Forward to Fundamentals

Electricity is the engine of prosperity and quality of life

Electricity is a consumer service-based enterprise

Technology can relieve cost pressures through elevation of electricity service value

Realizing these opportunities requires transformation of the electricity infrastructure & business model
Utility Frustration

“It’s all about the customer today and we know very little; and we have no regulatory incentive.”

“Customer price transparency is the key with education and automation.”

“Our infrastructure, policies and incentives are legacies of the 1930s.”
Value Being Lost to the U.S. Economy ($ billion per year)

- Unreliability — 150
- Inefficiency — 100
- Productivity Penalty — 500+

Annual Cost to Correct — 25
Unlocking Smart Grid Benefits Requires

- Intelligent Technology
- Intelligent Policy
- Empowered Consumers

INTELLIGENCE = the ability to understand and deal successfully with new situations
Intelligent Grid

A truly intelligent grid system creates a fully integrated network that diagnoses and resolves problems as they arise and enables real time exchange of information and energy between the utility and its customers.
A User Centric View
Emergence of an asynchronous "Enernet"

- Centralized Generation
  - Switch Gear
  - Power Servers
  - Devices
  - LV-DC

- Local Generation
  - Sourced AC/DC
  - Managed DC
  - Class 2

- Multiple Sources of Power

- Consumer Dominated Decentralized System “From the inside-out”
Gaining Customer Acceptance

- **ENGAGE** through dynamic rates, technology and education
- **MOTIVATE** through savings and automated control
- **DELIGHT** through easy, enjoyable, fulfilling experiences
Consumer Electricity Management Values

Programs need to consider the full spectrum of values:

• Customized to my personal needs 92%
• Simplify my life 90%
• Easy to use 89%
• Reduce my electricity bill 80%
• Information access by third parties 67%
• Able to personally purchase 63%

Accenture “Revealing the values of the New Energy Consumer” (2011)
The Micro Grid & Its Role in Helping Meet These Challenges

- Efficient Building Systems
- Internet
- Renewables
- PV
- Dynamic Systems Control
- Distribution Operations
- Consumer Portal and Building EMS
- Advanced Metering
- Plug-In Hybrids
- Distributed Generation and Storage
- Smart End-Use Devices
- Data Management
- Utility Communications
- Internet
- Renewables
- PV
- Dynamic Systems Control
- Distribution Operations
- Consumer Portal and Building EMS
- Advanced Metering
- Plug-In Hybrids
- Distributed Generation and Storage
- Smart End-Use Devices
- Data Management
- Utility Communications
**Key Characteristics of Smart Microgrids**

- **Self-healing.** Grid Rapidly Detects, Analyzes, Responds and Restores.
- **Empowers and Incorporates the Consumer.** Ability to Incorporate Consumer Equipment and Behavior in Grid Design and Operation.
- **Tolerant of Attack.** Grid Mitigates and Resilient to Physical and Cyber Attacks.
- **Provides Power Quality Needed by 21st Century Users.** Grid Provides Quality Power Consistent with Consumer and Industry Needs.
- **Accommodates Wide Variety of Supply and Demand.** Grid Accommodates Variety of Resources (Including DR, CHP, Wind, PV).
- **Fully Enables Maturing Electricity Markets.** Allows for and is Supported by Competitive Markets.
• **Reliability**
  – Ensures that the quality and safety are not compromised in the quest for cheaper energy.

• **Consumer Empowerment**
  – Measures the effectiveness of allowing consumer choice, participation and protection.

• **Cost**
  – Creates subsets of cost codes that would more specifically and accurately reveal waste and opportunities to invest more effectively.

• **Efficiency and Environment**
  – Promotes environmental responsibility and energy efficiency.
POLICY IMPLICATIONS

Focus on Consumer-Societal Benefits

- Seamless Supply/Demand Interconnect
- Consumer Empowerment
- Dynamic Pricing

Help Utilities Deal with the Inevitable

- Universal Real Time Pricing
- Distributed Generation Microgrids
- Retail Service Competition
Intelligent Policy Recommendations

- Provide consumers with choice of access to transparent real-time electricity pricing.
- All customer-specific data belongs to the customer.
- Establish strict distribution reliability and efficiency standards.
- Hold utilities publicly accountable to specific system performance standards.
- Link utility earnings to service quality not quantity sales – performance-based rates.
Intelligent Policy Recommendations

- Expand net metering to include physical and virtual aggregation.
- Enable retail energy management service competition to incent entrepreneurial and utility innovation.
- Enable early adapters to easily demonstrate the benefits beyond doubt.
- Require absolute interoperability of smart grid components.
HOW THE MICRO GRID REVOLUTION WILL UNLEASH CLEANER, GREENER AND MORE ABUNDANT ENERGY

PERFECT POWER

TOP COMPANIES & TECHNOLOGIES TO WATCH

ROBERT GALVIN AND KURT YEAGER

WITH JAY STULLER