SECTION H
Tab 5

ST. LEWIS DIESEL PLANT

CONDITION ASSESSMENT
AND
INVESTIGATION OF REPLACEMENT ALTERNATIVES

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1.0 SUMMARY

The existing plant has three diesel units installed inside the diesel hall and a mobile diesel unit installed outside the building. This mobile diesel was put in place in 1997 to meet growing power requirements and, due to inadequate space inside the building, was set up outside adjacent to the substation.

The existing plant building which is of wood framed construction with plywood cladding is 35 years old, and is in a deteriorated condition. The floor area, wall area and ceiling height are completely inadequate for the installation and operation of equipment necessary in a power plant of this capacity. The existing congested conditions are a result of increased energy requirements of the community over the years requiring the installation of larger units and auxiliary equipment. As well, the design criteria for diesel plants have changed significantly since this plant was built.

The lack of space results in operational and maintenance tasks being performed in close proximity to operating equipment which exposes workers to unsafe conditions. Noise and ventilation conditions are also substandard.

Alternatives considered were 1) upgrade of existing plant, 2) re-build of existing plant while it continued to operate, 3)interconnection to either Port Hope Simpson or Mary's Harbour or 4) construct a new plant on the existing property.

The recommendation is that a new plant be constructed on the existing property and that the old plant remain in operation during the construction period. One engine would be moved from the old plant to be installed in the new plant with the two new units. The plant would be designed in early 2006, with a construction contract tender and award in the spring of 2006 with an in-service date of October 2006.

2.0 GENERAL

The main areas of concern with the existing plant can be summarized under the following headings:

- Structural / Cladding
- Inadequate Floor Area
- Inadequate Wall Area
- Lack of Separate Control Room
- Inadequate Ceiling Height
- Inadequate Ventilation
- Inadequate Insulation
- Noise Issues
- Inadequate Storage
- Fire Prevention
- Environment
- Safety

3.0 EXISTING PLANT DEFICIENCIES

3.1 Structural / Cladding

Although there are no major concerns with respect to the structural strength of the building, the plywood cladding is in a deteriorated condition and would need replacement or covering by metal siding. Doors and windows need to be replaced. The roof leaks. The walls and roof are penetrated in a number of areas to accommodate fuel piping, exhausts, ventilation fans and electrical wiring and it is very difficult to seal these areas against snow and rain. Other openings which were used in the past and which have since being abandoned are patched but are also difficult to seal.

3.2 Inadequate Floor Area

The floor area of the existing diesel hall is approximately 65 m^2 as compared to the current design criteria of 140 m^2 for a similar capacity plant. This has resulted in the units having inadequate spacing such that operational and maintenance tasks must be performed in close proximity to operating equipment giving rise to safety

concerns. The minimum distance of : 0.9 meters between front of units and the plant walls or auxiliary systems mounted on walls; 1.7 meters between the gensets; and 3.1 meters between rear of units and plant wall for laydown areas during major overhauls are not available in St Lewis.

3.3 Inadequate Wall Area

The wall area is insufficient for the amount of equipment /panels which need to be mounted. Over the years, the necessity to make use of any bare wall space has resulted in an unorganized, cluttered installation of equipment with a resulting spider web of pipes and wiring. At present there is no available wall space to install any new equipment. New modern switchgear cannot be installed as it is larger and requires more space both for installation and maintenance.

The wall area in the existing diesel hall is approximately 82 m^2 as compared to the existing design criteria of 175 m^2 for a similar capacity plant

3.4 Lack of Separate Control Room

Hydro's standard is to have unit switchgear installed in a separate control room both as a safety measure and to provide a clean environment for the equipment. In St Lewis the switchgear is located in the diesel hall and in the case of an emergency such as a fire in the diesel hall, the plant operator would have to enter the diesel hall to shut down the plant. Also, the mobile unit controls are mounted at the mobile and remote from the operators.

3.5 Inadequate Ceiling Height

The ceiling height in the existing plant is 2.43 m as compared to the design criteria of 3.6 m. The inadequate floor area and ceiling height prevents the installation of overhead lifting devices suitable to perform the heavy lifts of engine parts during maintenance and major overhauls. This results in personnel using improvised lifting devices and exposing themselves to unsafe conditions which could result in damage to equipment or injury. Normal design criteria is that a lifting device capable of lifting the heaviest of the dismantled parts of a genset be installed in each diesel plant. This capability cannot be accommodated in the existing plant.

3.6 Inadequate Ventilation

The size of the engine hall does not permit the installation of an adequate ventilation system to obtain the number of air exchanges necessary to adequately cool the units under warm summer conditions. This results in overheating of the units and a subsequent derating and reduction in maximum power they can produce. In the summer, plant doors are kept open in an attempt to obtain cooling air. The volume of the St Lewis diesel hall is approximately 160 cubic meters as compared to the design criteria of approximately 510 cubic meters.

3.7 Inadequate Insulation

In the winter when the mobile unit is running and the units inside the plant are idle, it is impossible to retain heat in the plant. This is due to inadequate insulation and the difficulty of sealing of areas where the roof and walls are penetrated to accommodate equipment and piping. This creates startup problems when engines inside the plant become very cold. Admittedly, this is an unusual situation and would only happen if the units inside the plant had to be taken offline due to a significant problem.

3.8 Noise Issues

The existing plant's office and workshop areas are add-ons and are not adequately constructed to meet the noise criteria standard of 65 dBA.

3.9 Inadequate Storage

The storage room is too small to adequately store the plant supplies such as engine filters, etc. In addition, rain and snow infiltrates the structure and supplies get wet.

3.10 Fire Protection

The plant's structural members and siding, have become tinder dry, due to excessive build up of heat in the engine hall, and this combined with the congestion of electrical equipment and inadequately spaced gensets operating at elevated temperatures results in conditions condusive to a catastrophic fire.

3.11 Environment

The existing plant foundation is not constructed to contain fuel within the building should there be a spill, nor can it be modified to do so. This secondary containment feature which consists of a curb constructed on the foundation and which provides adequate sealing of all foundation openings is a requirement of all new plants. A fuel spill inside the existing plant could get outside the building. There are no spill containment capabilities in the existing plant.

3.12 Safety

Safety issues are addressed under other headings in this section and as such will not be discussed further.

4.0 GENERATION --- ALTERNATIVES INVESTIGATED

The generation alternatives investigated are:

- Upgrade of existing plant
- Rebuild of existing plant while it continues to operate
- Interconnection to Port Hope Simpson or Mary's Harbour
- Construct new plant on existing property.

The upgrade of the existing plant was eliminated as the existing structure is in a deteriorated condition and the floor area, wall area and ceiling heights are inadequate such that no amount of adjustment would produce any significant improvement.

The rebuilding of the old plant while it continued to operate was eliminated as past experience at other sites have highlighted the safety and schedule issues connected with this type of construction. The safety precautions required while constructing over and around operating equipment made for very slow progress and hence significantly increased the duration of the construction period and costs of the project. The Grey River plant was constructed in this manner as there was no other site available in the community. This is not the case in St Lewis as a new site is readily available on the existing property.

The alternative of removing the existing plant and supplying the St Lewis Distribution System from either Port Hope Simpson or Mary's Harbour via a new distribution was

studied. Over a thirty (30) year study period, it was not cost effective when compared to the construction and operation of a new diesel plant.. Major costs in the interconnection scenario were the construction of the distribution line and the expansion of generating capacity at either Port Hope Simpson or Mary's Harbour to carry the increase load demand by St Lewis. Please refer to Appendix 1 the Port Hope Simpson Interconnection, Economic Analysis.

The fourth alternative investigated was to build a new diesel plant within the boundaries of Hydro's existing fenced property, in close proximity to the existing tank farm. This would be a pre-engineered building to house three units with space to add a fourth unit with a control room, a washroom, an office, a workshop and a kitchen/lunchroom.

5.0 Conclusions and Recommendations

The existing plant falls well below Hydro's present operating standards and design criteria and there is no practical method of upgrading it to meet them. This combined with the requirement for two of the existing units to be replaced with larger units only exasperates the situation.

The interconnection to Mary's Harbour or Port Hope Simpson is not cost effective over a thirty year study period when compared to the construction of a new plant; hence, the recommendation is that a new plant be constructed on the existing fenced property to coincide with the proposed replacement of two diesel gensets in 2006.

The construction of a new plant is proposed for within the fenced area of our existing property, adjacent to the existing tank farm. The proposed site is expected to meet the approval of the St. Lewis Council. Preliminary discussions with the Council will start in 2005. If project costs increase significantly due to unforeseen Council requirements, then the project proposal for the new plant will be re-estimated and re-evaluated against the other alternatives.

6.0 Photos

Photo # 1—St Lewis Diesel Plant Site showing a) Plant (Blue Bldg to the right with Mobile Unit (White Bldg. in front of Plant), b) Hydro Fuel Storage Tank Farm (6 Horizontal Tanks to the left).

The Blue Building and Three Vertical Tanks in the foreground are owned by the Canadian Coast Guard.

Photo #2---St Lewis Diesel Plant ---Note Extensions a) Office to the right and b) Storage Room to the left and rear.

Photo #3—St Lewis Plant—Front View

Photo #4—St Lewis Plant—Rear View Showing Deterioration of Siding

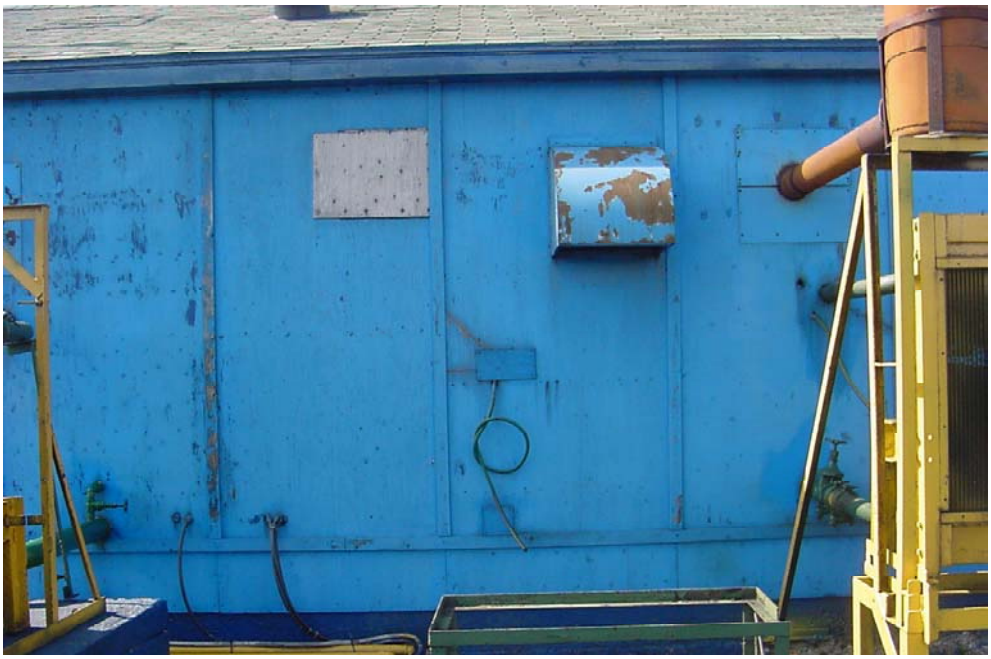


Photo #5—St Lewis Plant—Rear View Showing Wall Penetrations

Photo #6—St Lewis Plant—Rear View

Photo #7—St Lewis Plant—Rear View Showing Office & Kitchen Extensions

Photo #8—St Lewis Plant—Mobile Unit & Line Storage Building

Photo #9—St Lewis Plant—Interior View Showing Wooden Trusses

Photo #10—St Lewis Plant—Storage Room

Photo #11—St Lewis Plant—Interior View Showing Space Between Units

Photo #12—St Lewis Plant—Interior View Showing Three (3) Units

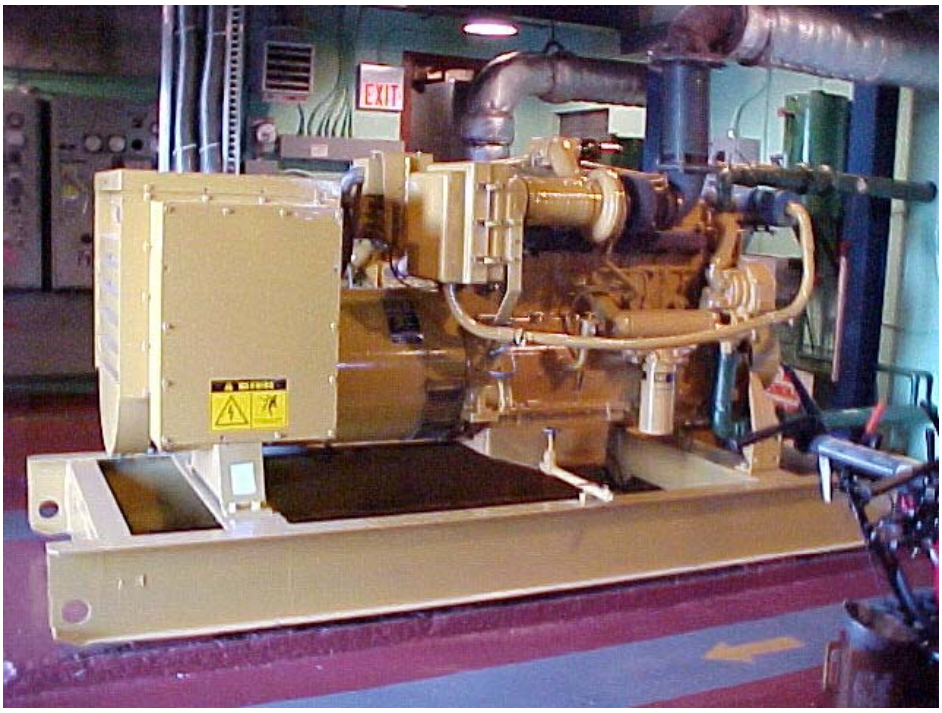


Photo #13—St Lewis Plant—Interior View Showing Single Unit

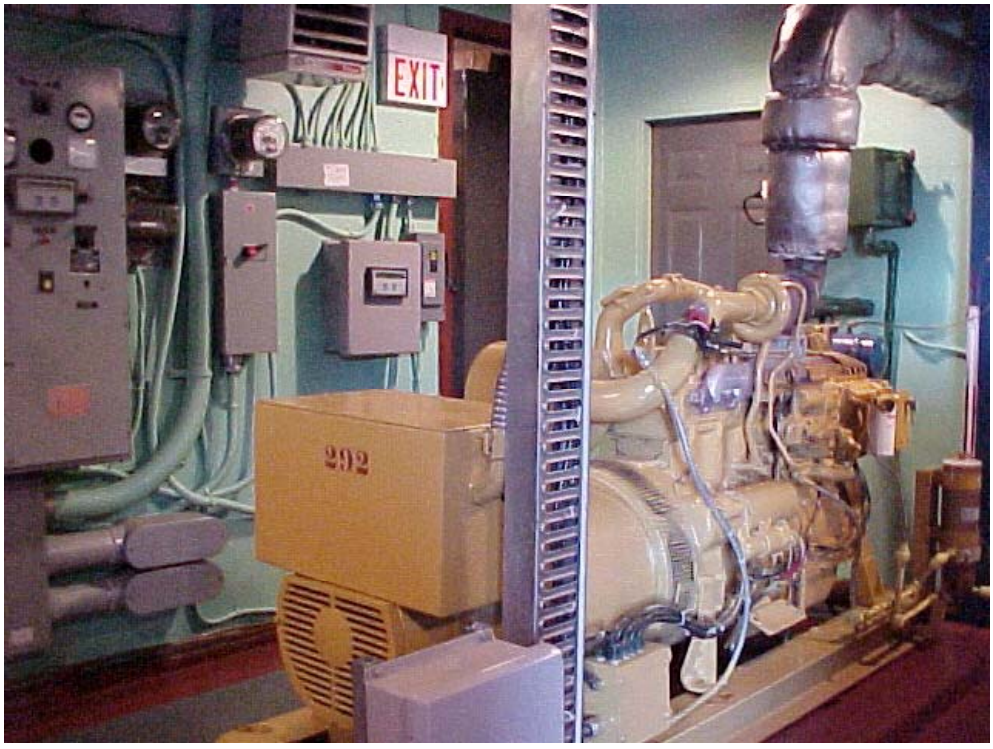


Photo #14—St Lewis Plant—Interior View Showing Single Unit

Photo #15—St Lewis Plant—Interior View Showing Congestion

Photo #16—St Lewis Plant—Interior View Showing Congestion

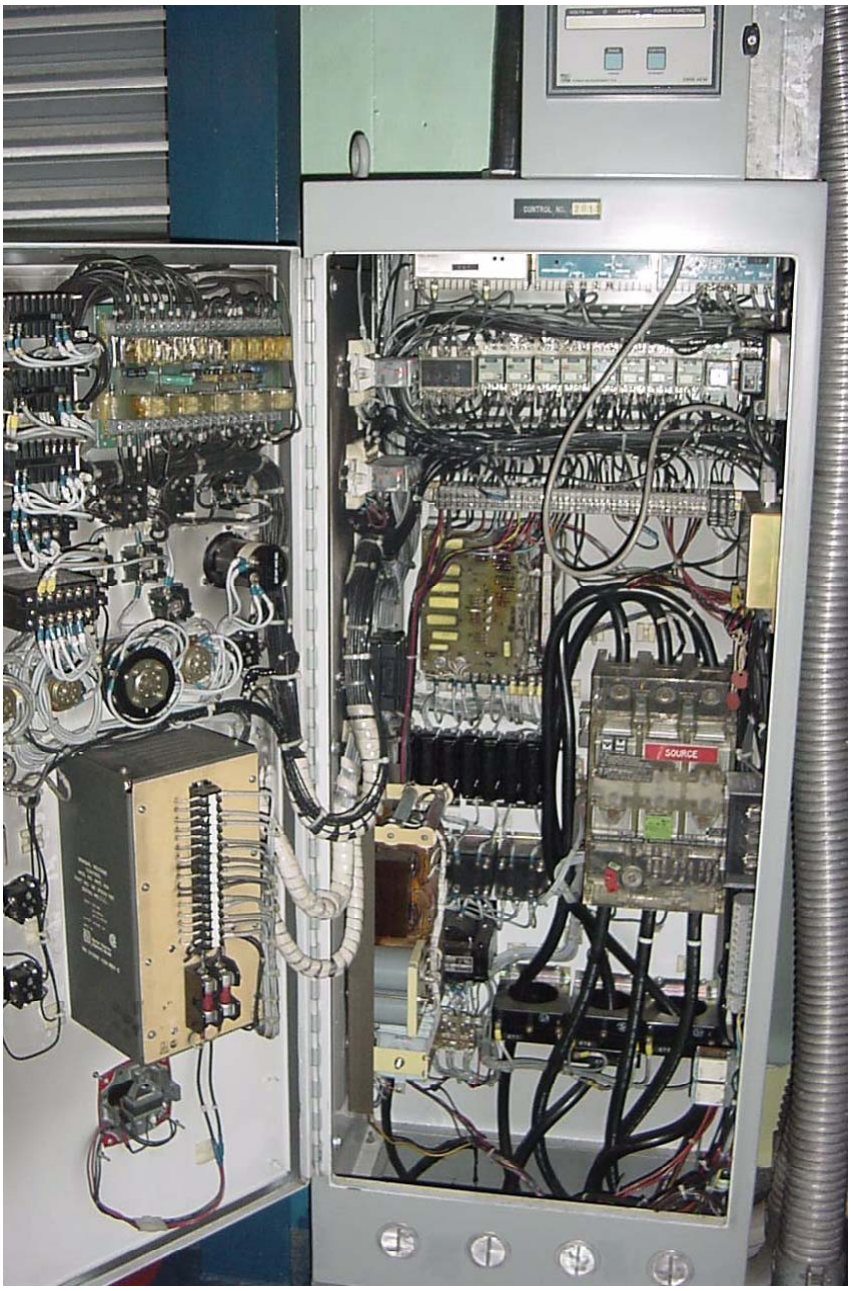


Photo #17—St Lewis Plant—Interior of Switchgear

APPENDIX 1

Newfoundland and Labrador Hydro

Construction of New Diesel Plant – St. Lewis

New Diesel Plant versus St. Lewis – Port Hope Simpson Interconnection

Economic Analysis

System Planning

June 2005

Introduction

An alternative to the construction of a new diesel plant at St. Lewis is to expend $3,400,000 to interconnect the St. Lewis Distribution System to the Port Hope Simpson Diesel Plant via a 50 km distribution line. This cost includes $400,000 for additional generation in the Port Hope Simpson Diesel Plant. This interconnection would enable the St. Lewis Diesel Plant to be shut down and taken out of service. An interconnection between St. Lewis and Mary's Harbour was also considered, but as the interconnection would be 6 km longer than from St. Lewis to Port Hope Simpson, the capital cost would be proportionately higher so it was decided to complete that analysis only if the St. Lewis – Port Hope Simpson interconnection showed promise.

One important consideration to note is that this is an interconnection of one diesel system to another and power will still be supplied by diesel generators of similar size. Primarily, the impact of reducing long-term fixed costs is being analyzed, as the interconnection will not lead to significant change in the cost of energy production, which is proportional to fuel cost and usage.

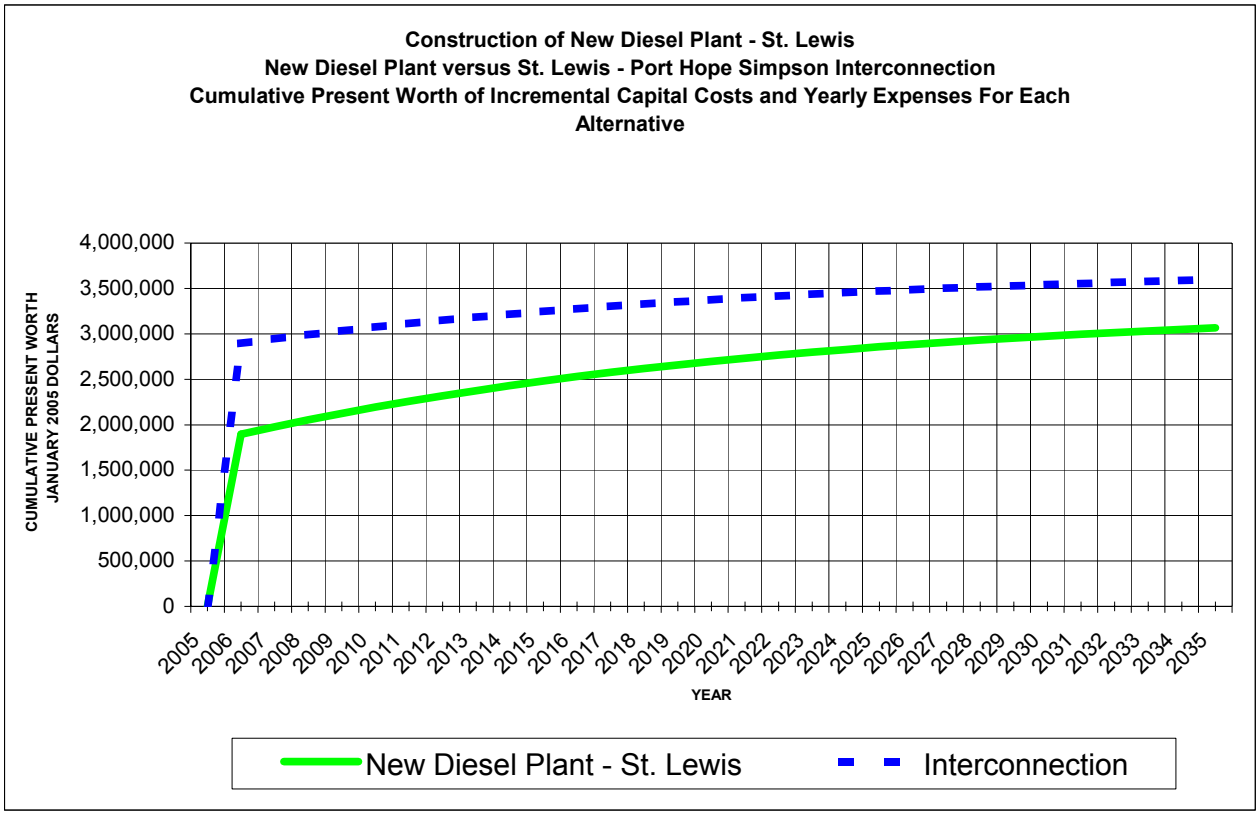
Summary

This study only looked at the incremental costs between the two alternatives:

- As both diesel plants are of similar size and production efficiency, fuel, lube and variable O&M costs were considered to be the same in both cases and therefore were not included;
- An increase in station service costs for the new Diesel Plant alternative was offset by the increase in distribution losses for the Interconnection alternative;
- There would be a savings in fixed O&M costs at the St. Lewis Diesel Plant, if the Interconnection was constructed and the St. Lewis Diesel Plant shut down.

A summary of the detailed economic analysis (attached) is presented in the following table and graph. Over a 30 year period, the new Diesel Plant alternative has a CPW preference of $530,732 and has a positive CPW from the beginning.

New Diesel Plant - St. Lewis versus St. Lewis – Port Hope Simpson Interconnection Comparison of Alternatives		
	CPW Preference of New Diesel Plant Alternative	
	CPW (2005$)	Payback Period
Base Case	$530,732	Immediate



Construction of New Diesel Plant - St. Lewis
Economic Analysis

New Diesel Plant versus St. Lewis - Port Hope Simpson Interconnection

Year	New Diesel Plant Alternative				St. Lewis - Port Hope Simpson Interconnection Alternative				Net Value of New Diesel Plant Over Interconnection		
	ANNUAL	CONSTRUCTION	TOTAL NEW DIESEL $		CONSTRUCTION	ANNUAL	TOTAL INTERCONNECTION $				
	Fixed O&M	New Diesel Plant	$ For Year	CPW Jan-05	Dist. Line & New Unit for PHS	O&M Dist Line	$ For Year	CPW Jan-05	Net $ For Year	Net CPW Jan-05	CPW Jan-05
2005				0				0			
2006	0	2,226,500	2,226,500	1,894,803	3,400,000		3,400,000	2,893,479	1,173,500	998,676	998,676
2007	104,142	0	104,142	1,976,563		62,485	62,485	2,942,535	(41,657)	(32,704)	965,972
2008	106,225	0	106,225	2,053,495		63,735	63,735	2,988,694	(42,490)	(30,773)	935,199
2009	108,562	0	108,562	2,126,027		65,137	65,137	3,032,213	(43,425)	(29,013)	906,186
2010	110,950	0	110,950	2,194,411		66,570	66,570	3,073,244	(44,380)	(27,353)	878,833
2011	113,391	0	113,391	2,258,883		68,035	68,035	3,111,927	(45,356)	(25,789)	853,044
2012	115,886	0	115,886	2,319,668		69,531	69,531	3,148,398	(46,354)	(24,314)	828,730
2013	118,493	0	118,493	2,377,004		71,096	71,096	3,182,800	(47,397)	(22,935)	805,795
2014	121,041	0	121,041	2,431,035		72,624	72,624	3,215,218	(48,416)	(21,612)	784,183
2015	123,583	0	123,583	2,481,925		74,150	74,150	3,245,752	(49,433)	(20,356)	763,827
2016	126,400	0	126,400	2,529,942		75,840	75,840	3,274,563	(50,560)	(19,207)	744,620
2017	129,282	0	129,282	2,575,249		77,569	77,569	3,301,746	(51,713)	(18,122)	726,498
2018	132,230	0	132,230	2,617,997		79,338	79,338	3,327,395	(52,892)	(17,099)	709,398
2019	135,245	0	135,245	2,658,332		81,147	81,147	3,351,596	(54,098)	(16,134)	693,264
2020	138,328	0	138,328	2,696,389		82,997	82,997	3,374,431	(55,331)	(15,223)	678,041
2021	141,385	0	141,385	2,732,274		84,831	84,831	3,395,961	(56,554)	(14,354)	663,688
2022	144,510	0	144,510	2,766,109		86,706	86,706	3,416,263	(57,804)	(13,534)	650,153
2023	147,703	0	147,703	2,798,012		88,622	88,622	3,435,405	(59,081)	(12,761)	637,392
2024	150,968	0	150,968	2,828,094		90,581	90,581	3,453,453	(60,387)	(12,033)	625,360
2025	154,304	0	154,304	2,856,457		92,582	92,582	3,470,472	(61,722)	(11,345)	614,014
2026	157,714	0	157,714	2,883,201		94,629	94,629	3,486,518	(63,086)	(10,698)	603,317
2027	161,200	0	161,200	2,908,418		96,720	96,720	3,501,648	(64,480)	(10,087)	593,230
2028	164,762	0	164,762	2,932,195		98,857	98,857	3,515,914	(65,905)	(9,511)	583,719
2029	168,403	0	168,403	2,954,614		101,042	101,042	3,529,366	(67,361)	(8,968)	574,751
2030	172,125	0	172,125	2,975,753		103,275	103,275	3,542,049	(68,850)	(8,456)	566,296
2031	175,929	0	175,929	2,995,685		105,557	105,557	3,554,008	(70,372)	(7,973)	558,323
2032	179,817	0	179,817	3,014,479		107,890	107,890	3,565,284	(71,927)	(7,517)	550,806
2033	183,791	0	183,791	3,032,199		110,275	110,275	3,575,917	(73,516)	(7,088)	543,717
2034	187,853	0	187,853	3,048,908		112,712	112,712	3,585,942	(75,141)	(6,683)	537,034
2035	192,004	0	192,004	3,064,662		115,203	115,203	3,595,394	(76,802)	(6,302)	530,732
CPW 2005$			**3,064,662**				**3,595,394**				

Discount Rate = 8.4%

CPW New Diesel Plant Cost - Jan 2005	**3,064,662**
CPW Interconnection Cost - Jan 2004	**3,595,394**
Cumulative Present Worth of New Diesel Plant	**530,732**