SECTION G
Tab 3

Rencontre East

Interconnection Study

Newfoundland & Labrador Hydro

System Planning Department

April 2004

HYDRO
THE POWER OF COMMITMENT

EXECUTIVE SUMMARY

As a result of the Rencontre East Diesel Plant burning down on September 02, 2002, Hydro has to provide a new permanent power supply for the community of Rencontre East. Two obvious alternatives are to build a new diesel plant or to interconnect Rencontre East to the Island grid. This report provides a summary of the findings of a study investigating the technical and economic feasibility of both alternatives. Currently, Rencontre East is being serviced by a temporary diesel power supply.

Two technically feasible interconnection alternatives have been identified for Rencontre East. They involve connecting to the English Harbour West distribution system via either a 38 km or a 41 km, 14.4 kV single-phase line. The 41 km line option ($3,250,100) is preferred, despite being marginally more expensive (~$75,000) than the 38 km option, as it has a number of operational and maintenance benefits over the 38 km option. For the continued diesel alternative, building a new diesel plant ($1,621,800: 2 new units + used "Harbour Deep" unit) to replace the one that burned is obviously technically feasible.

A present worth comparison of the costs for the continued diesel operation alternative and for the interconnection alternative indicates that the interconnection alternative would provide a 15-year payback under base case assumptions. At the end of the 31-year study period, the interconnection provides a CPW (cumulative present worth) cost preference of $1,042,907 over continued diesel operation. Further analysis indicates that the results are somewhat sensitive to capital cost estimates, with a 10% increase in capital cost for the interconnection increasing the payback period to 20 years.

An examination of the incremental change in revenue requirements indicates that 2006 is the only year where the revenue requirements for the interconnection alternative are higher than for the diesel alternative. Starting in 2007, revenue requirements from Hydro's customers would be lower, if the interconnection alternative is constructed.

A review of the demographics of the community of Rencontre East gives reason to believe that it will be a viable community for the foreseeable future. Rencontre East holds a unique status among Hydro's Island Rural Isolated systems in that its population and customer base has not materially declined during the 1990s.

A check with Municipal Affairs indicates that they have had no representation from Rencontre East on re-location potential (as happened in Harbour Deep) and Government has not undertaken an independent analysis of the matter. Notwithstanding, if, in the future, economic and community circumstances change for Rencontre East for what ever the reason(s), a re-location risk exists. At present, such a risk is deemed low.

Discussions with the insurance company regarding payment of Hydro's claim for the replacement of the old diesel plant are still ongoing. The insurance payment will be the same whether the diesel plant is rebuilt or the interconnection constructed.

Thus, based on these results, it is recommended that the community of Rencontre East be interconnected to the Island grid with an in-service date of 2005.

It should be noted that construction of the interconnection is dependant on receiving the appropriate environmental permits. Indications are that this would not be a problem.

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1.0 INTRODUCTION

The community of Rencontre East is located in Fortune Bay on the south coast of the Island of Newfoundland at approximately 47° 37' N latitude and 55° 14' W longitude.

The Rencontre East Diesel Plant burned down on September 02, 2002. Hydro has put a temporary power supply in place, until a permanent replacement for the community energy supply can be determined. Two obvious alternatives are to build a new replacement diesel plant or to interconnect Rencontre East to the Island grid.

Rencontre East's peak demand for 2006 is forecast to be 323 kW assuming continued isolated operation with Isolated Diesel rates. For this alternative, by 2035, the peak demand is forecast to increase to 365 kW. Comparative projections for an Interconnection scenario with Interconnected rates are 329 kW in 2006 growing to 532 kW in 2035 (see Schedule 1).

The community's population was 212 in 1991, 215 in 1996 and 202 in 2001 and it is expected that the community will be viable for the foreseeable future (see *Commentary on the Viability of the Community of Rencontre East* in Appendix A). Hydro had 91 customers in the community in 2000, 89 in 2001, 91 in 2002 and 89 in 2003. In 2003, the customer breakout was 73 in Domestic and 16 in General Service, including one streetlight.

All costs, escalation and load forecast data used in the study represent the most recent projections. Costs of all alternative supply options are compared on a cumulative present worth basis discounted to January 2004 dollars.

2.0 STUDY METHODOLOGY

In order to determine the least cost method of servicing the load requirements of Rencontre East it is necessary to first identify technically feasible alternatives for supplying the community load. Once these alternatives have been identified, their cost effectiveness can be evaluated in terms of cumulative present worth (CPW) costs, over a period of time. The alternative offering the lowest CPW cost over the study time horizon is the preferred alternative.

To manage risk, Hydro has set a 15-year payback period for interconnection alternatives as a threshold for project consideration. The payback period gives the time for the higher investment of the interconnection to be offset by the higher operating costs of the continued diesel alternative. Thus, in order to reduce the risk that circumstances significantly change during the subsequent years (and consequently reduce the cost effectiveness), the CPW cost of an interconnection alternative must equal or better that of the continued diesel alternative within 15 years following completion of the interconnection, to be considered further.

In order to develop the CPW costs of diesel and interconnection alternatives, the following is required:

- setting a time horizon over which to perform the analysis;
- developing load forecasts covering the study period for interconnected and diesel alternatives;
- developing options for each alternative;
- preparing technical and economic data for each alternative;

- determining technical feasibility for each alternative;
- developing capital and operating costs for each technically acceptable alternative; and
- performing a cost effectiveness analysis.

Each of the above is discussed in further detail in the following sections.

2.1 General Assumptions

2.1.1 Study Time Horizon

This study used a 31-year time frame, covering the period from 2005 to 2035, inclusive.

2.1.2 Load Forecast

Load forecasts were prepared for the study time horizon by Hydro's Economic Analysis section for both the continued diesel operation and interconnected alternatives (see Schedule 1). For the interconnected load forecast, the interconnection was assumed to take place late in 2005.

2.1.3 Discount Rate

The study used an 7.0% discount rate, with all costs discounted to January 2004.

2.1.4 Escalation Rates

Escalation rates for operating and maintenance (O&M) costs were prepared by Hydro's Economic Analysis section (see Schedule 2).

2.2 Diesel Plant Operating Parameters

The following were used in developing annual operating and maintenance (O&M) costs for a new Rencontre East diesel plant.

1) Fixed O&M – This cost was set at $108,800 in 2006, which is consistent with costs incurred in previous years, and projected into the future using the O&M escalation series.

2) Variable O&M – The variable O&M rate was set at $0.0443/kWh in 2006 and escalated as above. This rate is based on average costs for Hydro's other diesel plants.

3) Energy Conversion Efficiency –An efficiency of 3.50 kWh/litre was assumed. This rate is based on an examination of the efficiencies in Hydro's newer diesel plants.

4) Diesel Fuel Cost – A forecast of fuel costs for Rencontre East over the study period was prepared by Hydro's Economic Analysis Section (see Schedule 3).

5) Lube Factor – The lube factor covers the cost of lubricating fluids used by the diesel generating units. It is expressed as a percentage of diesel fuel cost. The lube factor was set at 1.0211 (2.11%), which is consistent with average costs for Hydro's other diesel plants.

Table 1 on the next page summarizes the diesel plant operating parameters used for this study.

TABLE 1

Rencontre East Diesel Plant Operating Parameters	
Fixed O&M - $/year (2006)	$108,800
Variable O&M - $/kWh (2006)	0.0443
Lube Factor	1.0211
Efficiency - kWh/litre	3.50
Diesel Fuel Costs - $/litre (2006)	0.390

2.3 Interconnection Parameters

The following was used to develop annual operating costs for the grid interconnection.

1) Line Maintenance Cost – This study assumed a line maintenance cost of 2% of the interconnection capital cost to approximate the annual cost of maintaining the interconnection.

2) Energy Costs – Interconnection energy costs were based on a marginal Holyrood energy rate. This energy rate was developed using a fuel forecast provided by Hydro's Economic Analysis Section and assuming an incremental energy conversion rate at Holyrood of 624 kWh/bbl (See Schedule 3).

3) Losses – The forecasts used in this study are for the load at the bulk delivery point for the community: the high-voltage bus of the diesel plant or in the case of the interconnection, the location at which the distribution line enters the community. In addition to the load itself, transmission and distribution losses had to be added to the Rencontre forecast to determine the total amount of incremental energy that would have to be generated at Holyrood to supply Rencontre East, in the interconnection alternative. The interconnected forecast was increased by 7.2% in 2006, increasing to

9.9% in 2035, as the load increased over the study period, to account for expected additional losses over the interconnection and the transmission system that would not occur under the diesel alternative.

2.4 Development of Alternatives

The study evaluates two alternatives: building a new diesel plant or interconnecting the community to the Island grid through the English Harbour West distribution system. (see single line diagrams in Figures section). The following highlights any significant issues associated with each alternative:

2.4.1 Interconnection

As a single-phase distribution line would address community requirements, the more expensive option of a three-phase distribution line was not considered. There is one small three-phase customer in Rencontre East, who has not been active since 1998. This requirement, if it materializes, is expected to be met with a phase-converter. As well, the distribution system in Rencontre East will have to be converted to 14.4 kV from 7.2 kV instead of using a step-down transformer, to provide adequate fault levels for protection purposes. Two routes were studied for the interconnection: (see map *Rencontre East Interconnection* in Figures)

Route "A": This option involved connecting to the existing single-phase line to Poole's Cove and constructing a 38 km, single-phase, 14.4 kV, 1/0 AASC conductor distribution line to Rencontre East. A second phase would be added to the existing single-phase line to Poole's Cove to the tap-off point to Rencontre East. This would also involve the installation of two single-phase voltage regulators and a recloser.

Route "B": This option, which is geographically and electrically closer to the English Harbour West Terminal Station, involved connecting to the main distribution line approximately 4.5 km from the English Harbour West Terminal Station and constructing a 41 km, single-phase, 14.4 kV,

1/0 AASC conductor distribution line to Rencontre East. This would also involve the installation of a single-phase voltage regulator and a recloser.

After having reviewed technical and operating considerations, as well as cost, Route "B" was chosen as the preferred interconnection option, despite being approximately $75,000 more than Route "A", for the following reasons:

- Route "B", while being physically 3 km longer than Route "A", is electrically 9.6 km closer to the English Harbour West terminal station due to the difference in interconnection points. This provides better fault levels in Rencontre East, less energy losses and better voltage balance on the main feeder.

- The routing of this alternative is through less difficult terrain and not as exposed as Route "A", as well as being further from the coast, lessening the probability of salt contamination. This route should provide greater reliability and better accessibility for maintenance than Route "A".

An additional cost for the interconnection alternative is the environmental remediation of the old Rencontre East diesel plant site. It is estimated that this would cost $100,000. A site evaluation would have to be carried out to firm up the estimate. Even if a new diesel plant is constructed, some environmental remediation of the site may be necessary, but to a much lesser scale than if the interconnection is built and the old diesel plant site cleared.

It should be noted that construction of the interconnection is dependant on receiving the appropriate environmental permits. Indications are that this would not be a problem.

A cost estimate for Route "B" is contained in Appendix "B".

2.4.2 Diesel Plant

The alternative to an interconnection is to build a new diesel plant in Rencontre East. At present, the community is being supplied by a temporary power supply that was obtained, shipped to site, assembled and put on-line within 31 hours of the fire that destroyed the former diesel plant and its contents (the fuel storage tanks and the pole-mounted station transformers were not damaged). This supply consists of two mobile diesel-generating sets and a diesel unit released from Harbour Deep due to the relocation of that community. The units are housed in temporary structures that were to provide power to the community on a short-term basis, until such time as a permanent solution could be designed and implemented. As such, it was not designed and installed consistent with Hydro's standards for prime power installations and is lacking components that would provide appropriate control and protection for long-term operation.

Operation with the existing arrangement is not feasible, over the long term, as meeting regulatory, operation, and maintenance requirements would require significant upgrade or replacement of most equipment and systems currently installed. For example, the current building structure is a temporary shell built directly on the ground with limited services, and the trailers enclosing the mobile units make routine maintenance difficult because of limited space. While the mobile units can operate parked where they are in the short term, the lack of an adequate foundation means that settling of the units over time will cause problems. As well, the current power diesel plant is being operated on temporary environmental permits, as among other things, the exhaust stacks are not high enough and the fuel delivery system is not up to standard. Hydro has been allowed to operate up to this point, with the understanding that the diesel plant will be upgraded in the near future.

The diesel plant alternative could consist of constructing either a conventional diesel plant or a modular diesel plant, with three diesel generating units in the 200 kW size range.

"Conventional" Diesel Plant:
This option would involve constructing a diesel plant with the units and controls in a single building. This would be typical of the type of diesel plant Hydro has constructed over the last number of years.

One point to note is that if a new conventional diesel plant were constructed, the "Harbour Deep" diesel unit mentioned above (which is three years old) would be used in the new plant and only two new units purchased. The estimated cost to construct this new diesel plant would be $1,621,800. (See Appendix "B"). However, as the "Harbour Deep" unit could be used to displace future capital expenditures elsewhere within Hydro's systems, if it was not used in Rencontre East, a credit has been included in the Interconnected alternative in the economic analysis. This credit was arrived at as follows: In Hydro's 5-year plan, there is a proposal to purchase and install a new diesel unit to replace an obsolete unit in St. Lewis in 2006. As an alternative, an estimate to transport and install the "Harbour Deep" unit in St. Lewis was prepared. The difference between the two alternatives, $112,000 (2006$), is considered to be the incremental cost to Hydro of using the "Harbour Deep" unit in the new Rencontre East diesel plant rather than in St. Lewis.

The two mobile units currently being used in the temporary power supply would not be used in a new diesel plant. In order to incorporate them into a new diesel plant, they would have to be broken down into components: the diesel unit, controls, radiators, and switchgear and reassembled as part of the new plant. However, all of the components might not be usable in the new plant, as there might be incompatibilities with the other units. In the past, there have been no appreciable benefits realized by purchasing and installing new units, rather than by retrofitting. As well, if new units are purchased, the mobiles will be put back into system spares to be used as spares or as construction power on various jobs, as needed.

"Modular" Diesel Plant":
This option would involve constructing a diesel plant consisting of four enclosures, or modules, each housing generation or control equipment. Three of the enclosures would house generator sets, while the fourth would house the control equipment.

The estimated cost to construct this new modular plant would be $2,485,000. As the O&M costs for this plant would be similar to those for the conventional plant above, and the capital cost would be approximately 50% greater, no further consideration was given to this option.

2.4.3 Environmental Evaluation of Alternatives

This section discusses the environmental considerations for the alternatives considered. One key assumption is that with the interconnection alternative, the displacement of energy produced by a local diesel plant will be by generation at the Holyrood Thermal Generation Station.

The first consideration is Environmental Assessment Requirements. The interconnection will have to be assessed under the provincial and federal environmental assessment processes and will likely require an Environmental Preview Report with component Studies, while the diesel plant alternative will require permitting under *Gasoline and Associated Products Storage Regulations* and *Pollution Control Regulations*.

The interconnection and diesel plant alternatives both have a number of potential environmental effects. Construction of the interconnection may affect the "Heritage River" designation of the Bay du Nord River and other historic and geologic resources of the area. As well, generation of the energy at Holyrood to serve the Rencontre load will result in more SO_2, more CO_2 and less NO_x being produced, than if the diesel plant alternative was built and operated. On the other hand, local air quality may be adversely affected by particulate, if a new diesel plant produces the energy. As well, the diesel plant alternative will increase both the noise levels in the community and the risk of spills of petroleum product.

In the area of environmental protection planning requirements, the interconnection will require an environmental protection plan for construction, raptor and rare plant assessment and construction monitoring. The diesel plant will have no specific requirements.

In summary, the interconnection alternative will require substantially more resources for environmental assessment and construction monitoring, however the potential long term environmental effects of the two alternatives are not substantially different.

2.4.4 Insurance

Discussions with the insurance company regarding payment of Hydro's claim for the replacement of the old diesel plant are still ongoing. The insurance payment will be the same whether the diesel plant is rebuilt or the interconnection constructed. Therefore, as any payment would be common to either alternative, it has been excluded from the economic analysis. The payment is expected to be received in 2004 and be in the amount of approximately $250,000 to $300,000 after deductible.

2.5 Additional Capital Costs During the Study Period

It is expected that there would be no further capital costs for either the interconnection or diesel plant alternatives during the study period, due to load, given the load forecasts. There is minimal growth forecast under diesel rates and while there is more growth expected under interconnected rates, the minimum interconnection configuration identified at present is sufficient to handle this growth.

However, as the life of the diesel units is estimated to be 20 years, a cost was included in the analysis in 2025, to replace all three diesel units. This cost was adjusted to account for the remaining life left in the replacement diesel units, at the end of the study period.

2.6 Economic Analysis of Alternatives

The respective capital and operating costs of the interconnection and the continued diesel operation alternatives were analysed on a cumulative present worth basis. Alternatives were compared on the basis of:

(1) Cumulative Present Worth costs over the study period;
(2) Cumulative Present Worth preference;
(3) Pay Back Period; and
(4) Benefit/Cost Ratio

The CPW Preference is defined as the difference in present worth costs between alternatives at the end of the study period.

The Payback Period measures the time at which an investment is at risk to changes in the alternative or market. For interconnection studies, it is normal to plot the accumulated costs (capital investment plus operating costs) of the alternatives, discounted to a point in time. The payback period gives the time required for the higher investment in one project to be offset by higher operating costs and future investments of the alternative.
A sensitivity analysis was carried out to assess the impacts of changes in a number of key parameters: diesel plant capital cost, interconnection capital cost, fuel costs, discount rate and diesel plant site environmental cleanup cost.

The Benefit/Cost Ratio is defined as the sum of the Cumulative Present Worth and the Cumulative Present Worth Preference of the preferred alternative, over the study period, divided by the Cumulative Present Worth of the preferred alternative.

2.7 Revenue and Revenue Requirements

In addition to the economic analysis, the impact that choosing the interconnection alternative would have on Hydro's incremental revenue requirements was analysed over the study period.

3.0 RESULTS

The following presents a summary of the economic evaluation carried out for this study, as well as a revenue requirement analysis.

3.1 Economic Evaluation

A detailed spreadsheet showing the development of annual costs over the study period for each alternative can be found in Appendix C.

Table 2 summarizes the results of the analysis comparing the Continued Diesel alternative and the Interconnection alternative. As can be determined from the table (and in more detail in the table and graph in Appendix C), for the base case assumptions, the Interconnection alternative produces a 15-year payback period. At the end of the entire study period, the interconnection provides a CPW cost preference of $1,042,907 over continued diesel operations.

As well, the payback period is sensitive to capital cost changes for both the new diesel plant and the interconnection. The payback period is 20 years, with a 10% increase in the interconnection capital cost, and 10 years, with a 10% decrease. The payback period is 13 years, with a 10% increase in the diesel plant capital cost, and 17 years, with a 10% decrease. It is not very sensitive to changes in fuel costs, although a switch from 2.2% sulphur fuel to 1.0% sulphur fuel at Holyrood would extend the payback period to 16 years. An increase in the discount rate of 1.5% would increase the payback period to 17 years, while a similar decrease would reduce it to 13 years. The sensitivity for the diesel plant site environmental remediation was included, as that estimate has not been finalized. The payback period is not very sensitive within the +/- 50% range.

The benefit/cost ratio remained positive for the base case and all sensitivities considered, as noted in Table 2.

TABLE 2

Continued Diesel Versus Interconnection Sensitivity to Base Assumptions ($ x 000)						
Parameter Varied	Variation	CPW to 2035		CPW Preference (Interconnection) to 2035	Payback Period (Years)	Benefit/ Cost Ratio
		Continued Diesel	Interconnection			
Diesel Plant Capital Cost	-10%	5,339	4,438	901	17	1.20
	Base	5,481	4,438	1,043	15	1.24
	+10%	5,622	4,438	1,184	13	1.27
Interconnection Capital Cost	-10%	5,481	4,065	1,416	10	1.35
	Base	5,481	4,438	1,043	15	1.24
	+10%	5,481	4,810	671	20	1.14
Discount Rate	5.5%	6,504	4,906	1,598	13	1.33
	Base	5,481	4,438	1,043	15	1.24
	8.5%	4,704	4,070	634	17	1.16
Diesel Plant Site Environmental Cleanup	$50,000	5,481	4,397	1,084	14	1.25
	Base	5,481	4,438	1,043	15	1.24
	$150,000	5,481	4,479	1,002	15	1.22
Fuel Costs	-10%	5,307	4,361	946	15	1.22
	Base	5,481	4,438	1,043	15	1.24
	+10%	5,654	4,514	1,140	14	1.25
	1% S at HRD	5,481	4,622	859	16	1.19

3.2 Revenue and Revenue Requirements Analysis

Table 3 below outlines the incremental difference in annual costs and revenues each year between the interconnection and diesel alternatives. As can be seen from this data, 2006 is the only year where the annual revenue requirements for the interconnection alternative are higher than for the diesel alternative. This is primarily due to two one-time costs related to the interconnection alternative, which are projected to occur in 2006. When the diesel plant is shut down, as expected under the interconnection alternative, there is anticipated to be remediation costs of $100,000 at the diesel plant site and a loss on disposal of assets of an additional $100,000 in 2006. Subsequent years show a growing annual net benefit of the interconnection alternative. Commencing in 2007, overall customer rates would be lower as a result of reduced revenue requirements. Cost of service studies, however, are not available for the analysis period, 2006 to 2035, to quantify individual customer impacts.

Base data related to the diesel and interconnection alternatives is shown in Appendix D.

TABLE 3

Rencontre East Analysis - Annual Costs and Revenues

	Interconnection Over Diesel Alternative						
			Capital-Related				
Year	O&M	Fuels	Deprec	Loss on Disposal	Financing	Revenues	Total Difference
2006	9,432	(72,177)	21,647	100,000	103,155	14,561	176,619
2007	(92,815)	(72,958)	21,647		101,672	9,387	(33,067)
2008	(95,073)	(74,348)	21,647		100,189	7,852	(39,733)
2009	(97,179)	(75,608)	21,647		98,706	6,409	(46,026)
2010	(99,374)	(78,723)	21,647		97,222	5,105	(54,122)
2011	(101,595)	(80,571)	21,647		95,739	3,359	(61,421)
2012	(103,844)	(82,504)	21,647		94,256	1,936	(68,510)
2013	(106,177)	(84,376)	21,647		92,773	242	(75,891)
2014	(108,562)	(86,443)	21,647		91,289	(1,303)	(83,372)
2015	(111,000)	(88,609)	21,647		89,806	(2,803)	(90,959)
2016	(113,537)	(90,500)	21,647		88,323	(4,484)	(98,551)
2017	(116,130)	(92,478)	21,647		86,840	(6,425)	(106,547)
2018	(118,783)	(94,380)	21,647		85,357	(8,292)	(114,452)
2019	(121,495)	(96,435)	21,647		83,873	(10,183)	(122,593)
2020	(124,270)	(98,412)	21,647		82,390	(12,083)	(130,728)
2021	(127,107)	(99,944)	21,647		80,907	(14,169)	(138,666)
2022	(130,008)	(101,718)	21,647		79,424	(16,283)	(146,939)
2023	(132,975)	(103,260)	21,647		77,940	(18,409)	(155,057)
2024	(136,009)	(104,984)	21,647		76,457	(20,682)	(163,571)
2025	(139,113)	(106,537)	21,647		74,974	(23,238)	(172,268)
2026	(142,286)	(108,334)	36,837		(25,013)	(25,703)	(264,499)
2027	(145,531)	(110,082)	36,837		(27,537)	(28,166)	(274,480)
2028	(148,850)	(111,828)	36,837		(30,061)	(30,790)	(284,693)
2029	(152,244)	(113,600)	36,837		(32,585)	(33,696)	(295,288)
2030	(155,715)	(115,369)	36,837		(35,110)	(36,514)	(305,871)
2031	(159,264)	(117,086)	36,837		(37,634)	(39,580)	(316,727)
2032	(162,894)	(118,966)	36,837		(40,158)	(42,435)	(327,615)
2033	(166,605)	(120,711)	36,837		(42,682)	(45,761)	(338,923)
2034	(170,401)	(122,469)	36,837		(45,206)	(49,238)	(350,477)
2035	(174,283)	(124,241)	36,837		(47,730)	(52,506)	(361,923)

Notes:

1. Both the initial capital costs for the diesel alternative of $1,733,800, and the replacement diesel unit cost of $1,430,000 in 2025 are depreciated over 20 years.
2. Total capital costs for the interconnected alternative of $3,250,100 are depreciated over 30 years
3. Diesel plant site remediation of $100,000 is included as a one-time operating cost in 2006 for the Interconnection Alternative.
4. Asset additions are financed at the weighted average cost of debt of 6.852%, in accordance with the 2004 Forecast Cost of Service, Rev. 2 (Oct 2003).
5. The above amounts do not reflect full cost of service allocations or any re-allocations of existing costs.
6. Revenues for both alternatives are assumed to escalate at 2% per annum.

4.0 CONCLUSIONS AND RECOMMENDATIONS

This study analysed two alternatives for a long term power supply for the community of Rencontre East: rebuild and continue to operate the diesel plant in the community or interconnect Rencontre East to the English Harbour West distribution system via a 41 km, 14.4 kV single-phase distribution line. Based on this analysis, the interconnection alternative offers a cumulative present worth cost preference of $1,042,907 as compared to the continued diesel alternative at the end of the study period (2035). The payback period is 15 years.

A sensitivity analysis indicates that the results are somewhat sensitive to capital cost estimates, with a 10% increase in capital cost for the interconnection increasing the payback period to 20 years.

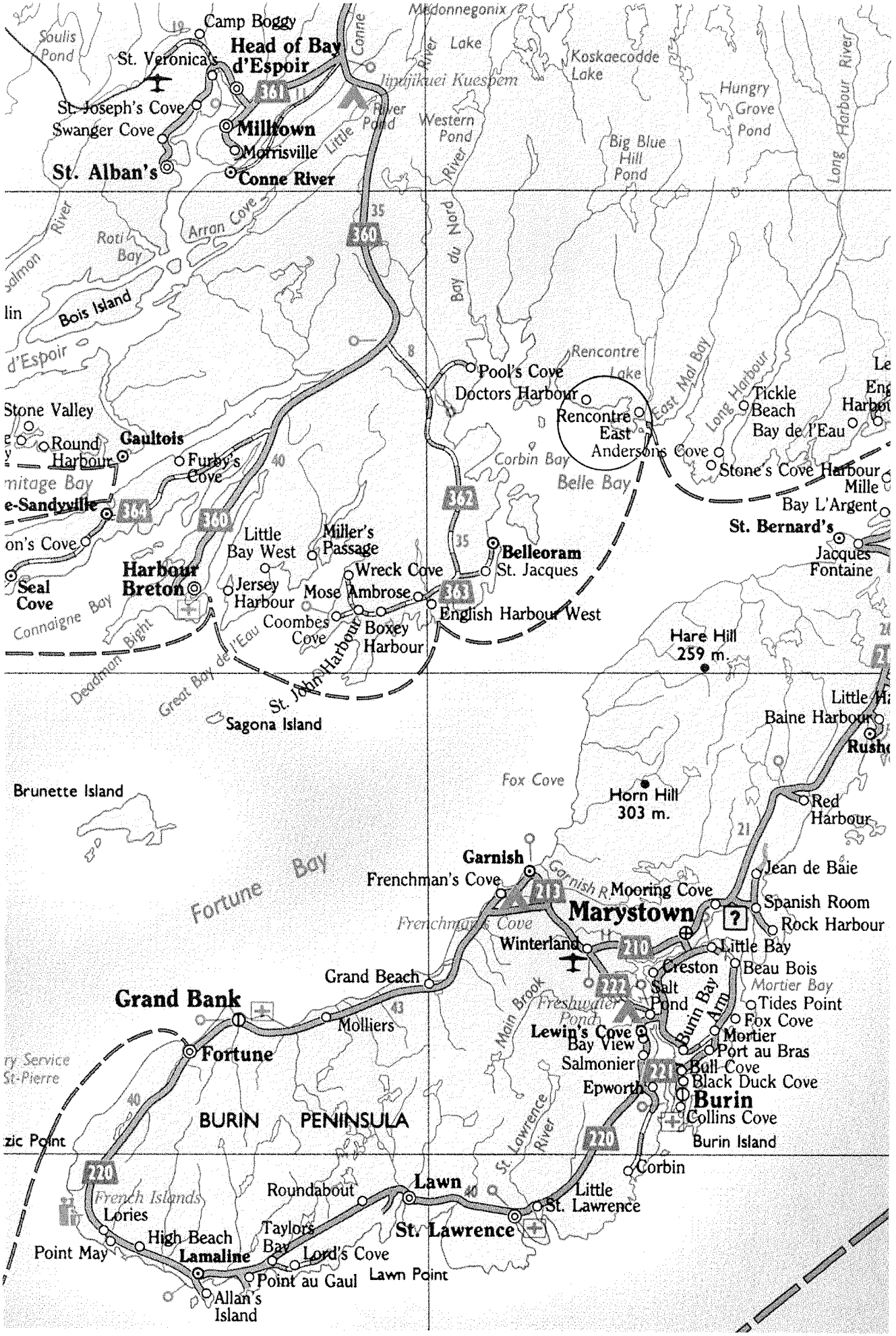
Looking at the incremental change in revenue requirements, 2006 is the sole year where the revenue requirements for the interconnection alternative are higher than for the diesel alternative. Starting in 2007, revenue requirements from Hydro's customers are lower, if the interconnection alternative is constructed.

A review of the demographics of the community of Rencontre East gives reason to believe that it will be a viable community, for the foreseeable future. Rencontre East holds a unique status as an Island Rural Isolated system in that its population and customer base has not materially declined during the 1990s.

A check with Municipal Affairs indicates that they have had no representation from Rencontre East on re-location potential (as happened in Harbour Deep) and Government has not undertaken an independent analysis of the matter. Notwithstanding, if, in the future, economic and community circumstances change for Rencontre East for what ever the reason(s), a re-location risk exists. At present, such a risk is deemed low.

Based on these results, it is recommended that the community of Rencontre East be interconnected to the Island grid in 2005.

FIGURES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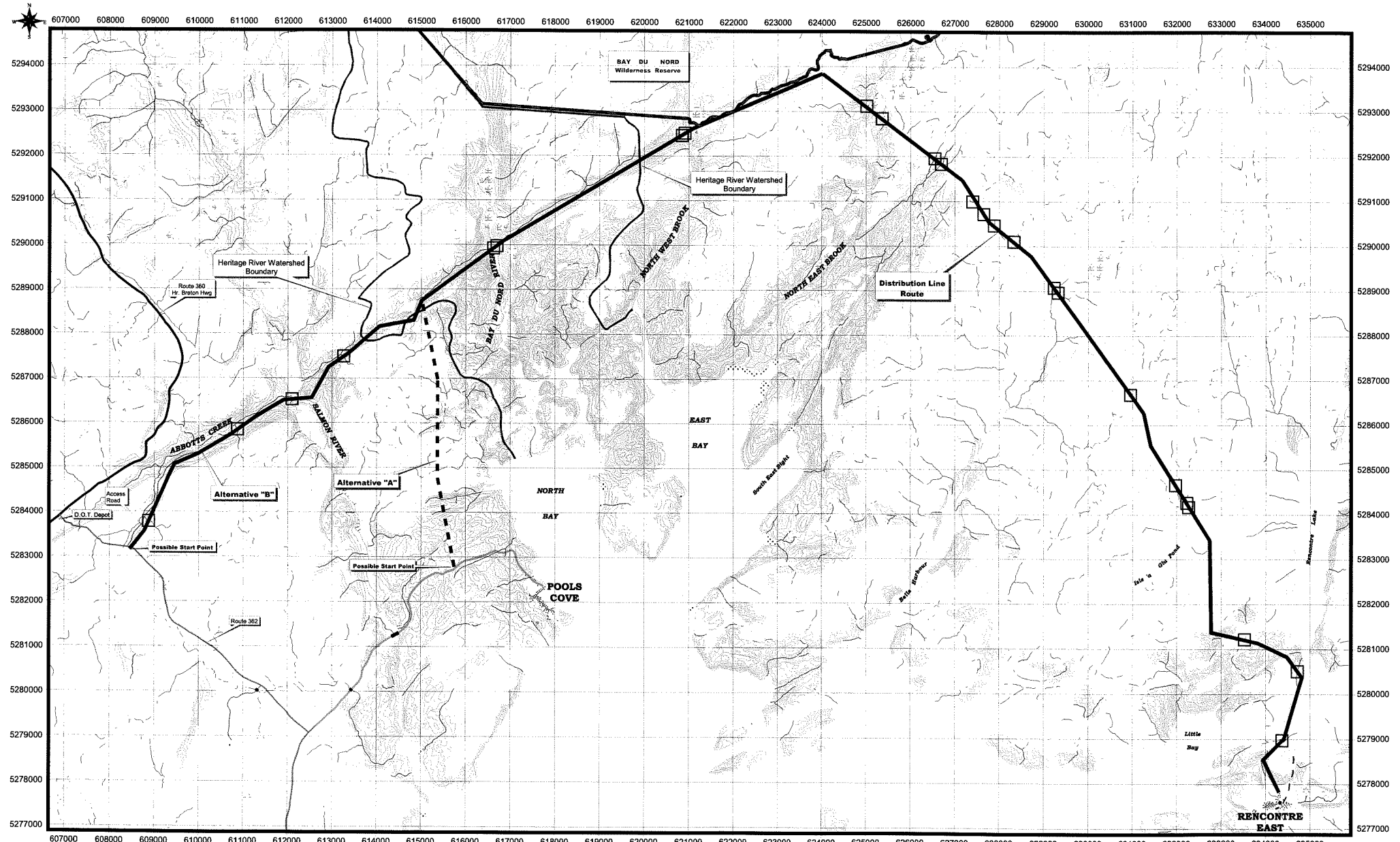
Head of Bay d'Espoir
St. Veronica's
St. Joseph's Cove
Swanger Cove
Millltown
Morrisville
St. Alban's
Conne River
Soulis Pond
Little River Pond
Western Pond
Big Blue Hill Pond
Hungry Grove Pond
Koskaecodde Lake
Long Harbour River
Arran Cove
Roti Bay
Bois Island
Bay du Nord River
Pool's Cove
Doctors Harbour
Rencontre Lake
Rencontre East
Andersons Cove
Tickle Beach
Bay de l'Eau
Stone's Cove Harbour
Bay L'Argent
St. Bernard's
Jacques Fontaine
Stone Valley
Round Harbour
Gaultois
Furby's Cove
Corbin Bay
Belle Bay
Little Bay West
Miller's Passage
Wreck Cove
Belleoram
St. Jacques
Harbour Breton
Seal Cove
Jersey Harbour
Mose Ambrose
English Harbour West
Coombes Cove
Boxey Harbour
Connaigne Bay
Deadman Bight
Great Bay de l'Eau
St. John Harbour
Sagona Island
Hare Hill 259 m.
Baine Harbour
Brunette Island
Fox Cove
Horn Hill 303 m.
Red Harbour
Garnish
Frenchman's Cove
Mooring Cove
Jean de Baie
Spanish Room
Marystown
Rock Harbour
Winterland
Little Bay
Creston
Beau Bois
Grand Beach
Salt Pond
Mortier Bay
Tides Point
Fox Cove
Mortier
Port au Bras
Bull Cove
Black Duck Cove
Burin
Collins Cove
Burin Island
Corbin
Grand Bank
Molliers
Fortune
Lewin's Cove
Bay View
Salmonier
Epworth
BURIN PENINSULA
Roundabout
Lawn
St. Lawrence
Little St. Lawrence
French Islands
Lories
Point May
High Beach
Lamaline
Taylors Bay
Lord's Cove
Point au Gaul
Lawn Point
Allan's Island
Fortune Bay
Main Brook
Freshwater Pond
Burin Bay Arm
St. Lawrence River



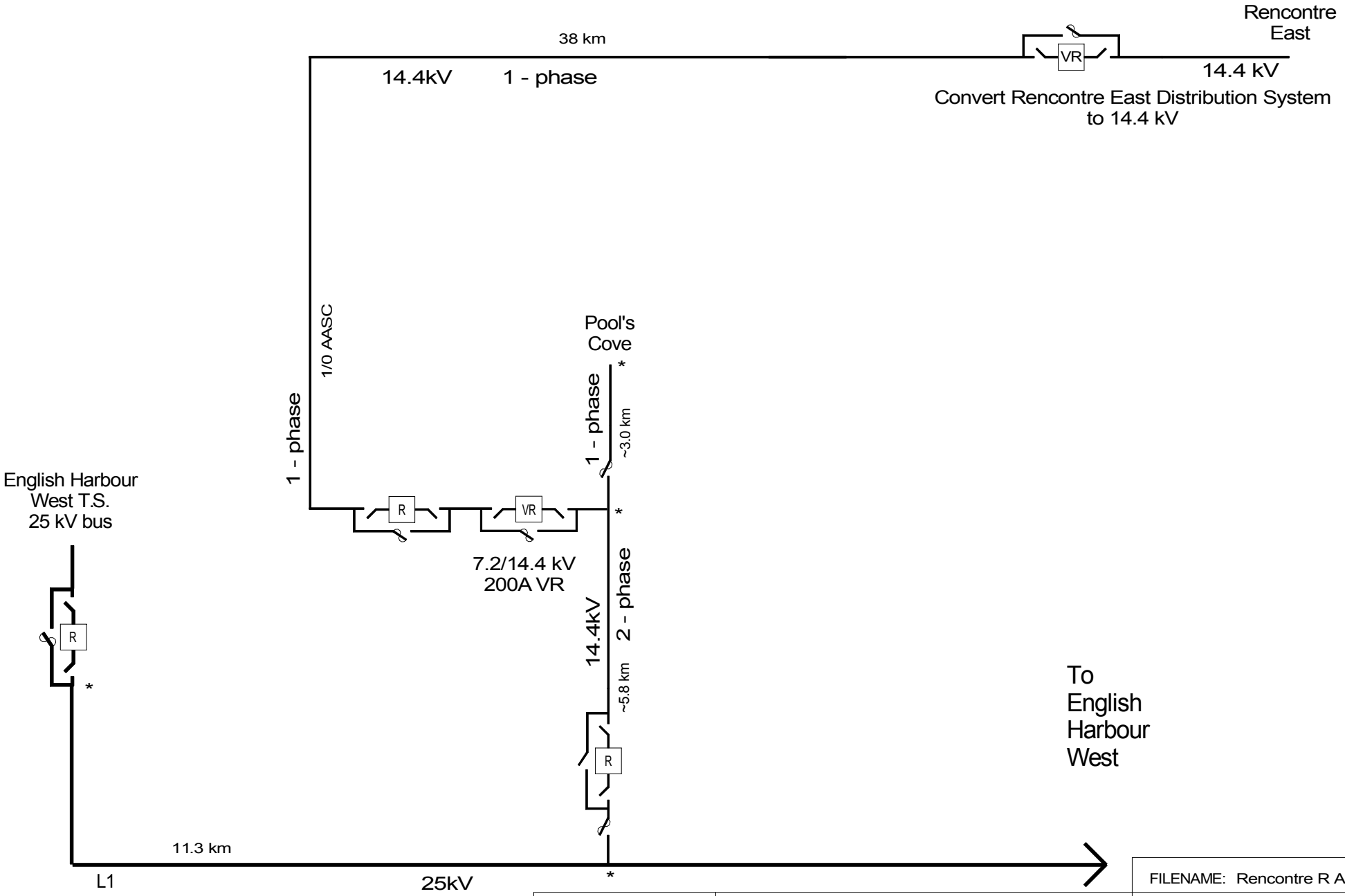
HYDRO
Environmental Services and Properties Department

LEGEND
☐ Fording Site

RENCONTRE EAST INTERCONNECT LINE
(PROPOSED)

ONE THOUSAND METRE
U.T.M. GRID ZONE 21
N.A.D.83

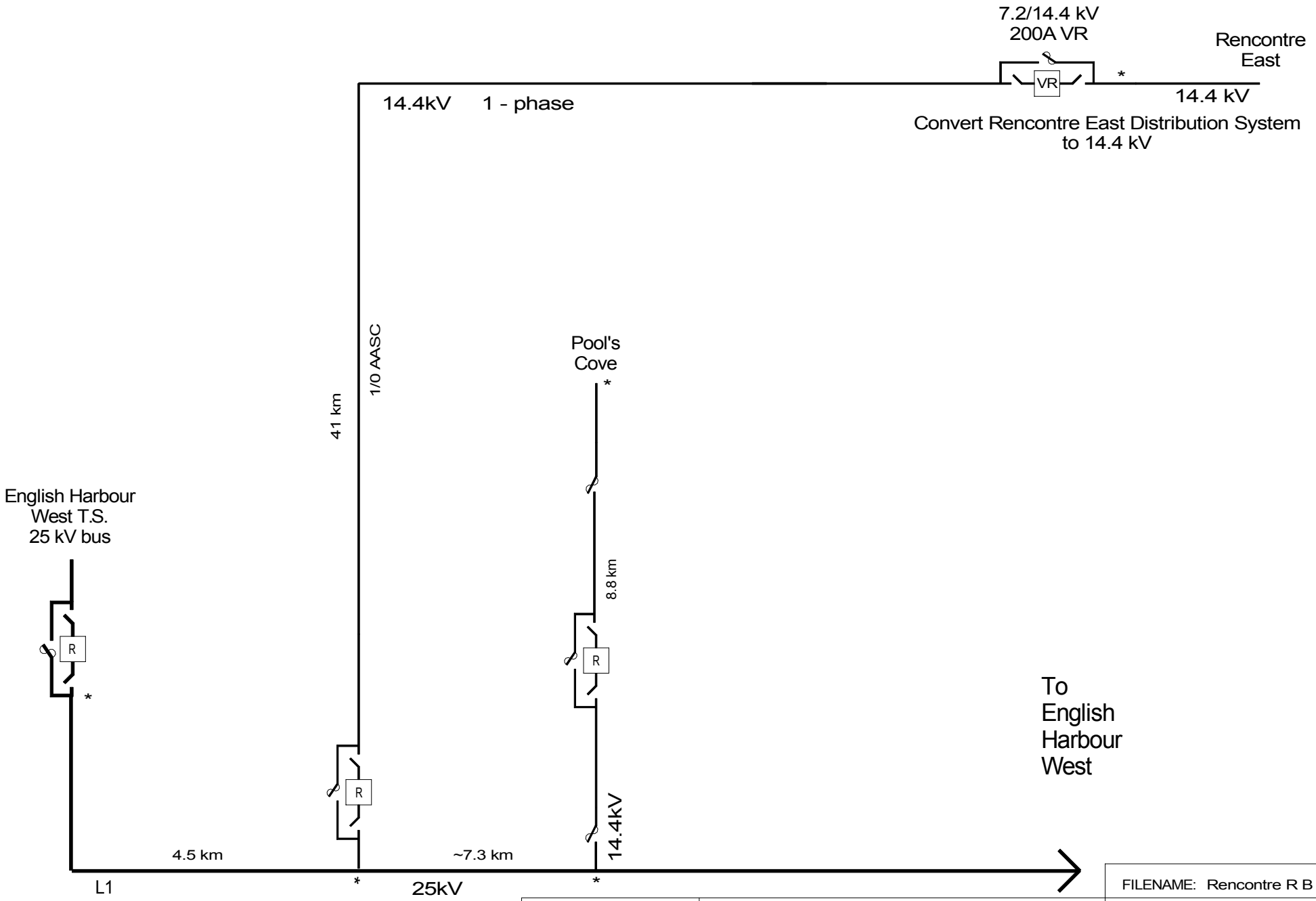
1000 0 1000 2000 Meters



HYDRO

TITLE:
RENCONTRE EAST INTERCONNECTION
ROUTE "A"

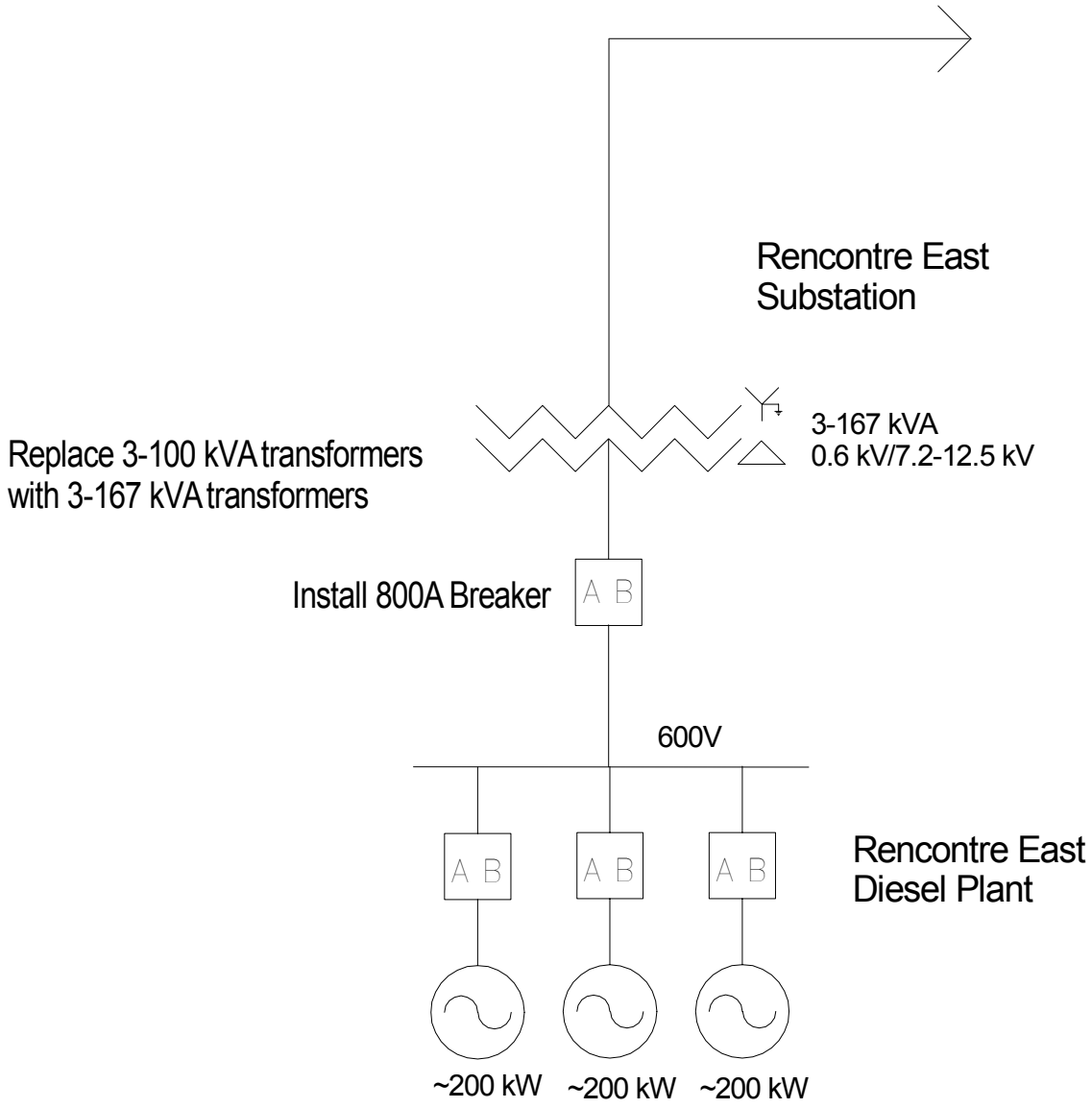
FILENAME: Rencontre R A
SHEET 1 OF 1
DRAWN BY: B. Moulton
DATE: Jan. 17, 2003



HYDRO

TITLE:
RENCONTRE EAST INTERCONNECTION
ROUTE "B"

FILENAME: Rencontre R B
SHEET 1 OF 1
DRAWN BY: B. Moulton
DATE: Jan. 17, 2003



Size plant for possible 800 A output.

Provide totalized metering for fuel and energy measurement.

Provide protection as required.

HYDRO

TITLE:
RENCONTRE EAST
PROPOSED DIESEL PLANT

FILENAME: Rencontre DP

SHEET 1 OF 1

DRAWN BY: B. Moulton

DATE: Jan. 17, 2003

SCHEDULES

Rencontre East Load Forecasts

Year	Interconnection Forecast		Diesel Forecast	
	Peak kW	Energy MWh	Peak kW	Energy MWh
2004	294	1,049	294	1,049
2005	319	976	320	1,001
2006	329	1,002	323	1,009
2007	338	1,029	326	1,018
2008	348	1,056	329	1,027
2009	355	1,075	330	1,031
2010	361	1,094	332	1,035
2011	368	1,113	333	1,039
2012	375	1,132	334	1,043
2013	382	1,152	336	1,047
2014	389	1,170	337	1,051
2015	396	1,188	338	1,055
2016	402	1,206	339	1,059
2017	409	1,224	341	1,063
2018	416	1,243	342	1,067
2019	423	1,261	343	1,071
2020	430	1,280	345	1,075
2021	436	1,299	346	1,079
2022	443	1,317	347	1,083
2023	450	1,336	349	1,087
2024	457	1,355	350	1,091
2025	464	1,374	351	1,095
2026	470	1,392	353	1,099
2027	477	1,410	354	1,103
2028	484	1,429	355	1,107
2029	491	1,447	357	1,111
2030	498	1,466	358	1,115
2031	504	1,485	359	1,119
2032	511	1,503	361	1,123
2033	518	1,522	362	1,127
2034	525	1,541	363	1,131
2035	532	1,560	365	1,135

Schedule 1

O & M Escalation Series (Annual Percentage Change)	
	Variable & Fixed
2004	2.255
2005	1.790
2006	1.978
2007	2.032
2008	1.985
2009	2.017
2010	2.061
2011	2.038
2012	2.017
2013	2.050
2014	2.050
2015	2.050
2016	2.089
2017	2.089
2018	2.089
2019	2.089
2020	2.089
2021	2.089
2022	2.089
2023	2.089
2024	2.089
2025	2.089
2026	2.089
2027	2.089
2028	2.089
2029	2.089
2030	2.089
2031	2.089
2032	2.089
2033	2.089
2034	2.089
2035	2.089

Schedule 2

Fuel Price Forecast

	Diesel Fuel at Rencontre East ($Cdn/litre)	#6 Fuel at Holyrood ($Cdn/bbl)
2004	0.400	27.65
2005	0.382	25.00
2006	0.390	24.85
2007	0.395	25.00
2008	0.407	26.25
2009	0.420	27.40
2010	0.435	27.95
2011	0.448	28.75
2012	0.461	29.55
2013	0.474	30.40
2014	0.488	31.25
2015	0.502	32.10
2016	0.516	33.00
2017	0.530	33.90
2018	0.545	34.85
2019	0.560	35.80
2020	0.575	36.80
2021	0.588	37.65
2022	0.601	38.45
2023	0.615	39.35
2024	0.628	40.20
2025	0.642	41.15
2026	0.657	42.05
2027	0.672	43.00
2028	0.687	43.95
2029	0.702	44.95
2030	0.718	45.95
2031	0.734	47.00
2032	0.750	48.05
2033	0.767	49.15
2034	0.784	50.28
2035	0.802	51.43

Schedule 3

APPENDIX A

Commentary on the Viability of the Community of Rencontre East

Commentary on the Viability of the Community of Rencontre East

Rencontre East holds a unique status as an Island isolated system in that its population and customer base has not materially declined during the 1990s. Hydro presently has 75 domestic accounts, an actual increase of 10 percent during the 1990s. In 2001 its population was 201 persons, down only marginally from the 1991 census count of 212. For the three census counts in the period 1986 to 1996, the population of Rencontre East was stable at an average of 215 persons per census year. Looking further back, post Confederation, Rencontre East had a population of about 300 during the 1950s and 1960s. It was actually during the 1970s when the population of Rencontre East contracted somewhat. Since that time, the relative stability of the community has been quite notable. Relative to the Province overall, Rencontre East has a younger demographic profile so it would not be true to characterize Rencontre East as a retirement community. About 25% of the population is school aged and currently enrolled in school. This school age population has also been noticeably stable in relative terms for a community of this size.

Changes to population across a forecast period are a function of births, deaths, and the net impact of in and out-migration. Generally, net-migration will be the key to the future population base for Rencontre East. The existing data trends would indeed suggest a lower population twenty years from now. But more importantly, the data suggest Rencontre East is a viable community that has not been materially contracting and/or re-locating due to economic circumstances like many other isolated rural communities.

The only primary economic activity is fish harvesting. The harvesting effort has been seemingly more diversified than strictly groundfish dependency (e.g. lobster) and this has likely contributed to the community's stability. As expected, government income transfers are an important source of community personal income.

Because Rencontre East is an isolated community, government provides year-round regular ferry and freight service that runs from Bay L'Argent (Burin Peninsula) to Rencontre East to Pool's Cove (Connaigre Peninsula). Both Bay L'Argent and Pool's Cove enjoy interconnected road

access. While on the surface there may well exist an incentive to abandon this ferry service in favour of relocation buyouts, as was essentially the case with Harbour Deep, current government policy does not lead in such matters and responds only to a stated community's will. A check with Municipal Affairs indicates that they have had no representation from Rencontre East on re-location potential and government has not undertaken an independent analysis of the matter. Notwithstanding, if, in the future, economic and community circumstances change for Rencontre East for what ever the reason(s), a re-location risk exists. At present, such a risk is deemed low.

Rencontre East can be expected to remain a viable community as long as some primary fishing activity remains, and/or government transfers and subsidies continue to support the community, and/or the community chooses not to re-locate. These contributing factors are not matters that Hydro has any control over or expert judgement on. All Hydro can observe is that the community has been very stable in the past despite the fisheries moratoria and out-migration patterns apparent in other rural communities. Rencontre East's demographics are presently supportive of a sustained community presence. There is no information that stands out to indicate to Hydro that the community is not viable going forward.

Economic Analysis, NLH
December 2002

APPENDIX B

Alternatives – Cost Estimates

File: _____

CAPITAL BUDGET PROPOSAL

Project Title:	New Power Supply - Rencontre East - Interconnection	Date Prepared	5-Mar-2004
Location:	English Harbour West Distribution Line to Rencontre East	Start Date	1-Feb-2005
Division:	Production	Completion Date	30-Nov-2005
Classification:	Rural Systems - Major Upgrading		

Asset(s) Retirement/Transfer is involved: Yes _____ **No** _____ ***If Yes, Attach Particulars***

Project Description:

This project consists of the construction of a single-phase 14.4 kV distribution line from the English Harbour West distribution system to the community of Rencontre East. The project includes the installation of a voltage regulator, single- phase recloser and the conversion of the community of Rencontre East from the existing 7.2kV to 14.4kV.

Project Cost: *($ x1,000)*	**2005**	**2006**	**Beyond**	**TOTAL**
Material Supply	586.0	0.0	0.0	586.0
Labour	1488.0	0.0	0.0	1488.0
Engineering	365.0	0.0	0.0	365.0
Project Management	46.0	0.0	0.0	46.0
Inspection & Commissioning	155.0	0.0	0.0	155.0
O/H, AFUDC, Esc. & Cont.	610.1	0.0	0.0	610.1
Total	**3,250.1**	**0.0**	**0.0**	**3,250.1**

Operating Experience:

This is a new interconnection to the Rencontre East distribution system. The community is currently served by a temporary diesel generation plant, which was installed when the permanent plant was destroyed by fire in 2002.

Project Justification:

The "Rencontre East Interconnection Study - April 2004" identified this interconnection as the most cost-effective method of servicing the community in the long term.

Future Plans:

None.

Project Initiator "Asset/Labour Manager"		Regional/Plant Manager "Initiating Dept."		Department Director "Managing Dept"	
Project Estimator "Asset or Labour Staff or Support Eng. Group"		Department Director "Initiating Dept."		Divisional Vice-President	

File: _____

CAPITAL BUDGET PROPOSAL

Project Title:	New Power Supply - Rencontre East - New Diesel Plant	Date Prepared	4-Dec-2003
Location:	Rencontre East	Start Date	15-Jan-2005
Division:	Production	Completion Date	31-Oct-2005
Classification:	Generation - New Generation Source		

Asset(s) Retirement/Transfer is involved: Yes _____ **No** √ ***If Yes, Attach Particulars***

Project Description:
To construct a new diesel plant to house three new gensets. The Work involves removing the existing foundations, grading site ,constructing a concrete block building, incorporating sound mitigation elements, installing an existing genset and switchgear (the Harbour Deep unit), supplying and installing two new gensets c/w switchgear and associated systems, supplying and installing a fire alarm system, supplying and installing 3 HVCTs and supplying and installing 3-167 KVA transformers to replace the existing 3-100 KVA substation transformers. Construction will be by contractor. Municipal and Environmental Permits will be required

Project Cost: *($ x1,000)*	**2005**	**2006**	**Beyond**	**TOTAL**
Material Supply	540.0	0.0	0.0	540.0
Labour	583.1	0.0	0.0	583.1
Engineering	74.5	0.0	0.0	74.5
Project Management	26.0	0.0	0.0	26.0
Inspection & Commissioning	110.0	0.0	0.0	110.0
O/H, AFUDC, Esc. & Cont.	288.2	0.0	0.0	288.2
Total	**1,621.8**	**0.0**	**0.0**	**1,621.8**

Operating Experience:
This is a new facility.

Project Justification:
In 2002, the Rencontre East diesel plant burned down requiring the use of a temporary facility to house the temporary diesels. A study (see "Rencontre East Interconnection Study") was conducted by System Planning into a permanent power supply for Rencontre East

Future Plans:
At present, there are no future commitments associated with this capital budget proposal.

Project Initiator "Asset/Labour Manager"		Regional/Plant Manager "Initiating Dept."		Department Director "Managing Dept"	
Project Estimator "Asset or Labour Staff or Support Eng. Group"		Department Director "Initiating Dept."		Divisional Vice-President	

APPENDIX C

Base Case - Economic Analysis

Rencontre East Interconnection Study
Economic Analysis

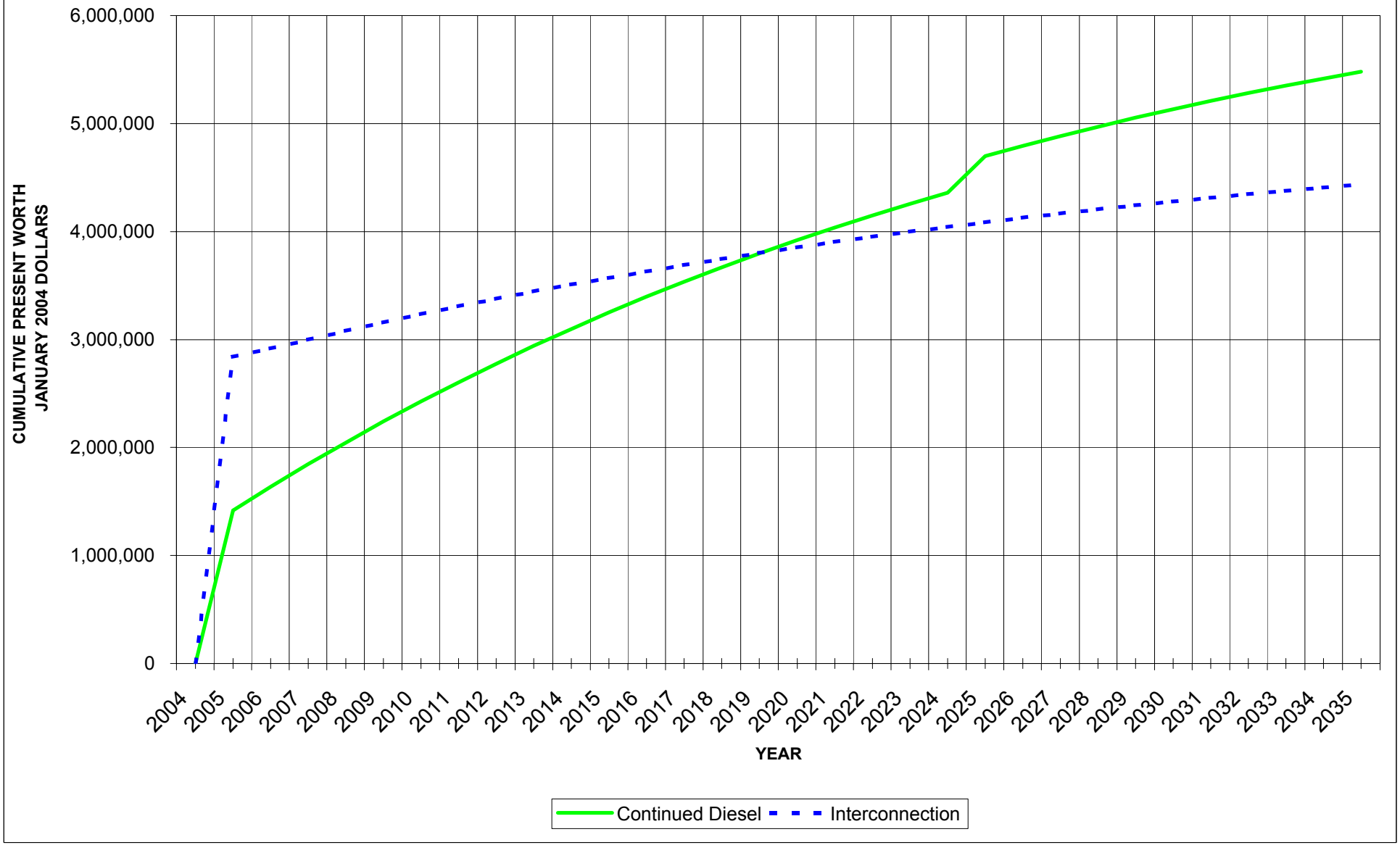
Base Case - New Diesel Plant with Harbour Deep Unit Diesel Plant versus Interconnection

Year	Diesel Alternative						Interconnection Alternative						Net Value of Interconnection Over Continued Diesel		
	ANNUAL			CONSTRUCTION	TOTAL Cont. Diesel $		CONSTRUCTION		ANNUAL		TOTAL INTERCONNECTION $				
	Fixed O&M	Variable O&M	Fuel & Lube	New Diesel Plant	$ For Year	CPW Jan-04	Dist. Line & DP Site Remediation	Credit for Harbour Deep Diesel	O&M	Energy 2.2% S Fuel	$ For Year	CPW Jan-04	Net $ For Year	Net CPW Jan-04	CPW Jan-04
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	1,621,800	1,621,800	1,416,543	3,250,100	0	0	0	3,250,100	2,838,763	(1,628,300)	(1,422,220)	(1,422,220)
2006	108,800	44,731	114,943	0	268,474	1,635,698	100,000	(112,000)	62,963	42,766	93,729	2,915,274	174,745	142,644	(1,279,576)
2007	111,010	46,047	117,182	0	274,240	1,844,914			64,242	44,224	108,467	2,998,023	165,773	126,467	(1,153,109)
2008	113,214	47,376	122,045	0	282,636	2,046,429			65,518	47,698	113,216	3,078,744	169,420	120,794	(1,032,315)
2009	115,498	48,520	126,338	0	290,356	2,239,906			66,839	50,730	117,569	3,157,085	172,787	115,135	(917,180)
2010	117,878	49,712	131,434	0	299,024	2,426,123			68,217	52,711	120,928	3,232,393	178,096	110,909	(806,270)
2011	120,280	50,921	135,783	0	306,985	2,604,791			69,607	55,212	124,819	3,305,039	182,166	106,022	(700,248)
2012	122,707	52,149	140,275	0	315,130	2,776,201			71,011	57,770	128,781	3,375,088	186,349	101,361	(598,887)
2013	125,222	53,422	144,913	0	323,557	2,940,681			72,467	60,538	133,004	3,442,700	190,553	96,867	(502,020)
2014	127,789	54,725	149,703	0	332,218	3,098,515			73,953	63,260	137,213	3,507,889	195,005	92,646	(409,374)
2015	130,409	56,060	154,650	0	341,119	3,249,976			75,469	66,041	141,510	3,570,721	199,609	88,629	(320,745)
2016	133,134	57,448	159,475	0	350,057	3,395,237			77,045	68,976	146,021	3,631,315	204,036	84,668	(236,077)
2017	135,916	58,870	164,449	0	359,234	3,534,555			78,655	71,971	150,626	3,689,730	208,608	80,902	(155,175)
2018	138,755	60,326	169,575	0	368,657	3,668,173			80,299	75,195	155,494	3,746,088	213,163	77,260	(77,915)
2019	141,654	61,817	174,860	0	378,331	3,796,327			81,976	78,425	160,401	3,800,421	217,930	73,821	(4,095)
2020	144,614	63,345	180,306	0	388,265	3,919,241			83,689	81,894	165,583	3,852,841	222,682	70,495	66,401
2021	147,636	64,909	185,040	0	397,584	4,036,872			85,438	85,096	170,533	3,903,295	227,051	67,176	133,577
2022	150,720	66,510	189,895	0	407,125	4,149,446			87,223	88,177	175,400	3,951,795	231,726	64,074	197,651
2023	153,869	68,151	194,874	0	416,895	4,257,179			89,045	91,614	180,659	3,998,481	236,235	61,048	258,698
2024	157,084	69,831	199,982	0	426,897	4,360,280			90,906	94,998	185,904	4,043,379	240,993	58,203	316,901
2025	160,366	71,551	205,221	1,066,530	1,503,668	4,699,678			92,805	98,684	191,488	4,086,600	1,312,180	296,176	613,078
2026	163,717	73,313	210,594	0	447,624	4,794,103			94,744	102,260	197,004	4,128,158	250,620	52,868	665,945
2027	167,137	75,117	216,105	0	458,360	4,884,467			96,723	106,023	202,746	4,168,128	255,613	50,393	716,339
2028	170,630	76,965	221,757	0	469,352	4,970,945			98,744	109,930	208,674	4,206,576	260,678	48,030	764,368
2029	174,195	78,857	227,555	0	480,606	5,053,703			100,807	113,955	214,762	4,243,557	265,844	45,777	810,145
2030	177,834	80,794	233,501	0	492,129	5,132,901			102,914	118,131	221,045	4,279,130	271,084	43,626	853,771
2031	181,550	82,778	239,599	0	503,926	5,208,693			105,064	122,512	227,576	4,313,358	276,350	41,564	895,335
2032	185,343	84,810	245,853	0	516,006	5,281,224			107,259	126,887	234,146	4,346,270	281,860	39,619	934,954
2033	189,215	86,890	252,267	0	528,373	5,350,635			109,500	131,556	241,057	4,377,937	287,316	37,744	972,698
2034	193,169	89,020	258,846	0	541,035	5,417,059			111,788	136,376	248,164	4,408,405	292,870	35,957	1,008,654
2035	197,205	91,202	265,592	0	553,999	5,480,626			114,123	141,351	255,475	4,437,719	298,524	34,253	1,042,907
CPW 2004$	1,456,974	630,725	1,735,654	1,657,273	0 **5,480,626**		2,920,393	(91,425)	843,160	765,592	**4,437,719**		**1,042,907**		

Discount Rate = 7.0%

CPW Continued Diesel Cost - Jan 2004	**5,480,626**
CPW Interconnection Cost - Jan 2004	**4,437,719**
Cumulative Present Worth of Interconnection	**1,042,907**

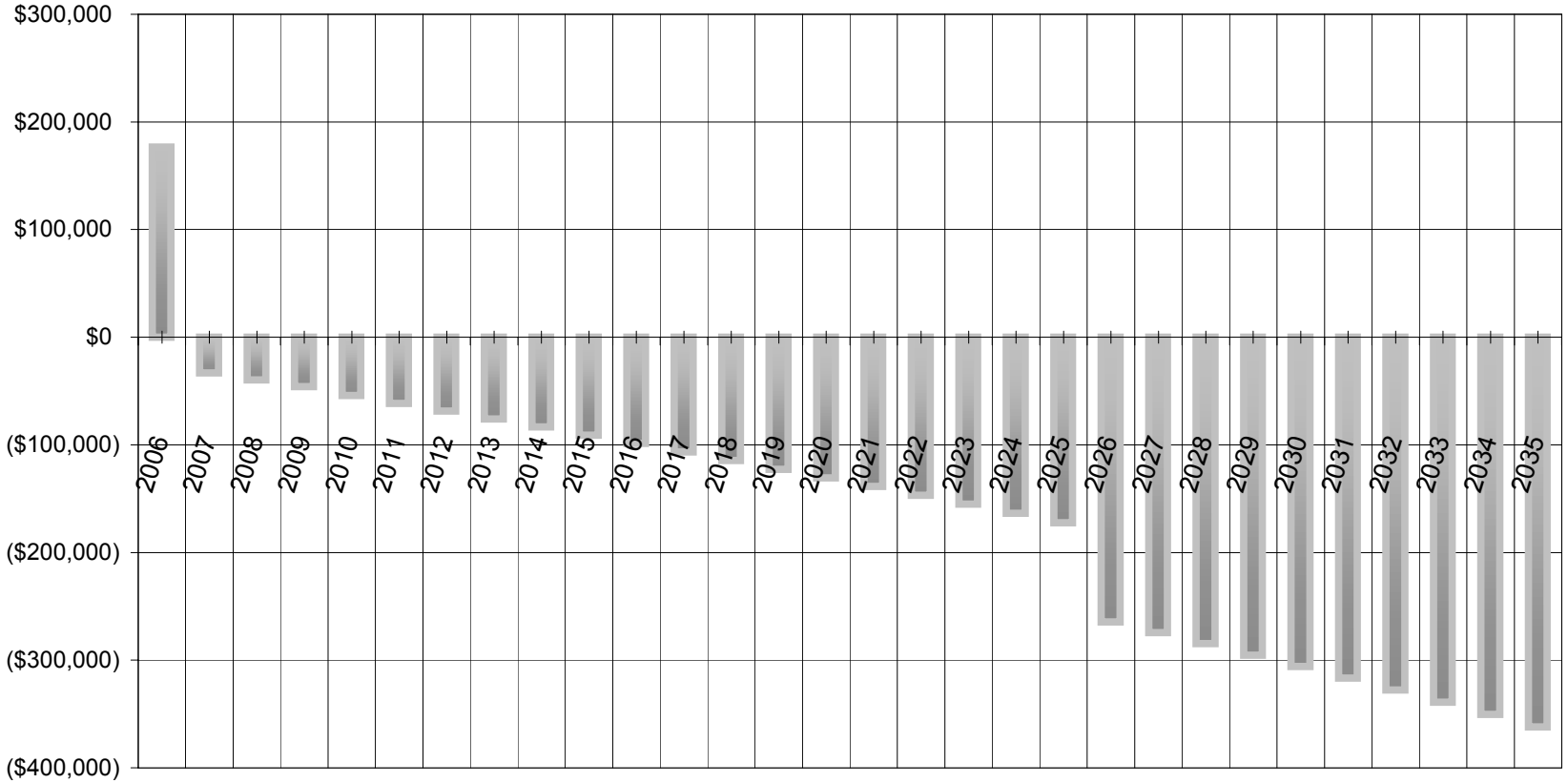
Rencontre East Interconnection Study
Cumulative Present Worth of Incremental Capital Costs and Yearly Expenses For Each Alternative



APPENDIX D

Base Data – Revenue and Revenue Requirement Analysis

Rencontre East - New Power Supply
Annual Net Revenue Requirement of Interconnection Over New Diesel Plant



Rencontre East Analysis - Annual Costs and Revenues

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Diesel Alternative					**Interconnection Alternative**					
			Capital-Related Increases					Capital-Related Increases			
Year	Total O&M	Total Fuels	Deprec	Financing	Total Revenues	Total O&M	Total Fuels	Deprec	Loss on Disposal	Financing	Total Revenues
2006	153,531	114,943	86,690	115,830	(118,214)	162,963	42,766	108,337	100,000	218,985	(103,653)
2007	157,057	117,182	86,690	109,890	(117,928)	64,242	44,224	108,337		211,562	(108,540)
2008	160,591	122,045	86,690	103,950	(121,395)	65,518	47,698	108,337		204,139	(113,543)
2009	164,018	126,338	86,690	98,010	(124,326)	66,839	50,730	108,337		196,716	(117,917)
2010	167,590	131,434	86,690	92,070	(127,377)	68,217	52,711	108,337		189,292	(122,272)
2011	171,202	135,783	86,690	86,130	(130,264)	69,607	55,212	108,337		181,869	(126,905)
2012	174,855	140,275	86,690	80,190	(133,456)	71,011	57,770	108,337		174,446	(131,521)
2013	178,644	144,913	86,690	74,250	(136,670)	72,467	60,538	108,337		167,023	(136,428)
2014	182,515	149,703	86,690	68,310	(140,014)	73,953	63,260	108,337		159,599	(141,317)
2015	186,469	154,650	86,690	62,370	(143,381)	75,469	66,041	108,337		152,176	(146,183)
2016	190,582	159,475	86,690	56,430	(146,826)	77,045	68,976	108,337		144,753	(151,310)
2017	194,785	164,449	86,690	50,490	(150,204)	78,655	71,971	108,337		137,330	(156,629)
2018	199,081	169,575	86,690	44,550	(153,809)	80,299	75,195	108,337		129,906	(162,101)
2019	203,472	174,860	86,690	38,610	(157,498)	81,976	78,425	108,337		122,483	(167,681)
2020	207,959	180,306	86,690	32,670	(161,336)	83,689	81,894	108,337		115,060	(173,419)
2021	212,544	185,040	86,690	26,730	(165,200)	85,438	85,096	108,337		107,637	(179,370)
2022	217,231	189,895	86,690	20,790	(169,155)	87,223	88,177	108,337		100,214	(185,438)
2023	222,020	194,874	86,690	14,850	(173,268)	89,045	91,614	108,337		92,790	(191,677)
2024	226,915	199,982	86,690	8,910	(177,410)	90,906	94,998	108,337		85,367	(198,092)
2025	231,917	205,221	86,690	2,970	(181,648)	92,805	98,684	108,337		77,944	(204,887)
2026	237,030	210,594	71,500	95,534	(185,809)	94,744	102,260	108,337		70,521	(211,512)
2027	242,255	216,105	71,500	90,635	(190,316)	96,723	106,023	108,337		63,097	(218,481)
2028	247,594	221,757	71,500	85,736	(194,855)	98,744	109,930	108,337		55,674	(225,645)
2029	253,051	227,555	71,500	80,836	(199,312)	100,807	113,955	108,337		48,251	(233,007)
2030	258,628	233,501	71,500	75,937	(204,060)	102,914	118,131	108,337		40,828	(240,574)
2031	264,328	239,599	71,500	71,038	(208,997)	105,064	122,512	108,337		33,405	(248,576)
2032	270,153	245,853	71,500	66,139	(213,970)	107,259	126,887	108,337		25,981	(256,404)
2033	276,105	252,267	71,500	61,240	(218,855)	109,500	131,556	108,337		18,558	(264,617)
2034	282,189	258,846	71,500	56,341	(224,057)	111,788	136,376	108,337		11,135	(273,295)
2035	288,406	265,592	71,500	51,441	(229,465)	114,123	141,351	108,337		3,712	(281,970)