Visioning the 21st Century Electricity Industry: Strategies and Outcomes for America

Lauren Azar
Senior Advisor to the Secretary
U. S. Department of Energy

8 February 2012
We all have “visions,” in one form or another:

- Corporations call them strategic plans
- RTOs ... transmission expansion plans or Order 1000 plans
- State PUCs ... integrated resource plans
- Employees ... career goals
Would we all -- industry, regulators, vendors, & consumers -- benefit from a shared vision?
DOE asks your help...

to develop a shared vision of the future grid -- aiding us all to row in the same direction.
Our Future?

- **Smart appliances**
  - Can shut off in response to frequency fluctuations.

- **Processors**
  - Execute special protection schemes in microseconds.

- **Storage**
  - Energy generated at off-peak times could be stored in batteries for later use.

- **Generators**
  - Energy from small generators and solar panels can reduce overall demand on the grid.

- **Demand management**
  - Load can be shifted to off-peak times to save money.

- **Sensors**
  - Detect fluctuations and disturbances and can signal for areas to be isolated.

- **Wind farm**
- **Central power plant**
- **Houses**
- **Isolated microgrid**

- **Disturbance in the grid**
1. Enable a seamless, cost-effective electricity system, from generation to end use;
2. Capable of meeting
   • the clean energy demands, and
   • capacity requirements of this century;
3. While allowing consumer participation and electricity use as desired.
1. Seamless, Cost-Effective System

- A 100% holistically designed system (including AC-DC hybrid configurations)
- Optimizing asset utilization and operating efficiency
- Regionally diverse, while meeting essential requirements of a shared national vision
- Providing the power quality for a range of needs
- A reliable, secure, and resilient grid
- Enabling new products, services, and markets
- Global competitiveness and leadership
Effective grid modernization requires seamless, end-to-end integration.
AC-DC Hybrid System
Regional Diversity: Regulatory...Resource...Policy
2. Meet Clean Energy Demands & Capacity Requirements

- Significant scale-up of Clean Energy (80% by 2035)
- Accommodating all generation and storage options
Significant scale-up of Clean Energy (80% by 2035) + Accommodating all Generation & Storage
3. Consumer Participation

- Enabling informed participation of consumers;
- Allowing 100% customer participation and choice;
- Including distributed resources, demand response, demand-side management, electrification of transportation, and energy efficiency.
Smart & Efficient Homes, Distributed Generation
... and Electric Vehicles
How do we get from here to a seamless, cost-effective electricity system...
Implementation Option: Electricity Systems Hub

New functionalities, protocols, designs, and operations required at the substation level will be the “pinch point” for end-to-end integration.

Blurring of transmission and distribution presents numerous challenges and opportunities for innovation and outreach.
The End