MARITIME ELECTRIC
A FORTIS COMPANY

February 27, 2019

Ms. Cheryl Mosher
Island Regulatory and Appeals Commission
PO Box 577
Charlottetown PE C1A 7L1

Dear Ms. Mosher:

2018 Storm Post-Mortem
Response to Interrogatories from Jamie Fox

Please find attached the Company's response to the Interrogatories filed by Mr. Jamie Fox with respect to the 2018 Storm Post-Mortem. An electronic copy will follow.

Yours truly,

MARITIME ELECTRIC

Gloria Crockett

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GCC14
Enclosure

IR-1 According to a CBC News Article dated the 8th Feb 2019, what is the current condition of utility poles in the Province of PEI and are they rated as per condition?

RESPONSE

> *The CBC news article dated February 8, 2019 reported the damage that was done: 149 broken poles and 2.5 kilometres of power lines that needed to be replaced.*

Utility poles are selected for the application based on CSA Standards and weather criteria that is associated with local conditions and recent trends. Transmission structures are inspected on a two year cycle and distribution structures are inspected on a six year cycle. Poles are typically replaced as required with the average life of a pole being 50 to 60 years. Pole treatments are selected based on the application and play a key role in the life extension of a pole.

Maritime Electric inspectors are trained to look for signs of pole deterioration and non-destructive tests can be performed to obtain additional information about remaining pole strength.

In 1984, Maritime Electric initiated a pole replacement program of the power system poles. This program expanded to a complete distribution rebuild program replacing poles and conductor on deteriorated power lines. Over the decades, 69 kV transmission lines were rebuilt as well. Of the 132,000 power poles in the system, approximately 17,000 poles remain to be replaced. As an asset group, the current condition of the poles in Maritime Electric's service territory is good.

IR-2 What problems occurred when high voltage transmission lines in central PEI failed?

RESPONSE

There are two 138 kV lines (Y-109 and Y-111) between the Bedeque area and Charlottetown and both of these lines tripped early on November 29.

The loss of Y-111 left just Y-109 supplying central and eastern PEI. All customers in central and eastern PEI lost power following the trip of Y-109 at 07:28h.

The Y-111 trip at 06:26h resulted from a tree contact and a crew was dispatched and cleared the tree from the line. This tree was located outside the transmission lines right of way but was tall enough to make contact with the line when it fell over. The tree contact damaged a section of conductor and this had to be replaced before the line could be reenergized. The repair work delayed the reenergization of line Y-111 until midday on November 30.

The Y-109 trip at 07:28h was recorded as a phase-to-phase fault. The cause was initially assumed to be a tree contact because the line tripped and reclosed four times in the span of 3 seconds before tripping a fifth time and remaining off. However, responding crews found no tree onsite and reported that the conductors were coated with ice. Maritime Electric believes this trip could have been caused by either debris from a tree (or otherwise) that bridged the gap between the phases or a phase-to-phase contact due to galloping lines.

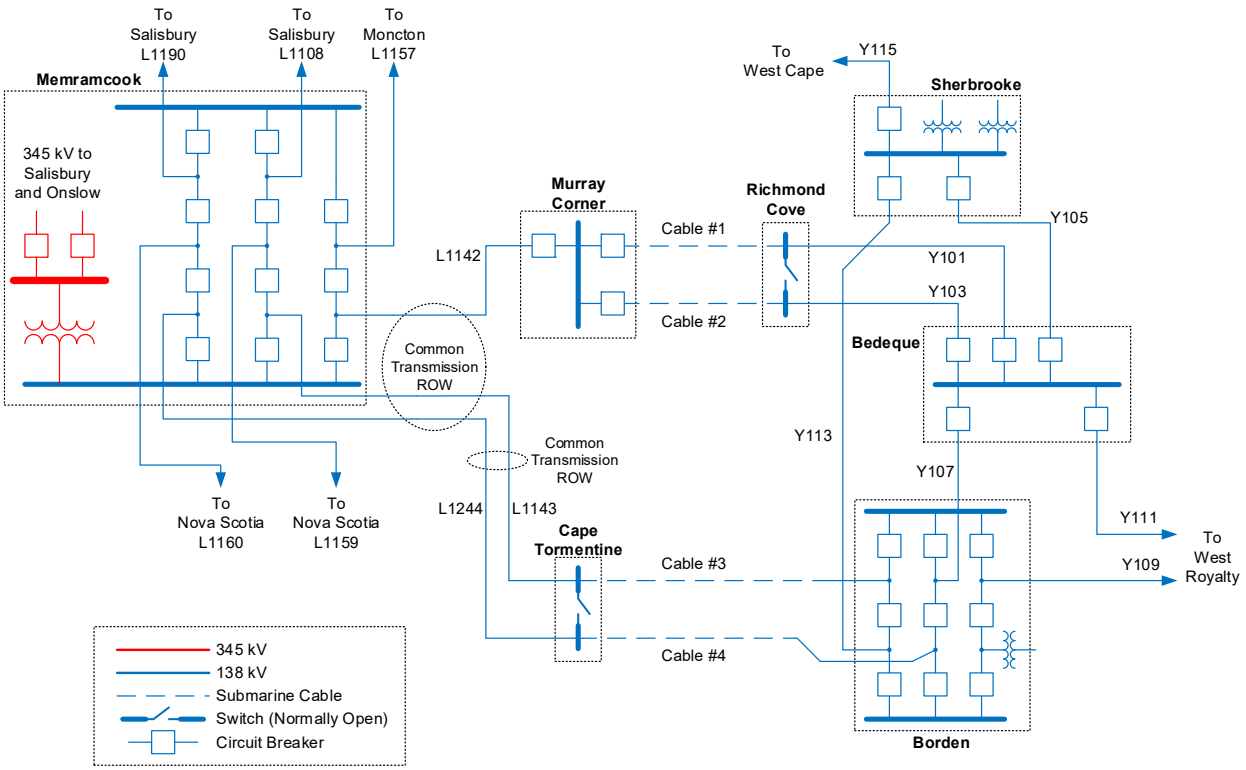
IR-3 What complications occurred or were present to prevent power coming to PEI from New Brunswick through the underwater power cables?

RESPONSE

There are four transmission lines that provide the main feed to the Memramcook Substation in New Brunswick, one 345 kV line and three 138 kV lines. It in turn supplies the three overhead transmission lines that connect New Brunswick to the Island (via the four submarine cables). The Memramcook Substation also has lines that connect to Nova Scotia and southeastern New Brunswick.

At 08:21h, the 345 kV transmission line supplying the Memramcook substation tripped due to a phase-to-phase fault. Then one of the remaining 138 kV transmission lines into Memramcook Substation tripped on a phase-to-ground fault that resulted from snow and ice built-up on conductors and overhead ground wire at 08:46h.

NB Power automatically initiated a remedial action scheme to protect the remaining transmission lines supplying the Memramcook Substation. As part of this scheme, NB Power requested that Nova Scotia and PEI dispatch generation to alleviate loading on the remaining two transmission lines. Before PEI was able to get its dispatched generation up to full output, the remaining two transmission line feeding the Memramcook Substation tripped off on thermal overload. All load supplied from Memramcook, including all supplies to Nova Scotia and PEI, were cut.



IR-4 Why is wind power that is generated in PEI and that is feed into the MECL grid designed to shut down in a power outage?

RESPONSE

Most of the wind turbines rely on the grid for excitation (supply of the magnetic field inside the generator which in turn creates the voltage), as they cannot provide their own. This support must come from other facilities located in PEI or on the mainland. These wind turbines have induction generators which means they get their excitation from the Maritime Electric system.

In addition, the wind turbines do not have the governor control needed to regulate frequency on their own. The power that the wind turbines supply to the grid is a function of wind speed and they rely on the grid to maintain system frequency constant at 60 Hz (cycles per second).

IR-5 What is the capability of the emergency back-up batteries in the MECL system, how old are the said batteries and what is the life span of the said batteries?

RESPONSE

Maritime Electric's 'emergency back-up batteries' are located in substations and provide DC control power to the substation. DC control power is required to operate devices within the substation as well as maintaining the communication system between Maritime Electric's Energy Control Centre and the substation. It also gives the substation the short-term capability of operating key substation equipment, such as circuit breakers, during a power outage.

Each substation's battery system is sized for the needs of the particular substation. Maritime Electric has a routine testing program in place which includes annual testing as well as load testing every 5 years. The expected lifespan of the batteries is 20 years. As such, Maritime Electric has a variety of battery vintages across its system.

Subsequent Written Questions:

IR-6 Has MECL conducted any review, research or study on the conversion of the backup generating system to be fueled by LNG gas or propane?

RESPONSE

Maritime Electric has provided for the use of natural gas in its combustion turbine in Charlottetown ('CT3'). This unit was purchased in 2005 with dual fuel unit capability (meaning that either diesel or natural gas can be used as its fuel source) in the event that natural gas became available in the Charlottetown area.

If liquefied natural gas (LNG) was to be used to fuel CT3, an entirely new fuel handling and storage system would be required. In order for this to be potentially economic, CT3 would be required to operate as a base load generator instead of continuing in its current role as a backup generator. As a result, CT3 would require a significant amount of LNG storage capability. Industry and safety code requirements for the storage and handling of liquefied natural gas (LNG) in the volumes needed to supply CT3 as a base load unit would require significantly more space than is currently available on the CT3 site (even after the existing Steam Plant is removed).

Similar code requirements for property and building setbacks in the storage of large quantities of propane would also restrict its usage on the existing CT3 site.

In addition, operating CT3 as a base load unit fueled by LNG or propone would not be economic. System energy purchases from NB Power are a lower cost source of energy. CT3's role will continue to be to provide generating capacity for the system: for planning reserve, for backup of interruptible system energy purchases and as an on-Island source of backup capacity.

IR-7 Has MECL conducted any review, research or study on the conversion of the back up generating system to be fueled by a bio mass fuel?

RESPONSE

The use of biomass as a fuel source for a backup generating system is not a viable option. The main objectives of a backup generating system are reliability and relatively low capital investment requirements. A 50 MW biomass-fueled generating system would be more capital intensive, more complicated and likely less reliable. The volume of fuel required would be significant and long-term storage of such fuel on-site would be difficult. In addition, the intermittent use of a back-up system would be problematic for the fuel delivery systems.

Biomass systems are more suitable for baseload applications where the biomass is available at zero costs (such as at a pulp and paper mill) and where the increased capital investment can be offset by low fuel costs over the life of the operation.

IR-8 Has MECL conducted any review, research or study on the conversion of the back up generating system to be powered by steam generated by the PEI Energy Systems facility?

RESPONSE

The output capacity of Maritime Electric's CT3 is 49 MW. PEI Energy Systems has a back pressure steam turbine with an output of 1.2 MW. Most of the output of the PEI Energy Systems back pressure steam turbine is consumed by the operation of the facility.

It is important to distinguish between a base load operation which operates year round and provides a large amount of energy as well as capacity, as compared to a backup generating unit which is installed to provide mainly just capacity. Because PEI does not have indigenous fuel sources such as hydro or coal, on-Island generators (apart from wind) are oil-fired and are installed to provide mainly capacity. Purchasing most of PEI's energy needs from the mainland provides the lowest cost supply over all, with some of the energy being purchased on an interruptible basis because it can be backed up by the on-Island oil-fired generating capacity.

IR-9 Has MECL conducted any review, research or study on the powering of the back up generating system by a dedicated wind turbine system that could supply power to the grid or switched directly to the back up generating system?

RESPONSE

Wind turbines rely on the grid for voltage support and frequency regulation as they cannot provide their own. This support must come from other facilities located in PEI or on the mainland.

In addition, wind is intermittent and as such cannot be relied upon for a defined output. Backup generating systems must be capable of providing electricity when required, at levels specified by the system operator. Therefore, a wind turbine cannot be relied upon as a backup generating system.

IR-10 What is the cost per hour to operate the back-up generation system, what is the revenue income from all rate payers during operation of the back-up generating system per hour and what rate, fee or other cost is associated with the supplying of power from NB Power or other supplier during a period when the back-up generation system is in operation per hour?

RESPONSE

On a per kWh basis (i.e. per unit of energy purchased), the cost of energy from Maritime Electric's oil-fired combustion turbines is much more expensive than system energy purchased from NB Power. For example, at current oil prices, the cost to run CT3 at full load (i.e. 49 MW) is $10,500 per hour. This equates to $0.2131 per kWh.

However, this high energy cost is offset by the relatively low capital costs of a combustion turbine because of the low number of hours of operation during a year. On a planning basis, combustion turbines typically are the lowest cost way of supplying a portion of the peak load (i.e. load that is there for only 100 or 200 hours per year).