

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, fuel cells) 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
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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	<ul style="list-style-type: none"> • Better usage of existing power generation • Reduced peak power demand • Potential cost savings for consumer and provider 	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Fewer natural gas peak power plants potentially reducing carbon emissions • Customers use less energy through incentivized usage patterns 	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Enables wide-scale deployment of renewable energy sources or fuel cell power generation at users' facilities • Localized storage could decrease the need for building new power plants and new transmission lines 	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • More efficient use of delivered power • Rapid response to outages; self-healing capabilities to permit rerouting of power 	<ul style="list-style-type: none"> • Requires implementing enterprise-wide systems that share data across all applications and systems

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 hardware and software, wireless communications, sensors)
- ▶ 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

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 power and grid technologies
- ▶ Rollout of the Smart Grid will be a key enabler for the growth of renewable energy and distributed power in the US

[Email Mort Cohen](#) for more detailed analysis and insights of the Smart Grid Market

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- ▶ Bring products to market and through life-cycle transitions
- ▶ Develop strategies based on objective, customized intelligence
- ▶ Perform technology assessment and validation
- ▶ Manage due diligence

Fields of expertise:

- ▶ Solar energy
 - ▶ Smart grid
 - ▶ Wireless communications
 - ▶ PC software, Web 2.0, enterprise networking
 - ▶ Semiconductor equipment and technology

We deliver:

- ▶ Advice, strategies, models and tools, alternatives
- ▶ Research, analysis, evaluation, validation
- ▶ Operational assistance