

Working Group on System Design Minutes 2003 IEEE/PES T&D Technical Committee Meeting

53 members and guest attended the meeting that began at 8 AM. As usual, this group requires a larger room! John McDaniel (mcdanielj@dteenergy.com) who is serving as secretary for the group recorded the minutes.

Note: A copy of the presentations will be placed on the groups' web site:

<http://grouper.ieee.org/groups/td/dist/sd/>

Introductions were made and the groups' membership list was circulated. Members were asked to correct any information that was not correct. They were also asked to make sure their IEEE member number was there, and if not to add it.

Minutes from the 2002 IEEE/PES Summer meeting were reviewed. A few typographic errors were corrected and the minutes approved (motion by Larry Conrad and second by Dick Hensel).

Task Force on Reliability Indices

The meeting started out with Jim Bouford updating the group on how the Major Event Definition came into existence. Charlie Williams, Jim Bouford, Rich Christie, Dave Schepers, John McDaniel, Joe Viglietta, Dan Kowalewski Rodney Robinson, and Cheri Warren worked diligently to analyze member data and develop the methodology. Other WG members tested data and helped to resolve issues.

The whole issue started out as a "Major Storm" definition. There was a need to develop a better definition. A method was presented that used Customer Minutes Interrupted (CMI)/Event to evaluate major storms and this approach appeared to be useful, but differing size utilities posed a problem. To mitigate the size issue and to consider mergers that change the total customers served, the group moved to using SAIDI per day as the metric. Rich Christie performed a significant amount of work to provide the statistical basis for the definition. In the process, we reaffirmed that outages are not normally distributed (do not follow a Gaussian distribution), but they appear to be best represented by the Lognormal distribution. Their distribution does not exactly match the lognormal distribution, but it closely approximates reality. Hence that approach was used to further the major event definition. There was also a need to move away from just storms (as the events of 9/11 showed). The effects of the event led to the Major Event Days (MED). A good indication of baseline reliability can be seen when MED's are removed from the data set. One of the main goals is to reduce variability caused by Major Events to allow for trending and goal setting based on utility performance. Jim showed Figure 1 to illustrate his point. Using the blue curve, the major event days were obscuring daily operational performance to the point that sound decisions could not be made using the blue curve. The pink curve clearly shows an upward trend and indicates that the utility's daily performance is worsening over time. This curve will cue executives, regulators and engineers alike to take action.

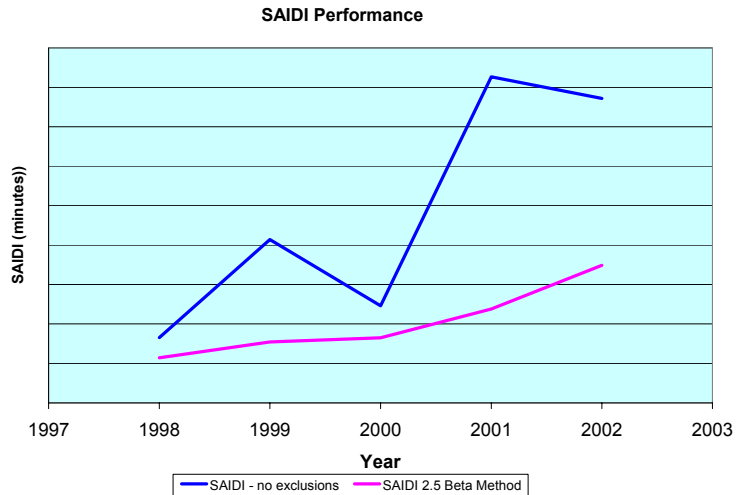


Figure 1. An example of variability

When an MED occurs, the utilities design and/or the operational limits are exceeded. The group believes that these events should be separately analyzed and reported. MED's are for classifying, **not excluding** (i.e., how did you respond to the MED – not is the design or operation adequate because we don't design or staff for major events – it would be cost prohibitive to do so). As the outage data is not Gaussian, but more closely approximates the lognormal distribution, α and β were used in the definition as opposed to sigma (σ). We have developed a heuristic model, formulated from a theoretical basis, modified to provide real world results. We are using a log-normal ESTIMATION of the data, since that seems to provide the best chance of reasonable results (the data is not log-normal).

From a strictly theoretical perspective the Lornormal of SAIDI can cause a problem when the daily SAIDI is zero. When SAIDI is zero, the Ln is $-\infty$, which cannot be evaluated. The days with zero SAIDI can be eliminated or the minimum value of SAIDI can be used in its place. Jim ended by stating that this was the "Most incredible thing I ever worked on".

Some comments that followed were:

- There is some think by executives (and regulators) that they will be able to compare utilities performance. Not true as the Beta Method will not give a one-to-one comparison, but will help explain why there are differences.
- The main purpose is not for weather normalization, but weather will show up in baseline fluctuations.
- MED's do not look at the event, but looking at how the event affects the system.
- Each utility will have different thresholds for MED's based on their individual design and operational practices.
- There are events that happen on a local basis that will not show up as MEDs on a system basis. Some areas will have local "major events" that will not show up system wide (such as a tornado). In Florida, confirmed tornados can be excluded from SAIDI calculations...it is up to each states commission to decide.
- Some commissions (such as in Oregon) are looking for trends in reliability and also looking at how the utilities respond to a major event.
- MED – what is overloading the utility either operationally or from a design perspective (or both).

A plot of one utility SAIDI per day was then shown (see Figure 2). It was expanded to show the top 60 days. There are several "steps" that can be seen. These represent situations where

operational or design limits are exceeded. In most cases outside help is needed (either from other areas within the utility or from other utilities – different steps).

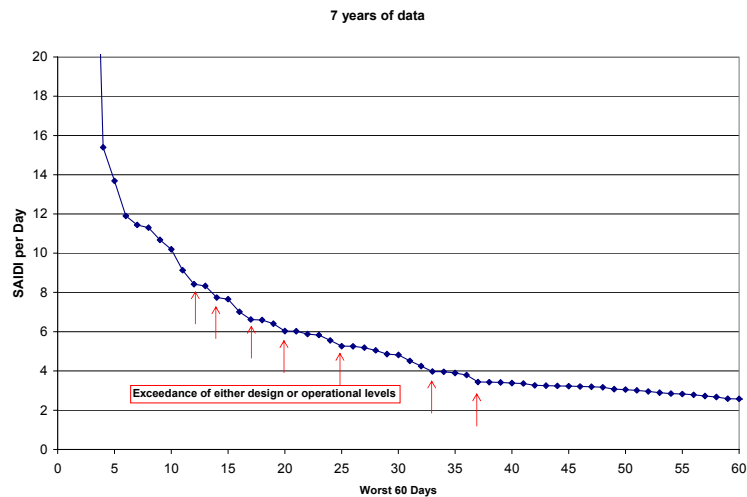


Figure 2 Exceeding Design or Operational Limits

The wording for MED is to be modified stating its use is for system wide numbers, not regionally. It cannot be used to compare different areas of the country.

In some cases, a utility may want to use the methodology on a regional basis for internal purposes. This is permitted; the only caveat is that the individual region adjusted indices cannot be aggregated to calculate the system total. If a utility is calculating both regional and system indices, they need to keep them separated. If the calculations are being performed on a regional basis, then regional numbers must be reported.

Cheri informed the group that the document had received a favorable review from IEEE Standards Association. After the minor edits are made, the Guide will go out for ballot.

The Working Group paper, “*Classification of Major Event Days*” was submitted to be presented at the IEEE/PES 2003 General in Toronto. We are stilling waiting to see if it has been accepted. In hind sight, it may have been better to publish it as a transactions grade paper.

The recent email survey on momentaries (fuse blow or fuse saving practices) received a huge response. Over eight (8) pages of responses were received and sent back out to the group. The group could put together a paper on the results. Some members suggested that we further explore the affects that different fuse saving (or fuse blow) practices have on reliability indices. It was suggested that this group could send out survey questions every so often (about every 6 months) and publish findings. The next step would be to collect a list of questions. Rodney Robinson brought up that EEI is always willing to send out surveys, which may be one possible route.

There were then several presentations made.

Major Event Classification of Catastrophic Events

The first was: “*Major Event Classification – Adjustment to the 2.5 Beta Method*” by Majella Lafontaine of Hydro Quebec. Please see the web site for a copy of the presentation. It dealt with the 1998 Ice Storm (which was at least a 1 in 100 year event) and its impacts on the 2.5 β Method. Their proposed adjustment would be to ignore any daily SAIDI days that were over 4 β when determining the major event day threshold (T_{MED}). A comparison of MED’s was shown with and without this proposed adjustment. There were several Pros and Cons, which were:

Pros:

- Best reflects “normal” system performance
- Rigorous statistical approach
- No need to define in detail “exceptional” events

Cons:

- Days to be excluded could be very severe events without necessarily being rare events

Some comments that followed were:

- Need confidence in the predictions
- Not much difference in the MED's with and without 4β
- Need a practical model instead of just a purely theoretical one
- The issue of extreme events influencing the 2.5β Method (Need to revisit this in the next version on the Guide)
- It appears that more than just the 1998 Ice Storm is excluded by using the 4β prior to calculation of T_{MED} . Needs further investigation.

At Hydro Quebec, job performance is based on normalized reliability, not total and 4β is close to 1 in 100 year event. It was asked if a footnote could be added to the MED definition about this (Cheri will check into this with IEEE Standards Association). We will add this to the introduction.

Adjustment to the Major Event Day Definition to Address Storms that Span Multiple Days

The next presentation was by Dennis Hansen and Heidi Caswell of PacifiCorp. Their presentation was on multiple days within a Major Event. The old methodology allowed for multiple days within an event. With the new 2.5β method, only those days above the threshold are MED's. They showed data from several storms, in particular the Thanksgiving 2001 Utah storm (as they called it the “broken tooth” storm due to the daily SAIDI plot). During this storm, the first, third and fourth days were above the threshold, but the second day was not. Even though the second day was not classified as a MED, the system is still undergoing exceptional stress and the utility is still in an emergency mode.

It was pointed out by the group that this situation was one Major Event with 3 MED's. The commission will still be looking at all of the days within the event. But, the reliability statistics will be adjusted for the MED's. Reporting for this event to the commission and executives should be for the entire event. Ultimately, it is up to each state's commission as to what is included in the Major Event.

The following proposed language was accepted by the group (30 for, 3 against with some abstentions) for the Major Event definition:

Major Event. Designates an event that exceeds reasonable design and or operational limits of the electric power system. A Major Event includes at least one Major Event Day (MED).

Zero SAIDI Days

There was then a discussion on what to do with days that have no interruptions (0 SAIDI). One smaller utility (WMECO) had 110 days of 0 SAIDI over the past 5 years. By replacing the 0 SAIDI days with the smallest non-zero value skewed their results (MED's). This seems to impact smaller utilities more than larger ones (it would also impact regional analysis within larger utilities). If the outage data were truly Lognormal, then replacement of the zero SAIDI with the lowest SAIDI would be OK. With most utilities, there is little or no difference in the

SAIFI or CAIDI using the 2.5β method when either the zero SAIDI's are ignored or replaced with the lowest non-zero SAIDI.

Some comments that followed were:

- A 1 customer-minute outage is the opposite extreme (due to the squaring function of the statistics)
- Can we use the average or median instead of the lowest non-zero SAIDI?
- Either stay with the theoretical (the current method) or go with a practical one
- The low end and high end should be treated the same
- Days with 0 SAIDI are "non event" days and should be ignored and not included in the calculation
- Shape of the Ln SAIDI curve can affect the outcome
- Maybe it's the skewness

After this discussion, the groups decided to change the wording on item 2 under Section 4.4 to:

If any day in the data set has a value of zero for SAIDI, do not include that day in the analysis.

The group will continue its research on this issue, but allow the guide to be balloted in its present format. A comment will be added to the introduction.

Possible new task force on Reliability Regulation

Larry Conrad (Cinergy Corp.) inquired about the regulatory use of the Guide (1366). An e-mail inquiry was sent out on Friday, January 24, 2003. Some points were:

- Summarize/track regulatory use of 1366
 - Exchange information, with a possible survey
 - Better understanding of future needs
 - Help improve Guide (1366) for users
- Promote a better understanding within the state commissions

There is a lot of regulatory interest in the Guide. In at least one state, each feeder (or circuit) has to meet reliability targets. There is a need to satisfy commissions, but the need is to ultimately improve the customer's reliability. Overall, there are a lot of different users of 1366. With all of this interest, the question was raised does the group wants to form another Task Force to follow this.

The National Regulatory Research Institute (NRRI), the research arm of NARUC, has an online survey which can be found at: (<http://www.nrri.ohio-state.edu/programs/reliability.html>)

CEA (Canadian Electric Association) is starting their annual survey that has been in existence for over 40 years. They are looking for international participants. The cost per utility is around \$1,000. This is an open survey, so everyone knows what everyone else's responses were. CEA's contact is Peter Gelineau [gelineau@canelect.ca]

At this point, the Task Force on Reliability Indices meeting was adjourned (Motion by Jim Bouford, 2nd by John McDaniel).

Task Force on Reporting Practices

This meeting was co-chaired by Ken Lau (PG&E)(substituting for Dan Pearson) and Don Hall (CES).

Ken made a presentation: “*Outage Reporting Guide*”. This was an update to Dan Pearson’s “*Outage Reporting Hierarchy*” which was presented at the 2002 Summer Meeting. The outline of the presentation was:

- Thought Provoking (How outage reporting should be)
 - PG&E just had a Centennial Event which overload their reporting system (data was suspect)
 - The CPUC was asking questions about the event that PG&E could not answer
 - Primary/secondary cause
 - Tool to use as true root cause analysis
 - Controllable versus non-controllable outages
 - Press was comparing large utility to small utility in terms of performance
 - Training issues (PG&E has an outage reporting team that meets monthly to go over all of the previous months outages)
- Hierarchy
 - Several levels within the reporting hierarchy
 - First is momentary or sustained
 - Second is which part of system (Generation, Transmission, Distribution...)
 - Third is basic cause
 - Fourth is supplemental cause
 - Fifth is fault location
 - Sixth is Device that operated
- What do we want
 - Status Quo
 - Alternate 1 – get copies of utilities hierarchy and create one with the best or is at least consistent between them
 - Alternate 2 – start from scratch
- Outage Questionnaire
 - Emails should be sent to Don Hall (don.hall@ces.com) or Ken Lau (kcl4@pge.com) if anyone is interested.

From this presentation that group was asked do we want to create a new Guide or include this in the next version of 1366. This will help with benchmarking. CEA’s survey has 10 or 11 broad categories were each participant is to place all of their outages. This Guide could help develop a standard OMS product.

It was decide a scope document should be developed. Clay Doyle had volunteered to help out with this at the last meeting. It was decided that the Task Forces recent IEEE paper would be another good starting point.

It was also pointed out at EEI is willing to work with IEEE on this matter.

Task Force on Reliable Design

Jim Bouford reported on two (2) other meetings that he had attended. The first was on the 1159 meeting. Jim got that group to place a footnote in 1159 that the definitions for momentary and sustained outages in 1159 referred to Power Quality and that Reliability had their own definitions. The second meeting was from the Lightning and Insulator Subcommittee’s Task Force on Bird Related outages. Jim related to this group that there is a group that deals with reliability and these two groups should coordinate efforts. This Task Force has been meeting for some time and they are close to some form of document.

This group has planned on sponsoring a panel session at the IEEE/PES T&D Conference in Dallas. None of the volunteers from the previous meeting were present. If this panel does go forward, panel papers are due (upload electronically) by March 3, 2003 to IEEE.

Other Business

There are 2 other Reliability Panels that are planned for the T&D Conference. They are:

Distribution Reliability Standards and their Basis, chaired by Mani Venkata

and

Experiences in Comparing Reliability Indices Collected before and after OMS Implementations, chaired by Hahn Tran

The WG adjourned at 12:00.