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Redundant Power Dominating Sets. Preliminary report.

A Phasor Measurement Unit (PMU) is a device placed on a bus of an electrical power system to obtain time-stamped readings of the voltage and current phasors of the electromagnetic wave at the bus. In addition, if PMUs are placed at strategically selected buses, their synchronized readings yield the electromagnetic wave at any bus without a PMU. The PMU placement problem asks for the minimum number of PMUs needed to monitor a network, and the buses where they must be placed. When an electrical power network is modeled by a graph, a solution to the PMU placement problem for the network corresponds to a minimum power dominating set for the graph.

Since 2010, multiple measurement systems based on PMUs have been implemented, and they have shown that minimizing the number of PMUs alone yields unsatisfactory results, due to frequent loss of PMU readings caused by network failures. While higher levels of redundancy require larger number of PMUs, implying increased cost, the addition of a few redundant PMUs has been proven to yield multiple advantages, resulting in a cost-effective system upgrade. In this talk, we present results on the relationship between the level of added redundancy and the fault-tolerance capability of the system obtained, from the power domination viewpoint. (Received September 13, 2019)