

Materials Research for Smart Grid Applications

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Our nation is transitioning to a Smart Grid which can sense and more optimally control the transmission, distribution, and delivery of electric power. The control of the electric power system is becoming more challenging with the addition of distributed renewable power sources, energy storage systems, electric vehicle charging, building and home energy management systems, smart appliances and devices capable of demand response, and other technologies. These assets coupled with a smarter grid can provide many benefits including reducing peak demand and electricity consumption; better efficiency and reliability in distribution network, remote meter reading, improved outage management, automated feeder reconfiguration, improved maintenance by monitoring equipment health, and providing ancillary services to enhance grid stability and reliability.

Materials research can enhance many applications made possible by smart grid. Materials research can result in reduced cost, increases in operating voltage and current, faster switching and sensing speed, better thermal management, greater efficiency, better protection, and longer life for many devices including solid-state circuit breakers, relays and switches, solid-state transformers, current limiters, static VAR compensators, high-voltage direct converters, and AC/DC inverters.