

1135-05-2124

**Sinan G Aksoy\***, Pacific Northwest National Laboratory, Richland, WA 99352, and **Eduardo Cotilla-Sanchez, Mahantesh Halappanavar** and **Emilie Purvine**. *A Generative Graph Model for Electrical Infrastructure Networks*.

We propose a generative graph model for electrical infrastructure networks that accounts for heterogeneity in both vertex and edge type. To inform the design of this model, we analyze the properties of power grid graphs derived from the real-world Eastern Interconnect, Texas Interconnect, and Polish power grids. Across these datasets, we find that subgraphs induced by vertices of the same voltage level exhibit shared structural properties atypical to small-world networks, while subgraphs induced by so-called transformer edges linking vertices of different voltage types contain a more limited structure, consisting mainly of small, disjoint star graphs. We propose a two-phase graph model, based on the Chung-Lu model, that is designed to match both these inter and intra-network properties. Our model may be used to generate synthetic graphs, test algorithms and hypotheses at different scales, and serve as a baseline model on top of which further information about the electrical network may be appended. Lastly, we demonstrate the model's effectiveness on the aforementioned data. (Received September 25, 2017)