

Capacity Markets – The U.S. Experience and Swiss Challenges

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Capacity Markets In Competitive Power Systems

- A Different Perspective
 - From technology innovation to a large-scale issue
 - What is capacity? Why is it needed?
- Current Capacity Market Issues in the U.S.
 - “Missing money” if energy prices too low
 - Short term: resource performance, reserves
 - Long term: system reliability, diversity
- Lessons Learned and Challenges for Switzerland
 - Energy-only market has practical difficulties
 - Capacity market may be needed for system reliability
- Final Thoughts on Microgrids, Renewables, etc.



Capacity Markets – A Different Perspective

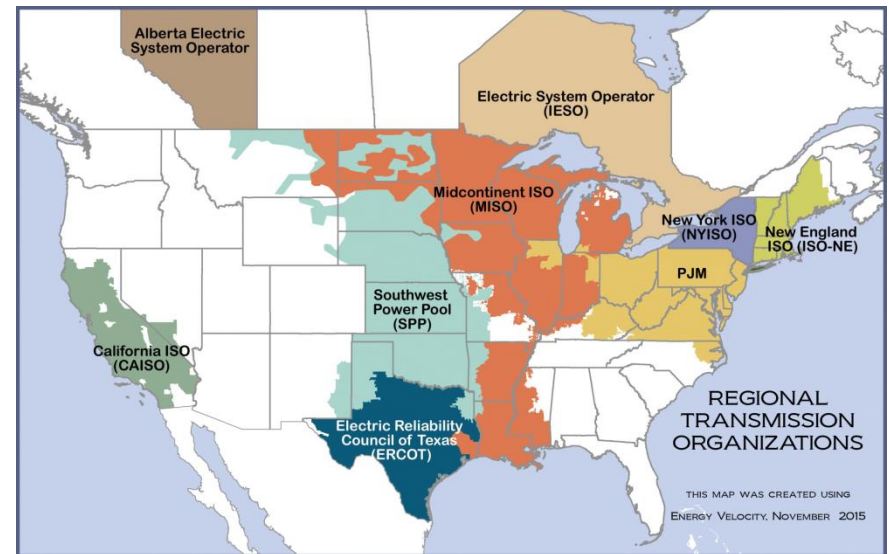
Moving from technology innovation to large-scale issue

- Energy versus Capacity
 - Energy (MWh) does work
 - Generators are paid for metered energy*
 - Capacity (MW) is the *ability* to generate energy (or reduce load)
 - Supply-side and demand-side resources provide capacity*
- Competitive Power Markets
 - Competition encourages innovation and efficiency
- Capacity Keeps Power Systems Reliable
 - System operators dispatch capacity to assure daily reliability
 - Planners depend on capacity resources for long-term reliability



Capacity Markets – Current U.S. Situation

- U.S. Power System
 - Regional power systems – most are deregulated / competitive
 - Independent RTOs administer energy, capacity, ancillary svcs markets
- Shift in Generation Mix
 - Wind and solar additions
 - Coal and oil retirements
 - Gas fuel very inexpensive
- Market Weaknesses Revealed
 - Solar and wind intermittency
 - Limited gas pipeline capacity
 - Extreme weather events (2013-14 Polar Vortex)



Source: FERC

Coal and nuclear plants are retiring due to low energy prices



Capacity Markets – Current U.S. Issues

- Subsidized Wind and Solar Resources
 - Public policy choice but is competition fair?
 - Low energy prices create “missing money” problem
- Storage
 - Solves intermittency problem but impose new system demands
 - Non-hydro: valuable *but* expensive and limited energy
- Pay for Performance Concept
 - Capacity resources penalized if unavailable in critical hours
 - A capacity resource isn’t reliable without assured fuel supply
- Clean Energy / Zero Emission Credits
 - Wind and solar plants deserve but don’t receive carbon credits
 - Nuclear plants also want carbon credits



Capacity Markets – Lessons Learned

- Capacity Pricing
 - Must reflect local supply / demand dynamics
 - Must be sufficient to incentivize new capacity when & where needed
 - Capacity value of intermittent resources may be low
- RTOs Preserve Market Competitiveness
 - Competition has winners and losers, *but...*
 - Prohibit seller monopoly power / buyer price suppression
- System Reliability
 - Subsidized wind /solar and low gas costs lowering energy prices
 - Low energy prices forcing retirements, discouraging investment



Capacity Markets – Swiss Challenges

- European Energy-Only Market
 - EPEX provides liquidity for efficiency
 - Links Switzerland to low energy prices (due to solar & wind)
 - Good for consumers, bad for generators
 - Unconstrained energy prices have political and financial difficulties
- Long-Term Reliability May Require a Capacity Market
 - Difficult when stakeholders have competing goals
 - Carbon pricing possible (but not yet accepted in U.S.)
 - Fuel diversity credit option
 - Compromise necessary if long-term reliability is threatened

***Capacity, carbon, or other fixed payments may be required
to assure long-term reliability***



Final Thoughts

- Reliability
 - Bulk power system : 1-in-20 system reliability requirement enforced
 - Distribution system: left up to U.S. states; “good utility practice”
- Microgrids
 - Higher reliability is like insurance – *cost for uncertain benefit*
 - Project economics: energy during blackouts may be “priceless”
- Renewables
 - Good decisions need good facts (direct and indirect costs & benefits)
 - Texas wind, California solar duck back, higher capacity margin

Bottom line – be smart, think long-term, be realistic!

