



California Energy Commission
Smart Grid Technologies
Workshop

May 2009



SmartGridCity™ – Boulder, Colorado



Collaborating to Build the Next Generation Utility

“The fundamental component for making the smart grid work will be a robust and dynamic communications network; providing the utility the ability for real-time, two-way communications throughout the grid and enabling interaction with each component from fuel source to end use” (Xcel Smart Grid White Paper)



The Smart Grid City

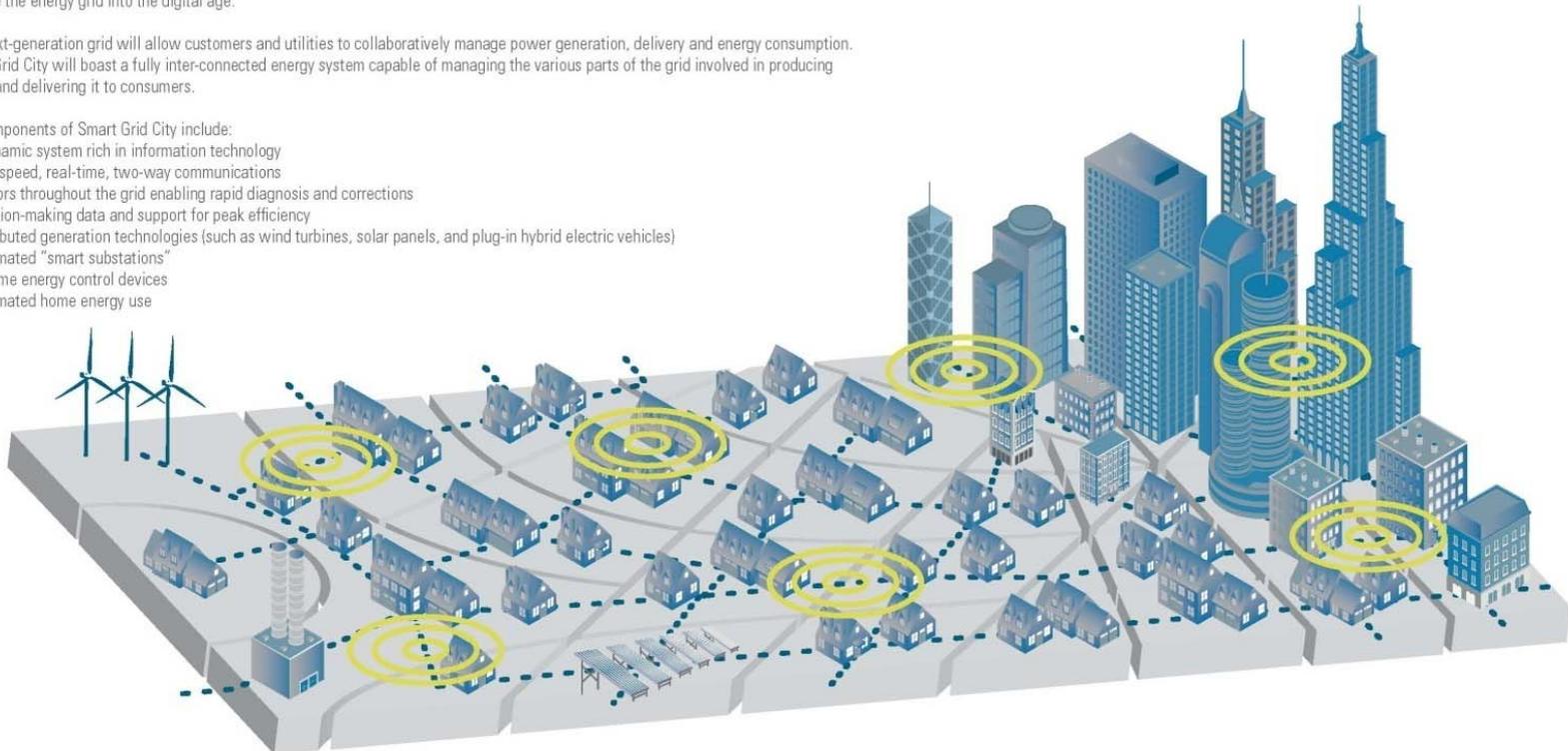
Xcel Energy's Smart Grid Consortium is working towards a future when our energy grid can predict its problems and strengths while optimizing available resources.

The Consortium has announced plans to build Smart Grid City, a community that combines traditional and emerging technology to move the energy grid into the digital age.

This next-generation grid will allow customers and utilities to collaboratively manage power generation, delivery and energy consumption. Smart Grid City will boast a fully inter-connected energy system capable of managing the various parts of the grid involved in producing power and delivering it to consumers.

Key components of Smart Grid City include:

- A dynamic system rich in information technology
- High-speed, real-time, two-way communications
- Sensors throughout the grid enabling rapid diagnosis and corrections
- Decision-making data and support for peak efficiency
- Distributed generation technologies (such as wind turbines, solar panels, and plug-in hybrid electric vehicles)
- Automated “smart substations”
- In-home energy control devices
- Automated home energy use



What Does Smart Grid Mean?

Distribution Management

Utility distribution systems have been operated as static “as built” systems

With the growth of dynamic generation sources and the needs of the Smart Grid the distribution system will need to be dynamically managed. Dynamically controlling a complex distribution system will require new tools and systems.

Enterprise Not Silo Systems

Utilities have generally deployed silo systems

Smart Grid is about an enterprise platform. All departments sharing data and analytics. Actionable intelligence needs to be integrated between IT systems and within the business processes.

Paradigm shift: Data and Communications

Need higher speed enterprise communications and Smart Grid opens Pandora’s Box of Data

Huge quantities of otherwise untapped data will be available. Up till now utilities focused on SCADA data. The ability to collect, store and provide data independent analytics will be required.

Maximizing Renewables

System designed to address dynamic renewable generation

Minimize costs and waste to allow for renewables

Solid Engineering Solutions are Available

Voltage Control

- Reduce energy and carbon by precise dynamic voltage control
 - Many studies have shown a 1% drop in voltage results in a close .8% drop in energy demand
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Load Balancing

- Reduce losses (I^2R) due to unbalanced feeders (3 phase) and circuits
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Advanced Load Control

- Reduce carbon, energy and costs by integrating load control functions (voltage, DR, DG, etc.) into a single efficient solution
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Real Time Asset Analysis

- Reduce maintenance and capital costs, improve reliability, improve system capacity
- Supports CBM, dynamic rating, loss of life and replacement programs

Interoperability is Key to Smart Grid

- Many utilities are proposing “silo” systems that inherently do not permit reasonable interoperability
- Interoperability means data and analytics are exposed across the network
- It means that IT systems can be integrated fast and with minimal resources
- At Boulder a key objective is interoperability and driving technologies through the complete business process