

1 Q. **Re: Page 16, section 4.1.2.1**

2 With respect to Holyrood boiler tubes, please describe Hydro's view of the  
3 likelihood and consequence of tube failures in the coming winter season, and how  
4 qualitatively and quantitatively Hydro has incorporated that risk into its analysis of  
5 generation adequacy. Also describe the impacts on adequacy in the event of tube-  
6 related outages at the levels experienced in 2015-2016.

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9 A. Hydro experienced forced outages and deratings during the winter of 2015-2016 as  
10 a result of reheater tube failures in Holyrood's Unit 1 and Unit 2. With these tube  
11 sections replaced in 2016, and continuing tube thickness inspections being  
12 completed annually, there are no remaining tube sections that are considered to be  
13 at an elevated risk of failure, and as a result, boiler tube issues as seen in 2016 are  
14 considered to be unlikely in the coming winter season. With no identified sectional  
15 concerns, any tube associated failures would likely be small in scale, involving one  
16 tube or a small number of tubes. The likelihood of this type of tube failure in the  
17 coming winter season is considered to be moderate. Any issue with a boiler tube  
18 repair or replacement requires that the unit be fully cooled in order to work on it  
19 from a safety perspective. Considering this requirement, the duration expected to  
20 complete a repair or replacement of a failed tube is one week with cool down,  
21 repair, start-up and, finally, synchronization back to the system. This could be  
22 extended by several days to a week if the tube was difficult to reach or if there were  
23 multiple tubes.

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25 Boiler tube failures are relatively common in facilities similar to Holyrood due to  
26 many factors including the high temperatures and pressures, relatively thin tube  
27 walls that are required by design to achieve good heat transfer, stress from

1 construction methods and supports (welding), load cycling and other factors. The  
2 age of the tube materials at Holyrood contributes to the risk.

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4 Hydro manages this risk by completing annual boiler internal visual inspections and  
5 thickness measurements, operating the boilers within design parameters, and  
6 limiting normal operating loads to 150 MW, 150 MW, and 135 MW for Units 1, 2,  
7 and 3, respectively, during normal system operating conditions. Additionally, should  
8 a tube failure occur, Hydro is well positioned to respond. Spare tube material is  
9 available on-site, and there is a contract in place with Babcock & Wilcox to provide  
10 boiler repairs on an urgent basis throughout the upcoming winter operating season.  
11 Hydro also notes that from previous experience with boiler tube failures, such  
12 instances can generally be managed (i.e. window of wait time) to schedule the  
13 required downtime to address the failed tube. This is helpful during a peak period.

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15 Hydro incorporates a number of operational scenarios for Holyrood in its Near-  
16 Term Generation Adequacy Report analysis. By contemplating Derated Adjusted  
17 Forced Outage Rates (DAFORs) ranging from 15% to 20%, Hydro evaluates the  
18 potential impact of high unavailability of the Holyrood plant on supply adequacy.  
19 For context, a DAFOR of 20% for the Holyrood plant can be equated to having a unit  
20 unavailable at Holyrood three of every five days. For context, Hydro notes that if a  
21 unit was not derated, and had issues that required 28 days of unplanned outage to  
22 address, this would translate into about an annual 11% DAFOR for that unit only.