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IEEE Guide for Electric Power Distribution Reliability Indices

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4.4.2 Momentary average interruption event frequency index (MAIFI$_E$)

This index indicates the average frequency of momentary interruption events. This index does not include the events immediately preceding a lockout. Mathematically, this is given in Equation (21).

$$MAIFI_E = \frac{\sum \text{Total Number of Customer Momentary Interruption Events}}{\text{Total Number of Customers Served}} \qquad (21)$$

To calculate the index, use Equation (22).

$$MAIFI_E = \frac{\sum IM_E N_{mi}}{N_T} \qquad (22)$$

4.4.3 Customers experiencing multiple sustained interruption and momentary interruption events (CEMSMI$_n$)

This index is the ratio of individual customers experiencing more than n of both sustained interruptions and momentary interruption events to the total customers served. Its purpose is to help identify customer issues that cannot be observed by using averages. Mathematically, this is given in Equation (23).

$$CEMSMI_n = \frac{\text{Total Number of Customers Experiencing More Than } n \text{ Interruptions}}{\text{Total Number of Customers Served}} \qquad (23)$$

To calculate the index, use Equation (24).

$$CEMSMI_n = \frac{CNT_{(k > n)}}{N_T} \qquad (24)$$

4.5 Major event day classification

The following process ("Beta Method") is used to identify MEDs. Its purpose is to allow major events to be studied separately from daily operation, and in the process, to better reveal trends in daily operation that would be hidden by the large statistical effect of major events. This approach supersedes previous major event definitions (see Annex A for sample definitions). For more technical detail on derivation of the methodology refer to Annex B.

A major event day is a day in which the daily system SAIDI exceeds a threshold value, T_{MED}. The SAIDI index is used as the basis of this definition since it leads to consistent results regardless of utility size and because SAIDI is a good indicator of operational and design stress. Even though SAIDI is used to determine the major event days, all indices should be calculated based on removal of the identified days.

In calculating daily system SAIDI, any interruption that spans multiple days is accrued to the day on which the interruption begins.

The major event day identification threshold value, T_{MED}, is calculated at the end of each reporting period (typically one year) for use during the next reporting period as follows:

a) Collect values of daily SAIDI for five sequential years ending on the last day of the last complete reporting period. If fewer than five years of historical data are available, use all available historical data until five years of historical data are available.

b) Only those days that have a SAIDI/Day value will be used to calculate the T_{MED} (do not include days that did not have any interruptions).

c) Take the natural logarithm (ln) of each daily SAIDI value in the data set.

d) Find α (Alpha), the average of the logarithms (also known as the log-average) of the data set.

e) Find β (Beta), the standard deviation of the logarithms (also known as the log-standard deviation) of the data set.

f) Compute the major event day threshold, T_{MED}, using equation (25).

$$T_{MED} = e^{(\alpha + 2.5\ \beta)} \tag{25}$$

g) Any day with daily SAIDI greater than the threshold value T_{MED} that occurs during the subsequent reporting period is classified as a major event day.

Activities that occur on days classified as major event days should be separately analyzed and reported.

4.5.1 An example of using the major event day definition

An example of using the major event day definition to identify major events and subsequently calculate adjusted indices that reflect normal operating performance is shown in this subclause.

This subclause illustrates the calculation of the daily SAIDI, calculation of the major event day threshold T_{MED}, identification of major event days, and calculation of adjusted indices.

Table 1 gives selected data for all outages occurring on a certain day for a utility that serves 2,000 customers.

Table 1—Outage data for 1994

Date	Time	Duration (min)	Number of Customers	Interruption Type
3/18	18:34:30	20.0	200	Sustained
3/18	18:38:30	1.0	400	Momentary
3/18	18:42:00	513.5	700	Sustained
NOTE— Although the third interruption was not restored until the following day, its total duration counts in the day that the interruption began. Note also that SAIDI considers only sustained interruptions. Then for 3/18/1994, daily SAIDI (assuming a 2000 customer utility) is given in Equation (26).				

$$SAIDI = \frac{(20 \times 200) + (513 \times 700)}{2000} = 181.73\ min \tag{26}$$

One month of historical daily SAIDI data is used in the following example to calculate the Major Event Day threshold T_{MED}. Five years of historical data is preferable for this method, but printing that many values in this standard is impractical, so only one month is used to illustrate the concept. The example data is shown in Table 2.