k-cuts on paths and some trees

We define the (random) k-cut number of a rooted graph to model the difficulty of the destruction of a resilient network. The process is as the cut model of Meir and Moon except now a node must be cut times before it is destroyed. The first order terms of the expectation and variance of X_n, the k-cut number of a path of length n, are proved. We also show that X_n, after rescaling, converges in distribution to a limit $\mathcal{B}_k$, which has a complicated representation. The paper then briefly discusses the k-cut number of some trees and general graphs. We conclude by some analytic results which may be of interest.