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## **TRANSMISSION SCORECARD**

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3 Please refer to TSP-01-05.

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**RELIABILITY PERFORMANCE**

**1.1 TRANSMISSION RELIABILITY**

Hydro One measures and actively monitors its transmission system reliability from two principal perspectives, namely: equipment performance and delivery performance. The equipment performance perspective enables Hydro One to assess the operational performance of transmission components, ensuring that the transmission equipment is functioning effectively according to their design. The delivery performance perspective establishes a measure of how reliably electricity is delivered to transmission customers such as Local Distribution Companies and Direct Connect Customers, in addition to the Hydro One distribution system. Being a customer focused organization, Hydro One considers the delivery of electricity an important measure of transmission reliability and it strives to achieve a high level of performance in the area.

Transmission reliability is determined using measures developed collaboratively with other transmission utilities across Canada at the Transmission Consultative Committee on Outage Statistics (“T-CCOS”) with the Canadian Electricity Association (“CEA”). These measures have been widely adopted since they are well defined and understood by the participating member utilities. The metrics are sufficiently precise and consistent over time to be used for historical performance trending and multi-jurisdictional transmission performance comparisons.

**1.2 TRANSMISSION RELIABILITY MEASURES**

Hydro One’s service reliability includes a set of transmission system equipment performance and delivery performance measures. Four reliability measures are listed in

1 Table 1, the first three are related to delivery point (“DP”)<sup>1</sup> performance and the last one  
2 is based on transmission equipment performance.

3  
4 Delivery performance is measured by the frequency of delivery point interruptions, the  
5 duration of delivery point interruptions and the delivery point unreliability index which is  
6 a normalized measure of estimated unsupplied energy to customers. All interruptions  
7 caused by forced outage are included in these measures. For equipment performance,  
8 transmission system forced unavailability is used.

9

10 **Table 1: Transmission Reliability Measures**

<b>Perspective</b>	<b>Measure</b>	<b>Description</b>
Reliability of Delivery of Electricity to Customers	Frequency of Delivery Point Interruptions	Average number of interruptions experienced at delivery points due to forced interruptions
	Duration of Delivery Point Interruptions	Average interruption duration in minutes experienced at delivery points due to forced interruptions
	Delivery Point Unreliability Index – a measure of unsupplied energy	Energy not supplied to customers caused by forced interruptions, normalized by system peak load and presented in System Minutes
Performance of Transmission Equipment	Transmission Equipment Unavailability	Extent to which transmission equipment is not available due to forced outages

11

12 Hydro One’s rationale for employing these measures is as follows:

- 13
- 14 • These metrics are commonly used transmission reliability measures in the  
15 industry, especially in Canada. As a group, the measures address transmission service reliability, which is important to customers and stakeholders.

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<sup>1</sup> Delivery points are generally defined as the interfaces between Hydro One’s transmission system and its load customers. Delivery Points are either (a) low voltage buses at Hydro One owned step-down transformer stations, or (b) stations owned by transmission load customers, including Hydro One distribution stations and transmission directly connected customers.

Witness: Bruno Jesus

- 1 • The benchmarking of these measures is meaningful since the data collecting and  
2 reporting practices among all CEA member utilities are consistent, and have been  
3 developed and refined over time.
- 4 • These measures have been in place for several decades which facilitates internal  
5 performance trending, setting targets and external benchmarking.
- 6 • The limited number of measures keeps tracking and reporting requirements at a  
7 manageable and cost-effective level, while still covering a broad transmission  
8 reliability performance spectrum.

9  
10 A summary of delivery point performance according to the Hydro One Customer  
11 Delivery Point Performance (CDPP) Standards is discussed below under the delivery  
12 point performance outliers section. The standard, as attached in Attachment 1, is a Hydro  
13 One document previously filed with the OEB: Customer Delivery Point Performance  
14 (CDPP) Standard, EB-2002-0424. Additionally, Attachment 2 provides definitions and  
15 detailed descriptions of the reliability measures used in this evidence.

### 16 17 **1.3 EXTERNAL COMPARISONS OF RELIABILITY**

18  
19 Using data collected by the CEA, Hydro One is able to compare the reliability  
20 performance of its transmission system against the Canadian Transmission Utility  
21 average performance. The comparison of delivery point reliability performance is done  
22 at the system level, reflecting the system average of all delivery points. Below the  
23 system level, Hydro One also focuses on multi-circuit supplied delivery point  
24 performance, which is also benchmarked with comparable Canadian utilities.

25  
26 Hydro One's comparative reliability performance at the system level is illustrated in the  
27 following Figures:

Witness: Bruno Jesus

- 1       • Figure 1a - frequency of momentary interruptions;
- 2       • Figure 1b - frequency of sustained interruptions;
- 3       • Figure 2 - overall frequency of interruptions;
- 4       • Figure 3 - average duration of sustained interruptions; and
- 5       • Figure 4 - delivery point unreliability index.

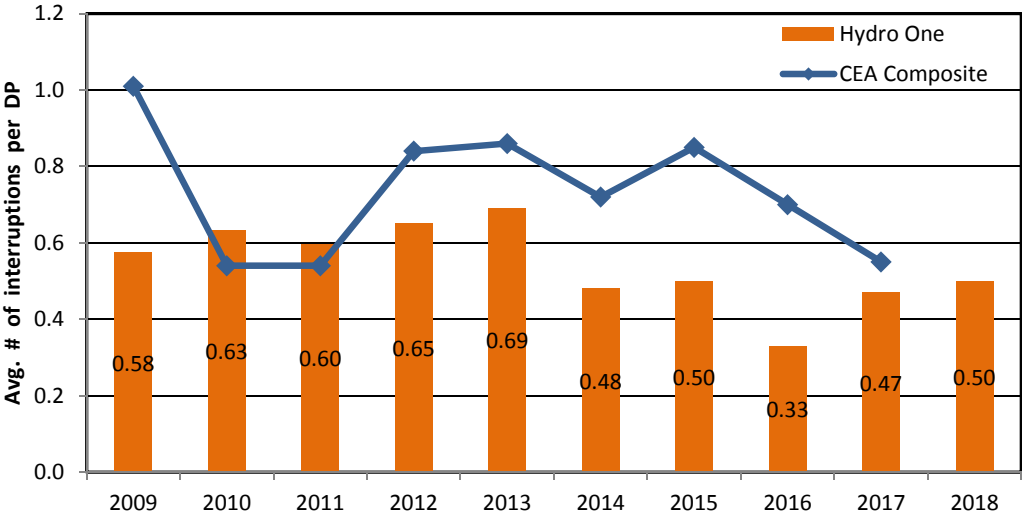
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7       **Exclusion of Extraordinary Events:**

8       Outages resulting from extraordinary events that have had an “excessive” impact on the  
9       transmission system and that, in Hydro One’s assessment, strongly skew the historical  
10       trend of the measure, such as the 1998 Eastern Ice Storm, the 2003 Northeast Blackout,  
11       the 2013 GTA Flood and 2018 Ottawa area Tornado, have been excluded. These outages  
12       were not due to equipment failure or human error, which Hydro One considers to be  
13       controllable.

14

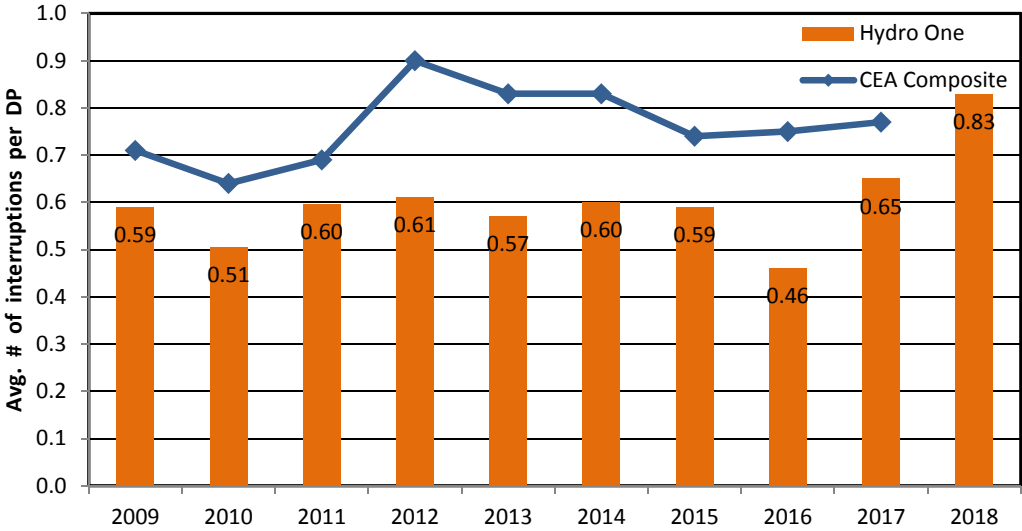
15       Hydro One removes extraordinary events from its reliability metrics that have had an  
16       “excessive” impact on the transmission system and that, in Hydro One’s assessment,  
17       strongly skew the historical trend of the measure. This exclusion threshold has been  
18       determined using a statistical method (log-standard deviation ( $\beta$ )) resulting in a threshold  
19       of 10,000 MW\*min being used to exclude major unsupplied energy events from  
20       reliability metrics. This threshold corresponds to a CEA Degree of Severity Level 2  
21       disturbance event. Hydro One will apply this exclusion threshold to performance tracking  
22       and target setting from 2019.



\* Results exclude the impact of the 2013 GTA Flooding and 2018 Ottawa Area Tornadoes

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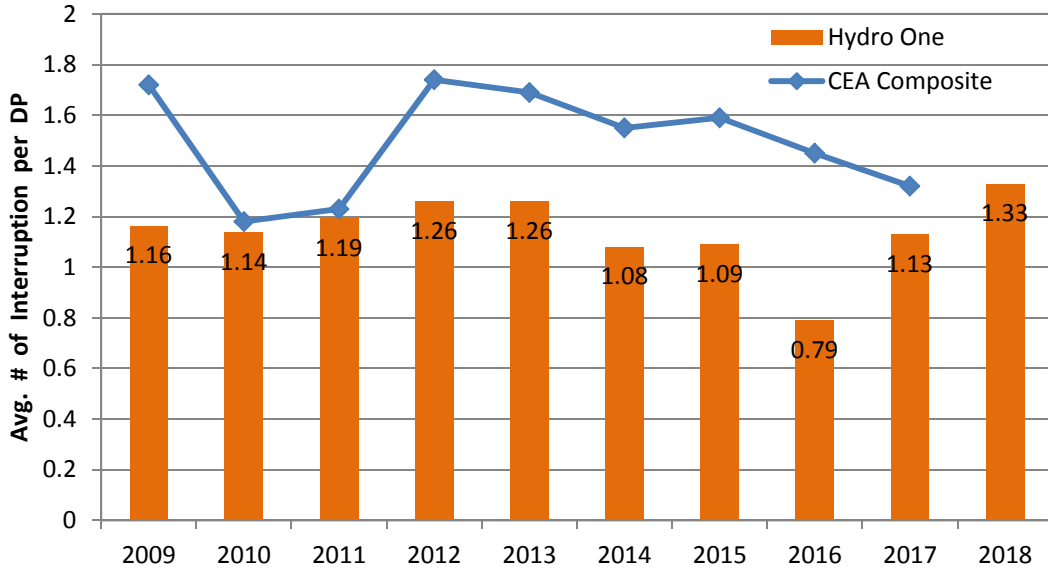
**Figure 1a: Comparison of Hydro One Frequency of Momentary Interruptions to CEA Composite**



\* Results exclude the impact of the 2013 GTA Flooding and 2018 Ottawa Area Tornadoes

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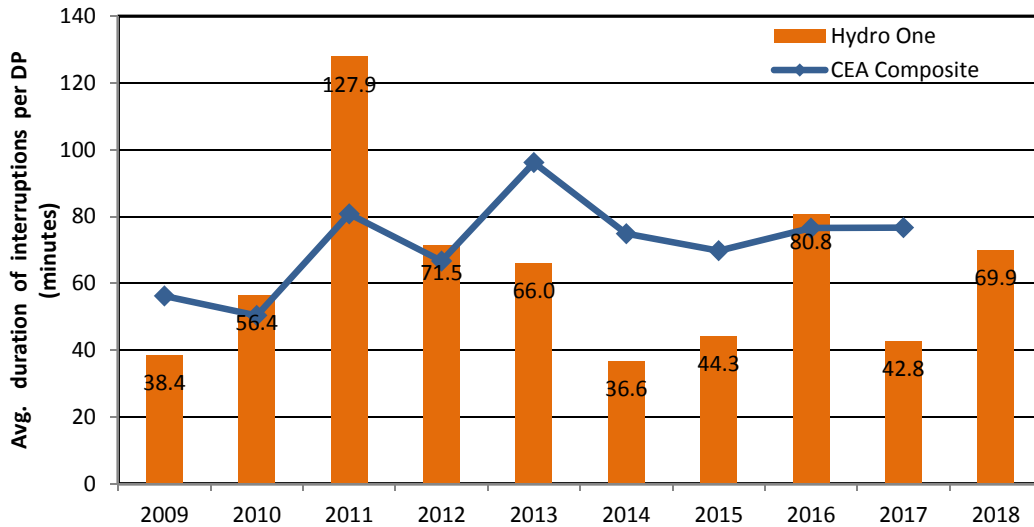
**Figure 1b: Comparison of Hydro One Frequency of Sustained Interruptions to CEA Composite**



\* Results exclude the impact of the 2013 GTA Flooding and 2018 Ottawa Area Tornadoes

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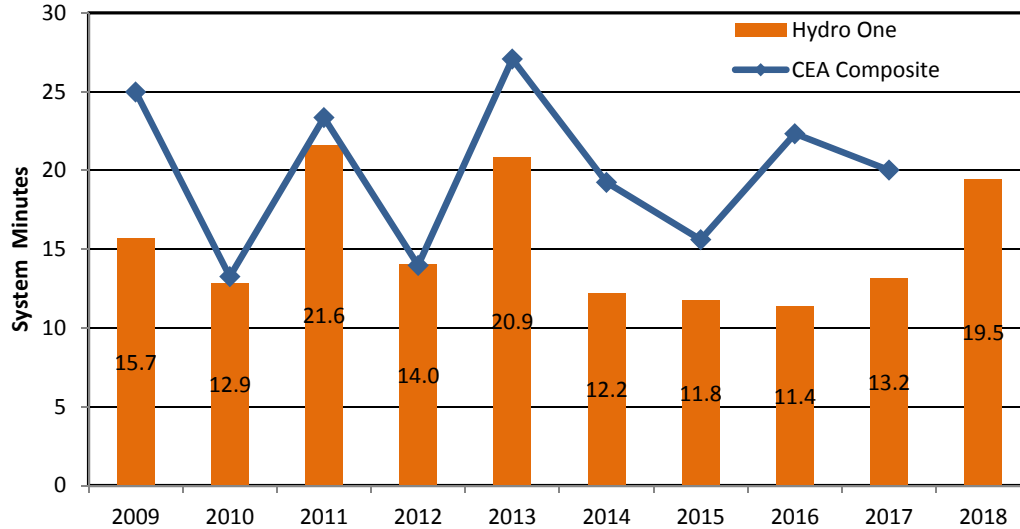
**Figure 2: Comparison of Hydro One Overall Frequency of Interruptions to CEA Composite**



\* Results exclude the impact of the 2013 GTA Flooding and 2018 Ottawa Area Tornadoes  
 1E1C/M1M Forest First represents ~50% of 2011 Total

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4  
5

**Figure 3: Comparison of Hydro One Duration of Sustained Interruptions to CEA Composite**



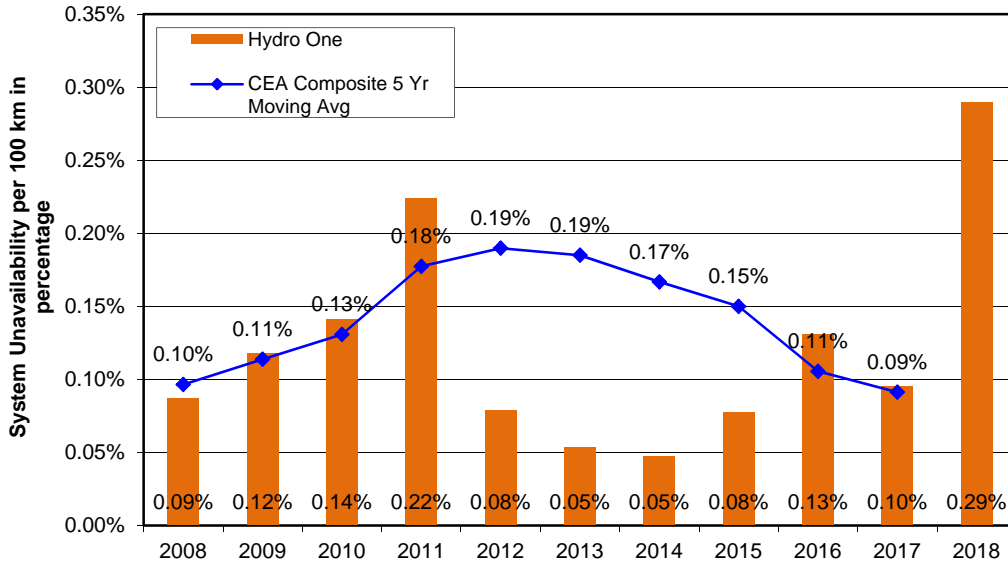
\* Results exclude the impact of the 2013 GTA Flooding and 2018 Ottawa Area Tornadoes

**Figure 4: Comparison of Hydro One Delivery Point Unreliability Index to CEA Composite**

In this evidence, transmission system forced unavailability is divided into Unavailability of Transmission Lines and Unavailability of Transmission Station Equipment. This is based on the different characteristics of the equipment. Station equipment includes power transformers and circuit breakers, etc. The Unavailability measure represents the extent to which the major transmission equipment is not available for use within the system due to forced outages. The detailed description of this measure is provided in Attachment 2 for both Major Transmission Station Equipment and Transmission Lines. Figures 5 and 6 illustrate historical performance of Hydro One lines and station equipment in comparison to the CEA Composite five-year moving average performance of all the CEA member utilities. Further information regarding 2018 performance has been provided in the Transmission System Plan at Exhibit B, Tab 1, Schedule 1 (“TSP”) at section 1.5.3, Performance Measurement Outputs and Performance Update.

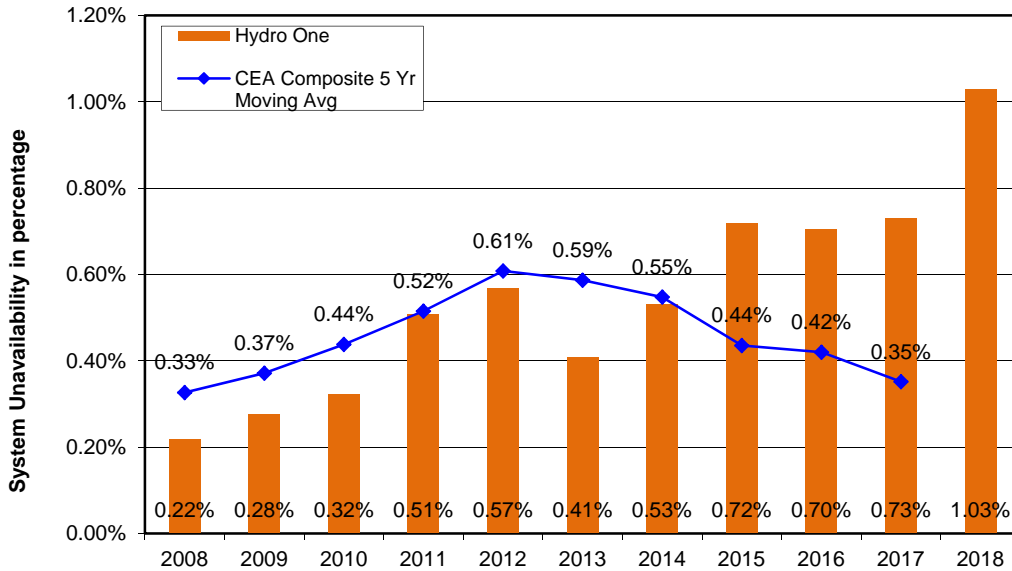
Witness: Bruno Jesus





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**Figure 5: Unavailability of Transmission Lines**



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**Figure 6: Unavailability of Major Transmission Station Equipment**

1 Equipment performance is a leading indicator of future system reliability. By the time  
2 system reliability has measurably degraded, equipment performance will have  
3 deteriorated and a significant increase in asset level investment will be required to return  
4 to historical reliability levels. Renewal investments are made to preserve the  
5 performance of critical asset groups by evaluating assets at both an individual asset level  
6 and at a station or line level. This prioritizes investment needs to identify the most  
7 effective reliability alternative. This approach helps preserve overall system reliability.

8  
9 Hydro One undertakes an annual detailed assessment of the cited performance measures.  
10 This assessment is taken into account along with other factors (such as asset condition)  
11 when establishing candidate investments. For further details see the Transmission  
12 System Plan at Exhibit B, Tab 1, Schedule 1 (“TSP”) at section 2.1, Investment Planning  
13 Process.

#### 14 15 **1.4 DELIVERY POINT PERFORMANCE OUTLIERS**

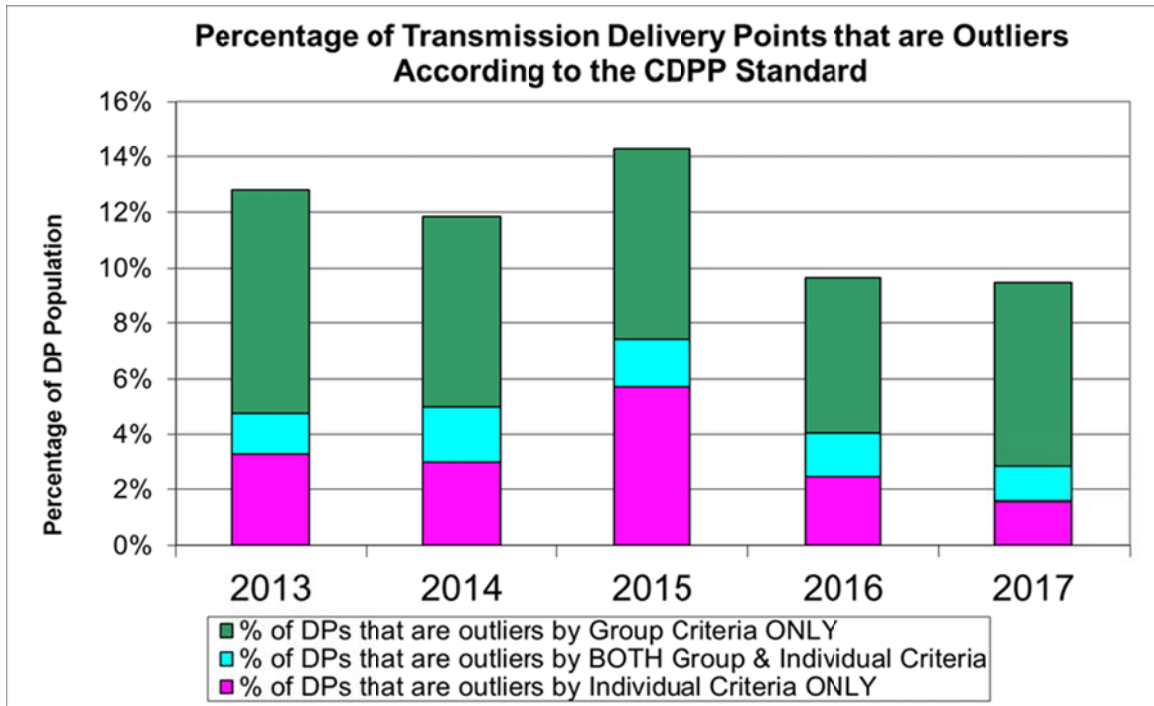
16  
17 Delivery point performance is evaluated according to the Customer Delivery Point  
18 Performance (CDPP) Standard that Hydro One developed, filed with, and was  
19 subsequently approved by the Board in EB-2002-0424. The performance standard is  
20 used as a trigger to initiate assessment and follow up with affected customers to:

- 21 • Determine the root cause of unreliability;
- 22 • Perform technical and financial evaluations; and
- 23 • Decide on remedial action to improve reliability.

24  
25 Figure 7 is a summary of the transmission Group and Individual Outliers as determined  
26 by the CDPP Standard criteria from 2007, the first year of formal CDPP reporting.

3 Note: The Group and Individual CDPP Standard criteria are not mutually exclusive. A  
4 delivery point can be both a group outlier and an individual outlier in same year.

4



5

6 **Figure 7: Transmission Load Delivery Point Performance Outliers**

7

17 The delivery point outliers are analysed and considered for incorporation into future  
18 investment programs. Hydro One endeavours to keep the number of outliers at  
19 approximately 10% of the total population of its delivery points. However, this will not  
20 always be the case. Some delivery points are flagged as individual outliers even though  
21 they normally experience better reliability performance as measured by the group outlier  
22 standard. For example, a specific delivery point may have performed better than the  
23 relevant group standard, but, given its extremely good individual outlier (historical)  
24 baseline, recent isolated events may drive a performance decline resulting in this delivery  
25 point temporarily becoming an individual outlier. In most cases, such delivery point  
26 could return to non-outlier status in the following year without the need for any

Witness: Bruno Jesus

1 incremental investment. Hydro One takes this possibility into consideration in its  
2 assessments.

3

4 **ATTACHMENTS: PERFORMANCE MEASUREMENT**

5 Attachment 1 - Customer Delivery Point Performance (CDPP) Standard

6 Attachment 2 - Description of the Reliability Measures

1                   **CUSTOMER DELIVERY POINT PERFORMANCE (CDPP)**  
2   **STANDARD**

3  
4       **1. INTRODUCTION**

5  
6       The Transmission System Code (“TSC”) requires transmitters to develop performance  
7       standards at the Customer Delivery Point (“CDPP”)<sup>1</sup> level, consistent with system wide  
8       standards, that:

- 9           • reflect typical transmission system configurations that take into account the  
10          historical development of the transmission system at the customer delivery point  
11          level;
- 12          • reflect historical performance at the customer delivery point level;
- 13          • establish acceptable bands of performance at the customer delivery point level for  
14          the transmission system configurations, geographic area, load, and capacity  
15          levels;
- 16          • establish triggers that would initiate technical and financial evaluations by the  
17          transmitter and its customers regarding performance standards at the customer  
18          delivery point level, as well as the circumstances in which any such triggering  
19          event will not require the initiation of a technical or economic evaluation;
- 20          • establish the steps to be taken based on the results of any evaluation that has been  
21          so triggered, as well as the circumstances in which such steps need not be taken;  
22          and
- 23          • establish any circumstances in which the performance standards will not apply.

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<sup>1</sup> A Delivery Point (“DP”) is defined as a point of connection between a transmitter’s transmission facilities and a customer’s facilities.

Witness: Bruno Jesus

1 On May 3, 2002, Hydro One filed proposed Customer Delivery Point Performance  
2 Standards to meet the requirements of the TSC with the OEB for review and approval.  
3 Subsequently, on September 8, 2004, as a result of stakeholder comments received,  
4 Hydro One filed amendments to its original CDPP Standards submission. On July 25,  
5 2005, the OEB issued its Decision and Order (RP-1999-0057/EB-2002-0424) which  
6 approved Hydro One's proposed CDPP Standards subject to a number of changes  
7 directed by the Board.

8  
9 The approved CDPP Standards apply to all existing transmission load customers  
10 (including customers that have signed a connection cost recovery agreement prior to  
11 market opening). For new or expanding customer loads, the delivery point performance  
12 requirements will be specified and paid for by the customer based on their connection  
13 needs and negotiated as part of the connection cost recovery agreement.

## 14 15 **2. DELIVERY POINT RELIABILITY STANDARDS**

16  
17 The approved CDPP Standards consist of two components;

- 18 • Group CDPP Standards that relate the reliability of supply to the size of load  
19 being served at the delivery point; and
- 20 • Individual CDPP Standards that maintain a customer's individual historical  
21 delivery point performance.

22  
23 Triggers for each component are used to identify performance "outliers" to initiate  
24 technical and financial evaluations to determine the root cause of unreliability and  
25 remedial action required to improve reliability. The CDPP Standards and triggers for  
26 each component are summarized in Sections 2.1 and 2.2.

1 **2.1 PERFORMANCE STANDARDS BASED ON SIZE OF LOAD BEING**  
 2 **SERVED: GROUP CDPP STANDARDS**

3  
 4 The CDPP Standards and the associated triggers are based on the size of load being  
 5 served. For this purpose, the load is the delivery point’s total average station gross load<sup>2</sup>  
 6 as measured in megawatts. The CDPP Standards vary with the size of the load in groups  
 7 or bands of 0 to 15 MW, greater than 15 up to 40 MW, greater than 40 up to 80 MW and  
 8 greater than 80 MW, as shown in Table 1.

9  
 10 **Table 1: Customer Delivery Point Performance Standards Based on Load Size**

Performance Measure	Customer Delivery Point Performance Standards (Based on a Delivery Point’s Total Average Station Load)							
	0-15 MW		>15 - 40 MW		>40 - 80 MW		>80 MW	
	Standard (Average Performance)	Minimum Standard of Performance	Standard (Average Performance)	Minimum Standard of Performance	Standard (Average Performance)	Minimum Standard of Performance	Standard (Average Performance)	Minimum Standard of Performance
DP Frequency of Interruptions (Outages/yr)	4.1	9.0	1.1	3.5	0.5	1.5	0.3	1.0
DP Interruption Duration (min/yr)	89	360	22	140	11	55	5	25

11  
 12 These CDPP Standards are based on historical 1991-2000 performance, as measured by  
 13 the frequency and duration of all momentary and sustained interruptions<sup>3</sup> caused by  
 14 forced outages, excluding outages resulting from extraordinary events that have had

<sup>2</sup> Total Average Station Gross Load (MW) = (Total Energy Delivered to the Station (MWh) + Total Energy Generated at the Station Site (MWh)) / 8760 hours.

<sup>3</sup> Momentary interruption is any forced interruption to a delivery point lasting less than 1 minute and a sustained interruption is any interruption to a delivery point lasting 1 minute or longer. A delivery point is interrupted whenever its requisite supply is interrupted as a result of a forced outage of one or more Hydro One components causing load loss. Interruptions caused by Hydro One’s customers are recorded but not charged against Hydro One’s reliability performance for the customer initiating the interruption, but are charged against Hydro One’s reliability performance for other interrupted customers.

Witness: Bruno Jesus

1 “excessive” impact on the transmission system. Included in this category of excluded  
2 events are the 1998 ice storm and the 2003 blackout.

3  
4 **2.1.1 CRITERIA FOR MINIMUM STANDARD PERFORMANCE TO**  
5 **IDENTIFY PERFORMANCE OUTLIERS FOR GROUP CDPP**  
6 **STANDARDS**

7  
8 The minimum CDPP standards of performance, for each of the four load groups or bands,  
9 are used as triggers by Hydro One. The trigger occurs when the three-year rolling  
10 average of the delivery point performance falls below the minimum CDPP Standard for  
11 the delivery point of the load size group or band (referred to as a performance outlier or  
12 outlier) or when a delivery point customer indicates that analysis is required. When an  
13 outlier is identified, it is considered a candidate for remedial action. In such cases, Hydro  
14 One will initiate technical and financial evaluations in consultation with affected  
15 customers to determine the root cause of the unreliability and any remedial action  
16 required to improve the reliability.

17  
18 **2.1.2 PERFORMANCE STANDARDS TO MAINTAIN HISTORICAL**  
19 **DELIVERY POINT PERFORMANCE INDIVIDUAL CDPP**  
20 **STANDARDS**

21  
22 In this component, the CDPP Standards are intended to maintain the reliability  
23 performance levels at each customer delivery point. This is done by identifying customer  
24 delivery points with deteriorating trends in reliability performance, irrespective of  
25 whether they are satisfactory performers under the Group CDPP Standards (Section 2.1).  
26 In order to identify customer delivery points with deteriorating trends in reliability  
27 performance, a performance baseline trigger for the frequency and duration of forced  
28 (momentary and sustained) interruptions is established for each delivery point based on  
29 that delivery point’s historical 1991-2000 average performance, plus one standard

Witness: Bruno Jesus



1 deviation (the “historical baseline”). The historical baselines exclude outages resulting  
2 from extraordinary events that have had “excessive” impact on the transmission system  
3 and that, in Hydro One’s assessment, strongly skew the historical trend of the measure,  
4 such as the 1998 Eastern Ice Storm, the 2003 Northeast Blackout, the 2013 GTA flood  
5 and 2018 Ottawa area Tornado. Also, for delivery points that came into service after  
6 1991, the in-service year is to be the first year of the 10-year period used to determine the  
7 performance baseline.

8  
9 **2.1.3 CRITERIA FOR MINIMUM STANDARD PERFORMANCE TO**  
10 **IDENTIFY PERFORMANCE OUTLIERS FOR INDIVIDUAL CDP**  
11 **STANDARDS**

12  
13 Delivery point performance that is worse than the historical baseline (for either frequency  
14 or duration) in two consecutive years is considered to be a performance outlier and a  
15 candidate for remedial action. In such cases, Hydro One will initiate technical and  
16 financial evaluations with affected customers to determine the root cause of the  
17 unreliability and the remedial measures required to restore the historical reliability of the  
18 delivery point’s performance.

19  
20 **2.1.4 REMEDIAL COSTS TO ADDRESS GROUP AND INDIVIDUAL**  
21 **PERFORMANCE OUTLIERS**

22  
23 For Group and Individual Performance outliers, Hydro One will cover the remedial costs  
24 of restoring and sustaining the inherent reliability performance of the existing assets to  
25 what was designed originally. These costs include appropriate asset sustainment costs,  
26 on-going maintenance costs and costs associated with asset refurbishment or  
27 replacement. These expenditures are made on an ongoing basis consistent with “good  
28 utility practices” irrespective of actual delivery point performance or whether a delivery

1 point is a performance outlier. No customer contribution formula is required for these  
2 normal sustainment expenditures.

3

4 For Individual Performance outliers, Hydro One will restore the delivery point to the  
5 historical level of performance. Hydro One's remedial work will not include capital  
6 reliability improvements that significantly enhance the reliability of supply relative to the  
7 reliability that was inherent to the original system design or configuration of supply.

8

9 For Group Performance outliers, Hydro One's level of incremental investment for  
10 improving the performance of an outlier beyond what was designed originally will be  
11 limited to the present value of three years' worth of transformation and/or transmission  
12 line connection revenue<sup>4</sup> associated with the delivery point. Any funding shortfalls for  
13 improving delivery point reliability performance will be contributed by affected delivery  
14 point customers. In cases where specific transmission facilities are serving two or more  
15 customers in common with outlier performance, Hydro One will approach all affected  
16 customers to determine their willingness to contribute jointly to the reliability  
17 improvements.

18

19 Cost responsibility for these investments is to be consistent with the TSC, specifically:

- 20 1. Hydro One will not attribute the costs associated with network investment to any  
21 customer and any variance from this approach requires a determination by the  
22 Board;
- 23 2. The costs of preparing the final estimate for reliability improvements required to  
24 address performance outliers is the only portion of the technical and financial  
25 evaluation that is to be included as part of the cost of the remedial work; and

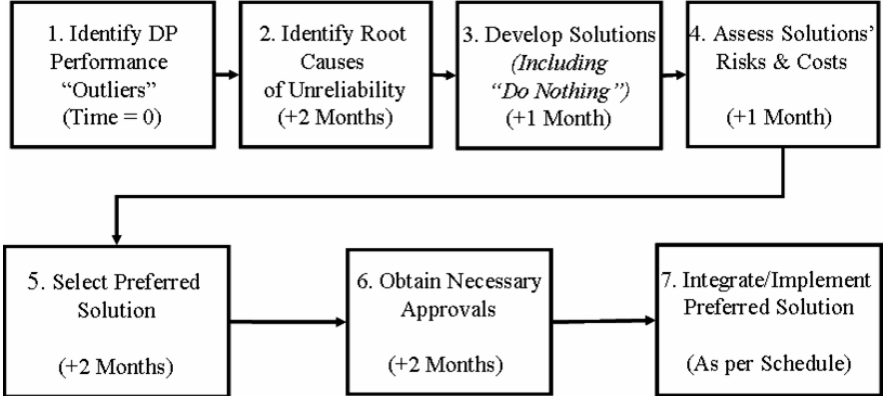
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<sup>4</sup> In the special case where a delivery point pays only network tariffs, transmission line connection tariffs are to be used as a proxy in the revenue calculation.

1 3. Where a customer contribution is required to improve or expand the transmission  
2 system to correct outlier performance, the customer will be given contracting  
3 privileges consistent with those applicable to contestability for new customer  
4 connections. In addition, affected delivery point customers are responsible for all  
5 of the costs associated with any new or modified facilities required on lines and  
6 stations they own to improve reliability. These financial and cost sharing  
7 arrangements are to be detailed in a connection and cost recovery agreement with  
8 the affected customers.

9  
10 **2.2 PROCESS TIMELINES TO ADDRESS PERFORMANCE OUTLIERS**

11  
12 The process and associated timelines that will be followed to address performance  
13 outliers– both for Group and Individual outliers – and to determine the preferred course  
14 of action, are provided in Figure 1 and Table 2.



16  
17 **Figure 1: Performance Outlier Process Map**

1

**Table 2: Performance Outlier Process**

<b>Step</b>	<b>Timeline</b>	<b>Action</b>
1	0	Hydro One identifies, annually, delivery point performance “outliers” for both Group and Individual standards. Hydro One will notify customers that are supplied from these performance outlier delivery points and solicit their feedback/issues/concerns on their reliability of supply.
2	< 2 months	Hydro One will determine the root causes of unreliability associated with each performance outlier identified in (step 1).
3	< 1 month	Hydro One will develop solutions to address performance outliers, including; <ul style="list-style-type: none"> <li>(i) the work to restore and sustain the inherent reliability performance of the existing assets to what was designed originally; and</li> <li>(ii) for Group Performance outliers, the additional capital improvements required to improve the performance of an outlier to within standard and beyond what was designed originally. Hydro One will discuss the proposed solutions with affected customers.</li> </ul>
4	< 1 month	Hydro One will determine the costs and assess the risks of the solutions, including any customer capital contributions required for option (step 2) above. Hydro One will present these costs to customers for their review and assessment.
5	< 2 months	Hydro One and customers select the preferred option and where appropriate customers state their intention on whether to proceed with capital improvements that involve customer contributions identified in option (step 2) above.
6	< 2 months	Hydro One and customers obtain the necessary approvals to proceed with the preferred solutions to address performance outliers.
7	Agreed to Schedule	Hydro One will integrate the solutions into its work programs and implement them according to a mutually agreed schedule.

1 When Hydro One completes work to restore delivery point performance to standard, it  
2 continues to monitor the delivery point the year after the work is completed. If future  
3 performance suggests that the standard has not been met, then Hydro One will review the  
4 work that has taken place and will identify corrective action. Hydro One will not, as a  
5 practice, wait another three years and start a new technical and financial evaluation.  
6 Hydro One reviews and identifies customer delivery point performance annually,  
7 regardless of the investment history.

1                   **DESCRIPTION OF THE RELIABILITY MEASURES**

2  
3           **Delivery Point**

4           The delivery point is the point of supply where the energy from the Bulk Electricity  
5           System (115 kV and above) is transferred to the Distribution System or the retail  
6           customer. This point is generally taken as the low voltage bus at step-down transformer  
7           stations. For customer-owned stations supplied directly from the Transmission System,  
8           this point is generally taken as the interface between utility-owned equipment and the  
9           customer's equipment.

10  
11           **Forced Interruption**

12           A delivery point interruption due to a disconnection as a result of an unplanned event.

13  
14           **Planned Interruption**

15           A delivery point interruption due to a disconnection at a selected time for the purpose of  
16           construction/preventive maintenance.

17  
18           **Momentary Interruption**

19           Any loss of supply voltage to a delivery point that has a duration of less than one minute.  
20           These are interruptions generally restored by automatic reclosure facilities and are of very  
21           short duration (of the order of a few seconds).

22  
23           **Sustained Interruption**

24           Any loss of supply voltage to a delivery point that has a duration of one minute or more.

1 **Average Frequency of Delivery Point Interruptions**

2 Average Frequency of Delivery Point Interruptions is an indicator of the average number  
3 of interruptions that a customer experienced and is presented as interruptions per delivery  
4 point per year. It is expressed mathematically as:

5  
6 
$$\text{Average Frequency of Delivery Point Interruptions} = \frac{\sum_{i=1}^N (M_i + S_i)}{N}$$
  
7

8 Where:

- 9 •  $M_i$  is the total number of momentary interruptions experienced at Delivery Point  $i$   
10 in a given year.
  - 11 •  $S_i$  is the total number of sustained interruptions experienced at Delivery Point  $i$  in  
12 a given year.
  - 13 •  $N$  is the equivalent total number of delivery points for a given year.
- 14

15 The frequency of power supply interruptions and indicators that track such performance  
16 are universally used in other regulatory jurisdictions. Transmission service providers in  
17 Alberta, Australia, the UK, New Zealand and Sweden used an interruption frequency  
18 indicator. Additionally, the Canadian Electricity Association (CEA) tracks the frequency  
19 of delivery point interruptions among the CEA transmission member utilities.

20

21 **Average Duration of Delivery Point Interruptions**

22 Average Duration of Delivery Point Interruptions is the average time that customers are  
23 interrupted from transmission system and presented as minutes per delivery point per  
24 year. It is expressed mathematically as:

25  
26 
$$\text{Average Duration of Delivery Point Interruptions} = \frac{\sum_{i=1}^N (D_i)}{N}$$

1 Where:

- 2 •  $D_i$  is the total effective interruption duration of Sustained Interruptions  
3 experienced at Delivery Point  $i$  in a given year.
- 4 •  $N$  is the equivalent total number of delivery points for a given year.

5  
6 The duration of delivery point interruptions and indicators that track such performance  
7 are universally used in other regulatory jurisdictions. Transmission service providers in  
8 Alberta, Australia, the UK, New Zealand and Sweden used an interruption duration  
9 indicator. Additionally, the Canadian Electricity Association (CEA) tracks the duration  
10 of delivery point interruptions among the CEA transmission member utilities.

11  
12 **Unsupplied Energy**

13 Unsupplied Energy is an indicator of total energy not supplied to customers due to  
14 delivery point interruptions. In order to make it comparable among different sizes of  
15 utilities, the unsupplied energy is normalized by the system peak. This measure is  
16 defined as Delivery Point Unreliability Index (DPUI). It is expressed mathematically as:

17  
18 
$$\text{Delivery Point Unreliability Index} = \frac{\sum_{i=1}^N U_i \times 60 \text{ min/hr}}{Pk}$$
  
19

20 Where:

- 21 •  $U_i$  is the total unsupplied energy, expressed in MWh, at Delivery Point  $i$  in a given  
22 year.
- 23 •  $Pk$  is the system peak load in the year, expressed in MW.
- 24 •  $N$  is the equivalent total number of delivery points for a given year.



1 The unit of the measure of normalized unsupplied energy is expressed in "system  
2 minutes". Transmission companies in Canada, the U.S., and Europe use indicators of this  
3 type to assess transmission system reliability.

4

5 **Transmission System Unavailability**

6 Transmission System Unavailability captures the total duration of transmission  
7 equipment out of service due to forced outages. Transmission System Unavailability due  
8 to forced outages is sub-categorized as (1) Transmission Line Unavailability, and (2)  
9 Station Equipment Unavailability, which are consistent to CEA reliability benchmarking  
10 programs.

11

12 These indicators are expressed mathematically as:

13

14

15

$$(1) \text{ Transmission Line Unavailability} = \left( \frac{\sum_{i=1}^{N_L} F_{L_i}}{T_L} \right) \times 100\%$$

16

Where:

17

18

19

20

21

- $F_{L_i}$  is the annual forced outage duration in hours due to transmission line-related outages of circuit  $L_i$ .
- $T_L$  is the inventory (expressed in 100 km-hours) of all in-service transmission circuits.
- $N_L$  is the total number of in-service transmission circuits

1  
2 (2) Station Equipment Unavailability =  $\left( \frac{\sum_{i=1}^{N_s} F_{S_i}}{T_s} \right) \times 100\%$   
3

4 Where:

- 5 •  $F_{S_i}$  is the annual forced outage duration in hours for Major Transmission Station  
6 Equipment  $S_i$ .
- 7 •  $T_s$  is the inventory (expressed in hours) of all In-service Major Transmission  
8 Station Equipment
- 9 •  $N_s$  is the total number of in-service major transmission station equipment.

10

11 These indicators track the extent to which the transmission system, including  
12 transmission circuits and substation equipment, is not available for use. These indicators  
13 are focused on the aspect of transmission service within Hydro One's control. It also puts  
14 the impact of outages in context with the availability of the transmission system as a  
15 whole and expresses the impact of outages in a single, easily understood indicator.  
16 Transmission companies in Canada, U.S., and in Europe use indicators of this type to  
17 assess transmission system reliability.

1 **COMPLIANCE MATTERS**

2  
3 **1. INTRODUCTION**

4  
5 Pursuant to the Filing Requirements, Hydro One is disclosing that there are no  
6 outstanding areas of non-compliance which have had an effect on this transmission rate  
7 application, and as such is not seeking any relief through this application to resolve any  
8 non-compliance issues. As such, the remainder of this Exhibit focuses on the compliance  
9 requirements and Hydro One's approach to achieving, sustaining and demonstrating  
10 compliance.

11  
12 **2. COMPLIANCE REQUIREMENTS**

13  
14 Hydro One materially complies with all applicable regulatory requirements associated  
15 with its Transmission License, including (and without limiting the generality of the  
16 foregoing) the reliability standards defined in Chapter 11 of the Independent Electricity  
17 System Operator ("IESO") Market Rules and the requirements stipulated in the Ontario  
18 Energy Board's ("OEB") Transmission System Code.

19  
20 The *Electricity Act, 1998* ("the Act") grants the IESO jurisdiction to direct the operation  
21 and maintain the reliability of the IESO-controlled grid; to participate in the development  
22 of criteria and standards, by any Standards Authority, relating to the reliability of the  
23 integrated power system; and to establish and enforce these reliability criteria and  
24 standards through the Market Rules. The Act recognizes as "Standards Authorities", any  
25 agency or body designated by regulation that approves standards or criteria applicable in  
26 Ontario relating to the reliability of transmission systems, including the North American  
27 Electric Reliability Corporation ("NERC") and the Northeast Power Coordinating

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1 Council (“NPCC”). Reliability criteria and standards developed by these Standards  
2 Authorities are approved by the OEB prior to enforcement in Ontario.

3  
4 Hydro One, as a market participant, is obligated to comply with these reliability criteria  
5 and standards, as applicable. Hydro One is subject to compliance monitoring (including  
6 audits) and enforcement of Hydro One’s compliance with these reliability criteria and  
7 standards by the IESO’s Market Assessment and Compliance Division (“MACD”) - the  
8 enforcement authority for reliability standards in Ontario.

9  
10 Hydro One is also subject to compliance oversight and audit by the OEB and the National  
11 Energy Board (“NEB”). As a matter of regular operations, Hydro One complies with  
12 various periodic reporting requirements, such as the OEB’s Reporting and Record  
13 Keeping Requirements, as well as annual reporting submissions to MACD and NEB.

14  
15 **3. COMPLIANCE CULTURE**

16  
17 Hydro One actively promotes and sustains a proactive corporate culture of compliance  
18 and reliability excellence, integrating compliance requirements into its core operations.  
19 Hydro One also actively participates in the development of reliability standards (in  
20 accordance with NERC Standard Process Manual and NPCC Regional Standard Process  
21 Manual) in order to support and advocate for the development of reasonable, balanced,  
22 and cost-effective requirements. In the event of a new or revised reliability standard,  
23 Hydro One may be required to undertake work to achieve compliance. Hydro One has  
24 internal controls in place to undertake the planning and execution of work to achieve  
25 compliance by the Ontario Enforcement Date.

26  
27 An important attribute of Hydro One’s proactive compliance culture is its constructive  
28 and transparent relationship with the OEB and the IESO (including MACD), particularly

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1 in respect to Hydro One's compliance posture and any compliance issues. It is Hydro  
2 One's practice and culture to self-report to MACD any discovered potential non-  
3 compliances with reliability standards and to self-correct these issues.

4  
5 **4. COMPLIANCE APPROACH**

6  
7 Hydro One takes a structured and disciplined approach to achieving, sustaining and  
8 demonstrating compliance to reliability standards; through its Internal Compliance  
9 Program.

10  
11 Governance and oversight of the Internal Compliance Program is provided by the  
12 Reliability Standards Compliance Committee ("RSCC"). The RSCC is a formal  
13 committee which oversees Hydro One's compliance with reliability standards. The RSCC  
14 is chaired by the Chief Compliance Officer and consists of a select group of Hydro One  
15 executives, each of which uphold material accountabilities in respect to reliability, and  
16 which together represent the company's commitment to compliance. The Chief  
17 Compliance Officer maintains independence from direct activities to achieve, sustain and  
18 demonstrate compliance to reliability standards. The Chief Compliance Officer has the  
19 authority to independently report to Hydro One's Board of Directors or such Board  
20 Committee as is determined to have compliance oversight in order to keep the Board  
21 informed of compliance matters.

22  
23 Hydro One undertakes a variety of activities to represent its compliance posture internally  
24 to the RSCC and externally to MACD. Internally, Hydro One conducts annual  
25 compliance assurance activities and communicates the outcomes of these to the RSCC.  
26 Hydro One has transitioned its compliance assurance processes to a risk-based approach  
27 and is enhancing this approach further by such means as evaluating and strengthening  
28 compliance related internal controls. The objective is to provide Hydro One executives

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1 with a higher level of compliance assurance, while internally minimizing the burden of  
2 compliance assurance activities.

3

4 Externally, Hydro One participates in MACD's Ontario Reliability Compliance Program  
5 ("ORCP"). MACD develops and publishes an annual ORCP by which it monitors,  
6 assesses and enforces compliance with reliability standards in Ontario. Under the ORCP,  
7 Hydro One is required to self-certify its compliance posture (including by way of guided  
8 self-certifications, requiring submission of evidence of compliance), self-report potential  
9 non-compliances, indicating actions taken or that will be taken to resolve potential non-  
10 compliances, respond to any other reliability data submittal requests by the IESO, and  
11 participate in compliance spot checks and audits.