

1 Q. **Reference: Program 4 Distribution System In-Service Failures, Miscellaneous Upgrades and**
2 **Street Lights (2025), page i.**

3 Hydro states that the program estimate includes an addition of \$1,042,442 for the purchase of a
4 new capital spare substation power transformer.

5 a) Please provide additional details on the spare power transformer including voltages,
6 MVA rating, winding configuration and where it could be deployed in Hydro's system.

7 b) Please provide a listing of all in service power transformers that the spare transformer
8 will provide backup. Identify if any of the in-service power transformers are in an N-1
9 configuration.

10 c) Please provide a listing of Hydro's existing inventory of spare power transformers,
11 including voltages, MVA rating, winding configuration, etc.

12 d) For Hydro's existing inventory of spare power transformers, please provide a listing of
13 which in-service power transformers can be backed up by each power transformer in
14 the spare inventory.

15 e) Has Hydro consulted with Newfoundland Power to coordinate the inventory of spare
16 transformers to minimize cost to customers?

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19 A. a) The new spare distribution power transformer will be configured and rated as follows: nine
20 MVA¹ (ONAF) 25kV(Wye) – 12.5kV(Wye)/4.16kV(Wye/Delta). This spare transformer is
21 designed to match loading and voltages at Newfoundland and Labrador Hydro's ("Hydro")
22 substations in Fogo and Burgeo, L'Anse-au-Loup, and St. Anthony diesel plants and Paradise
23 River Hydroelectric Generating Station. This spare can also be deployed at any other 25kV
24 Hydro distribution substation; however, it would be oversized. Hydro maintains a fleet of
25 smaller power transformer spares more appropriately sized for other substations.

¹ Megavolt-amperes ("MVA").

1 **b)** The proposed large spare distribution transformer will be suitable for any Hydro 25kV
2 distribution substation with an installed power transformer rated over 4 MVA. It can also be
3 used in smaller substations; however, it would be oversized for the application, with smaller
4 stations able to utilize one of the other spare units already available. In-service distribution
5 transformers over 4 MVA include:

- 6 ● Fogo Substation T1;
- 7 ● Burgeo Substation T1;
- 8 ● L'Anse-au-Loup Diesel Plant T1;
- 9 ● St. Anthony Diesel Plant T2; and
- 10 ● Paradise River Hydroelectric Generating Station T1.

11 The transformers that could be considered to be in an N-1 configuration would be L'Anse-
12 au-Loup Diesel Plant T1 and St. Anthony Diesel Plant T2.² Fogo Substation T1, Burgeo
13 Substation T1, and Paradise River Hydroelectric Generating Station T1 are critical equipment
14 with no redundancy other than the requested spare unit.

15 **c)** For Hydro's existing inventory of spare power transformers, a listing of which in-service
16 power transformers can be backed up by each power transformer in the spare inventory is
17 shown in Table 1.

² Transformers in an N-1 configuration are associated with parallel generation and interconnected sources that can be used interchangeably to prevent customer outages on the distribution systems; however, the loss of a redundant generation transformer may still result in local or grid-wide load curtailment in times of need.

Table 1: Spare Distribution Pad-mounted Power Transformers, Ratings, Configurations and Applications

| Spare Distribution Pad-mounted Power Transformers, Ratings and Configurations | In-Service Power Transformer Application |
|---|---|
| BIF ³ RARSS ⁴ Spare: 1/1.333MVA-25(Y)x12.5kV(Y)/4.16kV(Y) | Roberts Arm Substation T1 ⁵ |
| BIF Portable: 1/1.33/1.66MVA-25(Y)x12.5kV(Y)/4.16(Y/Δ)x0.6kV(Δ) | Roberts Arm Substation T1 |
| BIF T5: 1.5MVA-25kV(Y)/4.16kV(Y) | Roberts Arm Substation T1 |
| BIF T11: 1.5/2.5MVA-25kV(Δ)/4.16kV(Y/Δ) ⁶ | |
| BIF T9: 3/4MVA-25kV(Y)/12.5(Y)x4.16kV(Y) | Roberts Arm Substation T1, Triton Substation T1, La Scie Substation T1, L'Anse-au-Loup Diesel Plant Substation T2, and Happy-Valley North-Side Diesel Plant Substation T4 |
| BIF T10: 3.75/5/6.25MVA-25kV(Y)/12.5(Y)x4.26kV(Y) ⁷ | Roberts Arm Substation T1, Triton Substation T1, La Scie Substation T1, Fogo Substation T1 (undersized), St. Anthony Diesel Plant Substation T2 (undersized), L'Anse-au-Loup Diesel Plant Substation T1, Happy Valley North-Side Diesel Plant Substation T4, and Burgeo Substation T1 |

- 1 **d)** Please see part c) of this response.
- 2 **e)** No, Hydro has not been in contact with Newfoundland Power on spare distribution power
- 3 transformers, as they typically do not utilize the 2.4/4.16kV voltage on their distribution
- 4 systems. This voltage is utilized in high contamination areas and locations with 4.16kV
- 5 generation sources⁸ which Hydro serves.

³ Bishop's Falls ("BIF").

⁴ Roberts Arm Substation ("RARSS").

⁵ Roberts Arm is the smallest substation within Hydro's system that utilizes a pad-mount power transformer, which allows it to make use of the vast majority of spare units.

⁶ The delta HV winding on this unit makes it less preferable as a spare in most cases; the majority of Hydro's substations and feeders are (four) wire wye connected and would require reconfiguration of protection systems to allow integration.

⁷ Note that this unit is in deteriorated condition.

⁸ This voltage is used heavily in Hydro's isolated diesel systems; large backup diesel plants including the Hawkes Bay and St. Anthony Diesel Generating Stations also generate at 4.16kV.