Reliability Indices

(SAIFI, SAIDI & CAIDI)

Purpose

- To develop sophisticated system
- The index calculation will become broader

Definitions

1. **Customer count**: The number of customers. The number of customers is the preferred item to count if the counting system.
2. ** Interruption**: The loss of service to one or more customers.
3. **Duration of interruption**: The period measured in minutes from the initiation of an interruption to a customer or other facility until service has been restored to that customer or facility. It is essential to record the duration of each interruption.
4. **Duration of interruption**: The period measured in minutes from the initiation of an interruption to a customer or other facility until service has been restored to that customer or facility. It is essential to record the duration of each interruption.
5. **Forced interruption**: An interruption caused by a forced outage.
6. **Interruptions caused by events outside of distribution**: An interruption due to the cause of outside influences such as transmission line, of generating plant failure or outages.
7. **Loss of service**: The loss of electrical power, a complete loss of voltage, to one or more customers. This does not include any of the power quality issues (sags, swells, impulses or harmonics).
8. **Momentary event interruption**: An interruption of duration limited to the period required to restore service by an interrupting device. Note: Such switching operations must be completed in a specified time not to exceed 5 min. This definition includes all reclosing operations that occur within 5 min of the first interruption. For example, if a recloser or breaker two, three, or four times and then holds, the event shall be considered one momentary interruption event.
9. **Momentary interruption**: Single operation of an interrupting device that results in a voltage zero. For example, two breaker or recloser operations equals three momentary interruptions.
10. **Outage (electric power system)**: The state of a component when it is not available to perform its intended function due to some event directly associated with that component. Notes: 1. An outage may or may not cause an interruption of service to customers, depending on system configuration. 2. This definition derives from transmission and distribution applications and does not apply to generation outages.
11. **Scheduled interruption (electric power systems)** : A loss of electric power that results when a component is deliberately taken out of service at a selected time, usually for the purposes of construction, preventative maintenance, or repair.

Notes: 1. This derives from transmission and distribution maintenance applications and does not apply to generation interruptions. 2. The key test to determine if an interruption should be classified as a forced or scheduled interruption is as follows. If it is possible to defer the interruption when such deferment is desirable, the interruption is a scheduled interruption; otherwise, the interruption is a forced interruption. Deferring an interruption may be desirable, for example, to prevent overload of facilities or interruption of service to customers

10. **Total number of customers served** : The total number of customers served on the last day of the reporting period. If a different customer total is used, it must be clearly defined within the report.

11. **Reporting period** : A period assumed to be one month unless otherwise stated.

**Basic factors of Reliability indices**

1. $i$ An interruption event
2. $R_i$ Restoration time for each interruption event
3. $T$ Total
4. $N_i$ Number of interrupted customers for each interruption event during reporting period
5. $N_T$ Total number of customers served for the area being indexed

**Sustained interruption indices**

- **SAIFI**
- **SAIDI**
- **CAIDI**

**SAIFI**

SAIFI : - *System average interruption frequency index*. (sustained interruptions). This index is designed to give information about the average frequency of sustained interruptions per customer over a predefined area.

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SAIFI = \frac{\sum N_i}{N_T}
\]

**SAIDI**

SAIDI : - *System average interruption duration index*. This index is commonly referred to as customer minutes of interruption and is designed to provide information about the average time the customers are interrupted.
SAIDI = Customer interruption durations
Total number of customers served

SAIDI = (∑ ri x Ni) / NT

CAIDI
CAIDI: Customer average interruption duration index. CAIDI represents the average time required to restore service to the average customer per sustained interruption.

CAIDI = Customer interruption durations
Total number of customer interruptions
CAIDI = (∑ ri x Ni) / (∑ Ni) = SAIDI / SAIFI

Exclusions
While calculation the values of Reliability Indices i.e. SAIFI, SAIDI & CAIDI; the interruptions due to Load Shedding, EHV Openings (Distress load shedding), Forced interruption, Interruptions caused by events outside of distribution & Interruptions due to natural calamities are to be excluded.