

Smart Grid Briefing to Renewable Fund Managers

Clean Energy States Alliance

June 16, 2009

Richard Sedano

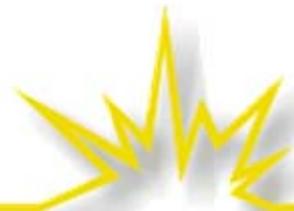
The Regulatory Assistance Project

50 State Street, Suite 3
Montpelier, Vermont USA 05602
Tel: 802.223.8199
Fax: 802.223.8172

27 Penny Lane
Cedar Crest, New Mexico USA 87008
Tel: 505.286.4486
Fax: 773.347.1512

PO Box 210
Volcano, California 95689
Office: 209.296.4979
Fax: 209.296.4979

P.O. Box 507
Hallowell, Maine USA 04347
Tel: 207.623.8393
Fax: 207.623.8369



About the Regulatory Assistance Project

- RAP is a non-profit organization providing technical and educational assistance to government officials on energy and environmental issues. RAP Principals all have extensive utility regulatory experience.
 - Richard Sedano was commissioner of the Vermont Department of Public Service and NECPUC member from 1991-2001 and is an engineer.
- Funded by foundations, the US Department Of Energy & Environmental Protection Agency. We have worked in nearly every state and 16 nations.
- Also provides educational assistance to stakeholders, utilities, advocates.



What is the Smart Grid?

- Good to ask and clarify this in any smart grid conversation
 - Many have a limited perspective based on their roles
- The smart grid is as big as the grid
 - The existing grid is not dumb, but there is a lot of room for improvement



The Smart Grid

- Provides customer value
 - Including more choices for customers
- Anywhere in the grid
- By adding technologies (and policy?)
- That provide key actors with information
 - Extracted in new ways from the grid
- Or that automate pre-programmed responses
- And enable other systems to work better
- That lead to a more integrated grid



Working Definition

- *The Smart Grid is an interconnected system of **information and communication** technologies and electricity generation, transmission, distribution and end-use technologies that will:*
 - *enable consumers to manage their usage and choose the most economically efficient offering,*
 - *maintain delivery system reliability and stability enhanced by automation, and*
 - *use the most environmentally benign generation alternatives including renewable resources and energy storage.*
- Adapted from Roger Levy, Smart Grid Technical Advisory Project, Lawrence Berkeley National Laboratory.

Goals and Characteristics of a Smart Grid



1. Increased use of digital information and controls technologies to improve reliability, security and efficiency of the electric grid
2. Dynamic optimization of grid operations and resources, with full cyber security
3. Deployment and incorporation of distributed resources and generation, including renewable resources
4. Development and incorporation of demand response, demand-side resources, and energy efficiency resources
5. Deployment of “smart” technologies (real-time, automated, interactive technologies that optimize the physical operation of appliances and consumer devices) for metering, communications concerning grid operations and status, and distribution automation
6. Integration of “smart” appliances and consumer devices
7. Deployment and integration of advanced electricity storage and peak shaving technologies, including plug-in electric and hybrid electric vehicles, and thermal storage air conditioning
8. Provision to consumers of time information and control options
9. Development of standards for communication and interoperability of appliances and equipment connected to the electric grid, including the infrastructure service the grid
10. Identification and lowering of unreasonable or unnecessary barriers to adoption of smart grid technologies, practices, and services. *

*Energy Independence and Security Act of 2007 (EISA), Section 1301.

Goals and Characteristics of a Smart Grid



1. Increased use of digital information and controls technologies to improve **reliability, security and efficiency** of the electric grid
2. Dynamic **optimization** of grid operations and resources, with full cyber security
3. Deployment and incorporation of **distributed resources and generation, including renewable resources**
4. Development and incorporation **of demand response, demand-side resources, and energy efficiency resources**
5. Deployment of “smart” technologies (real-time, automated, interactive technologies that optimize the physical operation of appliances and consumer devices) for **metering, communications concerning grid operations and status, and distribution automation**
6. Integration of “**smart**” **appliances and consumer devices**
7. Deployment and integration of advanced electricity storage and peak shaving technologies, including **plug-in electric and hybrid electric vehicles, and thermal storage air conditioning**
8. Provision to **consumers of time information and control options**
9. Development of **standards** for communication and interoperability of appliances and equipment connected to the electric grid, including the infrastructure service the grid
10. Identification and lowering of unreasonable or unnecessary **barriers** to adoption of smart grid technologies, practices, and services. *

*Energy Independence and Security Act of 2007 (EISA), Section 1301.



Translations

- Improvements in
 - Reliability
 - Cost
 - Carbon mitigation
 - Efficiency
 - Aligning business models with policy
 - Including market transformation
- Definitions still matter – what do these mean? A matter for public discussion.



Restating Promise of the Smart Grid

- *Enhanced System Reliability*
- *Improved energy efficiency*
- *Better rate design and more customer choice*
- *Reduction in peak demand*
- *Capacity and O&M savings*
- *Better integration of distributed and renewable resources*
- *Right charging of plug-in hybrid electric vehicles*
- *Reduced greenhouse gas emissions*



Making sense of the Smart Grid

- Define objectives
- Useful to parse objectives into which enabling steps that can be deployed
 - By the customer or agent in the premise
 - By the utility or other authorized agent in the distribution system
 - By the utility, authorized agent or system operator at the bulk power level



Challenges

➤ Cost

- Technology
- Data management

➤ Speculative benefits

- Customers learning new habits (HAN - not Solo)
- Utilities and regulators facing changes also
 - Is the utility in charge of the customer relationship?

➤ The smart grid business model not generic



Path to Customer Benefits

- Guiding principles, objectives, goals, plan
 - In terms of consumer value
 - Define business case in these terms
- Eventually need minimum functional requirements (what will it do or enable?)
- Open standards and protocols
- Pilots produce experience for all
- Customer data access and privacy



What government can do

- Promote collaboration, trials
- Focus deployment on high-value technologies and applications, especially in high-value locations
- Update studies on technology readiness and B/C
- Plan consistent with objectives and goals, forecast phased deployments of technologies and applications with an evaluation plan
- Pay attention to utility incentives and fix as needed
- Make programs and information available to consumers to enable them to take advantage of options and functions enabled by the smart grid



And...

- Consider tariffs that support smart grid capabilities and that deliver system benefits to customers
 - Dynamic or Time of Use rates
 - That match what customers can intuit about system prices with what they pay
 - That makes customers into system resources
 - And that protect vulnerable customers



What can be different

- Programmable devices on premise
 - Connected to a wireless network
- Internet-based information and choices
 - Informed by new rate designs
- Improved state of the system assessment
 - With changes in operating practices
- Customers reacting to system conditions within preset limits to optimize performance



Standards

- NIST is working on this
- States can promote interoperability but rely on standards organizations
 - “The ability of a system or product to work with other systems or products without special effort by the customer.” -- FERC



Thanks for your attention

- rsedano@raponline.org
- <http://www.raponline.org>
- RAP Mission: *RAP is committed to fostering regulatory policies for the electric industry that encourage economic efficiency, protect environmental quality, assure system reliability, and allocate system benefits fairly to all customers.*