Resource Adequacy Reconsidered: Mandates and Markets

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Background

• The Electric Markets Research Foundation (EMRF) formed in 2012 as a result of concerns about the operation of electric markets given today’s challenges.
• Funding external studies by experts.
• Non-profit 501(c)(3) Corporation.
• Independent Board of Directors.
Initial Studies

• First study, conducted by Navigant Consulting, looked at how we got to the current bifurcated market structure.
• Second study designed to look at how electric markets were working to ensure that adequate capacity is built to meet consumer needs.
• Christensen Associates Energy Consulting retained to perform this study.
What is Resource Adequacy?
Security, Adequacy, & Reliability

• Physics requires:
  – supply match demand in real time; and
  – voltages stay within tight limits.

• Reliability problems occur when system operators lack the resources, information, or judgment to maintain power balance and voltages.
  – Deviations can erode grid reliability and in extreme cases cause blackouts.
Security and Adequacy Depend Upon Reserves

• Security depends upon operating reserves.
  – *Operating reserves* are the amount by which available resources exceed load, where availability depends upon resources’ capacities and responsiveness.

• Adequacy depends upon planning reserves.
  – *Planning reserves* are the amount by which resources’ total capacity exceeds annual peak loads.

• Operating reserves and planning reserves are indicators of system reliability in short- and long-term timeframes, respectively.
The Two Market Models
The Resource Adequacy Approaches of the Two Market Models

• Traditionally regulated model
  – State regulatory agencies set prices based upon utilities’ average costs of service.
  – Investments are based upon integrated resource plans.

• Restructured market model
  – Competitive bidding sets wholesale market prices of energy, operating reserves, and capacity based upon supply and demand.
  – Investment responds to market prices.
Traditionally Regulated Model

- Vertically integrated utilities manage security and adequacy through self-supply and bilateral contracts.
- Capacity markets are bilateral and non-centralized.
- Utilities participate in reserve-sharing arrangements allowing them to rely on each other’s capacity, thereby reducing overall reserve requirements.
- States have integrated resource planning (IRP) processes that determine resource requirements and identify resources that meet those requirements at lowest cost.
Restructured Market Model

- Regional Transmission Organizations direct resource commitment and dispatch and administer centralized energy and capacity markets.
  - Originally, markets were energy only – theory was that when there were shortages, prices would rise to attract new capacity.
  - Price caps put in place.
  - Missing money problem discovered – plants operating limited hours a year could not recover enough revenue.
  - Some RTOs have thus developed capacity markets.
Capacity Cost Recovery Under the Two Market Models

• Traditional regulatory model:
  – Investors receive return of capital based on annualized costs of actual capital investments, including an allowed rate of return.

• Restructured market model:
  – Investors receive whatever return is achievable through market prices for energy (and capacity in some RTOs).
  – Capacity prices are determined through a variety of regulatory/administrative rules, including:
    • Minimum Offer Price Rules; and
    • penalties for load-serving entities (LSEs) that fail to procure sufficient capacity.
Problems with the Restructured Market Model
Market Model – In Theory (1)

• Investment responds to price expectations.
  – Investors develop resources when they expect to profit from sales at projected market prices, hedged by bilateral and derivatives contracts.
  – Capital and operating costs recovered solely through revenues from the sale of these services.
  – Locational prices induce generators to locate where generation services are most valuable.

• Long-term markets develop to facilitate hedging against price uncertainty.
Market Model – In Theory (2)

• When demand threatens to exceed available capacity:
  – high energy and ancillary services prices encourage immediate load reductions; and
  – customers do not receive service in excess of the resources to which they have purchased rights.
• There is no “capacity” product.
• Market rules are stable.
Market Model – In Practice (1)

• Public policy will not allow the price mechanism to work under shortage conditions.
  – Market participants do not want the extreme and unpredictable price volatility of unfettered electricity markets.
  – Price caps are used to limit upside volatility, which reduces incentives to invest in or postpone retirement of resources.

• Public policy distorts the price mechanism under all conditions.
  – Policy favoring particular resources – RPS and PTC – subsidize those resources while implicitly taxing other resources.
  – Minimum offer price rule unevenly applied

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Market Model – In Practice (2)

• Institutional limitations inhibit the price mechanism.
  – Limited demand-side participation restricts the extent to which prices reflect consumer value.
  – There has been little development in practice of long-term markets for energy and ancillary services.

• Is there a fatal flaw?
  – Different customers have different willingness to pay for different levels of bulk system reliability, but only one level of reliability can be maintained.
  – Society values reliability higher than individual customers.
  – Thus, reliability must be maintained at levels that exceed many customers’ willingness to pay for reliability.
Market Model – In Practice (3)

• The price mechanism does not suffice to get the “right” level or type of resources. Consequently:
  – RTO rules often specify the quantities and locations of resources that must be procured.
  – RTOs regularly make large out-of-market payments to resources to ensure reliable operations.
  – Fuel diversity is important, but largely ignored.
  – Fuel security (particularly natural gas) is important, but largely ignored.
Market Model – In Practice (4)

• Market rules continually change, creating uncertain investment environment.
• Demand-side resources make up large portion of reserves – should that be a concern?
• Incentives for investment for steel in the ground is not there:
# Net Revenue for Combustion Turbine Gas Plant ($/MW-month)

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<th>Year</th>
<th>CAISO</th>
<th>ERCOT</th>
<th>ISO NE</th>
<th>MISOs</th>
<th>NYISO</th>
<th>PJM</th>
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Forecast Summer Reserve Margins
Traditional Regions
Forecast Summer Reserve Margins
RTO Regions
Is it the Right Type?
Projected DSM Load Reductions by Program Type, 2012-2023
U.S. Resource Mix, Shares of Summer Capacity, 2000-2017

- Natural Gas
- Coal
- Nuclear
- Hydroelectric
- Wind
- Petroleum
- Pumped Storage
- Solar
- Other

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Actual & Projected Coal Plant Retirements, 2005 - 2026
Study Conclusions

• RTOs’ short-term centralized capacity markets do not provide incentives for long-term resource investments.
• The political process will not allow peak-period demand pricing that is consistent with a market solution.
• Mis-match between social and private value of reliability is a continuing issue and perhaps a fatal flaw.
• Markets can not ensure fuel diversity, which in turn has reliability implications.
• Fuel security is a major issue. Can generation without firm fuel supply contracts be considered firm for capacity purposes?

• Additional retirement of coal plants resulting from the proposed EPA clean power plan only exacerbates the problem.

• Will we act in time?
Potential Solutions

- Obligation to maintain capacity and reserves should be reinstated and rest with Load-Serving Entity (LSE)
- Costs should be placed in rate base
- Revenues obtained in energy market in excess of costs should be credited against capacity costs in rate base
- Certain % of obligation should be long-term resources
Potential Solutions - 2

- Should be a competitive supply requirement
- Capacity markets can still provide short-term options
- Competitive retail suppliers should have obligation to pay for capacity
Finally

• EMRF study available at http://www.emrf.net/uploads/3/1/7/1/3171840/ensuring_adequate_power_supplies_for_emrf_final.pdf

• Further information: www.emrf.net