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Mushuau Innu First Nation
P.O. Box 190, Natuashish
Labrador, NL A0P 1A0

Attn: Simeon Tshakapesh, Chief Mushuau Innu First Nation

Dear Chief Tshakapesh,

Thank you for the opportunity to discuss and address your concerns related to the capability of the Natuashish diesel generating station to meet the demand for electricity in your community, and the operating cost of the facility.

Newfoundland and Labrador Hydro (Hydro) operates the Natuashish diesel generating station on behalf of the Mushuau Innu First Nation. Hydro also regularly reviews the current and future energy requirements of the community in order to recommend any necessary capital or maintenance investments in the facility and distribution system to ensure it can meet customer demand.

This report provides the following information:

- A description of how Natuashish's electricity load forecast is developed, along with the forecast itself.
- The methodology regarding the annual planning of capacities at a diesel generating station, which is consistent with other isolated diesel supplied communities that Hydro operate. This section also includes the review of this year's review, and the long-term expansion plan for the system.A comparison of operating costs of the electricity system in Natuashish to that of the other systems in the same region.
- Comments on the reliability of the system.

## 1. LOAD FORECAST

Hydro prepares a forecast of the anticipated loads on all Hydro's distribution systems on an annual basis. A load forecast is also prepared on a yearly basis for the Natuashish electricity system. The forecast projects the peak demands and energy requirements for each electricity system for a seven-year period, which normally allows Hydro time to plan, gain approval and

carry out the necessary changes. The peak demand forecast is used to determine the required amount of capacity that a plant or piece of equipment within the plant must have in order to meet that demand. The energy forecast is used to determine the amount of fuel the system will require in a given year. The forecast includes new customers from new homes, new businesses and government facilities.

The historical load on a monthly basis at the Natuashish Diesel Plant is shown in Figures 1 and 2 below.

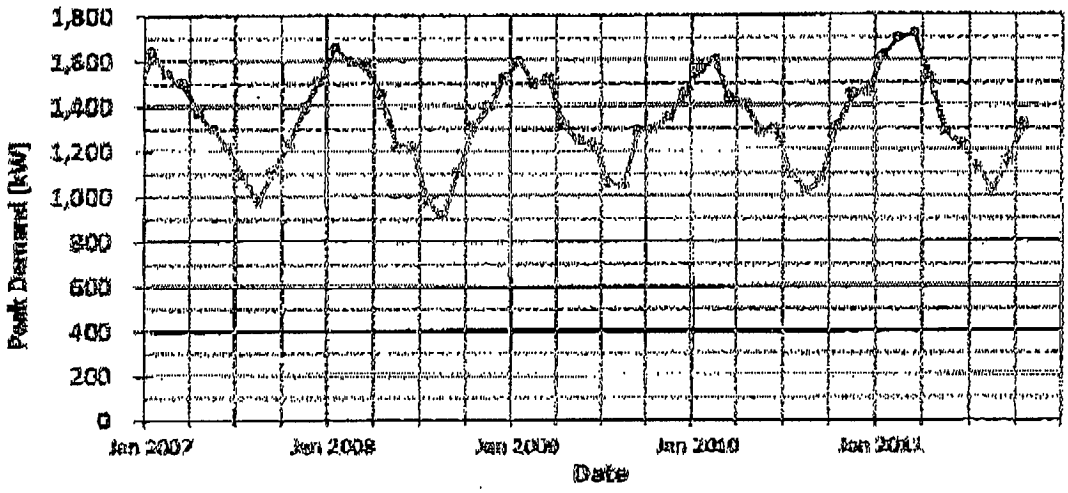


**Figure 1: Historical Monthly Gross Peak Load**

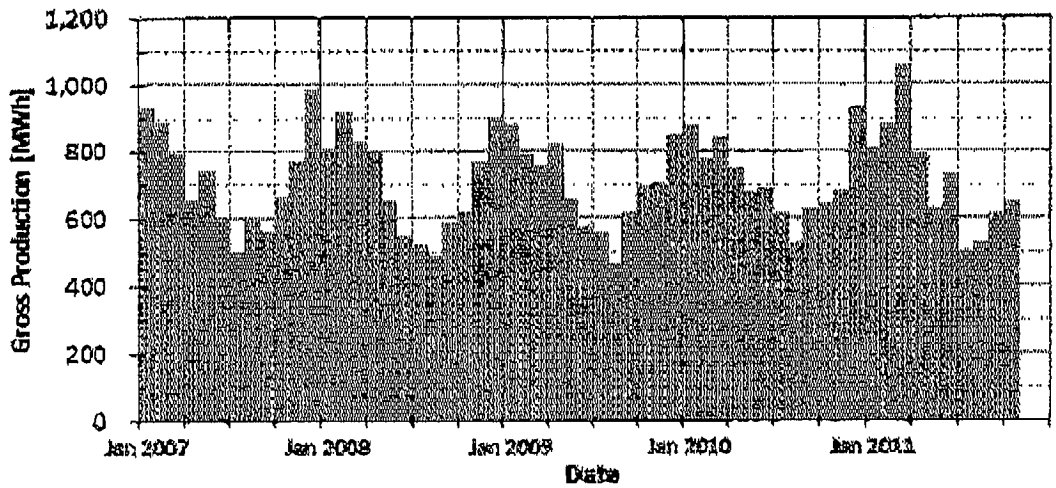


**Figure 2: Historical Monthly Gross Energy Production**

As the figure shows, the load on the Natuashish System has been generally stable since 2007 when the residents completed their move from Davis Inlet. Since 2007 the peak load has grown on average by 19 kilowatt (kW) per year and the energy production has grown by 35 kilowatt (kWh) per year. The highest peak load experienced at the generating station is 1,720 kW and in the past twelve months to date the generating station produced 8,791,781 kWh of electrical energy. To produce this energy, over 2.4 million litres of diesel fuel was burned.

As with all Hydro's electricity systems, the load forecast for Natuashish relies on past information about customer growth, and electricity consumption levels, and combines this information with what is known about expected construction activity in the near term. The customer history and future projections for Natuashish is shown in Table 1 below.

**Table 1: Natuashish Customer Counts – Actual and Forecasted**

| | Actual Customers | | | | | | | Forecasted Customers | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
| Total | 169 | 183 | 196 | 196 | 207 | 207 | 228 | 236 | 244 | 251 | 256 | 261 | 266 | 271 |
| New | 0 | 14 | 13 | 0 | 11 | 0 | 21 | 8 | 8 | 7 | 5 | 5 | 5 | 5 |

The new residential customers added to the system are assumed to have the same energy consumption as the average of the existing customers in that system. Hydro's residential customers in diesel systems in Labrador use approximately 10,000 kWh of electricity per year. These customers primarily use oil and wood to heat their homes. On average, residential customers in Natuashish use approximately 20,000 kWh of electricity per year. Hydro's residential customers in Happy Valley - Goose Bay, which are primarily electrically heated, use approximately 30,000 kWh of electricity per year. Based on the comparison of the average use of residential customers in Hydro's Labrador Diesel Systems, the customers in the Happy Valley - Goose Bay system, and those in Natuashish it is concluded that a combination of oil-fired furnaces and electric heating is being used in Natuashish to heat homes.

Hydro is also aware of the new Recreation Complex which would be a new business customer. Hydro has not received any information concerning the actual design and expected loads of this facility from any consulting firm. Therefore, this customer is assumed to be heated by oil and have a load similar to the other recreation complexes in the region.

Using the historical information and the projections of new customers being added in future years, a load forecast is developed for the system. The following table (Table 2) presents the forecasted peak demand and energy requirements for the Natuashish System to the year 2017.

**Table 2: Natuashish Load Forecast September 2011 Update[1]**

| Year | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|
| Gross Peak (kW) | 1,731 | 1,807 | 1,868 | 1,903 | 1,932 | 1,961 | 1,990 |
| Net Peak (kW) | 1,681 | 1,756 | 1,817 | 1,852 | 1,881 | 1,911 | 1,940 |
| Gross Energy (MWh) | 8,919 | 9,228 | 9,539 | 9,718 | 9,867 | 10,016 | 10,166 |
| Net Energy (MWh) | 8,622 | 8,920 | 9,221 | 9,394 | 9,538 | 9,682 | 9,827 |

This forecast is used in the review of the equipment planning ratings for development and justification of the five year generation expansion plan for the electricity system. The forecast is also extended out to twenty years to develop the twenty year expansion plan for the electricity system. The development of the expansion plan is described in Section 2 below.

## 2. NATUASHISH GENERATION PLANNING REVIEW

Using the load forecast presented above, Hydro reviews the capability of key components of the generating station and prepares a medium and long-term expansion plan for the electricity system to ensure it can meet the increasing electricity needs of the community.

The following equipment at the Natuashish Diesel Generating Station is covered under this review:

1. Firm generation capability against peak load
2. Main Breaker
3. Main Bus
4. Service Conductors
5. Fuel Storage Requirements

This review also covers the following distribution system equipment at Natuashish:

1. Substation Transformers
2. Substation Reclosers

As the system load increases, the load on the components of the system listed above also increases. Therefore, the equipment is reviewed annually to confirm that its rating is still adequate to serve the load. When the load is projected to exceed the rating in a given year, a capital project is proposed to increase the capacity of the equipment in that year to prevent the

[1] Meter readings for Natuashish are recorded every second month and there are several meters included in the reading list that are not read. This creates additional uncertainty in the actual number of domestic customers and average energy use of the system. Subsequently this introduces some additional uncertainty into the forecast.

overload from occurring. The following section provides detail on the equipment at Natuashish Diesel Generating Station.

### 2.1 PLANNING CRITERIA

The Diesel System should have sufficient firm capacity to supply the peak load of the system. Firm generation capacity is defined as the total installed capacity on the system minus the largest diesel unit. Essentially every isolated diesel generating station has a spare diesel unit installed in the plant so that it is still able to serve the entire load even if the largest unit is out of service. This is consistent criteria used for all Hydro isolated diesel systems.

In each system Hydro installs a minimum of three units to meet the load requirements.

### 2.2 EXISTING SYSTEM

The Natuashish diesel plant contains four diesel generators rated at 635 kW, 910 kW, 910 kW, and 671 kW respectively for an installed capacity of 3,126 kW and a firm capacity of 2,216 kW. The diesel units are coupled to a 1,200 A Main Bus. Substation protection is provided by a 1,200 A Main Breaker, which is connected to the diesel plant substation by a single run of 350 kcmil copper 5 kV power cables assumed to be rated for ninety degrees Celsius. The substation consists of three 750 kVA single-phase step-up transformers with a spare unit stored at the site. Primary distribution system protection is provided by two reclosers connected to the substation high voltage bus (the high voltage bus rating is unknown).

There are two fuel storage tanks located onsite with a total capacity of 90,962 L to supply the diesel plant. Equipment information was supplied by Hydro operations staff in Happy Valley-Goose Bay. The ratings of key equipment found at the Natuashish Generating Station are summarised Table 3.

**Table 3: Natuashish System Equipment**

| | | |
|---|---|---|
| **Installed Capacity** | 3,126 | kW |
| **Firm Capacity** | 2,216 | kW |
| **Main Bus** | 1,200 | A |
| **Main Breaker** | 1,200 | A |
| **Service Conductors** | 325 | A |
| **Substation** | 2,250 | kVA |
| **Recloser(s) ea.** | 560 | A |
| **Fuel Storage** | 90,962 | L |

The rated capacities of this equipment are reviewed against the forecasted peak loads for the particular system, and fuel storage is reviewed against the forecasted winter fuel requirements. Where planning ratings are exceeded, the appropriate project with preliminary scope is developed to address the issue.

## 2.3 EXPANSION PLAN

The following summary describes the Rural Generation Expansion Plan for Natuashish, which is based on the load forecast presented in the first section of this report. The expansion plans for each of the key diesel plant equipment in the Natuashish Generating Station are described as follows:

**Table 4: Natuashish Generation Expansion Plan Summary**

| Year Required | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|
| Equipment to Upgrade | COND | | GEN | | XFMR |

1. Firm Generating Capacity

Based on the above forecast, Natuashish will require an increase in firm generating capacity in 2025. The proposed expansion is to replace the existing 635 kW unit (Unit 2068) with a new diesel generator 1,200 kW to 1,500 kW in size. The forecasted peak demand and energy production for 2012 is 1,807 kW and 9,228,000 kWh respectively. Based on this forecast, the plant would be loaded to 58% of its installed capacity during the peak, and would be operating at a 34% capacity factor for that year. If the largest unit in the plant were out of service, the plant would be loaded to 82% of its remaining capacity during the peak.

If there are substantive changes in the load forecast, the dates noted above would be advanced annually with the review.

2. Main Breaker

The existing main breaker has a planning rating of 7.8 MW, which based on current growth rates is capable of meeting the system requirements for the life of the asset.

3. Main Bus

The existing main breaker has a planning rating of 7.8 MW, which based on current growth rates is capable of meeting the system requirements for the life of the asset.

4. Diesel Plant Service Conductor

Growth in system peak load is forecasted to exceed 100 % of the service conductors rating in 2023. The existing system is currently served by a single run of 350 kcmil copper 5 kV power cable. The addition of a second run of 350 kcmil cable in parallel with the existing run is recommended. The project will start and finish in 2023, with the budget proposal being prepared in the preceding year.

5. Diesel Plant Substation

Growth in system peak load will exceed the substation capacity (2250 kVA) in 2027. The Project Proposal will be prepared in 2025/2026 with the work scheduled to start and complete in 2027. A cost estimate was prepared for replacement of the existing bank of 3x750 kVA transformers

with a bank of 3x1000 kVA plus one spare 1000 kVA transformer at the site, or the replacement of the existing bank with two three-phase 2.5/3.3 MVA units depending on which is the most economical method.

6. Substation Reclosers
The existing reclosers each have a planning rating of 21.8 MW, which based on current growth rates, is capable of meeting the system requirements for the life of the asset.

7. Fuel Storage
The existing fuel storage is considered adequate provided that regular deliveries are available throughout the year. During the period from November 2010 to July 2011 the generating station consumed over 1.9 million litres of diesel fuel.

No other expansions to accommodate load growth were identified for the Natuashish Diesel Generating Station for the long-term.

Hydro has been preparing this review of the Natuashish System on an annual basis and forwarding the results and recommendations to the Band Council through Orville Pelley for the past five years.

8. Diesel OverhaulsThe foregoing does not include routine overhauls of diesel generator sets or breakdown replacement. Hydro generally plans all diesel systems for approximately 100,000 hours of operation per engine. During that period the engines will be overhauled four to five times depending on the condition. After that it is generally replaced with a unit of similar size, however the load forecast is reviewed to see if a larger (and in some communities, a smaller) unit is justified.

## 3. OPERATION AND MAINTENANCE COST

This section discusses the operation and maintenance (O&M) cost of the plant in Natuashish in comparison the other diesel systems which Hydro operates in Labrador. Based on the O&M expenses for 2008, 2009 and 2010, the actual O&M expense was found to average $1,033,148 annually over the period. This cost, while significant, is consistent with the other operations in the regions, and is in fact on average less costly than Hydro's other diesel systems. The O&M expense of a generating station is related to and largely dependent on the amount of energy it produces. This is because the maintenance performed on a diesel unit is based on the number of hours it operates. Regular maintenance is carried out at prescribed time intervals, such as every 500 hours for an oil change and every 20,000 hours for an engine rebuild.

**Table 5: Operation and Maintenance Expense – Natuashish and Isolated Diesel Labrador**

| Year | Natuashish Expenses | | | | Annual Expense Hydro Isolated Labrador |
|---|---|---|---|---|---|
| | 2008 | 2009 | 2010 | Average | |
| Total O&M Expense ($) | 1,202,851 | 1,090,489 | 806,103 | 1,033,148 | 9,371,167 |
| Gross Production (kWh) | 8,414,201 | 8,336,715 | 8,606,543 | 8,452,486 | 60,759,475 |
| O&M Expense ($) per Gross kWh | 0.14 | 0.13 | 0.09 | 0.12 | 0.15 |

As Table 5 shows, over the period from 2008 to 2010, the Natuashish diesel plant had an average annual O&M expense of $1,033,148. Of this cost, approximately $320,000 is for employee salaries and benefits, approximately $110,000 are travel expenses, and the remaining amount is for materials such as parts, tools, lube oil, coolants, and insurance. As stated above, these expenses are related to the energy the plant produces. The average annual energy produced at Natuashish for the same period was 8,452,486 kWh. This results in an O&M expense per unit energy cost of 12 cent/kWh. The overall cost/kWh would be the O&M expense plus fuel and oil per kWh.

Comparing this cost to Hydro's diesel plants in the other systems in Labrador, which had a total O&M expense of $9,371,167, produced 60,759,475 kWh of energy for a resulting in an O&M expense per unit energy cost of 15 cents/kWh. According to this data, operation and maintenance in Natuashish is less costly than the same expenses in the other isolated systems in Labrador. As well, since these expenses are related to energy production, the cost of O&M will increase as the system load grows. For example, in 2017, the Natuashish diesel plant is anticipated to produce a 10,166,000 kWh, and based on an O&M cost of 12 cents/kWh the expected total O&M cost for Natuashish for that year is $1,219,920.

It is also noted that there is some variation in the cost from year to year (note that 2008 expenses were higher than 2009 and 2010 expenses). A major cause of this variation is due to the diesel engine rebuilds, which get done every 20,000 hours or sooner depending on the condition of the engine. 20,000 hours of diesel engine operation would occur approximately every four to five years. So in some years there would be no expenses incurred for an engine rebuild, and in other years there may be multiple engines rebuilt in the same year resulting in an increased cost in that year.

To conclude, the O&M expense for the Natuashish, while approximately one million dollars per year, is consistent with the cost that would be expected for a plant of this size and energy output, and is comparable to and slightly less costly than Hydro's diesel plants in Labrador.

## 4. RELIABILITY

Unfortunately, Hydro does not record detailed statistics for Natuashish as it does for electricity systems that it owns. A review of the data that is available indicates performance levels in

general that are consistent with other systems in the region. We will review the steps necessary to collect and compile data going forward for Natuashish as we do in other owned facilities.

I would like to take this opportunity to comment on the apparent use of electric heat in the community. The typical non-electrically heated home along the Labrador Coast uses approximately 10,000 kWh/year. In comparison, in Natuashish the typical non-electrically heated home uses about 20,000 kWh/year. It takes approximately 2.5 times as much fuel to provide electric heat via diesel versus through a furnace. This impacts the amount of fuel required at the diesel plant to meet the electricity needs of the community. If the electricity usage was similar to other coastal communities, the total cost of diesel fuel in Natuashish would be reduced.

I trust the foregoing has addressed most of your concerns, however I encourage you to continue to communicate with us regarding any questions or other concerns you have related to expected growth and new development in your community. We would be happy to meet with you in person at your convenience in early 2012 to discuss this response and we will continue to work with you to ensure your power requirements are met well into the future.

If you would like to discuss this further, we would be happy to do so, just let us know.

Regards,

Jim Haynes
Vice President, Regulated Operations
Newfoundland and Labrador Hydro