

THE UTILITY OF THE FUTURE

Considerations for Evolving to a Smart Grid Infrastructure

Electrical power underpins today's economies throughout the world. Any loss of power results in decreased production, lost time, and additional cost to businesses. At the same time, demand for more energy continues to increase, putting a lot of pressure on utility companies to consider ways to upgrade their aging supply infrastructure.

Much of the world's current electric grid was designed more than a century ago and, although the systems continue to provide power to end-users today, the inefficiencies within this aging infrastructure are expensive. For example, according to data from the Environmental Defense Fund, a U.S.-based nonprofit environmental advocacy group, approximately 10 percent of all electricity generated is lost in the transmission and distribution system, costing consumers about \$25 billion annually. Additionally, power demand has risen sharply, about 30 percent over the last 10 years, resulting in a rising number of power outages and blackouts that cost at least \$150 billion each year.

In the UK, a number of coal-fired plants will likely need to close due to their inability to meet the clean air requirements of the European Large Combustion Plant Directive (directive 2001/80/EC). This shortfall will need to be filled by a combination of smarter usage, higher efficiency, and renewable energy sources.

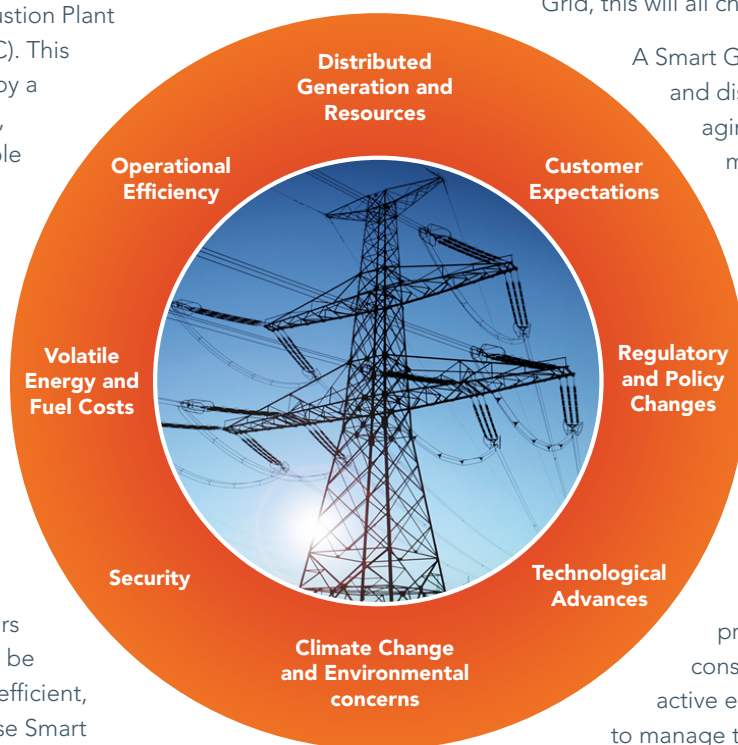
In short, a host of market pressures are bearing down on utilities globally. It is no longer a viable option to ignore systemic inefficiencies in the power delivery system while continuing to build expensive new power generation plants to keep pace with escalating energy demand. Over the next 25 years the best investment return will be achieved by creating flexible, efficient, and resilient Smart Grids. These Smart

Grids provide the opportunity to take action on the societal, financial, technological and regulatory/policy pressures that utilities face.

This paper addresses the current status of the electric grid, explains why upgrading to a Smart Grid is necessary, discusses the importance of the communication network's role in this migration, and offers prescriptions for success in a smooth evolutionary path.

Why the Need for a Smart Grid?

The realities of a rapidly-changing, dynamic market are driving the need for a Smart Grid. Utilities are feeling pressure to pursue, at least to some extent, a restructuring of their current grids. Traditionally, electricity has been delivered in just one direction: Energy from a large, central station power plant is transmitted along high-voltage lines through a substation to a home or business. There is virtually no real-time monitoring and control of the energy delivery system and very little communication with consumers regarding management of their energy usage. However, with the realization of the Smart Grid, this will all change.



A Smart Grid will automate transmission and distribution functions, and an aging infrastructure will be modernized to deliver increased reliability, improved power quality, and faster service restoration capability. Better overall management through real-time data communications will help alleviate the financial strain on utility companies by giving them greater control and cost-effectiveness.

As the Smart Grid evolves, previously passive energy consumers will be transformed into active energy customers with new tools to manage their energy use and control

Figure 1. Market pressures shaping utilities