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Our research in this area employs control methods for real-world applications in the domain of complex electrical power systems with a large share of decentralized, uncertain renewable generation. The overall objective is to enable carbon-free energy systems using automatic control. In what follows these applications are highlighted. They include distributed and decentralized low-level control as well as optimization-based high-level control, and control methods for wind power plants.

In future electrical power systems, conventional generators, such as coal power plants, will be mainly replaced by inverter-interfaced renewable sources and storage units. Our research in this field concerns different dimensions of low-layer control of such systems that comprise conventional and renewable generators as well as inverter-interfaced storage units. Modeling issues, which are a cornerstone for most control analysis and synthesis problems described below, were investigated in [Schiffer et al., 2016b].

Many wind farms are operated to a considerable extent in so-called power tracking mode in order to meet requirements of power system operators. In this mode, wind energy converters do not feed in the uncertain weather-dependent maximum possible power, but are operated with reduced power. Within current research activities at the Control Systems Group, existing degrees of freedom in the design of wind energy converters and wind farm controllers are exploited in order to achieve a better operation of the overall wind farm in power tracking mode.

Policies and ethics

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