Q. **Reference: CA-NLH-081:** The difference in supply to the Avalon Peninsula between 2013 and 2022 following Holyrood retirement relates to the amount of local generation – it is substantially reduced in 2022 with greater reliance on power brought in to the Avalon Peninsula over the enhanced transmission system. What are the pros and cons of this shift in approach to the supply of power to the Avalon Peninsula? Are there other jurisdictions in Canada and the United States that rely heavily on power brought in over the transmission system rather than local power? More specifically, do the major load centers in Montreal, Toronto and Winnipeg have full local backup power to supply the load in the event of loss of all transmission into the cities?

A. One may argue at the theoretical level that the most reliable configuration for power delivery for the end user is to eliminate the transmission and distribution systems and locate redundant generation sources at each customer's physical location. However, from a practicality and cost perspective, this approach is prohibitive. The concept of an interconnected transmission grid connecting many customers with larger, centrally located thermal generating stations near gas supplies, or deep water ports for coal/oil deliveries and more remote hydroelectric generating stations has proved to be a more practical and cost effective means of electrification of the population in the history of most utilities. The ratemaking concept of many customers sharing the cost burden for larger scale projects (i.e., large-scale hydro development) results in an overall reduced cost for all customers connected to a "common" network.

Application of the North American Electric Reliability Corporation (NERC) standards ensures a common level of bulk power system reliability across the North American grid.

The construction of the Muskrat Falls Generating Station and the Labrador – Island HVdc Link (LIL) provides benefit to the ratepayers of the Island Interconnected System by removing the price uncertainty surrounding fuel purchases for the Holyrood Thermal Generating Station and replacing it with clean, renewable energy from Muskrat Falls and stabilized rates over the long term. The transmission planning associated with the replacement of Holyrood with the Labrador - Island HVdc Link is, in the opinion of Hydro, consistent with the NERC transmission planning standards.

With the exception of the thermal generation at Holyrood and combustion turbines at Hardwoods and Holyrood, all other resources owned by Hydro are off-Avalon Peninsula resources. This is not an anomaly to Newfoundland, but common to jurisdictions where there is significant hydroelectric generation potential. Geography dictates where hydroelectric stations can be built, and often these sites are not located close to large urban centers. Consequently, transmission systems must be constructed to deliver the resource to the load center. In Canada, there are three jurisdictions with significant hydroelectric potential other than Newfoundland and Labrador, being Québec, Manitoba and British Columbia. Comparison of standby generation levels at the load centre for these jurisdictions with the Island of Newfoundland is viewed as appropriate. A comparison with Toronto is excluded as the Ontario transmission system and generation resource mix and location is not consistent with the predominantly hydroelectric resource supply situation the Island of Newfoundland will face in 2018.

According to the Hydro-Québec website (www.hydroquebec.com/generation/) the utility has an installed generating capacity of 36,100 MW of hydroelectric generation in 62 plants (one operated by Hydro-Québec Distribution on an isolated system), 543 MW of thermal generation in 25 plants (including one 411 MW plant operated by Hydro-Québec Production at Bécancour and 24 isolated plants operated by Hydro-Québec Distribution) and 9,671 MW of other sources including the Churchill Falls plant, wind farms, biomass, biogas and small hydroelectric plants operated by independent power producers. Figure 1 provides a map of the Hydro-Québec system. A review of Figure 1 indicates that most of the Hydro-Québec generating sites are located in the north and are remote from the Montréal load centre.

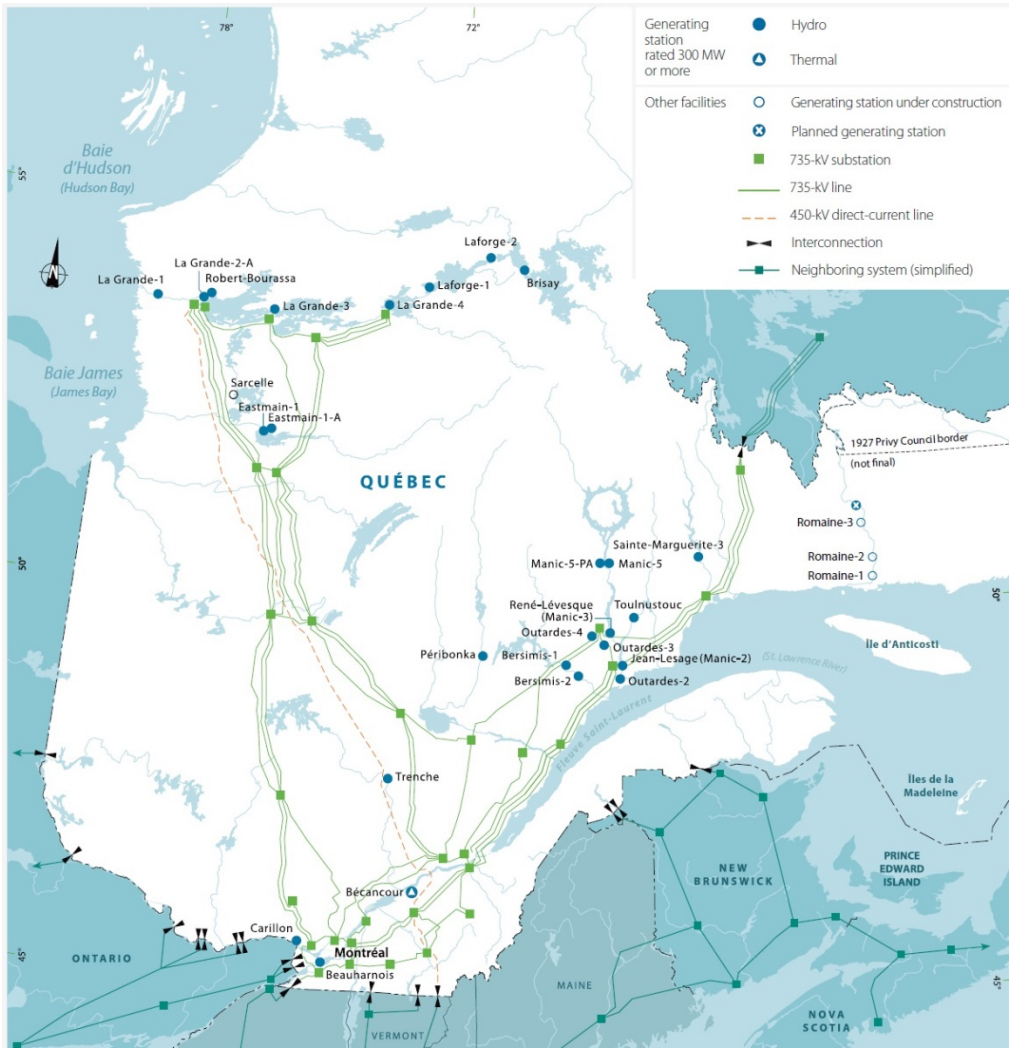

Figure 1 - Hydro-Québec System Map[1]

Figure 2 provides a map showing the Hydro-Québec St. Lawrence River watershed and relative location of generating stations and the Island of Montréal. From Figure 2, one notes a total of three generating stations "near" Montréal including Les Cédres (113 MW), Beauharnois (1,853 MW) and Rivière-des-Prairies (54 MW). However, a search of the publicly available information reveals no indication that the Montréal load centre can be supplied entirely by local "backup" generation.

[1] Source – page 121 Hydro – Québec 2012 Annual Report.

There is an inherent reliance on the transmission network to supply the load centre from remote generating stations, with the transmission network planned and operated to the reliability criteria.

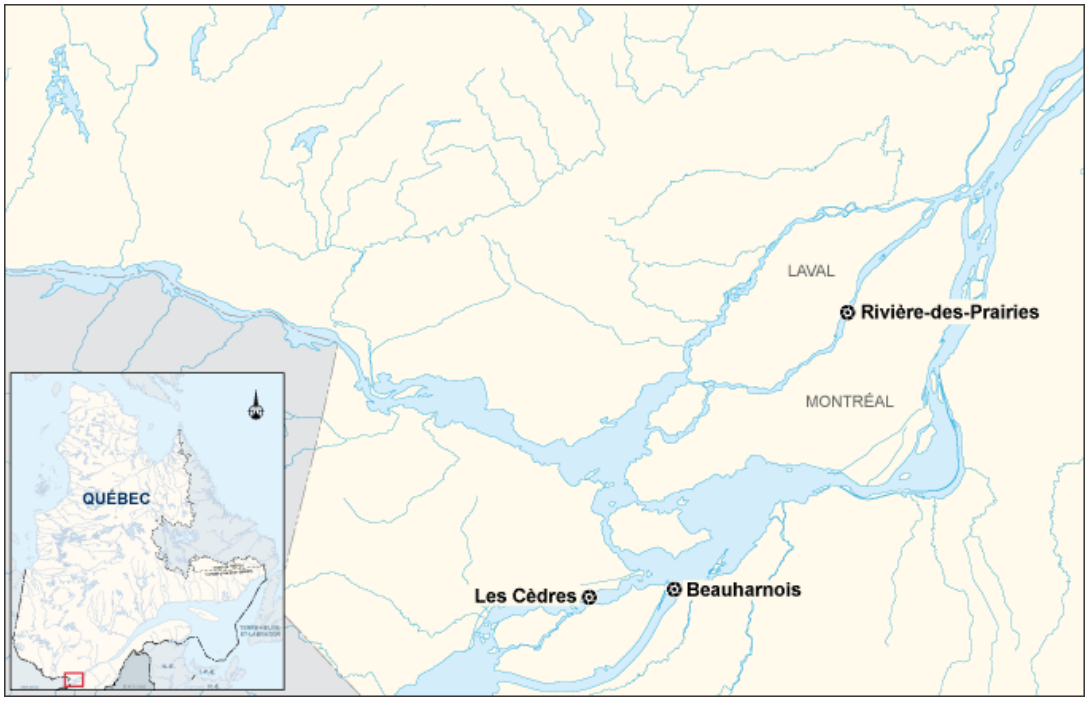

Figure 2 – Hydro-Québec St. Lawrence River Watershed[1]

According to the Manitoba Hydro website (www.hydro.mb.ca) approximately 75% of the utility's generating capacity (4638 MW) is delivered to southern Manitoba via two HVdc links, Bipole I and Bipole II (895 km and 937 km in length respectively). In southern Manitoba, the utility operates approximately 579 MW of hydroelectric generation on the Winnipeg River east of Winnipeg. In addition, Manitoba Hydro operates two thermal generating stations: Brandon (333 MW) and Selkirk (125 MW). Figure 3 provides the Manitoba system map. Upon review of the Manitoba Hydro system map one will note that there is no "back-up" generation supply within the Winnipeg area. The map shows transmission system infrastructure into the

region, with the closest generating source at Selkirk (125 MW) approximately 50 km away from the load centre.

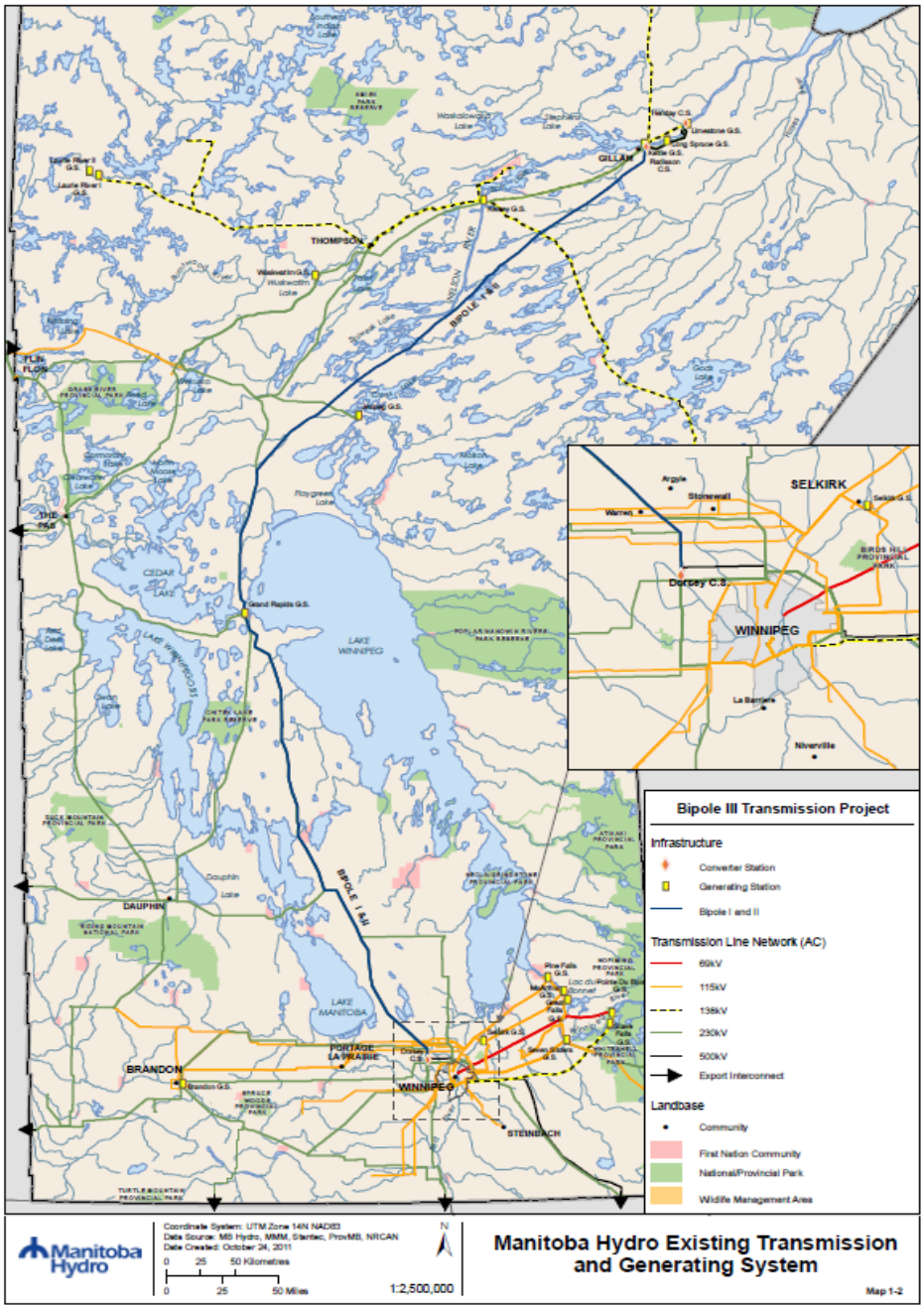

Figure 3 – Manitoba System Map[2]

According to the BC Hydro website (www.bchydro.com) 90% of the utilities generation is hydroelectric located in four regions. The utility has a total installed generating capacity of 12,048.9 MW. The Columbia Region has an installed capacity of 5946.4 MW or 49% of the installed capacity. The Peace Region has an installed capacity of 3,424 MW, or 28% of total capacity. The Lower Mainland and Coast Region has an installed capacity of 1,996.8 MW (17% of total installed) including one 950 MW thermal station (Burrard) which is to be de-commissioned in 2016. Finally, the Vancouver Island Region has an installed capacity of 459 MW, or 4% of total capacity. In addition to the hydroelectric and thermal resources, BC Hydro operates two combustion turbine plants: Prince Rupert combustion turbine 46 MW and Fort Nelson combustion turbine combine cycle 73 MW.

The BC Hydro Transmission Corporation website (http://transmission.bchydro.com/transmission_system/) states that 70 – 80% of the province's electricity is consumed in the Lower Mainland and on Vancouver Island. A review of the posted 2014 Balancing Authority Load Jan-Dec.xls file found on the website reveals that the hourly peak load for BC Hydro in 2014 equaled 10672 MW. Consequently, the peak load for the Lower Mainland and Vancouver Island is estimated to equal 7470 MW to 8537 MW. The total installed generation within the load centre equals 2,455.8 MW (1996.8 + 459 MW). In fact, this number is to be reduced to 1505.6 MW with the de-commissioning of Burrard in 2016. As a result, BC Hydro in not able to supply all load at the load centre following loss of all transmission into the area. Figure 4 provides a map of the metro Vancouver transmission system.

[2] Source: www.hydro.mb.ca

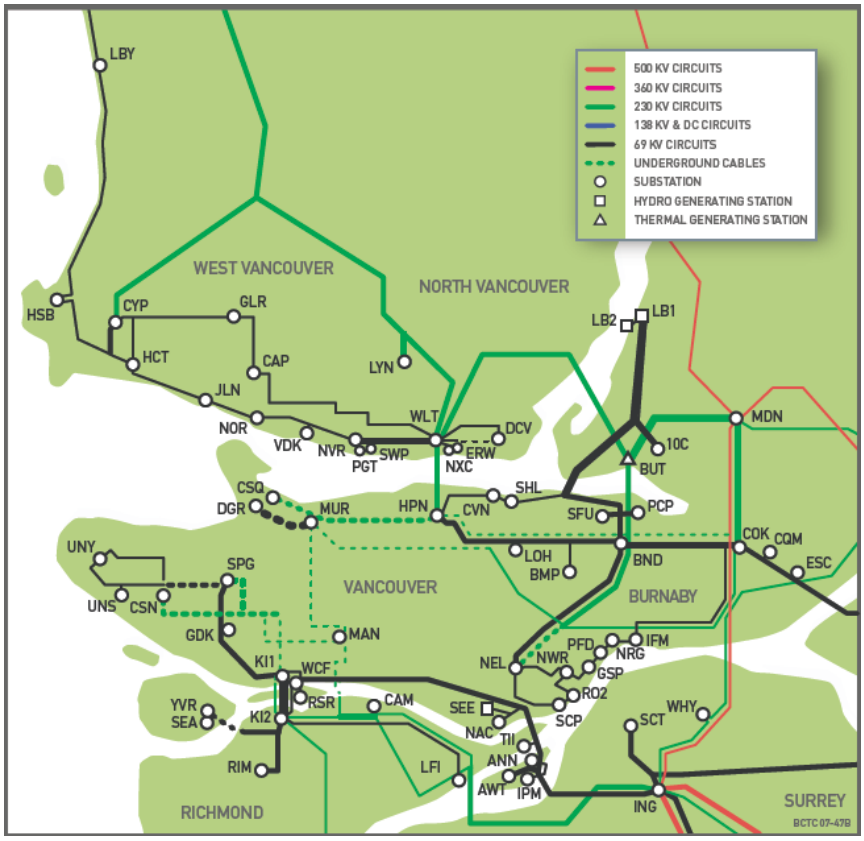

Figure 4 – BC Hydro Transmission Map – Metro Vancouver

Based upon a review of the other three jurisdictions in Canada utilizing hydroelectric generation as a significant source of supply, Hydro's overall approach to ensuring enhancing the transmission system to the Avalon Peninsula load centre with the retirement of Holyrood is consistent with Hydro-Québec, Manitoba Hydro, and BC Hydro. In each jurisdiction, there is no full local backup power supply to supply the load in the event of the loss of all transmission into the major cities.