

## **Energy Central Series on the Seven Principal Characteristics of the Modern Grid**

[Article 1 of 7: Motivates and Includes the Consumer]

In October 2007, Ken Silverstein (Energy Central) wrote an editorial, “Empowering Consumers” that hit a strong, kindred chord with the DOE/National Energy Technology Laboratory (NETL) Modern Grid Strategy team. Through subsequent discussions with Ken and Bill Opalka, Editor-In-Chief, Topics Centers, we decided it would be informative to the industry if the Modern Grid Strategy (MGS) team were to share our research on the seven (7) principal Characteristics of a Modern Grid that will deliver a 21<sup>st</sup> Century economy.

Over the next seven months, various MGS team members will present an abbreviated description of each of the Characteristics of a Modern Grid. The first Characteristic is “Motivates and Includes the Consumer”; a more detailed discussion can be found at:

[http://www.netl.doe.gov/moderngrid/docs/Motivates%20and%20Includes%20the%20Consumer\\_Final\\_v2\\_0.pdf](http://www.netl.doe.gov/moderngrid/docs/Motivates%20and%20Includes%20the%20Consumer_Final_v2_0.pdf)

### **Summary**

In the Modern Grid, consumers will be an integral part of the electric system. They will help balance supply and demand and ensure reliability by modifying the way they use and purchase electricity. These modifications will come as a result of consumers having choices that will motivate different purchasing patterns and behaviors. These choices will involve new technologies, new information about their electricity use, and new forms of electricity pricing and incentives.<sup>i</sup>

The electric system is a complete system from generation to transmission to distribution to consumer systems, overlaid with regulations, business models, and market behaviors. Motivating the consumer to participate gives the electric system more options for solutions and resources, from home energy management and demand response to participating in the energy market using its KWH, KW, and ancillary services.

### **Current State**

In today’s environment, the vast majority of consumers are fully insulated from the volatility of wholesale electricity markets and the true underlying moment-to-moment cost to produce and deliver the electricity they consume.<sup>ii</sup>

While there are many available technologies that support a more informed consumer environment in communications, media, transportation, and work environments, little technology has been applied to the electric space. In the electric industry, only demonstrations of tools to motivate and include the consumer exist. Some examples include advanced two-way metering (AMI), demand response (DR), and distributed energy resources (DER).

A common misconception is that automated meter reading (AMR) is a Modern Grid technology. Since AMR does not include providing information to the consumer or directly motivate a change in behavior for reliability or economics, it is not a truly part of the Modern Grid.

### **Future State**

In many ways, the industrial, commercial, and residential consumers are showing the electric industry that business as usual is no longer acceptable. Businesses and homeowners are taking a more aggressive stance on energy usage, cost, and environmental issues, essentially “voting with

## Energy Central Series on the Seven Principal Characteristics of the Modern Grid

their dollars.” Numerous industrial and commercial consumers are pressing for the ability to sell power to the grid from their installed base of generation. There is a multi-year, rapid increase in installed distributed renewables (predominantly wind and solar) at the edge of the network. Through policy and regulation pathways, the consumer is asserting that different business models and options must be made available.

As technology improves and new policies allow or even encourage increased deployment, the number of customers actively participating will increase and costs will drop. DR and DER programs and market-based offerings will become even more attractive to consumers.<sup>iii</sup>

Of course the complexity of this future state most impacts the grid operators (Figure 1). However, a difficult path forward does not mean that the industry should resist the movement. The industry must move from “tolerating” these new programs and offerings to “advocating” them. This change in behavior will yield a better designed, more successful interface that truly motivates and supports consumer action.

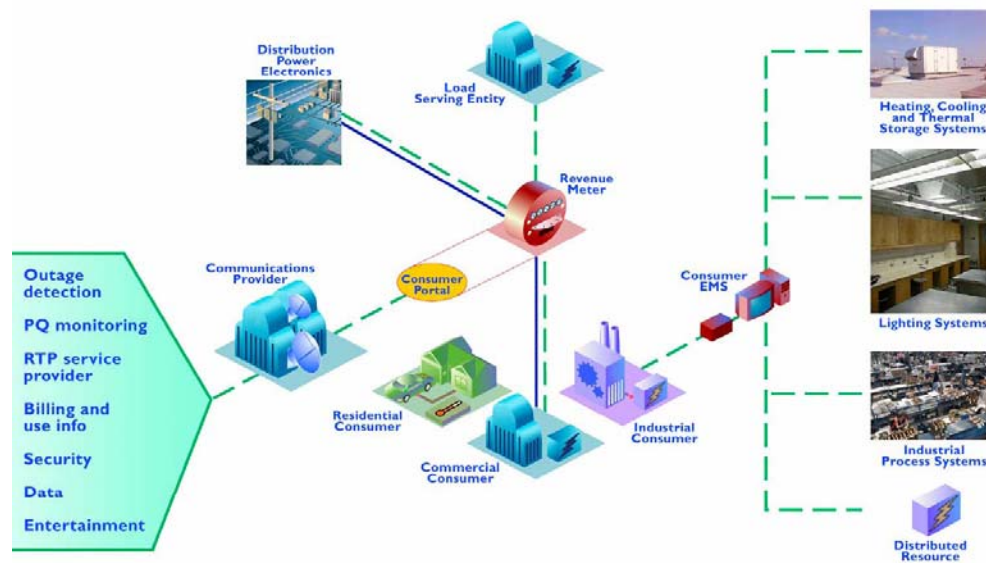


Figure 1: A consumer portal per EPRI IntelliGrid (image courtesy of EPRI).

### Requirements

The features and components of the new technology and processes that motivate and include the consumer in the electric system must meet the consumer’s needs (from lowering home energy bills to enhancing productivity of manufacturing).

Because consumers still expect the electric service to be an enabling service, and not primary in their thoughts at home or in the plant, the Modern Grid must incorporate the consumer in an automatic and cost-effective way.

The system must have features that:

- Perform consistently within the rules, regulations and agreements between the utility and the consumer.
- Provide power and/or reduce load when needed or desired.

## **Energy Central Series on the Seven Principal Characteristics of the Modern Grid**

- Deliver cost savings over time.

The technologies that support system performance in this environment include:

- Consumer applications (such as DR systems) that are reliable, easy to use and tamper-resistant.
- Software applications for the consumer that respond to pricing signals from the utility — this agent software automatically manages the consumer’s usage based on price and within boundaries established by the consumer in concert with the utility.
- Smart communicating meters that measure both consumer usage and grid conditions to help the utility provide desired service at minimum cost.
- The communications infrastructure and control systems to support two-way information flow and load management.
- Processes, tariffs and incentive programs that serve both the utility and consumer.

Using these systems to the full benefit of consumers and the grid requires:

- Semi-autonomous processes and programs that enable both consumers and utilities to share the benefits of grid efficiencies.
- New pricing regimens, enabling consumer choice and planning as well as acceptable utility returns.
- Grid-friendly appliances that consumers can be encouraged to deploy.
- Multiple, affordable choices for consumer-usable DER.<sup>iv</sup>

### **Barriers**

There are several studies that show that the barriers to achieving a Modern Grid are not centered on technology shortcomings, but mainly cultural and regulatory status quo within the electric industry. The consumers are asking to move from a “passive protected user” to a “proactive informed consumer” similar to their transition in other parts of their lives. Consumers seek to have options that competition offers while recognizing that this does add risk from a competitive environment. Consumers are educating themselves about electric services, options, and technologies in the void of such education currently not offered by the industry. While the demonstrated technology landscape is fairly rich, the actual amount of deployment of advanced technology is very low. This creates the belief in consumers that technology solutions are not available from their electric service providers and must come from others, not the electric industry.

### **Benefits**

Motivating and including the consumer in the electric system enables several important resources that the Modern Grid must use to become more reliable and cost-effective. For example, demand response has the potential to offset major peak capacity in a rapid, repeatable, and cost-effective way. Likewise, employing distributed energy resource (many of which are already in place) can make central station peaking capacity a minor player in the future. Such beneficial tools for the electric system reside with an improved consumer partnership.

## Energy Central Series on the Seven Principal Characteristics of the Modern Grid

### Recommendations

Likely, the move to truly including the consumer in the electric system will be deliberate. However, the need for the grid, the readiness of the consumer systems, and the new aggressiveness of the consumer suggest the industry should urgently respond:

- Regulatory encouragement at the federal and state levels.
- Broader education regarding the opportunities to deploy DR and DER and the overall benefits they produce.
- Continued improvement in the cost and performance of supporting technologies.
- Development of programs, tariffs, and computer agents that satisfy both utility and consumer needs.<sup>v</sup>

### More Information Available

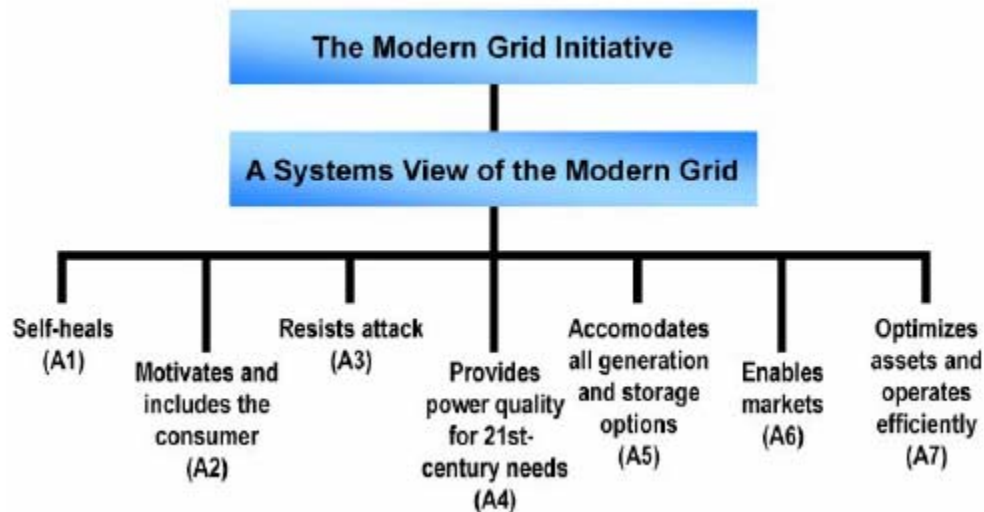


Figure 2: Principal Characteristics of a Modern Grid<sup>vi</sup>

Documents are available for free download from the Modern Grid website:

<http://www.netl.doe.gov/moderngrid/>

Email: [moderngrid@netl.doe.gov](mailto:moderngrid@netl.doe.gov)

(304) 599-4273 x101

<sup>i</sup> A Systems View of the Modern Grid, Appendix A2: Motivates and Includes the Consumer, DOE/NETL Modern Grid Team, v2.0, January 2007, pg A2-2.

<sup>ii</sup> Ibid. pg A2-4.

<sup>iii</sup> Ibid. pg A2-5.

<sup>iv</sup> Ibid. pgs A2-8,9.

<sup>v</sup> Ibid. pg A2-14

<sup>vi</sup> Ibid. pg A2-17.