Smart Grid
Smart Business?

Mort Cohen, MBA
RevGen Group
Mort.Cohen@RevGenGroup.com

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The Promise of the Smart Grid

- Accommodates future demand
- Integrates distributed energy sources (solar, wind) and new storage options (electric vehicles)
- Adds intelligence to improve reliability and quality of delivered power
- Increases responsiveness through self-healing features
- Enables consumers to manage energy usage
- Provides communication platform for new applications
- Protects against cyber attack or natural disaster
- Improves operational efficiency of existing grid

Market Drivers

- Increased Energy Demand
  - Peak energy increase required to power industrial growth, expanding populations, and introduction of electric cars
- Economic Factors
  - Rising asset costs such as capital, raw materials, and labor
  - Increasing costs to support aging power infrastructure
- Policy and Regulation
  - Renewable portfolio standards spurring use of distributed renewable power sources
  - Government incentives to pursue an upgrade to the grid
- Greenhouse Gas Reductions
  - Deliver reductions through peak load shifting and end user conservation
  - Enable reductions through increased use of renewable energy
- Energy Security
  - Reduced dependence on foreign energy sources
- Technology Advancement
  - Top tier IT, software, and hardware companies beginning to adapt technologies for the Smart Grid

Applications, Benefits and Challenges

Application	Benefits	Challenges
Advanced Metering: Managed energy usage through dynamic monitoring of two-way power metering	• Better usage of existing power generation • Reduced peak power demand • Potential cost savings for consumer and provider	• Requires new utility business model that promotes energy efficiency • Consumer uptake of new metering capabilities is uncertain • New communication architecture required to maximize benefits
Demand Response: Utility/user collaboration to reduce energy demand during peak usage periods	• Fewer natural gas peak power plants potentially reducing carbon emissions • Customers use less energy through incentivized usage patterns	• Smart meters and communications upgrade necessary to automate demand response • Success depends on unpredictable adoption rate by consumers
Grid Optimization: Digital control of the power delivery network	• Increased grid reliability, efficiency, security and near real-time response to grid problems • ROI should be predictable and is not dependent on changing consumer behavior	• Implementation involves expensive addition of sensors, communications infrastructure, and IT functions
Distributed Generation and Storage: Seamlessly integrating renewable energy sources and new storage technologies on to the grid	• Enables wide-scale deployment of renewable energy sources at users' facilities • Localized storage could decrease the need for building new power plants and new transmission lines	• Requires new utility business model that moves away from centralized power to supporting distributed power sources • Integration of large numbers of distributed sources requires complex load management and control
Energy Monitoring and Control: System-wide ability to manage network assets and respond to dynamic metering capabilities	• More efficient use of delivered power • Rapid response to outages; self-healing capabilities to permit rerouting of power	• Requires implementing enterprise-wide systems that share data across all applications and systems

Sources: GTM Research, Pacific Northwest National Lab, IBM

Outlook for Adoption

Opportunities

- Small regional smart grid demonstrations indicate up to 15% reduction in peak load, >25% reduction in total load, and >25% reduction in outage minutes
- Optimized grid architecture should reduce the number of new power plants that must be built
- Smart Grid has the potential to be a growth engine for high technology companies (IT hard-ware and software, wireless communications)
- Projected creation of >250,000 new jobs over the next 4 years

Obstacles

- Interoperability standards needed for plug and play compatibility throughout the grid network
- Business models and incentives must change from profitably delivering power to encouraging conservation
- Large numbers of new distributed energy sources must be integrated
- Uncertain consumer acceptance of smart grid services
- Must deploy complex, new system architectures

Sources: GTM Research, Pacific Northwest National Lab, IBM

Summary

- Smart Grid has the potential to be a major new technology initiative in the US
  - EPRI estimates full deployment of the Smart Grid could cost $165B over the next 20 years
- Staged rollout of the Smart Grid over an extended period is likely due to the conservative nature of the industry
  - Advanced metering techniques are getting the most media play, but demand response may be the first capability to be deployed
- Although significant opportunity exists in this market, the key obstacles are a lack of a uniform vision of its structure and the need for establishing interoperability standards
- Utility mindset change is essential
  - Incentivize conservation rather than power consumption
  - Embrace and invest in non-traditional grid technologies
- Rollout of the Smart Grid will be a key enabler for renewable energy growth in the US

Email Mort Cohen for more detailed analysis and insights of the Smart Grid Market

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