Energies, vol.12, no.23, pp.4427-1-4427-16, December, 2019.

A decentralized solution for transmission expansion planning: getting inspiration from nature

S. Lumbreras Sancho; S. Wogrin; G. Navarro Llevat; I. Bertazzi; M. Pereda García

Abstract-

Transmission expansion planning is a problem of considerable complexity where classical optimization techniques are unable to handle large case studies. Decomposition and divide-and-conquer strategies have been applied to this problem. We propose an alternative approach based on agent-based modeling (ABM) and inspired by the behavior of the Plasmodium mold, which builds efficient transportation networks as result of its search for food sources. Algorithms inspired by this mold have already been applied to road-network design. We modify an existing ABM for road-network design to include the idiosyncratic features of power systems and their related physics, and test it over an array of case studies. Our results show that the ABM can provide near-optimal designs in all the instances studied, possibly with some further interesting properties with respect to the robustness of the developed design. In addition, the model works in a decentralized manner, using mostly local information. This means that computational time will scale with size in a more benign way than global optimization approaches. Our work shows promise in applying ABMs to solve similarly complex global optimization problems in the energy landscape.

Index Terms- transmission expansion planning; agent-based modeling

Citation:
Lumbreras, S.; Wogrin, S.; Navarro, G.; Bertazzi, I.; Pereda, M. "A decentralized solution for transmission expansion planning: getting inspiration from nature", Energies, vol.12, no.23, pp.4427-1-4427-16, December, 2019.