The Lights Out Game on Subdivided Caterpillars

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We study the following generalization of the game "Lights Out". We begin with a graph G whose vertices are labeled with elements of $\mathbb{Z}_k$ for some $k \geq 2$. We play the game by toggling the vertices. Each time the vertex v is toggled, we add 1 to the labels of both the vertex toggled and each of its adjacent vertices. The game is won when each vertex has label 0. A graph in which the Lights Out game can be won regardless of the initial labeling is called *always winnable*, or *AW* for short. Amin and Slater devised a process in the case $k = 2$ in which one could create non-AW caterpillars by "pasting" certain "irreducible" non-AW caterpillars together. In this talk, we use a similar pasting process to construct AW subdivided caterpillars.