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## **BY E-MAIL AND WEB POSTING**

November 23, 2011

**To:** All Licensed Electricity Distributors  
All participants in Consultation EB-2010-0249  
All Other Interested Parties

**Re: Phase 2 – Initiative to Develop Electricity Distribution System Reliability Standards**

**Board File No.: EB-2010-0249**

### **1. Introduction**

On March 31, 2011, Ontario Energy Board (the “Board”) issued a letter to electricity distributors and other stakeholders confirming the Board’s commitment to the codification of distribution system reliability measures and performance targets. However, the Board also concluded that further consultations are warranted as a next step towards this goal. The Board stated that these consultations should focus on:

- resolving issues relating to the quality and consistency of reliability data gathered and reported by distributors; and
- understanding and resolving the implementation issues associated with monitoring and reporting requirements relating to the normalization of data, causes of outages, customer specific reliability measures, and a “worst performing circuit” measure.

Board staff is now moving forward with the consultations outlined by the Board, as Phase 2 of the reliability standards project.

The purpose of this stage of the project will be to facilitate the consistency of the reliability data used by distributors across the province. Some of this data relates to measures that are currently reported to the Board (like SAIDI, SAIFI and CAIDI), while other data relates to measures used by some distributors for internal purposes (like worst performing circuits). The ultimate objective of this stage will be to ensure there is a common understanding regarding how reliability measures should be monitored and reported.

While many of the issues identified for consultation have been discussed informally during the first phase of this initiative, stakeholders have not had the opportunity to provide their full views on these matters. Therefore, Board staff would like to offer distributors and other interested parties the opportunity to provide their comments and any other relevant background information on the topics under consideration.

Attachment A sets out background details on each specific topic and then offers a list of questions for interested parties to comment on. The topics covered in this letter are:

- Collecting and Reporting Reliability Data in the Board's RRR
  - Updating the current wording of the SAIDI, SAIFI, CAIDI definitions.
  - Improved monitoring and reporting processes.
- Normalizing reliability data for major events.
- Reporting of reliability data for outages caused by distributor-controlled factors.
- Standardizing certain customer-specific measures.
- Standardizing a Worst Performing Circuit measure.

Staff also wishes to invite a small group of distributors and other interested parties to form a Reliability Data Working Group.

To view all the material compiled as part of this initiative to date, please visit the following web page.

<http://www.oeb.gov.on.ca/OEB/Industry/Regulatory+Proceedings/Policy+Initiatives+and+Consultations/System+Reliability+Standards>

## 2. Invitation to Join the Reliability Data Working Group

Board staff believes that the assistance of a group of 8 – 10 distributors and other interested parties who will meet and discuss issues related to the topics in this paper will help improve staff's understanding of these matters. The Working Group members will consider the feedback provided in response to this letter, along with their own practical experience, in an effort to address the technical aspects of improving the quality of the reliability data being utilized by distributors.

It is expected that Working Group participation will involve a number of half day meetings starting in January 2012 through the spring of 2012. Those distributors and other interested parties who wish to be part of this Working Group are invited to identify their desire to participate when providing written responses to this letter.

If more than 8 – 10 parties express interest in participating in the Working Group, Board staff will choose the final membership with regard to establishing a group that is fairly representative of a cross section of Ontario distributors and any other interested parties.

## 3. Instructions for Providing Written Responses

Those interested in providing written responses to the questions set out in this letter (and/or joining the Working Group) should do so by via e-mail to [paul.gasparatto@ontarioenergyboard.ca](mailto:paul.gasparatto@ontarioenergyboard.ca) by **December 20, 2011**.

Written responses should quote file number **EB-2010-0249** and include your name, address, telephone number and e-mail address.

Board staff requests that parties providing written comments make every effort to provide electronic copies of their submission in searchable/unrestricted Adobe Acrobat (PDF) format.

There will be no cost awards given for responding to the questions in this letter. Cost awards for participating in the Working Group will be considered once the membership of the group is determined.

All materials related to this consultation will be available for public viewing on the Board's web site at [www.ontarioenergyboard.ca](http://www.ontarioenergyboard.ca).

If you have any questions regarding this letter or the formation of the Working Group, please contact Paul Gasparatto at [paul.gasparatto@ontarioenergyboard.ca](mailto:paul.gasparatto@ontarioenergyboard.ca) or at 416-440-7724. The Board's toll free number is 1-888-632-6273.

**DATED** at Toronto, November 23, 2011

Yours Truly,

Original signed by

Peter Fraser  
Managing Director  
Regulatory Policy

Attachment A: Topics and Questions  
Attachment B: Reliability Reporting Requirements  
Attachment C: Interruption Cause Codes

## ATTACHMENT A

### Topics and Questions

#### Collecting and Reporting Reliability Data in the RRR

After reviewing the reliability data that is being reported as part of the Board's Electricity Reporting and Record Keeping Requirements ("RRRs"), and after discussions with distributors during the first phase of this initiative, staff has formed the opinion that, at the present time, there are inconsistencies in the manner in which distributors interpret the existing reliability indicators and in the way in which they calculate performance results.

The data may be reported consistently from year to year by the same distributor, but there are differences in interpretation of each reliability measure from distributor to distributor. It has been suggested by distributors that the quality of the data being collected and reported could be improved if explicit definitions and example calculations were provided to distributors for various situations.

Considerable work has recently already been done through other staff initiatives to improve the quality of much of the data that is being reported under the RRRs. Staff believes that similar efforts should be undertaken with respect to system reliability data.

One of the objectives of this consultation and the associated Working Group is to address any changes or improvements needed to be made to the definitions used by the Board for reliability measures (SAIDI, SAIFI, CAIDI & MAIFI). There is also some question as to whether all distributors have adequate practices and protocols in place to ensure that reliability data is being collected and recorded properly.

It is expected that the Working Group can bring practical experience regarding how a distributor would actually engage in collecting the data, which will help ensure that the definitions are crafted in a manner that matches the way that the data is available. It is also hoped that involving the distributor staff who are

actually be implementing the reporting requirements will lead to wording that is easily and consistently understood by all parties, thereby improving the quality of the data being reported.

- Current Board Definitions

Section 2.1.4.2 of the RRRs sets out the Board's definitions and filing requirements for the System Average Interruption Duration Index ("SAIDI"), System Average Interruption Frequency Index ("SAIFI"), Customer Average Interruption Duration Index ("CAIDI"), and Momentary Average Interruption Frequency Index ("MAIFI"). (Please see Attachment B for full definitions from the RRRs.)

The definitions that are included in the RRRs are based on the feedback received from working groups involved in the Board's 2003/2004 service quality consultation. Although it was intended that the introduction of these definitions would be an opportunity to improve the common understanding of the definitions, staff is aware these efforts have not been entirely successful. For example, although the definition for the "total number of customers serviced" was meant to clarify that the total number of customers was equal to the total number of customer accounts a distributor has, staff is aware that some distributors continue to calculate the total number of customers based on connections or installed meters rather than accounts. The use of the term "sustained interruptions for all customers" vs the previously used "total customer-interruptions" is another example where the Board's definition appears to be causing confusion. Staff has also received questions on issues like whether partial power events or scheduled interruptions should be considered an outage for the purpose of calculating statistics. There may also be inconsistencies caused by differences in judgment among distributors when determining the duration of the outage and the number of customer's affected.

As a result, staff believes there needs to be further efforts to establish definitions that are consistently understood by distributors.

- Questions on Improving Current Definitions

1. Are the reliability definitions currently set out in the RRR's sufficient?

2. If not, what revisions would be recommended?
  3. What is the most effective way to define an interruption?
  4. What is the most effective way to define the start time of an interruption?
  5. What is the most effective way to define the end time of an interruption?
  6. What is the most effective way to define a “customer”?
  7. What is the most effective way to define the “total number of customers served”?
  8. Are there any other factors of an outage that should be defined?
  9. It has been suggested that the Board provide example calculations for various situations. Which types of situations would benefit from having examples provided?
- Monitoring Practices

Comments from distributors submitted in phase one of this initiative indicated that they use a variety of approaches for measuring SAIDI, SAIFI and CAIDI. These responses revealed that the tracking of outage information and system reliability performance is done chiefly through manual processes although there is some use of a combination of manual and automated methods.

One quarter of the responding distributors in phase one indicated that they did not have or use a SCADA system. A number of the responding distributors who indicated they do have a SCADA system also indicated that this system only tracks certain outages, such as those involving auto-reclosures or high voltage feeders. Most distributors reported that they rely on their Customer Information System or their Geographic Information System to determine the number of customers that have been affected by an outage.

Just as staff believes that improving the definitions of the reliability standards will improve the quality of reported data, staff also believes the quality of data will be improved if distributors can utilize the most effective and efficient practices and procedures for monitoring outages.

Staff believes it is worth considering whether the Board should develop a guide of best practices that distributors could follow when monitoring and reporting reliability data. For example, should all distributors track the restoration of service to individual customers, or is tracking the restoration of service to a feeder (and then extrapolating data based on the records of the number of customers on that feeder) sufficient? Another example would be whether distributors should be expected to install automated monitoring equipment, rather than rely solely on manual record keeping?

One of the goals of the Working Group will be to consider whether a guideline of best practices is needed, and/or even possible to compile. If so, what information could then be included in this guideline?

Distributors or interested parties are invited to provide any comments or concerns, regarding the creation of a guideline of best practices for monitoring and reporting outages, as part of their response to the other questions in this letter.

### Normalizing Reported Data

One of the common practices used when monitoring and tracking reliability performance is to adjust a distributor's performance to remove the impact of "major events". Major events are those events that occur rarely but have a significant impact on the operation of a distribution system, like ice or wind storms. By normalizing the reliability data to remove the impact of major events, distributors and regulators are better able to determine year to year comparisons of reliability performance.

Staff is aware that a few distributors in Ontario have a practice of reviewing their system reliability performance data after it has been adjusted to remove the impact of major events. However, this practice is not wide spread and the approaches used to adjust the data are not necessarily consistent across distributors. As well, there has been no requirement that adjusted data be reported to the Board, so any analysis of the impact of major events on reliability performance has only been available for use by distributors for their own internal purposes.

In order for a reliability standards regime to be most effective, staff believes that it is important that performance be adjusted to reflect the impact of major events. Also, that the approach used to normalize data is consistent among distributors. During the first phase of this initiative, distributors and stakeholders were also supportive of the introduction of a normalization approach. The outstanding question was which approach should be used.

There are different approaches for normalizing data used through out the world. Some jurisdictions use a generic approach and consider major events to be simply any storm or weather events that are more destructive then normal. Other jurisdictions rely on a third party like a national weather service, or independent system operator to determine when a major or catastrophic event has occurred.

However, the two most common approaches used in Ontario are:

- Events that affect a certain percentage of the customer base (e.g. 10% of customers affected); or
- The IEEE standard 1366

Many participants in the first phase of this initiative suggested that using IEEE Standard 1366 would be the appropriate approach for normalizing data. However, other participants have suggested that the IEEE Standard is flawed, and would prefer to use the “customers affected” approach.

Some distributors have also suggested that if the Board were to rely on reliability statistics that consider the cause of the outage, the normalization of statistics would become unnecessary.

Which ever approach is adopted, staff suggests that all distributors should measure and report their SAIFI, SAIDI and CAIDI performance both inclusive and exclusive of the impact of major events, as well as report the cause(s) of major event days. A review of this information would be important for assessing and comparing a distributor’s reliability performance year to year.

- Questions on Normalizing Reported Data
  1. Besides the two common normalization approaches mentioned (the % of customers or the IEEE standard), are there other methodologies that should be considered?
  2. Which normalization methodology would be the most efficient and effective?
  3. What are the perceived drawbacks and/or benefits of implementing the IEEE standard 1366 as a normalization approach?
  4. What are the perceived drawbacks and/or benefits of implementing a normalizing approach using the percentage of customer's affected as the trigger?
  5. If the "customer's affected" approach is adopted, what percentage of total customers should be used as the trigger?
  6. How great of an administrative burden, or increased costs, would distributors face if required to normalize reliability data to account for major events and then report that data to the Board? What would those burdens or costs be?
  7. What, if any, other barriers exist to implementing either the IEEE approach or the customer's affected approach? How could those barriers be addressed?

### Cause of Outages

A number of participants have suggested that the Board make greater use of information about the cause of outages. (Please see Attachment C for full description of the "cause codes" included in section 2.3.12 of the RRRs.) Stakeholders have suggested that the cause of an outage is an important feature of an outage. Also, that outages caused by factors within the control of a

distributor are deserving of greater attention from the Board in the context of its regulation of that distributor. Therefore, stakeholders have suggested that an outage should be measured and reported not only so as to understand its duration and the number of customers affected but also to understand its origin (e.g. controllable, non-controllable, loss of supply, planned).

Under section 2.3.12 of the RRRs, distributors are currently required to keep records of, but not report to the Board, interruptions by "cause code". The Board has recently begun requiring distributors to report SAIDI, SAIFI and CAIDI inclusive and exclusive of Cause Code 2 – Loss of Supply. The rationale behind this decision is that the loss of supply is an event that is outside of the distributor's control, as such any assessment of reliability performance should not include those outages.

Building upon this approach, staff suggests that the Board could consider requiring distributors to report their reliability statistics based solely on outages that are caused by factors that are within the control of the distributor. The most relevant causes appear to be:

- Code 1 – Scheduled Outages,
- Code 5 – Defective Equipment, and
- Code 8 – Human Element

Consideration could also be given to including Code 3 – Tree Contacts, since the number of outages caused by tree contact is likely impacted by a distributor's vegetation management program.

Gathering this type of data would provide greater transparency as to the origin of interruptions. As well, the data may help develop a more accurate picture of where distributor system planning and investment could be utilized most effectively.

One issue that staff is aware of that could impact the success of this reporting approach is the accuracy of the data being recorded. Having reviewed past audits of cause code record keeping, staff is aware that there are concerns regarding the proper categorization of the cause of the outage.

For example, staff has seen incidents where a cause that would correctly fall under Code 9 – Foreign Interference (i.e. caused by a customer vehicle hitting equipment) was listed as Code 8 – Human Element (i.e. caused by distributor staff). In another case, the cause was listed as Code 5 – Defective Equipment (i.e. caused by a failed transformer) was actually caused by animal contact, which would correctly fall under Code 9 – Foreign Interference.

Clearly, such instances of miss-classification diminish the credibility of caused-based reporting and could risk creating a focus on the wrong indicators. In order for a reporting system based on the cause of an outage to be effective, some improvement to distributor procedures are likely needed to ensure consistent and accurate reporting.

- Questions on Cause of Outages Reporting

1. Which Cause Codes should be selected as those which are within the control of the distributor?
2. Which would be the best reporting approach to use:
  - Reporting total SAIDI, SAIFI and CAIDI results based solely on all the relevant Cause Codes?
  - Reporting SAIDI, SAIFI and CAIDI results based on each separate relevant Cause Code?
  - Reporting the number of outages (normalized to X number of customers) by each relevant Cause Code?
  - Another option that could be considered?
3. What improvements to distributor practices or procedures, could be implemented to ensure the cause is being categorized accurately?
4. Are the current definitions of the Cause Codes sufficient or are there any suggestions on how to update the definitions so as to improve understanding?

5. How great of an administrative burden, or increased costs, would distributors face if required to report data on the causes of outages to the Board? What would those burdens or costs be?
6. What, if any, other barriers exist to requiring distributors report data on outages caused by factors within the control of the distributor? How could these barriers be addressed?

### Customer Specific Reliability Measures

Ontario's reliability regime currently measures *system* reliability, in other words the metrics being monitored only indicate the average number of times, an average customer experiences an outage, and the average length of time that an average customer goes without power. These current reliability measures do not show the extent to which specific customers may experience significantly below average reliability performance.

In phase one of this initiative both ratepayers and distributor groups suggested that in the future, there should be a move towards indicators and standards that are focused on the impact of outages on individual customers rather than system wide impacts.

Currently there are some distributors in the province who monitor such measures as "Customers Experiencing Multiple Interruptions", "Customers Experiencing Long Duration Interruptions", "Customer Interruptions per KM", and "Customer Hours of Interruptions per KM".

Staff sees merit in promoting the increased use by distributors of reliability measures that focus on the frequency and duration of outages experienced by individual customers. Such information may be more valuable than outage statistics based on the performance to the average customer across the entire distribution system. Measures of this kind could also be an important element of a robust reliability standards regime, and could be expected to improve the experience of customers who experience poor reliability.

As a first step towards the future consideration of Board mandated reporting on customer specific measures, staff believes it would be valuable to establish

standardized definitions of those most effective measures, which can be used by any distributor who monitors such measures.

- Questions on Customer Specific Reliability Measures

1. Which, if any, customer specific reliability measures are distributor's currently using?
2. Please provide the complete definitions of any customer specific reliability measure currently being used.
3. Of the 4 customer specific measures mentioned (Customers Experiencing Multiple Interruptions, Customers Experiencing Long Duration Interruptions, Customer Interruptions per KM, and "Customer Hours of Interruptions per KM.) which one (or combination of more than one) would be the most efficient and effective for all distributors to monitor?
4. How great of an administrative burden, or increased costs, would distributors face if required to monitor measures which are directed at tracking the reliability experience of individual customers? What would those burdens or costs be?
5. What, if any, other barriers exist to requiring distributors to monitor measures which are directed at tracking the reliability experience of individual customers? How could these barriers be addressed?

#### Worst Performing Circuit Measure

Just as the system-wide reliability measures currently in use do not provide insight into the reliability performance experienced by individual customers, these measures also do not track the reliability performance of specific assets.

Therefore, although a distributor may have a reasonable system-wide performance, there may also be certain assets in a distributor's system which have chronic reliability issues that are not evident in system-wide reporting measures.

To help identify such underperforming assets, many jurisdictions have adopted a monitoring and reporting measure for Worst Performing Circuits. This measure is considered an efficient way to help focus a distributor's resources on those parts of the system that are delivering the lowest performance to customers.

During the first phase of this initiative, some ratepayer representatives supported the use of such a metric. However, some representatives of distributors cautioned that automated distribution systems can be reconfigured on a regular basis such that the concept of a fixed feeder, which performance can be usefully measured, is not appropriate.

Staff believes that the introduction of such a measure could be an important part of a robust reliability standards regime. Staff is aware that a number of distributors, including those that raised a concern over introducing such a new requirement, have reported that they currently do track their feeder performance through various methodologies.

The help promote the use of a worst performing circuit measure among distributors, staff's view is that it would be valuable to establish a standardized definition of such a measure for use by distributors who do monitor their worst performing circuits.

- Questions on Worst Performing Circuit Measure

1. Which would be the most effective way to define or designate a "worst" performing circuit:
  - Worst SAIDI?
  - Worst SAIFI?
  - A combination of both the worst SAIDI & SAIFI?
  - Feeders Experiencing Multiple (ex: 5 or more) Interruptions in a year?
  - Feeders Experiencing the Longest Interruptions?
  - Another option to consider?
2. Should the number of customers who are being provided service by a feeder have an impact on the designation of "worst" performing? (For example, using

customer-minutes of outage as a performance measure would result in feeders with the most customers naturally being highlighted more frequently than feeders with fewer customers, even though such a feeder may have poorer reliability.)

3. Should there be expected distributor response to the identification of a worst performing feeder?
4. If so, what type of expected response should be considered? (E.g. No feeder should be designated the “worst feeder” more than 2 years in a row.)
5. How great of an administrative burden, or increased costs, would distributors face if required to monitor their worst performing circuits? What would those burdens or costs be?
6. What, if any, other barriers exist to requiring distributors to monitor a Worst Performing Circuit measure? How could these barriers be addressed?

## ATTACHMENT B

### Reliability Reporting Requirements

#### 2.1.4.2 - Reporting on System Reliability Indicators

The following apply for the purposes of applying and reporting on the application of each of the three system reliability indicators set out below:

1. In calculating the duration of an interruption the start of the interruption shall be considered to have occurred on the earlier of:
  - a) The time at which the distributor received a communication from a customer reporting the interruption; or
  - b) The time at which the distributor otherwise determined that the interruption occurred.
2. The “total number of customers served” by a distributor is the average number of customers served in the distributor’s licensed service area during the month, calculated by adding the total number of customers (accounts) served at the beginning of the month and the total number of customers (accounts) served at the end of the month and dividing by two.

Bulk metered buildings with individual smart sub-metering installations shall be counted as a single customer, provided that the smart sub-metering system is not operated by the distributor and that such customers are not billed by the distributor. Unmetered scattered load customers should not be included in the customer count.
3. “Interruption” means the loss of electrical power, being a complete loss of voltage, to one or more customers, including interruptions scheduled by the distributor but excluding part power situations, outages scheduled by a customer, interruptions by order of emergency services, disconnections for non-payment or power quality issues such as sags, swells, impulses or harmonics.
4. “Momentary interruption” means an interruption of less than one minute.
5. “Sustained interruption” means an interruption of one minute or more.

#### 2.1.4.2.1 - *System Average Interruption Duration Index (SAIDI)*

SAIDI is an indicator of system reliability that expresses the length of interruptions that customers experience in a year on average. All planned and unplanned sustained interruptions should be used to calculate this index.

SAIDI is defined as the total customer-hours of sustained interruptions normalized per customer served and is expressed as follows:

$$\text{SAIDI} = \frac{\text{Total Customer-Hours of Sustained Interruptions}}{\text{Total Number of Customers Served}}$$

A distributor is required to monitor this index monthly and to report to the Board the following information for each month of the year:

- a) Total customer-hours of sustained interruptions in each month;
- b) Total number of customers served in each month; and
- c) SAIDI, being (a)/ (b).

#### 2.1.4.2.2 - *SAIDI (Code 2 Outages)*

This indicator adjusts SAIDI for the effects of outages caused by a loss of supply, and is calculated in the same way as described in section 2.1.4.2.1, except that the total customer-hours of sustained interruptions caused by a loss of supply is deducted from the total customer-hours of sustained interruptions.

A distributor is required to monitor this index monthly and to report to the Board the following information for each month of the year:

- a) Total customer-hours of sustained interruptions in each month;
- b) Total customer-hours of sustained interruptions in each month caused by a loss of supply;
- c) Total number of customers served in each month; and
- d) Adjusted SAIDI, being ((a) - (b))/(c).

#### 2.1.4.2.3 - *System Average Interruption Frequency Index (SAIFI)*

SAIFI is an indicator of the average number of sustained interruptions each customer experiences. All planned and unplanned sustained interruptions should be used to calculate this index.

SAIFI is defined as the number of sustained interruptions normalized per customer served, and is expressed as follows:

$$\text{SAIFI} = \frac{\text{Number of Sustained Interruptions for all Customers}}{\text{Total Number of Customers Served}}$$

A distributor is required to monitor this index monthly and to report to the Board the following information for each month of the year:

- a) Total number of sustained interruptions in each month;
- b) Total number of customers served in each month; and
- c) SAIFI, being (a)/ (b).

#### 2.1.4.2.4 - *SAIFI (Code 2 Outages)*

This indicator adjusts SAIFI for the effects of outages caused by a loss of supply, and is calculated in the same way as described in section 2.1.4.2.3, except that the total number of interruptions caused by a loss of supply is deducted from the total number of customer interruptions.

A distributor is required to monitor this index monthly and to report to the Board the following information for each month of the year:

- a) Total number of sustained interruptions in each month;
- b) Total number of sustained interruptions in each month caused by a loss of supply;
- c) Total number of customers served in each month; and
- d) Adjusted SAIFI, being ((a) - (b))/(c).

#### 2.1.4.2.5 - *Customer Average Interruption Duration Index (CAIDI)*

CAIDI is an indicator of the speed at which power is restored. All planned and unplanned sustained interruptions should be used to calculate this index.

CAIDI is defined as the number of sustained interruptions normalized per customer served, and is expressed as follows:

$$\text{CAIDI} = \frac{\text{Customer-hours of Sustained Interruptions for all Customers}}{\text{Number of Sustained Interruptions for all Customers}}$$

A distributor is required to monitor this index monthly and to report to the Board the following information for each month of the year:

- a) Total customer-hours of sustained interruptions in each month;
- b) Total number of sustained interruptions in each month; and
- c) CAIDI, being (a)/ (b).

#### 2.1.4.2.6 - *CAIDI (Code 2 Outages)*

This indicator adjusts CAIDI for the effects of outages caused by a loss of supply.

A distributor is required to monitor this index monthly and to report to the Board the following information for each month of the year:

- a) SAIDI (Code 2 Outages) as calculated in accordance with section 2.1.4.2.2;
- b) SAIFI (Code 2 Outages) as calculated in accordance with section 2.1.4.2.4; and
- c) Adjusted CAIDI, being (a)/ (b).

#### 2.1.4.2.7 - *Momentary Average Interruption Frequency Index (MAIFI)*

MAIFI is an indicator of the average number of momentary interruptions each customer experiences. All planned and unplanned momentary interruptions should be used to calculate this index.

MAIFI is defined as the number of momentary interruptions normalized per customer served, and is expressed as follows:

$$\text{MAIFI} = \frac{\text{Number of Momentary Interruptions for all Customers}}{\text{Total Number of Customers Served}}$$

A distributor is required to monitor this index monthly and to report to the Board the following information for each month of the year:

- a) Total number of momentary interruptions in each month;
- b) Total number of customers served in each month; and
- c) MAIFI, being (a)/ (b).

Distributors that do not have the systems capability that enables them to capture or measure MAIFI are exempted from this reporting requirement.

## ATTACHMENT C

Interruption Cause Codes

2.3.12 A distributor shall maintain and provide in a form and manner and at such times as may be requested by the Board, a record of the cause(s) of all interruptions (as defined in section 2.1.4.2) in accordance with the list presented below:

<b>Code</b>	<b>Cause of Interruption</b>
0	<b>Unknown/Other</b> Customer interruptions with no apparent cause that contributed to the outage
1	<b>Scheduled Outage</b> Customer interruptions due to the disconnection at a selected time for the purpose of construction or preventive maintenance
2	<b>Loss of Supply</b> Customer interruptions due to problems in the bulk electricity supply system. For this purpose, the bulk electricity supply system is distinguished from the distributor's system based on ownership demarcation.
3	<b>Tree Contacts</b> Customer interruptions caused by faults resulting from tree contact with energized circuits
4	<b>Lightning</b> Customer interruptions due to lightning striking the distribution system, resulting in an insulation breakdown and/or flash-overs
5	<b>Defective Equipment</b> Customer interruptions resulting from distributor equipment failures due to deterioration from age, incorrect maintenance, or imminent failures detected by maintenance
6	<b>Adverse Weather</b> Customer interruptions resulting from rain, ice storms, snow, winds, extreme temperatures, freezing rain, frost, or other extreme weather conditions (exclusive of Code 3 and Code 4 events)
7	<b>Adverse Environment</b> Customer interruptions due to distributor equipment being subject to abnormal environments, such as salt spray, industrial contamination, humidity, corrosion, vibration, fire, or flowing
8	<b>Human Element</b> Customer interruptions due to the interface of distributor staff with the distribution system

9	<b>Foreign Interference</b> Customer interruptions beyond the control of the distributor, such as those caused by animals, vehicles, dig-ins, vandalism, sabotage, and foreign objects
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