EXAMINER REPORT FOR "POWER SYSTEM TRANSMISSION LINE OUTAGE DETECTION AND IDENTIFICATION: A PHYSICS-INFORMED DATA-DRIVEN APPROACH" BY YANG XIAOZHOU

Assessment: The thesis develops three methods to detect and identify transmission line outages. The research topic is interesting and practically meaningful. A real-time dynamic detection scheme is proposed based on nodal voltage phased angle data. It is further extended to develop a framework using both generator states and nodal voltage information. Last, a method to detect multiple-line outages is proposed. The thesis is well written. I really enjoy reading it. The contributions are sufficient, and the conclusions are useful.

I have the following comments.

Majors:

The structure of the literature review and Appendix

The literature is reviewed in Chapter 1: Introduction. I suggest the author move the literature review part in Chapters 1 to a separate chapter, "Literature Review". The literature reivw should also have a clear and logical structure like any other chapter in the thesis. Similarly, appendix should be organized into a appendix at the end of the thesis.

The impact of data availability and comparison of the methods

The second method proposed in Chapter 4, using both generator states and nodal voltage information, archives an over 80% detection rate for 80% of the lines. The third method tested using the same system, but only limited nodal voltage data achieves 93% identification accuracy under a 50% PMU coverage for single line. What is the requirement in terms of the number and the coverage of PMUs in order to achieve the 80% detection rate in Chapter 4? How does the author compare the two methods he proposed? Because the second method requires additional generator state data, the impact of additional data can be analyzed by comparing the performance of the second and the third methods, if it is a fair comparison. Whether generator state data will improve the detection accuracy? Also, how will the amount

of data available affect the detection accuracy? Does the third method generally perform better than the second method (if it requires fewer data and achieves higher accuracy)?

The effects of PMU location optimization

Following the comment above, more conclusion can be drawn for guiding the future study. What are the planning strategies that can be proposed for the PMU deployment? The locations of PMUs are optimized using a GA in Chapter 5. Is it also optimized in Chapter 4? Author may want to illustrate the effect of the PMU location optimization.

Minors:

- On Page 28, “the corresponding column of A need to be set to 0” should read “the corresponding column of A needs to be set to 0”.
- On Page 51, “when every particles has an equal weight” should read “when every particle has an equal weight”.
- On Page 70, “We can breakdown” should read “break down”.
- On Page74, “, e.g. cross validation” should read “, e.g., cross validation”. “i.e.” and “e.g.” should be always followed by a comma.
- On Page 84, “is reported in Section 5.7.2” should read “are reported in Section 5.7.2”.