

1 Q. **Reference: Failure Investigation Report – L3501/2 Pole Assembly Turnbuckle Failure – Failure**
2 **Event February 2021 in Labrador (2021 Turnbuckle Failure Report).**

3 Describe Hydro’s response to repair the LIL following the January 2021 icing event in Labrador
4 and the February, 2021 turnbuckle failure event. Include in the response how access to the
5 locations where damage occurred was obtained and the length of time to access each of the
6 damaged areas, the resources utilized to effect the repairs, any difficulties encountered in
7 securing resources, the use of helicopters in the event diagnosis and repair, and the availability
8 of materials required.

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11 A. On January 11, 2021 a Power Supply line crew observed an insulator leaning at a large angle
12 near the Trans-Labrador Highway at tower 318. The crew then investigated and found a failed
13 cross arm at tower 340. At the time, the Labrador-Island Link (“LIL”) was operating in metallic
14 return using two pole conductors. On January 13, 2021 the failed cross arm on tower 340 was
15 replaced by Power Supply line crew. Energization of the LIL in ground return following the repair
16 indicated potential issues with the electrode lines. In the following days, aerial and ground
17 patrols identified further damage, leading to the need to mobilize additional resources.

18 With respect to the January 2021 icing event, there were essentially two areas of damage. Note
19 that the entire length of the transmission line in Labrador has access roads that were used for
20 construction. These access roads are maintained as part of the annual maintenance program to
21 ensure reasonable access to towers for routine inspections and emergency repairs.

22 ● The first area was along the Trans-Labrador Highway in the structures S340 to S370 range,
23 which spans approximately 15 kilometers and is located approximately 125 kilometers from
24 Muskrat Falls. As this section runs along the highway, access was obtained through use of
25 multiple access roads that lead to the transmission line. Typical travel time to this location
26 was 90 to 120 minutes depending on highway conditions.

27 ● The second area of damage was located approximately 49 kilometers off the Trans-Labrador
28 Highway in the S516 to S530 range, which spans approximately 4.5 kilometers and is

1 approximately 185 kilometers from Muskrat Falls. This section of line was accessed via St.
2 Paul’s River Road access point, which is approximately 136 kilometers from Muskrat Falls.
3 Typical travel time to this location was 180 to 220 minutes depending on highway and
4 access road conditions.

5 On February 3, 2021, pole 2 of the LIL tripped while transferring 115 MW in bipole mode. Pole 1
6 compensated, resulting in no change in power transfer to the Island Interconnected System. The
7 transmission line protection operated correctly and from the event traces it was suspected that
8 there was an open circuit event followed by a ground fault. Employees stationed near Forteau
9 were able to conduct snowmobile inspection of the line discovering a pole conductor dead end
10 on the ground at tower 1229. On February 12, 2021 during a helicopter patrol of the line, a
11 second pole conductor failure was identified at tower 1209. Since the LIL was not in service, no
12 protection operated to indicate this failure. The failure mode appeared to be very similar to the
13 previous failure that occurred at tower 1229.

14 With respect to the February turnbuckle failure event, there was essentially one failure area.

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 - 16 ● The failure area was located approximately 12 kilometers off the Trans-Labrador Highway in
17 the S1209 to S1229 range, which spans approximately 6.5 kilometers, and is approximately
18 10 kilometers from Forteau in southern Labrador. Access was gained via an access road just
19 outside of Forteau. The access time to this location was 20 to 30 minutes depending on
 highway and access road conditions.

20 With respect to the January icing event, while repairs to the first tower were completed without
21 the requirement for snow clearing, upon discovery of further damage, snow clearing operations
22 were initiated. Snow clearing began on January 17, 2021 and progressed to tower S529 on
23 January 27, 2021. There were a number of factors that led to this duration, including:

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 - 25 ● The initial focus of snow clearing activities on the 300 series of towers. In total, it took
26 approximately one day to clear an initial path to priority towers in this series of tower and
 further snow clearing was required to allow proper crane setup;
 - 27 ● Continual snow clearing was required due to additional snow fall and drifting;

- 1 ● An expanded scope of snow clearing activities at the 500 series of towers as compared to
2 anticipated requirements; and
- 3 ● Snow clearing equipment provided by the contractor was initially also being used for Trans-
4 Labrador Highway snow clearing, due to Newfoundland and Labrador Hydro (“Hydro”) and
5 the Department of Works, Services and Transportation having a common contractor, and
6 24-hour a day resources were not originally requested.

7 With respect to the February turnbuckle failure event, snow clearing operations started on
8 February 4, 2021 and initial access was completed on February 5, 2021.

9 The initial use of tracked equipment to reach distant sites was a challenge due to snow
10 conditions, which increased the necessity of plowing and maintaining open roads until repairs in
11 an area were completed.

12 Based on the learnings from this recent event, adjustments to equipment type and deployment
13 have been identified to shorten future response times. It is now anticipated that it would take
14 two days to mobilize the appropriate equipment and resources. Once mobilized it is expected
15 that snow clearing could occur at an approximate rate of 20 km a day for snow conditions
16 similar to those experienced in January, provided no equipment issues and that public highways
17 remain open.

18 The line repairs were completed through the use of both internal resources from across the
19 organization (Churchill Falls, Muskrat Falls, St. Anthony, Springdale, Whitbourne, and Soldiers
20 Pond) and contracted resources. Contracts are in place for line repairs with two contractors for
21 repairs on the island portion of the province, multiple contracts with companies for snow
22 clearing along different sections of the transmission line, a contract for helicopter services and a
23 contract in place for the storage of Implodes. Upon identification of multiple failures on the
24 transmission line in Labrador, a line contractors was mobilized to support internal resources and
25 deployed both internal and contracted helicopter and snow clearing services. An out-of-
26 province contractor was also contacted to provide additional support and the contractor
27 mobilized with implodes to support some of the repairs. There were some resourcing challenges
28 with respect to use of out-of-province resources given public health measures in place

1 associated with COVID-19. Overall, there were no major issues encountered with securing
2 required human resources to complete the repairs.

3 The transmission towers for the LIL are much higher than the typical 230 kV tower used in
4 Hydro's transmission system. As such, the availability of aerial devices or cranes with the
5 required reach are typically large wheeled vehicles, and maneuvering these vehicles on a snow
6 covered access road is very challenging and potentially impractical in some situations. Smaller
7 cranes that were utilized had limited reach capabilities. They did allow the work to be
8 completed however they were not as efficient as the Hydro-owned tracked cranes. Mechanics
9 were on site supporting both cranes and snow clearing equipment. This helped to alleviate
10 challenges with starting equipment posed by cold weather. While most equipment resource
11 issues were resolved relatively quickly, minor delays were experienced.

12 Helicopters were primarily utilized to conduct inspections for anomalies and for ice removal.
13 Poor weather early in the repair window limited the ability to conduct a full inspection of the
14 line for several days. In addition, throughout the repair window, there would have been multiple
15 days where repairs via helicopter would not have been possible due to weather conditions.

16 Based on the distance from Happy Valley-Goose Bay to the work sites and the daylight flying
17 hours, a determination was made that wrench time would be highest by having the crews drive
18 to site versus having them flown to site via helicopter.

19 Based on the snow depths, daylight flying hours, weather conditions and the nature of the
20 repairs that were required on the LIL during this icing event, clearing the roads to utilize cranes
21 for repairs was the preferred approach. Stringing conductor across multiple sections of towers
22 required the use of heavy equipment to pull conductor through the travelers during the
23 stringing process. While helicopters are routinely used during significant line construction, the
24 helicopters and pilots with requisite experience to complete such work are not readily available.
25 Given the icing that was on the lines and towers, the crews determined the safest approach was
26 to utilize heavy equipment to secure the line which required getting equipment to the work site.

1 Hydro has in stock critical spares for failures associated with all of its assets. During the events of
2 January and February, 2021 Hydro was able to complete all required repairs with in stock
3 spares.