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Frank D'Andrea
Vice President, Reliability Standards and Chief Regulatory Officer

BY RESS AND EMAIL

January 14, 2022

Nancy Marconi
Acting Registrar
Ontario Energy Board
Suite 2700, 2300 Yonge Street
P.O. Box 2319
Toronto, ON M4P 1E4

Dear Ms. Marconi,

EB-2021-0307 – Reliability and Power Quality Review (RPQR) – Scope of Consultation

On November 30, 2021, the Ontario Energy Board ("OEB") issued a letter to launch a comprehensive review of reliability and power quality in the Ontario electricity sector, in alignment with the OEB's Strategic Plan. The letter also indicated that the OEB is seeking input from stakeholders, on the issues that should be addressed as part of this consultation, the approach that should be taken to address those issues, and the questions outlined in Appendix A. Hydro One is pleased to provide our input to the OEB in the attached submission on this important topic.

Hydro One has been proudly serving its customers reliable, safe, and cost-effective electricity for over 100 years. We work proactively with our customers to assess power quality needs and suggest mitigation measures. As the owner of more than 98% of Ontario's transmission system capacity and one-third of Ontario's distribution system, Hydro One is well-positioned to provide a unique and important perspective to the OEB on this proceeding.

As noted in the OEB's Strategic Plan, there are a diversity of customer needs in Ontario and as the costs of incremental improvements in reliability and/or power quality can be significant pursuing these improvements may be cost-effective for only a small subset of customers. Hydro One recommends that the OEB take a flexible approach in its regulatory framework to ensure that reliability performance and affordability can be balanced with the affordability of the sector.

Hydro One looks forward to participating in this important proceeding. Please do not hesitate to contact me directly or Mr. Stephen Vetsis at Stephen.Vetsis@hydroone.com if you have any questions.

Sincerely,

Frank D'Andrea

Frank D'Andrea

OEB'S RELIABILITY AND POWER QUALITY REVIEW (RPQR)

HYDRO ONE'S COMMENTS ON THE RPQR SCOPE AND RESPONSES TO OEB STAFF'S QUESTIONS

On November 30, 2021, the OEB issued a letter launching a comprehensive review of the effectiveness of the reliability performance framework and reporting requirements in the electricity sector. Hydro One agrees that a review of reliability and power quality in the Ontario electricity sector is important and timely, given the changes in the sector since the current framework was developed in the 2000s. The RPQR will provide stakeholders with the opportunity to gain a better understanding of the issues and the important work that is already undertaken by transmitters and distributors to ensure the reliability of the electricity system. In addition, the RPQR can work hand in hand with other ongoing OEB initiatives that are aimed at providing customers with access to a full range of solutions, including DERs or battery storage systems, to address their unique reliability needs.

Hydro One notes that reliability and power quality performance are two different and distinct aspects of electricity supply. Measures aimed at enhancing reliability can have the opposite impact for certain aspects of customer power quality, and vice-versa. Further, power quality covers a broader range of issues and has different meanings for utilities (e.g. voltage sags or swells, harmonics, etc.) which require a different set of considerations than reliability. As a result the OEB should consider discussing reliability and power quality separately under this initiative.

This submission provides Hydro One's comments on the policy context as well as general comments on scope, prioritization and approach for this consultation. Hydro One has also responded to the OEB Staff's questions provided in Appendix A of the November 30th letter to help guide the scope of the RPQR and provide a more detailed understanding of current practices. Below are Hydro One's key recommendations:

- Due to the technical nature of both reliability and power quality, Hydro One recommends that the first priority should be for the OEB and stakeholders to gain a more detailed understanding of utility reliability and power quality practices. This foundation will enable the accurate identification of issues and potential solutions and ensure the regulatory framework considers the nuances of operating the distribution system. As noted above, Hydro One also recommends that the OEB establish an RPQR Working Group of technical experts to ensure that the OEB has access to the right resources.

- In considering the establishment of benchmarking reliability and power quality performance, Hydro One strongly recommends that the OEB consider the impact various factors have on reliability and power quality performance, including how the unique aspects of the various utility service territories (e.g. urban vs rural, grid configuration, customer density, customer type, feeder length, etc.) impact performance. Without considering these factors, benchmarking utility results would create additional utility burden (in the form of additional reporting requirements) without providing commensurate value to the OEB, utility and other stakeholders.

- Lastly, given the variability in utility service territories and utility practices, Hydro One strongly recommends that the OEB consider the development of any 'consequences' for poor reliability or power quality performance last, as these can only be appropriately designed to achieve the OEB's objectives once consistency of measurement and reporting has been established.

Policy Context

As noted in the OEB's November 30th letter, this initiative is being undertaken in accordance with the OEB's Strategic Plan, which outlines the OEBs vision for an "energy sector that improves the quality of life by regulating utility provision of energy in a manner that is safe, reliable and affordable." While perfect, uninterrupted electricity supply cannot be achieved by any transmitter or distributor due to the physical attributes of electricity systems and dynamic interactions between customer behavior and the system, a higher degree of reliability can be realized through upgrades to the transmission and distribution systems at an incremental and often substantial cost. Hydro One recommends that the OEB and the sector consider the balance between improving reliability and affordability.

The OEB's Strategic Plan also notes that "Ontario's energy consumers are not homogenous … customers have different needs and interests with respect to energy service … because of the diversity of consumer needs and interest, flexible regulatory solutions will be required." Hydro One agrees with these statements and notes that there are also a diversity of LDC service territories that impact reliability performance which will need to be considered (e.g. northern, rural utilities will likely have longer response times to outages due to the geographic conditions of their territory compared to a utility in a dense urban area). Further, as power quality is a joint responsibility between utilities and customers due to the dynamic interaction of customer load and the electricity system, flexibility will enable utilities and customers to work together to identify the optimal solutions to meet customer needs.

Hydro One agrees that it is desirable to achieve consistency in reliability performance and reporting across the province, as long as it is based on a system that recognizes the variety of geographical characteristics in Ontario. Due to the diversity in consumer needs and LDC specific conditions, as well as the often high costs associated with improving reliability, Hydro One suggests that rather than developing province-wide standards through the RPQR, the OEB instead explores enabling all utilities to offer reliability enhancements to

their customers based on their individual needs. This approach would allow utilities to partner with their customers to provide higher reliability where required to meet their needs, while ensuring that other customers are not required to pay for reliability improvements that they do not need.

General Comments

The OEB's letter identifies the issues to be addressed in the consultation as: creating greater accountability for reliability performance to customers through enhanced reporting; benchmarking utility performance through consistency in utility reporting to help identify potential utility incentives and improving assessment of distributor capital plans; and implementing customer-specific reliability measures. Hydro One looks forward to working with the OEB to develop the details of these high-level goals so that the resulting framework is fit for purpose and achieves the OEB's goals.

Hydro One understands and appreciates that the reliability of electricity supply is more critical than ever before. As noted above, this is especially true for customers with sensitive equipment (e.g. pulp and paper mills, data centers, etc.). Addressing reliability through generic distribution system investments can be costly especially if the investments are not targeted to specific customers with greater reliability needs, as incremental reliability improvements frequently have a diminishing return on capital. In some instances, reliability and power quality concerns can be more cost-effectively addressed on the customer side through targeted solutions.

Hydro One recommends that as the RPQR explores reliability performance metrics, all options for improving reliability are studied/reviewed to ensure the most cost-effective solutions are identified. For example, the OEB should consider developing both utility and customer reliability and power quality guidelines / guiding principles. For customer guidelines, the OEB could leverage established voluntary industry standards that help

customer design their behind the meter systems to withstand momentary outages and voltage sags. Examples of voluntary industry standards include:

- Information Technology Industry Council (ITIC), the successor organization to the Computer Business Equipment Manufacturers Association (CBEMA), developed a revised voltage tolerance curve (ITIC curve) for single-phase data processing equipment operating at 120 volts.

- The Semiconductor Equipment and Materials International (SEMI) organization published SEMI F-42-0699 "Test Method for Voltage Sag Susceptibility of Semiconductor Processing Equipment" and a companion document SEMI F-47 "Specification for Semiconductor Processing Equipment Voltage Sag Immunity".

- IEEE Std. 1668-2017: IEEE Recommended Practice for Voltage Sag and Short Interruption Ride-Through Testing for End-Use Electrical Equipment Rated Less than 1000 V.

With regards to sequencing and prioritization, Hydro One recommends that the OEB and sector first work to establish a common understanding of the issues and current practices, which can then inform the development of a consistent means of measurement and benchmarking of reliability and power quality. Consideration of incentives for utilities to improve performance should be considered last as these can only be appropriately designed to achieve the OEB's objectives once consistency of measurement and reporting of reliability performance in the sector has been established. The OEB will also need to consider the link between any incentives and the utility's degree of control over the reliability or power quality performance that is being incented. As noted later in this submission, reliability and power quality metrics can be impacted by external factors (e.g., a vehicle accident that damages or destroys a distribution pole, changes to behind the meter

technologies that abruptly changes power flows, etc.), which are outside of the utility's control.

The OEB also asked for input on the approach to developing solutions to the issues identified. As reliability and power quality concerns are technical, Hydro One suggests that the OEB leverage working groups of technical experts. These working groups should include representation from a transmitter, LDCs, and small and large customer representatives to ensure that issues are accurately identified and the framework that is developed is fit for purpose to achieve the OEB's objectives.

While the reliability of the transmission system affects the distribution system, the considerations, design, and impact of reliability investments are significantly different and cannot be compared on a one-to-one basis. Therefor, Hydro One recommends that reliability issues and associated reporting be discussed and undertaken separately for Transmission and Distribution. Any contemplated changes to Transmission reliability performance reporting requirements or methodology should be consistent with current applicable reliability standards (e.g. NERC/NPCC).

Responses to OEB Questions

In the November 30, 2021 letter, OEB staff had outlined a series of questions under four subheadings in Appendix A. The OEB indicated that these questions should be used to guide input on the scope and approach of the consultation. Hydro One has provided comments on each to help inform the scope as well as preliminary responses to provide OEB staff and stakeholders with a more detailed understanding of current practices and potential issues.

Utility Accountability

- *OEB staff's assessment of distributors' reported data suggests that there may be a significant gap in reporting between transmitters, host distributors and embedded distributors in terms of delivery point/loss of supply outages. Outages reported under loss of supply and major events account for more than 50% of the total number of outages in the province. What type of improvements to transmission and/or distribution reporting and/or performance expectations should be considered to increase utilities' responsibilities for loss of supply events? What are stakeholders' views on the appropriate form of incentives to drive reliability performance?*

Hydro One is supportive of the RPQR working to establish a common understanding of the reporting practices of transmitters, host distributors and embedded distributors to identify what gaps exist in how loss of supply and major events are reported, including how scheduled upstream maintenance is reported and considered. This understanding will be very important to ensure that the RPQR is able to accurately articulate the issues to be addressed and develop effective solutions.

In addition, it will be important to identify and understand the cost implications of any increase in utility responsibility for loss of supply events. For instance, due to lesser redundancy, most Loss of Supply events occur on single-circuit supply as opposed to multi-circuit supply. The costs of installing a secondary or backup supply are extremely high and if a customer requested such an installation it would likely require significant customer capital contributions, as per the Transmission System Code (TSC). In Hydro One's experience, most customers have opted for single circuit supply rather than opting for solutions that would require customer capital contribution.

In terms of incentives, as noted above, the RPQR will need to consider the diversity of both customer needs and utility service territory conditions in the consideration of how to appropriately incent reliability while maintaining affordable rates for customers. Hydro One recommends that the RPQR consider practices in other jurisdictions to identify if there are lessons learned from reliability incentive structures that could apply to Ontario.

- *OEB staff's assessment of reported Major Events suggests that distributors have very different interpretations of what constitutes a "Major Event", which affects overall reliability performance scores. Should the OEB revise its Major Event reporting requirements to achieve a common understanding among distributors regarding the type of outages and events that should be reported under the Major Event category? Should the OEB review the effectiveness of outage restorations?*

As part of the RPQR, Hydro One suggests that the OEB develop a baseline of current LDC reporting practices for Major Events, potentially through a survey. Once the baseline has been established, the RPQR will more effectively be able to consider the gaps and if greater consistency is required. Major Events are generally considered 'one-off' events and are often excluded from reliability indices, as their inclusion would distort the indices and reduce year over year comparability. Currently, the OEB has different acceptable criteria in their current reliability framework so LDCs can use the most appropriate criteria for their service territory, including 2.5 Beta (from IEEE 1366), 2.5 Beta modified (ex: two-day rolling), and fixed percentage.

Hydro One notes that grid outage restoration fundamental authorities and obligations are established by the North American Electric Reliability Corporation (NERC) through their Emergency Operations Planning (EOP) standards and executed in coordination with the IESO Market Rules. These incorporate system reliability and safety principles established throughout the industry and while they are focused on transmission there are rules for distribution providers in certain instances. As outage restoration is done by LDC employees

and involves the safety of both employees and the public, Hydro One recommends that the OEB first work with the sector to gain a deep understanding of the current rules and practices. Based on this understanding, the OEB and sector can then identify if a further review is required through the RPQR. If a full review is not required, Hydro One suggests that the OEB could gather and publish best practices and lessons learned with regards to outage restoration, similar to the practices of NERC and Northeast Power Coordinating Council (NPCC) for transmission systems.

- *OEB staff's assessment of historical outage data has also suggested that there are inconsistent approaches between distributors in terms of reporting outages (e.g., different interpretations between "Adverse Weather" and "Tree Contacts" defined in RRR). What is the best approach to ensure consistent outage cause reporting across the sector?*

As noted above, Hydro One recommends that the OEB work with the industry to develop a common understanding of current practices and how these have developed. This will better equip the OEB and stakeholders to understand the issues and provide advice on improving consistency in reporting.

Monitor Utility Performance

- *The current performance evaluation (i.e., service area level SAIFI & SAIDI) does not support benchmarking across the industry due to the different characteristics of each utility (such as size and locations). What would be required to ensure successful distributor reliability benchmarking across the sector?*

As noted in the question, the reliability of supply to customers depends on many factors including service. Benchmarking reliability performance across different LDCs will only be meaningful and practical if they appropriately consider the drivers of differences in utility circumstances when making comparisons using factors.

Factors that will need to be considered include but are not limited to the following:

- Characteristics of service territory;
- Length of feeders and # of customers and load size and density;
- Location (e.g. rural versus urban);
- Meshed or network or radial configuration;
- Pre-existing outage conditions or maintenance conditions; and
- Customer sensitivity to momentary interruptions.

Due to these differences, Hydro One recommends that the RPQR develop a comprehensive list of factors that would be required to enable an 'apples to apples' comparison between like utilities. This could result in establishing groups of 'similar' LDCs to benchmark within. If groups of similar LDCs cannot be established, the RPQR could explore benchmarking LDC's against their historical performance to ensure that external variables (e.g. differences in length of feeders between LDCs) would not interfere with the comparability of benchmarking results.

- *Power quality and momentary outages can have a significant impact on customers. The OEB has seen an increase in customer concerns regarding these issues. Should the OEB establish reporting requirements to monitor utility performance in relation to momentary outages and power quality issues? What type of power quality issues should be and can be reported and monitored?*

The impacts of momentary outages and power quality, as described below, vary based on the sensitivity of customer equipment. In addition, momentary outages and power quality issues can be caused by factors external to the LDC, including the connection of electrical consumer products behind the meter. Due to the dynamic interaction between customer loads and the distribution system it can be hard to effectively track momentary outages without deploying sophisticated tracking equipment across their systems. As a result, Hydro One recommends that the OEB work with utilities and affected customers to understand the current practices and identify any gaps or issues. Following this work, the

RPQR could explore the applicability of existing industry standards used in other jurisdictions to address the customer concerns.

Further, Hydro One encourages the OEB to define power quality, as this is a general term that is often used to describe different things by customers. In defining power quality for the RPQR, Hydro One encourages the OEB to focus on the aspects of power quality that lend themselves to being managed without conflicting with the goal of enhancing reliability. These aspects include steady-state voltage levels, voltage unbalance and voltage harmonics and do not include performance aspects related to momentary disturbances, including voltage sags or swells.

Below is a brief discussion of the causes of momentary outages and the solutions deployed in other jurisdictions. The intention in providing this information is to help inform the scope of work for the RPQR.

Momentary outages and associated voltage sags are an inherent function of the design and operation of the electricity systems. They occur due to faults that cause a reclosing action on the system. The reloser reduces outage duration to as short a period as possible while maintaining the safety of the system. Momentary outages help to reduce the instances of sustained outages by protecting system equipment.

In recent years, customer equipment and processes have become extremely sensitive to voltage sags due to their increased reliance on electronics and microprocessor controls in industrial processes. The impact of momentary outages on customers can vary considerably between facilities, including among particular industries, depending on the equipment and processes involved and the attention that has been paid to their level of tolerance to such disturbances. Residential customers, for example, are generally not significantly impacted by momentary outages or voltage sags.

Given the diverse range of process sensitivities and the associated economic impacts for the process involved, it tends to be most cost-effective and practical to implement corrective measures close to the equipment or process that are experiencing disruptions. The level of intervention is calibrated by the customer needs and cost that can be justified by the customer's risk tolerance. Voltage sag tolerance for commercially available process controls and equipment can also be managed through industry standards. While industry standards have not been common historically, in recent years, various trade groups and international standards organizations have developed such voluntary standards to address customer needs.

For example, the international IEC standards listed below have been developed and adopted by vendors in most countries including Europe, Mexico and China, but have not yet been adopted in Canada. In Europe, studies have confirmed that voltage emissions into distribution systems have been significantly reduced after the adoption of these standards. The IEC is further developing standards for utility supply quality and this work is expected to be completed in 2023. Examples[1] of standards include:

- IEC 61000-3-2 Limits for harmonic current emissions (equipment input current less than or equal to 16A/phase);

- IEC 61000-3-12 Limits for harmonic current emissions produced by equipment connected to public low voltage system with input current>16A and less than or equal to 75A/phase).

[1] Additional IEC standards can be found on Hydro One's website, here.

Customer Specific Reliability

- *Given customers' expectations are changing because of an increasing reliance on a reliable system, should the OEB develop customer-focused reliability measures that can provide greater transparency on the level of service individual customers are receiving? Along with creating customer-focused reliability standards, should the OEB consider consequences when reliability performance expectations are not met? (e.g., customer compensation when reliability falls below acceptable level)?*

Customer-specific reliability is a joint undertaking by the customer and LDC, and is impacted by the customer reliability needs, other customers on the line, as well as the unique operating conditions of each LDC (e.g. length of line, customer density, etc.). As a result, Hydro One recommends that the OEB, consider all the levers that could be used to ensure transparency on the level of service customers are receiving.

For example, LDC Conditions of Service provide transparency on the LDC's standard operating conditions. Customers are also able to request additional connections or make investments to meet their needs at their own cost. Options to customize a customer's connection could potentially include offering connecting to a multi-circuit (rather than single-circuit) supply, installing a second supply circuit, or deploying a backup supply.

Hydro One does leverage additional customer-specific reliability metrics, including Customers Experiencing Multiple Interruptions (CEMI), and Customers Experiencing Long Interruption Durations (CELID), in our planning to identify investments. While Hydro One aims to ensure a high degree of reliability of supply, it is not possible to guarantee the level of reliability of supply due to the dynamic nature of the electricity system. Hydro One recommends that the OEB work closely with LDCs to understand the current practices to ensure that a reliability framework both meets customer needs and balances LDC operating, economic and reliability constraints.

Due to the degree of variability and the degree to which factors impacting reliability are outside of the LDC's control, Hydro One suggests that implementing a customer compensation approach when reliability standards are not met may not provide the right incentives for the industry. If this approach were to be taken, the utility incentive created could be to propose significant capital investments to improve reliability performance to a degree that most customers do not require, driving up rates for all customers.

A province-wide customer compensation approach may also disproportionally impact rural utilities that maintain long single radial distribution lines which can be more significantly impacted by weather-related incidents. Hydro One recommends that the OEB work with customers and utilities to understand what, if any, gaps in service currently exist and identify any gaps in the tools currently available to customers and utilities to address these concerns. On this basis, the RPQR could develop recommendations to the OEB on what changes may be required and whether or not incentives need to be realigned.

Utility Planning

- *How should reliability data be enhanced to support effective utility planning and rate setting? Are there any established methodologies to quantify the value, from a reliability perspective, added by transmission and/or distribution investments?*

Hydro One understands and appreciates that the reliability of electricity supply is more critical than ever before and encourages the OEB to gather information on current utility practices for quantifying the value of reliability in transmission and distribution investments. Capital expenditures must balance the needs of all customers for a safe, secure, and reliable supply of electricity with prudent and reasonable costs.

Hydro One uses a risk-based approach to planning to make sound transmission and distribution system investments, including a risk factor regarding reliability impact. This approach evaluates the mitigated risk from each investment to help prioritizes investments.