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Designing Resilient Electrical Distribution Grids—R&D Challenges

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Natural disaster such earthquakes, hurricanes, and other extreme weather pose serious risks to modern critical infrastructure including electrical distribution grids, as evidenced by recent events like Superstorm Sandy. To improve resilience to these events, recent U.S. government studies suggest that component and system-level hardening and resilience upgrades are needed, including adding redundant circuit segments, hardening transformers and other exposed components, adding switching and microgrid generation for flexibility. All of these upgrades are expensive. New methods are needed to design cost-efficient, high-performance combinations of upgrades. A network-centric resilience design approach is described and used to highlight several areas in need of fundamental research to improve the functionality of this and related resilience design tools.