

1 Q. Explain in detail whether the causes of the system outages in January 2013 were
2 similar to or related to the outages in January 2014?

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5 A. The two system disturbances were unrelated in that they resulted from different
6 causal factors. As described below the restoration time in January 2014 was
7 improved from 2013.

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9 Both disturbances had system wide impacts with significant terminal station
10 problems affecting the Avalon Peninsula. In addition, in both cases the restoration
11 time of units at Holyrood impacted the duration of customer outages. Also, both
12 had incidents originating at the Holyrood Terminal Station (HRD TS) that involved a
13 failure of breaker B1L17, but the causes of the failures are unrelated.

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15 The system outages on January 11, 2013 were primarily weather related. There
16 were electrical faults experienced in the HRD TS, caused by wet and salt
17 contaminated snow. One of these electrical faults was the result of the failure of
18 the insulation on B1L17. The disturbances in this 230 kV switchyard resulted in the
19 shutdown of all three Holyrood generating units and a trip of one of the two 230 kV
20 transmission lines from the Western Avalon Terminal Station (WAV TS) to the major
21 load centers on the Avalon Peninsula. In January 2013, restoration of the Holyrood
22 plant was greatly hampered by blizzard conditions preventing station maintenance
23 crews from arriving at the station. While crews worked to access the station, there
24 was no power system connection either in or out of the Holyrood Generating
25 Station. This resulted in delays in restarting the units at Holyrood and in supplying
26 customer demand. Station service into the Holyrood plant was not re-established
27 until late in the afternoon on January 11, 2013. The first Holyrood unit did not come

1 online until the next morning (22 hours after the initial trip). In order to increase the
2 unit restoration time in a similar circumstance, in 2013 Newfoundland Power's
3 mobile gas turbine was located at Holyrood to provide faster restoration of station
4 service.

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6 Later in the morning of January 11, 2013 the remaining in-service line out of WAV
7 TS faulted and tripped. This resulted from the high winds. The loss of this line
8 interrupted the load on the Avalon Peninsula and resulted in a high system
9 frequency in the central and western areas of the Island. The high frequency
10 caused protection relay mis-operations, resulting in multiple transmission line trips,
11 de-energization of terminal stations and the significant loss of generation in these
12 areas. This severely hampered the restoration efforts which were to take place for
13 the remainder of the day. In particular, the terminal stations at Stony Brook,
14 Buchans, Massey Drive, Bottom Brook, Doyles and Stephenville all required re-
15 energization before customer restoration could occur. The last station (Massey
16 Drive) was not restored until the early afternoon hours (more than five hours
17 following the triggering event). In addition, the hydraulic generation was restored
18 throughout the day with the last plant (Cat Arm) not back online until nearly 11
19 hours after the initial trip. Some of the delays in the restoration were the result of
20 the time to dispatch crews to the stations.

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22 The investigation into the January 2014 system outages is ongoing. However, the
23 weather has not been identified as a causal factor. The initial outage at Sunnyside
24 Terminal Station (SSD TS) on January 4, 2014 was the result of a failure to
25 transformer T1. It is suspected that a breaker failure at the terminal station
26 escalated this event and resulted in an outage to the 230 kV transmission to the
27 Avalon Peninsula and a trip of all three units at Holyrood. There was a significant
28 loss of generation in the central and western areas (similar to the January 11, 2013

events), however, in this case, the 230 kV lines and terminal stations in these regions remained in service. It is believed that the protection relay changes carried out following the January 2013 outages had positive results in that the lines stayed in service, allowing for more expedient restoration.

In 2014, transmission into the HRD TS was restored in just over an hour, facilitating the re-establishment of station service and earlier restoration of the units. The hydraulic generating stations (with the exception of Hinds Lake) were back online in just over three hours due to crews being dispatched to these sites in preparation of the storm. The unit at Hinds Lake was delayed due to a unit breaker issue.

The second outage at SSD TS on January 4, 2014 occurred during the restoration efforts following the events earlier in the morning. Personnel were in the process of restoring transformer T4 and the transmission supply to the Burin Peninsula when a 230 kV bus lockout occurred. At this time, the failure of a breaker and control wiring fire damage are being assessed as contributing factors. This event resulted in another system disturbance, with the loss of 230 kV transmission from SSD TS to WAV TS and to Bay d'Espoir Terminal Station, and a trip of some generation in the central and western areas (Cat Arm, Granite Canal, and Units 5 and 6 at Bay d'Espoir). Restoration following this latest event occurred in an expedient manner. The transmission into the HRD TS was restored in 30 minutes, again facilitating the re-establishment of station service and unit restarting. The hydraulic generating units were restored in less than an hour. The first Holyrood unit was restored in 12 hours and 30 minutes following the initial trip during the morning events at SSD TS.

The outage at HRD TS during the evening hours on January 5, 2014 occurred when personnel were restoring Unit 1 following the trip on the previous day. A HRD TS

1 equipment failure resulted in the shutdown of Holyrood Units 2 and 3 and the trip
2 of the 230 kV transmission line from Western Avalon to Holyrood (TL217). This was
3 primarily a HRD TS event and the impact was largely confined to the Avalon
4 Peninsula. Transmission into the HRD TS was restored within minutes, facilitating
5 the re-establishment of station service and the unit restart process. The first
6 Holyrood unit was restored the next morning (eight hours after the initial trip).
7 Hydro has determined that a failure of the 230 kV Unit 1 breaker (B1L17) was the
8 source of this outage and an original equipment manufacturer has been brought in
9 to investigate.

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11 The above are initial findings and further detail will be included as part of Hydro's
12 ongoing review.