Presentation to the DOE Electricity Advisory Committee

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My frame of reference

- Little load growth
- Declining grid usage
- Further declines in backbone grid use with coal retirements
- Highly fragmented grid operation
- Proposed big transmission stalled for lack of users
- Solar generation cost dropping the quickest
Solar Costs Dropping More

Total system levelized cost from EIA

- 2011 levelized cost
- 2012 levelized cost
- 2013 levelized cost
- 2013 Minimum levelized regional cost

$4 natural gas
21st Century grid evolution

Decentralized generation (and load technologies)

More advanced grid control technologies (e.g., synchrophasors)

Where we are headed

Centralized generation

Where we have been in the past 40 years

Early days of utilities

Less advanced BES grid control technologies (SCADA and local knowledge)
Factors that alter speed and trajectory of transition

• Accelerates transition
  – Battery cost reductions (which could create a tipping point to leave the grid)
  – PV improvements
  – Pricing schemes that spur innovation at distribution level
  – New or reconstituted market entrants

• Retards transition
  – Breakthrough in central station cost (e.g., CCS, modular nukes offshore wind, enhanced geothermal systems)
  – Institutional resistance to maintain status quo (e.g., high fixed charges to customers on grid)
  – FERC / State PUC jurisdictional division
What this means

• What this means
  – Transmission system becomes a backup system, balancing network and an economy energy delivery system
    • Who will pay for this backup system?
  – Lower vulnerabilities to widespread power disruptions
    • More resilience in system
  – More stress on distribution system

• What we need in this future
  – Greater visibility from the bulk power system into the distribution system and two-way communication
  – Better ways to accommodate ramping
    • Load side measures (DR, storage)
    • Supply side measures (EIM, fast moving power plants, responsive gas delivery system)

• Redesign FERC/state jurisdiction
What DOE should do

• Support deployment of new grid monitoring and control technologies
• Foster responsive distribution customer side technologies
• Support analyses of the impact on consumers
  – Impacts on utilities is secondary concern
• Support the evaluation of regional solutions to:
  – Ramping challenges
  – Reliability challenges from low spinning mass generation