## SMART GRID

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There are many definitions for the Smart Grid in industry and academia, and the issues driving electric power utilities to invest in Smart Grid technologies vary around the world based on a variety of factors, including the regulatory framework, government policy, local energy market structures, the maturity and utilization of the grid infrastructure, the penetration rate of new technologies such as renewable energy and electric vehicles, the behavior of the consumer base, etc. This broad class of boundary conditions in turn means that the technology solutions that get included into the Smart Grid dialogue are diverse, and hence the definitions tend to vary across the community. Nonetheless, a central tenet of all definitions is that there will be an overlay of the energy infrastructure with sensors, communications and controls technologies that allow the operation of different energy resources in the grid, both conventional and new players, to be coordinated in a better way to improve one or more objectives, including cost, infrastructure utilization, reliability, environmental impact, etc. The unifying challenge for electric power utilities implementing Smart Grid solutions will be managing the complexity of the controls solutions that will ensue; in a sense the control of power delivery in a region will be shifting from the dispatch of a few large, well-behaved power plants, to that of thousands if not millions of more diverse participants with less certain energy production and consumption profiles.

Devon Manz will kick the session off with a description of how infrastructure needs vary across different regions of the world, prompting different classes of Smart Grid solutions. Specifically, Devon will describe the needs in North America, Europe, India, China, and Hawaii, and describe similarities and differences in the Smart Grid strategies in these regions. Next, Vera Silva will describe two of the new demand-side actors in the energy scene: controllable loads and electric vehicles. Vera will focus on the challenges and benefits associated with integrating and leveraging these resources in modern grids. Following this, Maryam Saeedifard will highlight several recent and emerging supply-side technologies that promise to provide new controllability and capacity to stressed and growing grids, leveraging power electronics as an interconnecting tool. In particular, Maryam will treat opportunities associated with deploying Flexible AC Transmission Systems (FACTS) technology and High Voltage DC technologies as modern tools for grid planners. Cherry Yuen will close the session with an overview of how the controls and energy management architecture for grid operators will be modernized as the Smart Grid emerges.