Abstract Submitted
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Power-grid Network Partitioning and Cluster Optimization with Applications to Florida and Texas[1] PER ARNE RIKVOLD, IBRAHIM ABOU HAMAD, BRETT ISRAELS, Florida State University, SVETLANA V. POROSEVA, University of New Mexico — Cascading power-grid failures pose serious threats to lives and property, and it is desirable to contain them within a limited geographical area. One method to achieve this is Intelligent Intentional Islanding (I3): the purposeful partitioning of a grid into weakly connected "islands" of closely connected generators and loads. If such islands can be quickly isolated, the spread of faults can be limited. An additional constraint is that generating capacity and power demand within each island should be closely balanced to ensure self-sufficiency. I3 thus corresponds to constrained community detection in a network. After a matrix-based initial agglomeration of nearby loads and generators, we implement Monte Carlo simulated annealing to simultaneously optimize load-balance and internal connectivity of the resulting islands. The optimized network of islands is treated as a new network with the first-generation islands as the new nodes ("supergenerators" and "superloads"), and the same agglomeration and MC procedures are iteratively applied, reminiscent of real-space renormalization. Applications to the Floridian [1] and Texan high-voltage grids are demonstrated.

[1] I. Abou Hamad et al., Phys. Proc. **4**, 125-129 (2010); Phys. Proc. **15**, 2-6 (2011).

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