Robust Power Domination Part 1: An Introduction

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Sensors called phasor measurement units (PMUs) are used to monitor the electric power network. The power domination problem seeks to minimize the number of PMUs needed to monitor the network. We extend the power domination problem and consider the minimum number of sensors and appropriate placement to ensure monitoring when k sensors are allowed to fail with multiple sensors allowed to be placed in one location. That is, what is the minimum multiset of the vertices, S, such that for every $F \subseteq S$ with $|F| = k$, $S \setminus F$ is a power dominating set. Such a set of PMUs is called a k-robust power dominating set. The minimum cardinality of a k-robust power dominating set for the graph G is the k-robust power domination number of G. We provide general bounds and determine the k-robust power domination number of trees.

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