

Presentation to the DOE Electricity Advisory Committee

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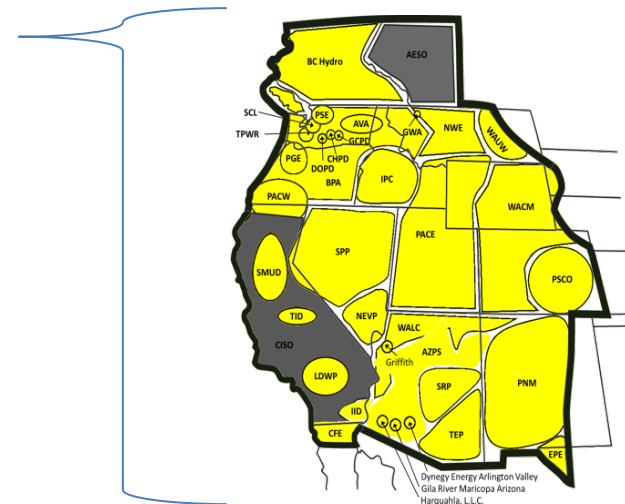
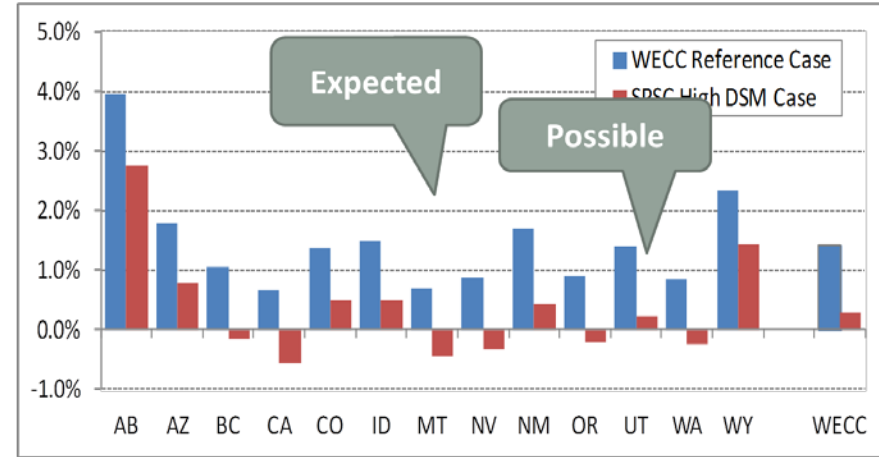
Western Interstate Energy Board

June 16, 2014

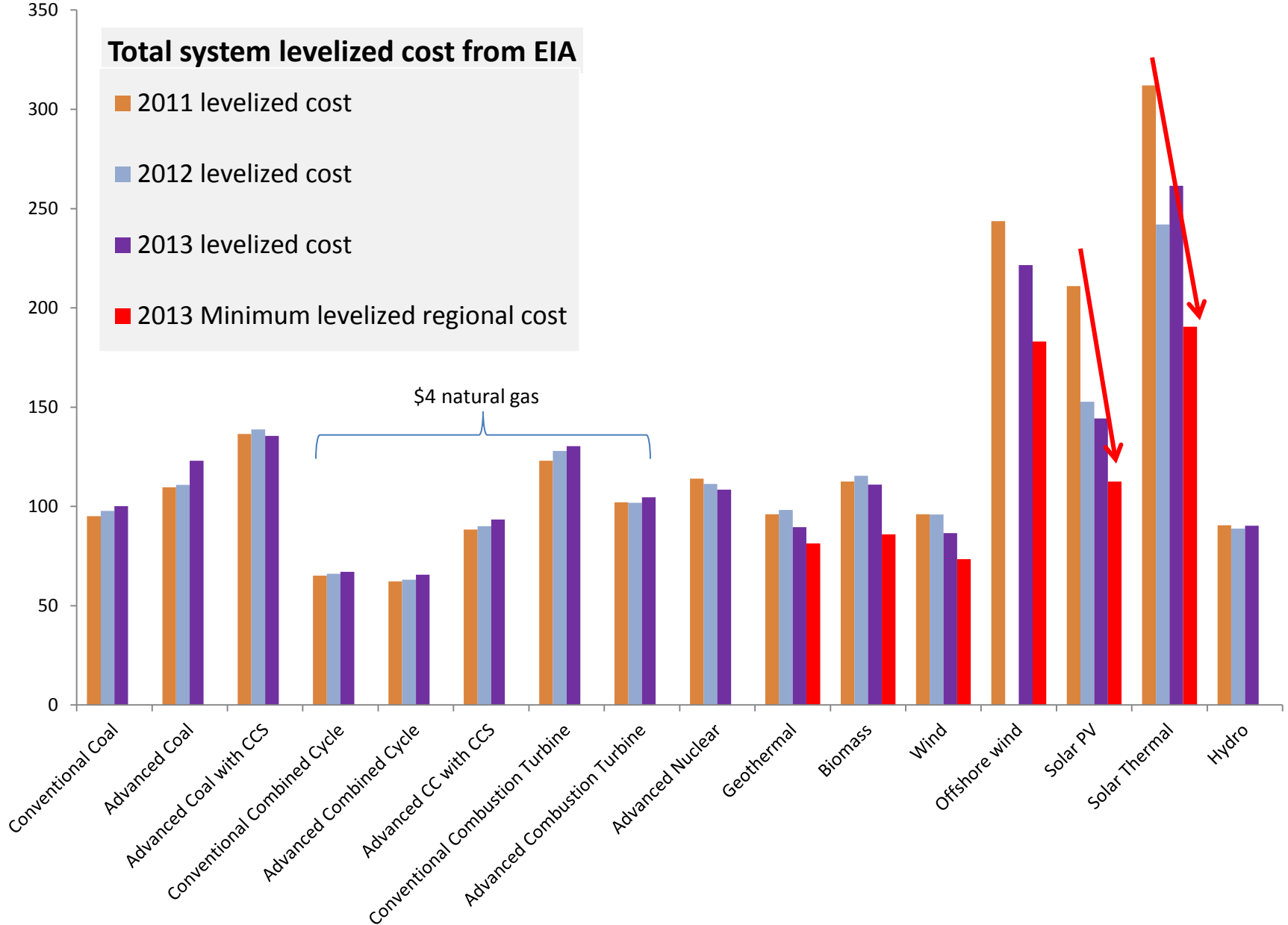
My frame of reference

- 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

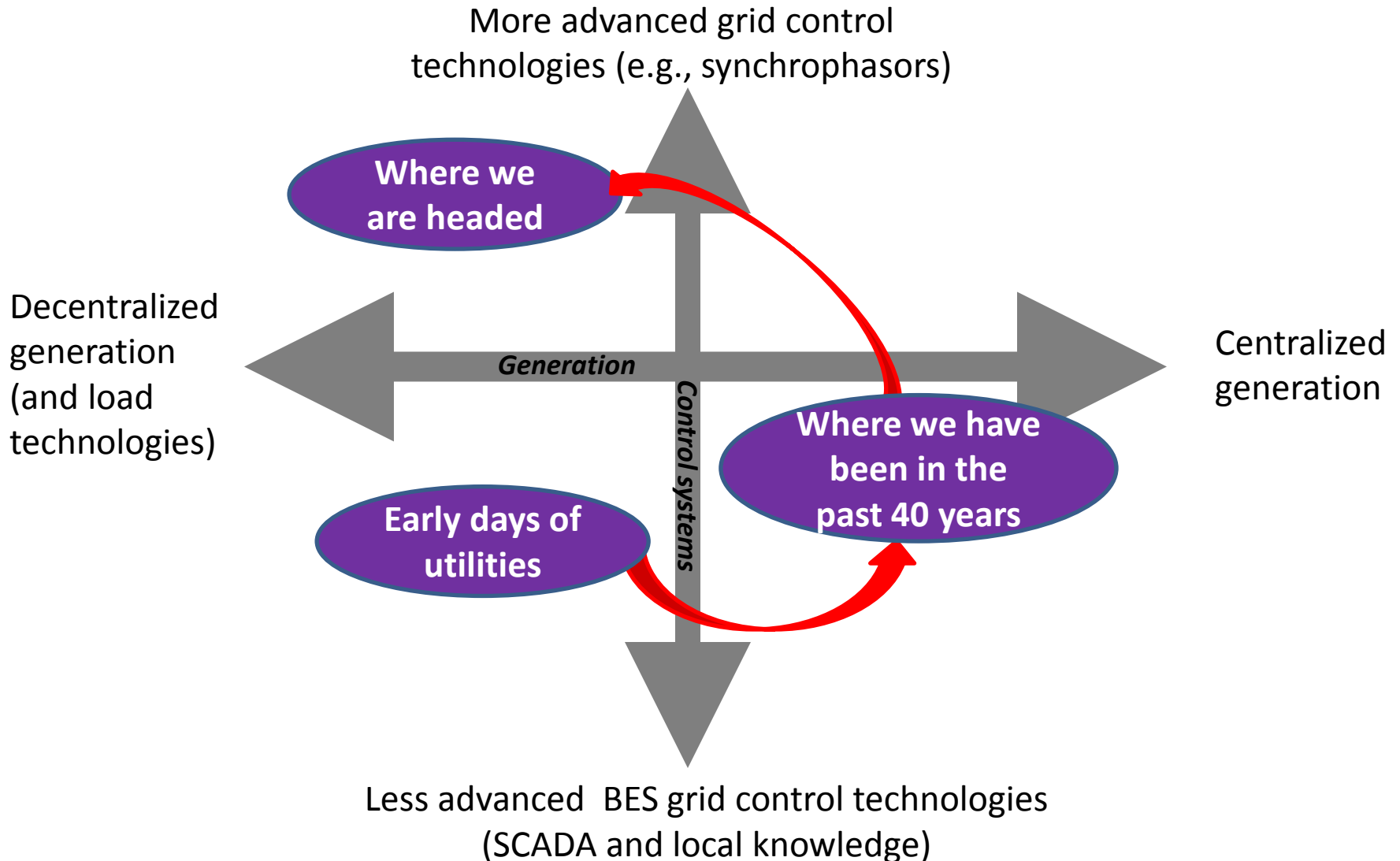
Compound Annual Growth Rates (Annual Energy, 2010-2032)



Solar Costs Dropping More



21st Century grid evolution



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