Examination of Trends in Major Events Days over Time, Considering the IEEE Benchmark Survey and Aspect of Std 1366

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Background

- IEEE DRWG has begun examining trends in the number of Major Event Days identified each year using Standard 1366
- IEEE DRWG provided LBNL with a subset of daily SAIDI data from past benchmarking analyses to further explore these trends
- LBNL summarized its initial findings and observations at the IEEE DRWG’s meeting at PES in July 2014
- Today, we present our final findings – A conference paper based on this work has been submitted for presentation at PES in July 2015
Questions we sought to address

• Are the number of MEDs identified by Std 1366 increasing over time?
• Have changes in the number of utilities contributing the Benchmark survey influenced these trends?
• Does the formulation of Std 1366, itself, influence these trends? In calculating $T_{med}$, what is the effect of:
  – relying on fewer years of daily SAIDIs
  – choose a different multiplier on beta
  – compute an alternative statistical representation for the 5-year record of daily SAIDIs
Are the number of MEDs identified by Std 1366 increasing over time?

Answer: Yes!
Has the inclusion of newer utilities in the Benchmark data set influenced this trend?

All groups, except A, exhibit positive slopes. The most recent group (E) has the greatest slope.
Relying on fewer years of data to calculation Tmed

Reducing the # years does increase the probability the data may be normally distributed

But there are no noticeable changes in the # MEDs over time
Choosing a different multiplier on beta

Increasing the beta multiplier can significantly reduce the # MEDs

Yet, the trend over time is still positive
Computing an alternative statistical representation for the 5-years of daily SAIDIs

- We examined a mixture model consisting of two normal distributions.
- Mixture models are popular for representing data with subpopulations. In this instance: can we use an automatable approach to identify and separate extreme events (e.g., owing to weather or planned outages) from all other events.
- We applied an algorithm to identify the best fitting combination of two normal distributions to the data.
Determining $T_{med}$ using 2 normal distributions

- Step 1: Compute best fitting mixture of 2 normal distributions
- Select the $T_{med}$ so that the cumulative area under the left side of the curve adds to 99.379%
% Utilities with more than 3, 5, or 7 MEDs

# MEDs decreases using a 2-component mixture model compared to Std 1366

And, the trend over time is no longer positive

Yet, a 2-component model, in effect, “embeds” the upward trend
Summary of our findings

• Major events appear to be increasing over recent years
• The increases result from changes in the composition of utilities contributing to the Benchmark survey starting in approximately 2005
• Using fewer historic years to calculate $T_{med}$ does not affect the trend in MEDs
• Using higher multiples of beta reduces the average # MEDs but does not change the direction of the trend in MEDs
• The example of a mixture model embeds the underlying trend in MEDs
• We believe, based on these findings, that factors external to the Benchmark sample and IEEE Std are causing increases in MEDs over time
Next Steps

• Pursue efforts to further address or account for trends in MEDs associated with current application of IEEE Std 1366
  – Take explicit account of pre-arranged interruptions?
  – Segment data within a service territory more finely according to geography?

• Examine other factors that may associated with/causing increases in MEDs over time

• Examine other topics of interest to DRWG – e.g., T vs D as sources of interruptions