The Power Domination Problem in Graphs

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Abstract: Electric power companies need to monitor the state of their networks continually in order to prevent black-outs. One method to accomplish this task is to place Phase Measurement Units (PMUs) at selected network locations. The synchronized readings provided by these PMUs, in conjunction with Kirchoff's laws, permit to determine the state of the power network at any element of the network. Because of the high cost of a PMU, it is important to minimize the number of PMUs needed to maintain the ability of monitoring the entire system. Since power networks can be modeled by graphs, this problem translates into a graph theory problem: the power domination problem. In spite of the name, the problem differs substantially from traditional graph domination problems in the sense that the domination rule can be iteratively applied, giving a dynamic formulation to the problem. The power domination problem in graph theory is closely related to the zero-forcing problem in algebraic graph theory. In this talk we will survey known results and future challenges in the study of the power domination problem.