000)								
				Radio Repeater & VoIP Network (NLH & NP)	**Site Asset Upgrade**							
					Repeater Antenna (Note 1)		**DC Pwr & Gen (Note 2)**		**Radio Link (Note 3,4)**		**Site Asset Upgrade Total**	
	Use By	**Name**	**Owner**		Shared Sites	NP Only	Shared Sites	NP Only	Shared Sites	NP Only	Shared Sites	NP Only
1	NP + NLH	Clarenville (Shoal Harbour)	Aliant	1664							0	0
2	NP + NLH	Corner Brook	Aliant								0	0
3	NP + NLH	Gambo Hill	NP		10		35		33		78	0
4	NP + NLH	Jonathan's Pond	Aliant		10		35		85		130	0
5	NP + NLH	Pine Tree	NP		10		35				45	0
6	NP + NLH	Rattling Brook	NP		10		35		85		130	0
7	NP + NLH	Red Rocks	Aliant								0	0
8	NP + NLH	Sandy Brook	NP		10		35		33		78	0
9	NP + NLH	Sheffield Lake	Aliant		10						10	0
10	NP + NLH	Torbayman's Pond	NP		25		35				60	0
11	NP + NLH	Whitbourne	NP		10		35				45	0
12	NP + NLH	Baie Verte	Aliant		10						10	0
13	NP + NLH	Marystown	Aliant		10						10	0
14	NP	Cape Broyle	Aliant								0	0
15	NP	Deer Lake	Aliant								0	0
16	NP	Grand Bank	NP			10					0	10
17	NP	Heart's Content	Allstream			10					0	10
18	NP	Lamaline	Aliant			10					0	10
19	NP	Lockston Hill	Aliant			10				25	0	35
20	NP	Lumsden	Aliant							25	0	25
21	NP	Peter's River	NP			10		35		25	0	70
22	NP	Placentia	CBC			10		17			0	27
23	NP	Port aux Basques (Flagstaff)	CBC			10		35			0	45
24	NP	Rose Blanche	Aliant								0	0
25	NLH	Annieopsquotch	Aliant								0	0

Site Particulars				**2006 Expenditures** ($000)									
				Radio Repeater & VoIP Network (NLH & NP)	**Site Asset Upgrade**								
					Repeater Antenna (Note 1)		**DC Pwr & Gen (Note 2)**		**Radio Link (Note 3,4)**		**Site Asset Upgrade Total**	
	Use By	**Name**	**Owner**		Shared Sites	NP Only	Shared Sites	NP Only	Shared Sites	NP Only	Shared Sites	NP Only
26	NLH	Bay d'Espoir Hill	NLH								0	0
27	NLH	Bay L'Argent	Aliant								0	0
28	NLH	Blue Grass	NLH								0	0
29	NLH	Blue Mountain	NLH								0	0
30	NLH	Bonne Bay	Aliant								0	0
31	NLH	Brent's Cove	Aliant								0	0
32	NLH	Carmanville	Aliant								0	0
33	NLH	Codroy Pond	Aliant								0	0
34	NLH	Godaleich	NLH								0	0
35	NLH	Goose Bay	Aliant								0	0
36	NLH	Granite Canal	NLH								0	0
37	NLH	Gull Pond Hill	NLH								0	0
38	NLH	Hermitage	NLH								0	0
39	NLH	Jackson's Arm	Aliant								0	0
40	NLH	L'Anse au Loup	Aliant								0	0
41	NLH	Labrador City	Aliant								0	0
42	NLH	Mary's Harbour	Aliant								0	0
43	NLH	Mt. St. Margaret	Aliant								0	0
44	NLH	Port Saunders	Aliant								0	0
45	NLH	Portland Creek	Aliant								0	0
46	NLH	Rocky Ridge	Aliant								0	0
47	NLH	Southwest brook	Aliant								0	0
48	NLH	St. Anthony	Aliant								0	0
49	NLH	Woody	Aliant								0	0
50	NLH	Four Mile Pond	Aliant								0	0
51	NLH	Sunnyside	Aliant								0	0
52	NLH	Millertown	Aliant								0	0
SUB-TOTALS				1664	115	70	245	87	236	75	596	232
Misc. (Cables, H/W, Etc.) - 10%				166							60	23
Contingency (15%)				275							98	38
Eng Design & Project Mgmt (10%)				211							75	29
Loading - IDC,etc. (10%)				232							83	32
TOTALS				**2548**							**912**	**355**

Notes

(1) Replacement of all SRL 210-C4 antennas owned by NP.

(2) Replacement of all dc power equipment and emergency generators at sites owned by NP.

(3) Replacement of existing Gambo Hill - Jonathan's Pond - Rattling Brook - Sandy Brook point-to-point with new.

(4) Replacement of base stations (for off-air pickup) at Peter's River, Lockston and Lumsden.

Table C-6 Date: 03-Aug-04

Operating Costs
(For NP's Component of Expanded NP System)

Description	**2006 - 2020** ($000)
Radio Licences	29.0
Circuit Rentals	82.0
Site Rentals	59.2
Mobile Radio Mtce	10.0
Level II Mtce - 26 Radio Repeaters	75.8
Tower Inspection	10.0
NP Administration	20.0
Subtotal	286.0
Contingency (5%)	14.3
TOTAL	**300**

Table C-7 Date: 03-Aug-04

Operating Costs
(For NLH's Component of Expanded NP System)

Description	**2006** ($000)	**2007 - 2020** ($000)
Radio Licences (by NLH)	---	---
Circuit Costs (One-time)	19.2	---
Circuit Rentals (41 sites)	439.6	439.6
Site Rentals (28 Aliant)	168.0	168.0
Radio Infrastructure Mtce (41 Repeaters)	119.5	119.5
Network Infrastructure Mtce	48.9	48.9
NP Administration	20.0	20.0
Subtotal	815.2	796.0
Contingency (5%)	40.8	39.8
TOTAL	**856**	**836**

Appendix D

List of Radio Sites

Table D-1 lists the radio sites that constitute the existing mobile systems and the alternatives being considered.

Table D-1: List of Radio Sites

Radio Sites	Owned By	NP SITES				NLH SITES			
		Present	Alt #1 Sta-Quo	Alt #2 NLH Sys	Alt #3 NP Sys	Present	Alt #1 Sta-Quo	Alt #2 NLH Sys	Alt #3 NP Sys
Annieopsquotch	Aliant	--	--	Yes	--	Yes	N/A	Yes	Yes
Baie Verte	Aliant	Yes	Yes	Yes	Yes	--	TO	Yes	Yes
Bay D'Espoir Hill	NLH	--	--	--	--	Yes	NLH	Yes	Yes
Bay L'Argent	Aliant	--	--	Yes	--	Yes		Yes	Yes
Blue Grass Hill	NLH	--	--	Yes	--	Yes		Yes	Yes
Blue Mountain	NLH	--	--	--	--	Yes		Yes	Yes
Bonne Bay (ThreeTom)	Aliant	--	--	Yes	--	Yes		Yes	Yes
Brent's Cove	Aliant	--	--	--	--	Yes		Yes	Yes
Bull Arm Hill	NLH	--	--	Yes	--	--		Yes	--
Cape Broyle	Aliant	Yes	Yes	Yes	Yes	--		--	--
Carmanville	Aliant	--	--	Yes	--	Yes		Yes	Yes
Chapel Arm	Aliant	--	--	--	--	--		--	--
Chapel Arm Hill	NLH	--	--	Yes	--	--		Yes	--
Clarenville (Shoal Harbour)	Aliant	--	--	--	Yes	Yes		--	Yes
Clarenville (AT&T)	AT&T	Yes	Yes	--	--	--		--	--
Codroy Pond	Aliant	--	--	Yes	--	Yes		Yes	Yes
Corner Brook	Aliant	Yes	Yes	Yes	Yes	Yes		Yes	Yes
Deer Lake (Aliant)	Aliant	Yes	Yes	--	Yes	--		--	--
Four Mile Hill	NLH	--	--	--	--	--		Yes	--
Four Mile Pond (Hawkes Hills)	Aliant	--	--	--	--	Yes		--	Yes
Gambo (Aliant)	Aliant	--	--	--	--	Yes		--	--
Gambo (NPI)	NP	Yes	Yes	Yes	Yes	--		--	Yes
Godaleich Hill	NLH	--	--	--	--	Yes		Yes	Yes
Grand Bank	NP	Yes	Yes	Yes	Yes	--		--	--
Granite Canal Hill	NLH	--	--	--	--	--		Yes	Yes
Gull Pond Hill	NLH	--	--	--	--	--		Yes	Yes
Happy Valley / Goose Bay	Aliant	--	--	--	--	--		Yes	Yes
Heart's Content	Allstream	Yes	Yes	--	Yes	--		--	--
Hermitage	Aliant	--	--	--	--	Yes		Yes	Yes
Jackson's Arm	Aliant	--	--	--	--	Yes		Yes	Yes
Jonathan's Pond (Gander)	Aliant/NP	Yes	Yes	Yes	Yes	--		--	Yes
Kenmount Hill	Aliant	--	--	--	--	Yes		Yes	--
Labrador City / Wabush	Aliant	--	--	--	--	--		Yes	Yes
Lamaline	Aliant	Yes	Yes	Yes	Yes	--		--	--
L'Anse au Loup	Aliant	--	--	--	--	--		Yes	Yes
Lockston	Aliant	Yes	Yes	Yes	Yes	--		--	--
Lumsden	Aliant	Yes	Yes	Yes	Yes	--		--	--
Mary March Hill	NLH	--	--	Yes	--	--		Yes	--
Mary's Harbour	Aliant	--	--	--	--	--		Yes	Yes
Marystown Tolt	Aliant	Yes	Yes	Yes	Yes	--		Yes	Yes
Millertown	Aliant	--	--	--	--	Yes		--	Yes
Mount Margaret	Aliant	--	--	--	--	Yes		Yes	Yes
Notre Dame Hill	NLH	--	--	Yes	--	--		Yes	--
Peter's River	NP	Yes	Yes	Yes	Yes	--		--	--
Petty Harbour Hill	NLH	--	--	--	--	--		Yes	--
Pine Tree	NP	Yes	Yes	Yes	Yes	--		--	Yes

Radio Sites	Owned By	NP SITES				NLH SITES			
		Present	**Alt #1** Sta-Quo	**Alt #2** NLH Sys	**Alt #3** NP Sys	**Present**	**Alt #1** Sta-Quo	**Alt #2** NLH Sys	**Alt #3** NP Sys
Placentia	CBC	Yes	Yes	Yes	Yes	--		--	--
Port Aux Basques (Flagstaff)	CBC/NP	Yes	Yes	Yes	Yes	--		--	--
Port Saunders	Aliant	--	--	--	--	Yes		Yes	Yes
Portland Creek	Aliant	--	--	--	--	Yes		Yes	Yes
Rattling Brook	NP	Yes	Yes	--	Yes	--		--	Yes
Red Cliff (Central)	Aliant	--	--	--	--	Yes		--	--
Red Rocks	Aliant	Yes	Yes	Yes	Yes	Yes		Yes	Yes
Rocky Ridge	Aliant	--	--	--	--	Yes		Yes	Yes
Rose Blanche	Aliant	Yes	Yes	Yes	Yes	--		--	--
Sandy Brook Hill	NLH	--	--	Yes	--	--		Yes	--
Sandy Brook Hydro Plant	NP	Yes	Yes	--	Yes	--		--	Yes
Serrated Hills	Aliant	--	--	--	--	Yes		--	--
Sheffield	Aliant	Yes	Yes	Yes	Yes	Yes		Yes	Yes
Shoal Harbour Hill	NLH	--	--	Yes	--	--		Yes	--
Southwest Brook	Aliant	--	--	--	--	Yes		Yes	Yes
Square Pond Hill	NLH	--	--	--	--	--		Yes	--
St. Anthony	Aliant	--	--	--	--	Yes		Yes	Yes
Stephenville	Aliant	--	--	--	--	Yes		Yes	--
Sunnyside	Aliant	--	--	--	--	--		--	Yes
Torbayman's Pond	NP	Yes	Yes	Yes	Yes	--		--	Yes
Whitbourne	NP	Yes	Yes	--	Yes	--		--	Yes
Woody Harbour	Aliant	--	--	--	--	--		Yes	Yes
Total Sites		24	24	30	24	29		41	41

Appendix E

Net Present Value Worksheets

NP - HYDRO VHF RADIO STUDY ECONOMIC ANALYSIS

1. This workbook was created to summarize the cost data coming from the joint study. (**Note:** analysis is performed only for NP costs).
2. It examines the alternatives 1, 2a, 2b and 3, capturing capital and operating costs for each, and present worthing all costs.
3. Each alternative has an input sheet (to capture the un-escalated capital and operating costs) and a results sheet to calculate the NPV for each alternative.
4. NOTE: Data should only be keyed into yellow coloured (or shaded) cells!!!!
5. Below are common factors used in the analysis.

ESCALATION TABLE

Year	NP ESC	NP ESC	HYD CAP	HYD OP	DTW CAP	DTW OP
	"% per year	factor	"% per year	factor	"% per year	factor
2005	2.0%	1.020	1.5%	1.015	1.5%	1.015
2006	2.0%	1.040	1.7%	1.032	1.7%	1.032
2007	2.0%	1.061	1.7%	1.050	1.7%	1.050
2008	2.0%	1.082	1.7%	1.068	1.7%	1.068
2009	2.0%	1.104	1.7%	1.086	1.7%	1.086
2010	2.0%	1.126	1.6%	1.103	1.6%	1.103
2011	2.0%	1.149	1.8%	1.123	1.8%	1.123
2012	2.0%	1.172	1.8%	1.143	1.8%	1.143
2013	2.0%	1.195	1.8%	1.164	1.8%	1.164
2014	2.0%	1.219	1.8%	1.185	1.8%	1.185
2015	2.0%	1.243	1.8%	1.206	1.8%	1.206
2016	2.0%	1.268	1.8%	1.228	1.8%	1.228
2017	2.0%	1.294	1.8%	1.250	1.8%	1.250
2018	2.0%	1.319	1.8%	1.272	1.8%	1.272
2019	2.0%	1.346	1.8%	1.295	1.8%	1.295
2020	2.0%	1.373	1.8%	1.319	1.8%	1.319
2021	2.0%	1.400	1.8%	1.342	1.8%	1.342
2022	2.0%	1.428	1.8%	1.367	1.8%	1.367
2023	2.0%	1.457	1.8%	1.391	1.8%	1.391
2024	2.0%	1.486	1.8%	1.416	1.8%	1.416
2025	2.0%	1.516	1.8%	1.442	1.8%	1.442
2026	2.0%	1.546	1.8%	1.468	1.8%	1.468
2027	2.0%	1.577	1.8%	1.494	1.8%	1.494
2028	2.0%	1.608	1.8%	1.521	1.8%	1.521
2029	2.0%	1.641	1.8%	1.548	1.8%	1.548

COSTS OF CAPITAL

NP COC	8.52%	HYDRO COC	8.52%	DTW COC	8.52%
NP PW CAP COSTS	1.036	HYDRO PW CAP COSTS	1.000	DTW PW CAP CO	1.000

STATUS QUO - BOTH HYDRO & NP CONTINUE SEPARATELY (Alternative 1)
INPUT SPREADSHEET FOR VHF RADIO ANALYSIS
Values entered here are 2004 dollars and include all costs with exception of escalation.
Notes: 1. Only costs incurred by NP are shown.
2. For analysis purposes, capital costs are entered at the beginning of each year and operating costs entered at end of the year. This format is consistent with that used by NLH in their analysis.

Study Year	Year	NP CAP $1,000	NP OP $1,000		HYD CAP $1,000	HYD OP $1,000		DTW CAP $1,000	DTW OP $1,000
	2005	0	0						
0	2006	70	0						
1	2007	70	256						
2	2008	70	256						
3	2009	70	256						
4	2010	70	256						
5	2011	2,064	256						
6	2012	70	256						
7	2013	70	256						
8	2014	70	256						
9	2015	70	256						
10	2016	70	256						
11	2017	70	256						
12	2018	70	256						
13	2019	70	256						
14	2020	70	256						
15	2021	0	256						
	2022								
	2023								
	2024								
	2025								
	2026								
	2027								
	2028								
	2029								

STATUS QUO - BOTH HYDRO & NP CONTINUE SEPARATELY (Alternative 1)
RESULTS SPREADSHEET FOR VHF RADIO ANALYSIS
Values entered here are escalated $ and include all costs incurred by NP.

Study Year	Year	NP CAP	NP OP	NP RR CUM NPV (to 2005)
		$1,000	$1,000	$1,000
	2005	0	0	0
0	2006	73	0	69
1	2007	74	272	366
2	2008	76	277	644
3	2009	77	283	905
4	2010	79	288	1150
5	2011	2,371	294	2833
6	2012	82	300	3050
7	2013	84	306	3255
8	2014	85	312	3447
9	2015	87	318	3627
10	2016	89	325	3796
11	2017	91	331	3956
12	2018	92	338	4105
13	2019	94	345	4246
14	2020	96	351	4379
15	2021	0	358	4475
	2022	0	0	4475
	2023	0	0	4475
	2024	0	0	4475
	2025	0	0	4475
	2026	0	0	4475
	2027	0	0	4475
	2028	0	0	4475
	2029	0	0	4475

NP COC 8.52%
NP PW CAP COSTS 1.036

EXPAND HYDRO SYSTEM TO ACCOMMODATE NP (2011) AND DTW (Alternative 2A)
INPUT SPREADSHEET FOR VHF RADIO ANALYSIS
Values entered here are 2004 dollars and include all costs with exception of escalation.
Notes: 1. Only costs incurred by NP are shown.
2. For analysis purposes, capital costs are entered at the beginning of each year and operating costs entered at end of the year. This format is consistent with that used by NLH in their analysis.

Study Year	Year	NP CAP $1,000	NP OP $1,000		HYD CAP $1,000	HYD OP $1,000		DTW CAP $1,000	DTW OP $1,000
	2005	0	0						
0	2006	70	0						
1	2007	70	256						
2	2008	70	256						
3	2009	70	256						
4	2010	70	256						
5	2011	3,860	256						
6	2012	50	388						
7	2013	50	388						
8	2014	50	388						
9	2015	50	388						
10	2016	50	388						
11	2017	50	388						
12	2018	50	388						
13	2019	50	388						
14	2020	50	388						
15	2021	0	388						
	2022								
	2023								
	2024								
	2025								
	2026								
	2027								
	2028								
	2029								

EXPAND HYDRO SYSTEM TO ACCOMMODATE NP (2011) AND DTW (Alternative 2A)
RESULTS SPREADSHEET FOR VHF RADIO ANALYSIS
Values entered here are escalated $ and include all costs incurred by NP.

Study Year	Year	NP CAP	NP OP	NP RR CUM NPV (to 2005)
		$1,000	$1,000	$1,000
	2005	0	0	0
0	2006	73	0	69
1	2007	74	272	366
2	2008	76	277	644
3	2009	77	283	905
4	2010	79	288	1150
5	2011	4,434	294	4142
6	2012	59	455	4433
7	2013	60	464	4707
8	2014	61	473	4964
9	2015	62	482	5205
10	2016	63	492	5431
11	2017	65	502	5645
12	2018	66	512	5846
13	2019	67	522	6034
14	2020	69	533	6211
15	2021	0	543	6357
	2022	0	0	6357
	2023	0	0	6357
	2024	0	0	6357
	2025	0	0	6357
	2026	0	0	6357
	2027	0	0	6357
	2028	0	0	6357
	2029	0	0	6357

NP COC 8.52%
NP PW CAP COSTS 1.036

EXPAND HYDRO SYSTEM TO ACCOMMODATE NP (2009) AND DTW (Alternative 2A)
INPUT SPREADSHEET FOR VHF RADIO ANALYSIS
Values entered here are 2004 dollars and include all costs with exception of escalation.
Notes: 1. Only costs incurred by NP are shown.
2. For analysis purposes, capital costs are entered at the beginning of each year and operating costs entered at end of the year. This format is consistent with that used by NLH in their analysis.

Study Year	Year	NP CAP $1,000	NP OP $1,000		HYD CAP $1,000	HYD OP $1,000		DTW CAP $1,000	DTW OP $1,000
	2005	0	0						
0	2006	70	0						
1	2007	70	256						
2	2008	70	256						
3	2009	3,860	256						
4	2010	50	388						
5	2011	50	388						
6	2012	50	388						
7	2013	50	388						
8	2014	50	388						
9	2015	50	388						
10	2016	50	388						
11	2017	50	388						
12	2018	50	388						
13	2019	50	388						
14	2020	50	388						
15	2021	0	388						
	2022								
	2023								
	2024								
	2025								
	2026								
	2027								
	2028								
	2029								

EXPAND HYDRO SYSTEM TO ACCOMMODATE NP (2009) AND DTW (Alternative 2A)
RESULTS SPREADSHEET FOR VHF RADIO ANALYSIS
Values entered here are escalated $ and include all costs incurred by NP.

Study Year	Year	NP CAP	NP OP	NP RR CUM NPV (to 2005)
		$1,000	$1,000	1000
	2005	0	0	0
0	2006	73	0	69
1	2007	74	272	366
2	2008	76	277	644
3	2009	4,262	283	4030
4	2010	56	437	4359
5	2011	57	446	4669
6	2012	59	455	4959
7	2013	60	464	5233
8	2014	61	473	5490
9	2015	62	482	5731
10	2016	63	492	5958
11	2017	65	502	6172
12	2018	66	512	6372
13	2019	67	522	6560
14	2020	69	533	6737
15	2021	0	543	6883
	2022	0	0	6883
	2023	0	0	6883
	2024	0	0	6883
	2025	0	0	6883
	2026	0	0	6883
	2027	0	0	6883
	2028	0	0	6883
	2029	0	0	6883

NP COC 8.52%
NP PW CAP COSTS 1.036

EXPAND HYDRO SYSTEM TO ACCOMMODATE NP (2008) AND DTW (Alternative 2A)
INPUT SPREADSHEET FOR VHF RADIO ANALYSIS
Values entered here are 2004 dollars and include all costs with exception of escalation.
Notes: 1. Only costs incurred by NP are shown.
2. For analysis purposes, capital costs are entered at the beginning of each year and operating costs entered at end of the year. This format is consistent with that used by NLH in their analysis.

Study Year	Year	NP CAP $1,000	NP OP $1,000		HYD CAP $1,000	HYD OP $1,000		DTW CAP $1,000	DTW OP $1,000
	2005	0	0						
0	2006	70	0						
1	2007	70	256						
2	2008	3,860	256						
3	2009	50	388						
4	2010	50	388						
5	2011	50	388						
6	2012	50	388						
7	2013	50	388						
8	2014	50	388						
9	2015	50	388						
10	2016	50	388						
11	2017	50	388						
12	2018	50	388						
13	2019	50	388						
14	2020	50	388						
15	2021	0	388						
	2022								
	2023								
	2024								
	2025								
	2026								
	2027								
	2028								
	2029								

EXPAND HYDRO SYSTEM TO ACCOMMODATE NP (2008) AND DTW (Alternative 2A)
RESULTS SPREADSHEET FOR VHF RADIO ANALYSIS
Values entered here are escalated $ and include all costs incurred by NP.

Study Year	Year	NP CAP $1,000	NP OP $1,000	NP RR CUM NPV (to 2005) $1,000
	2005	0	0	0
0	2006	73	0	69
1	2007	74	272	366
2	2008	4,178	277	3969
3	2009	55	428	4318
4	2010	56	437	4647
5	2011	57	446	4956
6	2012	59	455	5247
7	2013	60	464	5520
8	2014	61	473	5778
9	2015	62	482	6019
10	2016	63	492	6245
11	2017	65	502	6459
12	2018	66	512	6660
13	2019	67	522	6848
14	2020	69	533	7024
15	2021	0	543	7171
	2022	0	0	7171
	2023	0	0	7171
	2024	0	0	7171
	2025	0	0	7171
	2026	0	0	7171
	2027	0	0	7171
	2028	0	0	7171
	2029	0	0	7171

NP COC 8.52%
NP PW CAP COSTS 1.036

EXPAND HYDRO SYSTEM TO ACCOMMODATE NP (2011) ONLY (Alternative 2B)
INPUT SPREADSHEET FOR VHF RADIO ANALYSIS
Values entered here are 2004 dollars and include all costs with exception of escalation.
Notes: 1. Only costs incurred by NP are shown.
2. For analysis purposes, capital costs are entered at the beginning of each year and operating costs entered at end of the year. This format is consistent with that used by NLH in their analysis.

Study Year	Year	NP CAP $1,000	NP OP $1,000		HYD CAP $1,000	HYD OP $1,000		DTW CAP $1,000	DTW OP $1,000
	2005	0	0						
0	2006	70	0						
1	2007	70	256						
2	2008	70	256						
3	2009	70	256						
4	2010	70	256						
5	2011	5,452	256						
6	2012	30	629						
7	2013	30	629						
8	2014	30	629						
9	2015	30	629						
10	2016	30	629						
11	2017	30	629						
12	2018	30	629						
13	2019	30	629						
14	2020	30	629						
15	2021	0	629						
	2022								
	2023								
	2024								
	2025								
	2026								
	2027								
	2028								
	2029								

EXPAND HYDRO SYSTEM TO ACCOMMODATE NP (2011) ONLY (Alternative 2B)
RESULTS SPREADSHEET FOR VHF RADIO ANALYSIS
Values entered here are escalated $ and include all costs incurred by NP.

Study Year	Year	NP CAP	NP OP	NP RR CUM NPV (to 2005)
		$1,000	$1,000	$1,000
	2005	0	0	0
0	2006	73	0	69
1	2007	74	272	366
2	2008	76	277	644
3	2009	77	283	905
4	2010	79	288	1150
5	2011	6,263	294	5301
6	2012	35	737	5737
7	2013	36	752	6148
8	2014	37	767	6534
9	2015	37	782	6896
10	2016	38	798	7237
11	2017	39	814	7557
12	2018	40	830	7858
13	2019	40	847	8141
14	2020	41	863	8407
15	2021	0	881	8645
	2022	0	0	8645
	2023	0	0	8645
	2024	0	0	8645
	2025	0	0	8645
	2026	0	0	8645
	2027	0	0	8645
	2028	0	0	8645
	2029	0	0	8645

NP COC 8.52%
NP PW CAP COSTS 1.036

EXPAND HYDRO SYSTEM TO ACCOMMODATE NP (2009) ONLY (Alternative 2B)
INPUT SPREADSHEET FOR VHF RADIO ANALYSIS
Values entered here are 2004 dollars and include all costs with exception of escalation.
Notes: 1. Only costs incurred by NP are shown.
2. For analysis purposes, capital costs are entered at the beginning of each year and operating costs entered at end of the year. This format is consistent with that used by NLH in their analysis.

Study Year	Year	NP CAP $1,000	NP OP $1,000		HYD CAP $1,000	HYD OP $1,000		DTW CAP $1,000	DTW OP $1,000
	2005	0	0						
0	2006	70	0						
1	2007	70	256						
2	2008	70	256						
3	2009	5,452	256						
4	2010	30	629						
5	2011	30	629						
6	2012	30	629						
7	2013	30	629						
8	2014	30	629						
9	2015	30	629						
10	2016	30	629						
11	2017	30	629						
12	2018	30	629						
13	2019	30	629						
14	2020	30	629						
15	2021	0	629						
	2022								
	2023								
	2024								
	2025								
	2026								
	2027								
	2028								
	2029								

EXPAND HYDRO SYSTEM TO ACCOMMODATE NP (2009) ONLY (Alternative 2B)
RESULTS SPREADSHEET FOR VHF RADIO ANALYSIS
Values entered here are escalated $ and include all costs incurred by NP.

Study Year	Year	NP CAP $1,000	NP OP $1,000	NP RR CUM NPV (to 2005) 1000
	2005	0	0	0
0	2006	73	0	69
1	2007	74	272	366
2	2008	76	277	644
3	2009	6,019	283	5342
4	2010	34	708	5836
5	2011	34	723	6301
6	2012	35	737	6737
7	2013	36	752	7147
8	2014	37	767	7533
9	2015	37	782	7896
10	2016	38	798	8237
11	2017	39	814	8557
12	2018	40	830	8857
13	2019	40	847	9141
14	2020	41	863	9407
15	2021	0	881	9644
	2022	0	0	9644
	2023	0	0	9644
	2024	0	0	9644
	2025	0	0	9644
	2026	0	0	9644
	2027	0	0	9644
	2028	0	0	9644
	2029	0	0	9644

NP COC 8.52%
NP PW CAP COSTS 1.036

EXPAND HYDRO SYSTEM TO ACCOMMODATE NP (2008) ONLY (Alternative 2B)
INPUT SPREADSHEET FOR VHF RADIO ANALYSIS
Values entered here are 2004 dollars and include all costs with exception of escalation.
Notes: 1. Only costs incurred by NP are shown.
2. For analysis purposes, capital costs are entered at the beginning of each year and operating costs entered at end of the year. This format is consistent with that used by NLH in their analysis.

Study Year	Year	NP CAP $1,000	NP OP $1,000		HYD CAP $1,000	HYD OP $1,000		DTW CAP $1,000	DTW OP $1,000
	2005	0	0						
0	2006	70	0						
1	2007	70	256						
2	2008	5,452	256						
3	2009	30	629						
4	2010	30	629						
5	2011	30	629						
6	2012	30	629						
7	2013	30	629						
8	2014	30	629						
9	2015	30	629						
10	2016	30	629						
11	2017	30	629						
12	2018	30	629						
13	2019	30	629						
14	2020	30	629						
15	2021	0	629						
	2022								
	2023								
	2024								
	2025								
	2026								
	2027								
	2028								
	2029								

EXPAND HYDRO SYSTEM TO ACCOMMODATE NP (2008) ONLY (Alternative 2B)
RESULTS SPREADSHEET FOR VHF RADIO ANALYSIS
Values entered here are escalated $ and include all costs incurred by NP.

Study Year	Year	NP CAP $1,000	NP OP $1,000	NP RR CUM NPV (to 2005) $1,000
	2005	0	0	0
0	2006	73	0	69
1	2007	74	272	366
2	2008	5,901	277	5364
3	2009	33	694	5889
4	2010	34	708	6383
5	2011	34	723	6848
6	2012	35	737	7284
7	2013	36	752	7694
8	2014	37	767	8080
9	2015	37	782	8443
10	2016	38	798	8784
11	2017	39	814	9104
12	2018	40	830	9404
13	2019	40	847	9688
14	2020	41	863	9953
15	2021	0	881	10191
	2022	0	0	10191
	2023	0	0	10191
	2024	0	0	10191
	2025	0	0	10191
	2026	0	0	10191
	2027	0	0	10191
	2028	0	0	10191
	2029	0	0	10191

NP COC 8.52%
NP PW CAP COSTS 1.036

EXPAND NP SYSTEM TO ACCOMMODATE HYDRO (Alternative 3)
INPUT SPREADSHEET FOR VHF RADIO ANALYSIS
Values entered here are 2004 dollars and include all costs with exception of escalation.
Notes: 1. Only costs incurred by NP for NP's portion of the system are shown.
2. For analysis purposes, capital costs are entered at the beginning of each year and operating costs entered at end of the year. This format is consistent with that used by NLH in their analysis.

Study Year	Year	NP CAP $1,000	NP OP $1,000		HYD CAP $1,000	HYD OP $1,000		DTW CAP $1,000	DTW OP $1,000
	2005	0	0						
0	2006	1,901	0						
1	2007	70	300						
2	2008	70	300						
3	2009	70	300						
4	2010	70	300						
5	2011	70	300						
6	2012	70	300						
7	2013	70	300						
8	2014	70	300						
9	2015	70	300						
10	2016	70	300						
11	2017	70	300						
12	2018	70	300						
13	2019	70	300						
14	2020	70	300						
15	2021	0	300						
	2022								
	2023								
	2024								
	2025								
	2026								
	2027								
	2028								
	2029								

EXPAND NP SYSTEM TO ACCOMMODATE HYDRO (Alternative 3)
RESULTS SPREADSHEET FOR VHF RADIO ANALYSIS
Values entered here are escalated $ and include all costs incurred by NP.

Study Year	Year	NP CAP	NP OP	NP RR CUM NPV (to 2005)
		$1,000	$1,000	$1,000
	2005	0	0	0
0	2006	1,978	0	1,887
1	2007	74	318	2,222
2	2008	76	325	2,538
3	2009	77	331	2,835
4	2010	79	338	3,113
5	2011	80	345	3,375
6	2012	82	351	3,621
7	2013	84	359	3,854
8	2014	85	366	4,071
9	2015	87	373	4,275
10	2016	89	380	4,467
11	2017	91	388	4,648
12	2018	92	396	4,817
13	2019	94	404	4,977
14	2020	96	412	5,126
15	2021	0	420	5,240
	2022	0	0	5,240
	2023	0	0	5,240
	2024	0	0	5,240
	2025	0	0	5,240
	2026	0	0	5,240
	2027	0	0	5,240
	2028	0	0	5,240
	2029	0	0	5,240

NP COC	8.52%
NP PW CAP COSTS	1.036