

1 **Q. (Reference Application, para. 4)**
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3 **It is stated "The assessment determined MUN-T2 is experiencing a rare form**
4 **of core deterioration that exposes it to a high probability of in-service failure.**
5 **Newfoundland Power has no previous experience with this failure mode."**
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- 7 **(a) Which utilities have experienced this failure mode?**
- 8 **(b) What did they do in response?**
- 9 **(c) What actions have they implemented to identify the potential for such**
10 **failures going forward?**
- 11 **(d) Please provide some quantification of "high probability;" e.g., is it 20 to 40**
12 **per cent over the next two years or higher than 80 per cent in the next 18**
13 **months?**

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15 **A. (a)** Newfoundland Power is not aware of any other utilities that have experienced this
16 failure mode. The Company's power transformer consultant, van Kooy Transformer
17 Consulting Services Inc. ("van Kooy"), indicated that it has seen only one other
18 power transformer where the core failed in its 35 years of experience. The power
19 transformer was an industrial application. It was sent to a facility for assessment.
20 The unit was disposed of after the core deterioration was confirmed.

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- 22 (b) See part (a).
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- 24 (c) van Kooy confirmed there is currently no standard industry practice used for
25 monitoring core deterioration. A deteriorating core is a rare condition that cannot
26 be monitored while a power transformer is still in service.
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- 28 (d) Newfoundland Power does not currently use statistical models that permit the
29 quantification of probability of failure.¹

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31 The determination that MUN-T2 is exposed to a "high probability" of in-service
32 failure is based on a qualitative assessment that used engineering expertise and
33 considered the identified failure mode.

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35 The failure mode affecting MUN-T2 is deteriorating core lamination to lamination
36 insulation. Industry experience suggests the insulation material will continue to
37 break down.² A further decrease of insulation material will likely lead to additional
38 core vibration, which can cause shifting in the transformer windings and result in an
39 internal fault. This was confirmed by independent consultant van Kooy. The
40 consultant also noted that there is no way to track the core deterioration in service
41 or to establish a point beyond which failure is imminent.³ From Newfoundland
42 Power's perspective, MUN-T2 has already functionally failed as it can no longer be
43 safely returned to service.

¹ Statistical models use distribution functions that apply data such as failure modes, condition and other factors to quantify the probability that an asset will fail. These methodologies are being reviewed by Newfoundland Power as part of its ongoing asset management review.
² See the *Application, Schedule B*, page 4.
³ See the *Application, Schedule B, Appendix C*, page 3.