Q. **System Design**

Describe the Island Interconnected transmission system before the 230kV system was constructed in the 1960s. What was the time period when the original 230kV system was constructed? When were the ring and breaker and one-half buses installed?

A. Prior to the construction of Hydro's 230 kV transmission system in the 1960s, there was no single Island Interconnected Transmission System. There were a number of isolated transmission systems on the Island. These are summarized by owner/operator as follows:

- West Coast Power Company Limited (a subsidiary of United Towns Electric Company Limited);
  - 60 Hz transmission system from Lookout Brook Generating Station to Port-au-Port.
  - Total installed generating capacity including Port-aux-Basques diesel plant 11,750 Hp or approx. 15.75 MW.
- Bowater Power Company;
  - 50 Hz transmission system including:
    - 66 kV transmission Deer Lake to Corner Brook;
    - 66 kV transmission Deer Lake to Buchans;
    - 138 kV transmission Deer Lake to Baie Verte, Rambler Mines, Springdale and Whalesback Mines; and
    - Total line length approx. 297 miles or 478 km.
  - Total installed generating capacity including Buchans generation 179,600 Hp or approx. 240 MW.

- Price Newfoundland Limited;
  - 50 Hz transmission at 46 kV between Bishop's Falls and Grand Falls approximately eight miles or 12.8 km in length.
  - Total installed generating capacity 78,700 Hp or approx. 105.5 MW.
- Union Electric Light and Power Company;
  - 60 Hz transmission on the Bonavista Peninsula running from its Lockston and Port Union plants north to Bonavista and south to Clarenville.
  - Total transmission line length 294 miles or approx. 473 km.
  - Total installed generating capacity including Clarenville and Port Union diesels 7,035 Hp or approx. 9.4 MW.
- United Towns Electric Company Limited; and
  - Two separate 60 Hz transmission systems:
    - One system on the Burin Peninsula connecting Grand Bank, Lawn, West Brook, Fall Pond and Salt Pond; and
      - Total installed generating capacity 5,150 Hp or approx. 6.9 MW.
    - Second system on the Avalon Peninsula predominantly east side of Trinity Bay and Conception Bay with a connection to Newfoundland Light & Power Company Limited.
      - Total installed generating capacity 16,340 Hp or approx. 21.9 MW.
  - Total transmission line length including West Coast Power Company Limited transmission 291 miles or approx. 468 km.
- Newfoundland Light & Power Company Limited.
  - Two separate 60 Hz transmission systems.

- One system in central Newfoundland connecting Sandy Brook and Rattling Brook plants to Grand Falls, Gander, Lewisporte, Bishop's Falls and Botwood; and
  - Total installed generating Capacity 29,800 Hp or approx. 39.9 MW including 400 Hp of diesel generation at the town of Baie Verte.
- Second system on the Avalon Peninsula (St. John's and southern shore) connected to United Towns Electric Company Limited.
  - Total installed generating capacity 98,980 Hp or approx. 132.7 MW.

o Total transmission line length 292 mile or approx. 469.8 km.

The original 230 kV transmission system consisting of a 230 kV transmission path connecting Bay d'Epsoir Generating Station to St. John's in the east and Corner Brook and Stephenville in the west was completed between 1965 and 1967. The second 230 kV transmission paths east and west from Bay d'Espoir were completed between 1968 and 1981.

The Bottom Brook Terminal Station was commissioned in 1967 with one 230 kV transmission line connection (TL211 – Massey Drive to Bottom Brook). The second line, TL209 to Stephenville was added in 1971, and the third 230 kV transmission line, TL233 to Buchans, was added in 1973. The fourth 230 kV circuit breaker, which forms the 230 kV ring bus at Bottom Brook, was added in 1978.

The 66 kV ring bus at Stephenville Terminal Station was established in 1975.

The Deer Lake Terminal Station was originally commissioned as a 138/66 kV station in 1980. The addition of the 138 kV transmission line TL239 (Deer Lake to Berry Hill) in 1982 and the construction of the 230 kV transmission lines TL248 (Deer Lake to Massey Drive) and TL247 (Cat Arm to Deer Lake) in 1983 and 1984 respectively resulted in the establishment of a 138 kV ring bus at Deer Lake in 1983-84.

The Buchans Terminal Station was commissioned in 1973. Prior to 1973, Buchans was supplied by Bowater Power Company at 50 Hz from its Deer Lake plant. Based upon available asset in service dates it is apparent that the 230 kV ring bus at Buchans was established in 1973. In the late 1980s, transmission lines TL232 and TL233 termination points were swapped to improve the overall reliability of the station.

The Stony Brook Terminal Station was commissioned in 1966. The station was originally arranged as a load bus. The station configuration was modified to a 230 kV ring bus arrangement in 1995.

The Bay d'Espoir 230 kV bus was originally commissioned in 1965-66 as a main and transfer bus. The main and transfer bus is similar to a load bus arrangement with a spare circuit breaker connected between the main and transfer buses. Each transmission line has a dedicated circuit breaker to the main bus and a normally open disconnect switch between the line and the transfer bus. The arrangement permits any one line to be transferred from the main bus to the transfer bus by opening the line circuit breaker and closing the transfer disconnects switch. The spare circuit breaker between the main and transfer buses acts as the line circuit breaker providing line protection while the dedicated line breaker is out of service for maintenance. The 230 kV bus arrangement at Bay d'Espoir was modified in 1993 to form ring buses in both Terminal Station #1 and #2. Terminal Station #2 is

physically arranged as a breaker-and-one-half scheme and can be modified from the ring bus arrangement to breaker-and-one-half with the addition of one 230 kV circuit breaker.

The Sunnyside Terminal Station was originally commissioned in 1965-66. The addition of the second 230 kV transmission path to the Avalon Peninsula in 1968 (i.e., TL206 and TL207) resulted in the development of the 230 kV ring bus configuration at Sunnyside. Based upon available asset in service dates it is apparent that the 138 kV ring bus at Sunnyside was established at the time of construction in 1967. In the late 1980s, 230 kV transmission lines TL206 and TL207 termination points were swapped to improve the overall reliability of the 230 kV bus arrangement.

The Western Avalon Terminal Station was originally commissioned in 1966. At that time the 230 kV bus was configured in a load bus arrangement. The Western Avalon 230 kV bus was modified into a ring bus arrangement in 1993-94.

The Holyrood Terminal Station was originally commissioned in 1970 as a breaker-and-one-half arrangement.