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**Tutorial**

**Anil Pahwa – Kansas State University**

## **Future Distribution Systems with Smart Grid Technologies**

In the past few years the concept of smart grid has emerged. Smart grid entails fusion of advanced measurements, communications, controls, cyber systems, and energy storage to make delivery of electricity more efficient, reliable, and secure with increased power production from renewable resources. Due to proliferation of many different technologies, the distribution systems of the future will be very different from those of today. The systems of the future will have intelligent sensors at different places on the feeders, automated control of devices in the system with distributed intelligence. These systems will interface seamlessly with advanced metering infrastructure on the one hand and the transmission and generation systems on the other hand. These systems will be able to handle large penetration of customer-owned wind or solar generation, other distributed energy sources, and electric vehicles. Due to the embedded intelligence at all levels the distribution systems will become smart distribution systems and will be an integral part of the Smart Grid. This tutorial covers infusion of smart grid technologies in distribution systems. Important applications include traditional distribution automation functions along with advancements in volt and var control, system monitoring, distribution management systems and distributed resource integration.