Response to Reviewer#1

Thanks for working on revising the paper and addressing the issues that I have raised. And the quality of the paper has improved. However, I still found two additional issues that need to be addressed.

Dear Reviewer,

We thank you for reviewing our work, and your comments helped us to improve the manuscript. Please find the detailed response to these and other specific comments.

Comment#1: The discussion seems not very relevant to discoveries from this research but more like a wide discussion. So changes need to be made.

Response#1:

We agree with the reviewer that the discussion focused on general problems that could arise from erroneous power outage predictions. Thus, instead of keeping a separate discussion session, we have moved the contents of the discussion that are relevant just to the findings of this paper to the conclusion section. Please see the changes in Line 543 (also highlighted here in blue).

Line 543… Overestimated power outages could result in prioritizing a less affected city, placing more resources on that city than required. Limited mobility of crews during a disaster can lead to prolonged outages, delaying the restoration effects (National Academies of Sciences, Engineering, and Medicine, 2017). In general, erroneous power outage estimates with high uncertainty can result in the non-optimal placement of resources, as optimal resource allocation algorithms will use predicted outages (Brown, 2002).

Reference:

Brown, R. E. (2002). *Electric Power Distribution Reliability*. http://www.dekker.com

Enhancing the Resilience of the Nation's Electricity System. (2017). In *Enhancing the Resilience of the Nation's Electricity System*. https://doi.org/10.17226/24836

Comment#2: There is no background information about Beta BAMs and it seems to appear suddenly at the end of the paper. If you believe it works better, why it is not tested in the current study? I suggest reducing the amount of discussion of Beta BAMS.

Response#2:

Thank you for pointing this out. Since we did not test beta regression analysis as it was not the scope of this paper, we have removed the section on Beta GAMs. But, since we are currently exploring the possibility of different regression as a power outage prediction model, we suggested possible candidate methods to overcome the challenges with state-of-the-art power outage prediction models as the future research in the conclusion section. Accordingly, we have modified the last section to "Conclusions and Future Research" to point out that the additional models are just a suggestion (and we are currently working on that) as follows:

We suggest Beta and Binomial regressions to model power outages in future research. While testing their performance fell outside this paper's scope, Beta and Binomial distribution can help overcome existing limitations due to their fundamental properties. For example, Beta and Binomial regressions are upper-bounded, unlike Negative Binomial GLM and GAM regressions. Thus, Beta or Binomial GAMs can model the fraction of outages in a city, i.e., directly in the case of Beta since it goes from 0 to 1, or after normalizing the total number of outages by the maximum number of customers in the case of the Binomial regressions. Also, Beta and Binomial GAMs can extrapolate outages for the extreme (low and high) values of winds since they can model monotonically increasing outages as a function of environmental parameters, like winds. Finally, Beta and Binomial GAMs have variance closer to zero at outage fraction observations values of zero and 1, representing better the physics or power infrastructure failures.

Reference:

Dunn, P. K. and Smyth, G. K.: Generalized Linear Models With Examples in R, https://link.springer.com/book/10.1007/978-1-4419-0118-7, 2018.

Ferrari, S. L. and Cribari-Neto, F.: Beta Regression for Modelling Rates and Proportions, http://dx.doi.org/10.1080/0266476042000214501, 31, 799–815, https://doi.org/10.1080/0266476042000214501, 2010. 234