

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

37 members and guest attended the meeting that began at 8:10 AM. The delay was to allow for those who may have gone to the wrong room due to IEEE's scheduling of multiple rooms for the Working Group and its Task Forces. This was followed by welcome and introductions. The membership list was circulated and members were asked to correct their information. 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/>

Handouts included: the minutes from the winter technical meeting, the agenda, and the latest draft (D13) P1366.

The minutes of previous meeting were reviewed and were approved with minor changes. The paragraph on CEA studied was to be re-worded to reflect that this is an annual survey. The WPM 2003 minutes will be distributed with these minutes.

Task Force on Reliability Indices

The Task Force paper "*Classification of Major Event Days*", was presented at a panel session on Monday afternoon. The slides that were used are available on the group website. These slides can be used as a starting point for our membership to discuss the major event day issues with their management and regulators.

1366 Update

The first ballot was conducted for P1366/D12. The results follow:

Ballot Members: 117 eligible people

Returns: 101, 86% of members with 3 abstentions (2% of group) – 75% minimum required

Approve: 94, 93% of eligible voters – 75% minimum required

Disapprove with comments: 4, 4% of eligible voters

Disapprove without comments: 0, 0% of eligible voters

Abstain: 3 due to lack of time

Two of the negative votes were immediately converted to affirmatives with required changes made. Cheri will respond to other two negative ballots and seek resolution. Only one of the negative votes appears to be an issue. A southern utility thought that the MED method was unfair to them, but made no recommendation for wording changes. Cheri will offer to show them the mechanics of the method. The group agreed that the comment was unfounded. We have analyzed data for 37 companies that range in size from 1,400 to 5 million customers served and it has successfully identified major event days.

MS Word did not automatically update the equation numbers in D13, so there will be D14. A few additional comments will be added. Virtually all of the comments from the ballot were incorporated in D13.

One large change was the removal of the section on re-calculation of the indices after MEDs were segmented. This section instructed the users to estimate what the indices would have been if no MEDs were removed. This removed the MEDs from the calculation and inserted an "average" day, which is an estimate of the performance that might happen if no MEDs occurred. Dropping the section means that when combining indices calculated for MEDs with those

calculated for day-to-day performance, the total will add up to actual performance. The original purpose was compare years regardless of how many MEDs each year had (if 1 yr has x MED and other doesn't – how to compare day-to-day performance). Removed due to complexity (only 1% difference). A vote of 16 for, 1 against & 5 abstained to drop the recalculation of the indices. All the information is still there so you can go back and do comparisons. (On page 10 of marked up).

The other significant change of draft 13 from the balloted draft was the reformation of the example on how to calculate major event days; the balloted version did not drop zero days from example, which Don Hall caught this missing correction and re-calculated the correct numbers. D14 will be used for re-circulation ballot. Only existing ballot group members can vote and they can **only** vote on changes or on the negative ballots. If they don't vote, their existing vote is carried. The recirculation will be for a period of 10 days. This should be done by end of August and then the draft will go to RevCom in September for their approval.

States Update

Cheri showed chart from Monday panel, see working group website for a copy of the presentation. There are 4 states & 1 province considering adoption of the 1366/D14 as soon as it is finalized. One utility that had a previously established PBR mechanism communicated the MED methodology to their commission. The commission allowed them to use the MED approach, retroactively, thus avoiding a penalty. Don Hall discussed the current Pennsylvania's Commission rule making. They have an opportunity to use the new version of 1366. He asked if we could write to regulators as a group to inform them about the latest draft. Kansas is quoting the 1992 version or D14 of 1996 version. Cheri will draft a letter with on 1366 and its methodology to commissions to communicate the work our group has been performing. This letter will be sent to Canadian regulatory bodies too. This was approved unanimously.

Rich Christie gave a presentation titled, "*Predicting Distribution System Performance Against Reliability Standards*". This research was supported by EPRI. See slides for notes. This paper is available via IEEE Xplore. Some of the regulation in place today uses poor criteria for identifying worst performing feeders ("WPC"). Those states that use multi-year performance as opposed to single year performance achieve a better review of the poor performing circuits. The motivation for this work was that a small company (Muni) wanted to know how reliability rules in their state would impact them versus the large investor owned. Rich mentioned that further study could be performed to assess the impact of urban versus rural on indices and WPCs. Roy Billington objected to use of lognormal distribution in the work presented (except for MED). Rich's response was that lognormal is a distribution for those with 0 as the lower bound (some publications in probability area). Evidence points that way. In this case, lognormal seems to be a good approximation of the issue. Rich and Mani used the EPRI program DRIVE to conduct their analysis. The analysis showed that the larger the utility, the smaller the standard deviation. In Texas, there will be repeat violators and the commission does not think this should be happening. This work will help them see the why the criteria they are presently using is not adequate for the task. It will show that there can and will be repeat violators. The research also asked the question, "How much is it worth to change the performance?" It was pointed out that many of the current approaches do not consider load density. The working group needs to do a better job of communicating with the Commissions and helping them to understand these issues.

2.5 β Methodology Discussion

A point was made about the ultimate purpose of using this methodology, namely that data segmentation will allow the analysis of appropriate information: day-to-day and major event performance. Analysis of day-to-day performance will allow more accurate trending and should be used for internal and external goal setting. Also, since nothing is "excluded", Major Event performance can be reviewed in detail.

The WG now has data from 37 companies that range in size from 1,400 to 5 million customer served. Extensive testing of the methodology has occurred and will continue to occur as we refine our approach.

Data was presented from a Massachusetts utility as shown in Figure 1. Three views of performance were shown 1) SAIDI including all interruptions, 2) SAIDI for commission excluded interruptions, and 3) SAIDI using the IEEE 2.5 β methodology. The graph also showed penalties calculated using the commission based indices and indices using the IEEE 2.5 β methodology. The penalties were based on five-year average. It was pointed out that the penalty bands need to be recalculated every year, but that is true regardless of methodology. If the DTE in Massachusetts elects to adopt the IEEE 2.5 β methodology for identification of major events, then the penalty bands will need to be re calculated using the IEEE indices as the basis. The IEEE method (2.5 β methodology) showed the day-to-day trend much more clearly. In this case, the performance was deteriorating. For 2002, this utility would still need to pay the maximum penalty regardless of methodology used.

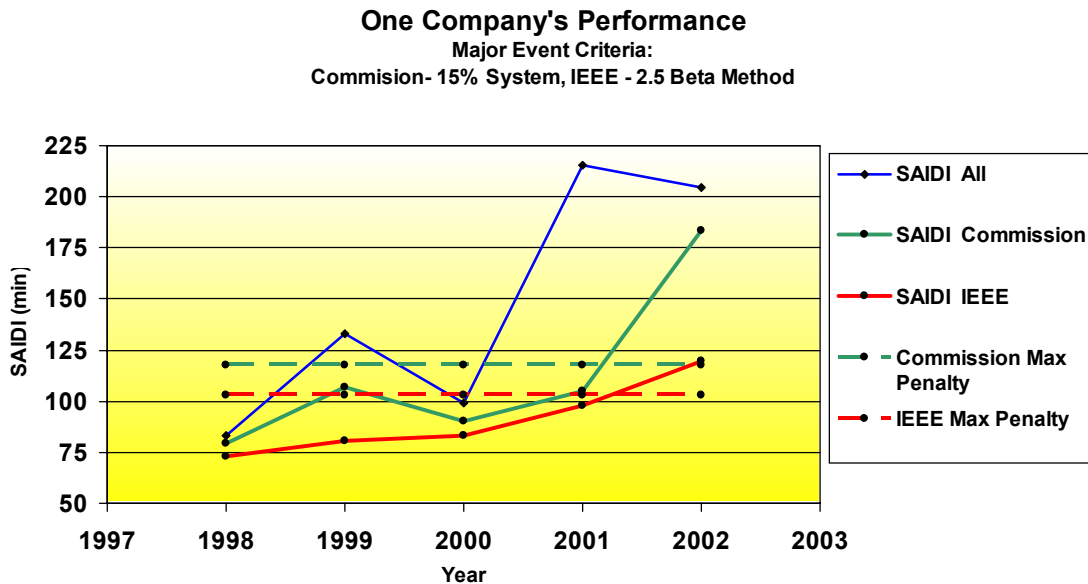


Figure 1. Mass. Utility Impact on Existing PBR

Zero Day Analysis.

The working group now has data from five more small utilities (courtesy of Bob Saint – thank you!). These data sets contained numerous zero days. During this work, data sets from some larger utilities were analyzed on a district basis. When analysis is performed on a district basis, then the districts tend to have zero SAIDI days.

Thoughts from Rich Christie: probability versus SAIDI (lognormal distribution). Take LN of data. Take the alpha & beta. If no zero days, looks like a Gaussian distribution. If the zeros are ignored, then the alpha moves to right. By using the average alpha in place of the zero's, the alpha moves even further to right. By using the minimum value in place

of the zero's, the alpha is just to right of true alpha. Another method is Maximum Likelihood Estimator (MLE) – where the calculated alpha is closest to true alpha if you assume that the left hand side is truncated due to missing data. Rich had sent a paper to group about a year ago explaining all these methods. The tables on p6 & p7 showed the 5 different methods. **Rich will take a look at small data sets.** Jim Bouford thanked Rich for theory, but mentioned that the performance of small companies may diverge from theory in practice. It was pointed out that not all of the data sets were lognormal. Data sets from new small utilities and some from original set were displayed. Zero days had some different tails when replaced by minimum value (in one set the tail was nearly half of the data set). The data sets were then plotted based on percent of time for days with outages. Curves were similar in shape, but varied due to there standard deviation. Jim Bouford's recommendation was to ignore zero days. Anil Phawa wanted to know, what if you let curves continue instead of replacing zero days with the minimum value and Rich stated that is what MLE does. Cheri has problem with replace zero days with "artificial" data, as some of the small companies have many zero days year after year and that would artificially inflate the overall indices.

In reality, we are reviewing the unreliability of the system. The method does not exclude anything form indices as there are no outages. This only affects the calculation of the T_{MED} . By using any of methods for replacing the zeros, the limit is above true T_{MED} . With the zero's, there is big bar out at the end, which skews data. With some of the utilities, replacing zero's work, with others it does not work. Utilities with many zero's can have a significant range in T_{MED} with different methods. By ignoring the zeros, the results were closer to what would be expected. Mani offered the suggested, "why not use Maximum Likelihood Estimation". Rich stated that there would still be problems with results. **Rich volunteered to re-test the methods with the small utilities data.** Analysis requires large number of samples for discrete analysis. With many zero's, beta is shifted, which will skew T_{MED} . The subgroup is still willing to analyze more data sets, so send them if you have them.

Smaller utilities will be affected (also at district level for large utilities). Roy suggested that Rich look at data – lognormal fits large utilities, but what about at the feeder level. Push larger utilities towards feeder end, then the large utilities looks like small utility. Rich mentioned that the WMECO paper stated that ignoring zeros is best approach.

Exclude corporate MED's on lower levels?

MLE assumes 0's are small values that have been omitted. Area under truncated curve is roughly equal to zero days. Discrete and continuous processes are both at work. With many zero's, cannot use any methods except to ignore the zero days. Rich will write this up after looking at the small data sets. Anil asked if this could be conditional probability. More work to be done, with synopsis to be given to the group.

Cheri showed data from smaller utilities. The range was from 1,400 to 70,000 customers. Showed the T_{MED} for them, # of zero's and number of years of data. Also showed individual results for each of the five utilities. The 1,400-customer utility has two to three customers per mile, with no trees. The group will be putting together a table of alpha's and beta's and the utility size and look for trends. One of the main purposes is to look at base variability not overall variability.

Cheri then showed chart for New York state rules. They currently have 10% rule Showed SAIFI all, SAIFI NY and SAIFI IEEE and the differences. One outage for 26 hrs

would knock a feeder out of the reportable indices. Not sure that this is what the commission had in mind.

Large Events Discussion

Discussed the Hydro-Quebec data, which contained the 1998 Ice Storm (1 in 100 year event). 1998 Ice Storm really skewed data (SAIDI of 40 hrs). Showed the effect of using 2.5β and pre-classifying using 4β . Also showed another utility's data that experienced the ice storm with the 2.5β and using a 5β preclassification. Showed the group the comparison between two utilities. The question is, "Should you pre-classify for 1 in 100 year event." Is it worth the trouble? There was not much difference with or without pre-classifying. The issue was the standard deviation change with the 1998 Ice Storm. The purpose is to look at trends over time for the base reliability. Trends are the same, with small difference in value, based on either method. Concern is that it may be more of a 1 in 10 year event, instead of 1 in 100 year. What is the best predictor of a catastrophic event? Also ran this for the small utilities and had the same results. **Cheri will put together a small group to look at this.** Simplicity would recommend that we not add a pre-classification to the approach. The groups' feeling is to leave all the data in there. Pre-classifying could lead to lack of objectivity. Need to leave it alone and deal with the events individually. Need to analyze the data sets. These events stick out in SAIDI not SAIFI. Roy stated that he was reluctant to take them out, as they are recognizable by just looking at the curves. Also look at trend in T_{MED} over time. Westar had 5β event last year; the difference in T_{MED} was 7 vs. 6.8 for pre-classifying versus not. The group's consensus was that it would not add complication to method, but still take a look at this offline.

Rich Christie moved to adjourn the Task Force meeting with a second from Charles Perry.

Task Force on Reporting Practices – Don Hall (don.hall@ces.com)

Discussion

The group started discussing how to proceed with this task force. P1366 had cause codes in it previously, but they were removed since they would have generated considerably more discussion. The group had previously elected to table that discussion until the major event definition was completed. This TF agreed to create a Guide separate from 1366 and to address all the codes within it. **A motion was made by Charles Perry, with a second from Mort Khodaie to create a separate Guide on Reporting, which passed unanimously.** A scope and purpose, for the PAR, will be circulated soon. Also a partial draft of the text for the Guide will be circulated, hopefully before the T&D Committee Winter Technical meeting (probably in late January, 2004). Hopefully there will be enough in the document for a comprehensive review at the next PES General Meeting (June 2004 in Denver).

The group discussed possible codes for inclusion in the document. One topic centered around how the group would specify codes for those utilities that no longer have transmission and how to evaluate those situations. The purpose is for accuracy of data collection. When new systems go on-line, indices tend to go up. From the ethics panel

(at the conference), use set of best practices to evaluate accuracy should be in place. One question they ask is, "Does the utilities have any elements to check the accuracy of the data." Bob Saint working on best practices within NRECA and will act as a liaison with this group. One company noted that for every animal outage their crews were required to install guards, after that, animal outages dropped. We need to keep codes simplified. Also need a process of collecting number of customers and step restoration. Also, what was the start time of the interruption. Accuracy is key!! As a base, do we want a survey to see what cause codes are currently in use? CES reviewed their customers and their systems to identify commonalities. The results will be circulated to the group. What is the minimum set, CEA has a good base to start with, and this will also be circulated. What is the true root cause? Use systems to look for trends and then take corrective actions. Vendor and operations speak systems, usually without reliability and planning's input, which causes problems down the road.

Rodney Robinson volunteered to Co-Chair this Task Force. Thanks to Ken Lau and Dan Pearson for their former leadership. They have elected to step down as Co-Chairs due to workload issues.

Task Force on Reliable Design – Jim Bouford **(james.bouford@us.ngrid.com)**

No work has been done lately due to workload commitments. Need new chair for TF. Purpose of group was to create document to capture "experts" day-to-day knowledge. Need this due to "brain drain". Charles Perry conditionally volunteered. EPRI-PEAC has started on this type of guide. Tom Short and Charles Perry are performing a tutorial at T&D Conference on a very similar subject (Distribution System Design and Operation to Improve Power Quality Performance, Wednesday, September 10, 8-10 am in Room ES11).

The following either volunteered or were volunteered to write something up on the topics list. Any other volunteers should contact Charles Perry cperry@epri-peac.com

John McDaniel – Lightning protection
Charles Perry – Overcurrent protection.

Jim Bouford moved to adjourn the Task Force meeting, Rich Christie 2nd.

Panels at the 2003 T&D Conference.

Lightning Protection of Transmission and Distribution Lines, Wednesday, September 10 from 8-10 am, Room C144. Chair: John McDaniel. While not sponsored by this group, it does have several reliability talks that would be of interest to the group.

Distribution Reliability Standards and Their Basis, Wednesday, September 10 from 10:30 am to 12:30 pm, Room C147. Co-Chairs: Rich Christie and Mani Venkata.

Managing Changes in Numerical Values of Reliability Indices After Implementing New Outage Management Systems, Wednesday, September 10 from 1:30-3:30 pm, Room C143. Chair: Hahn Tram

Mani's panel missing a state regulator for his panel. If you have anyone that could participate, please let Mani know.

Panels for next General meeting.

Charles Perry moved to adjourn the meeting with a second from Mani Venkata. The WG adjourned at 12:00.