Resource Adequacy Alternatives and Their Consequences

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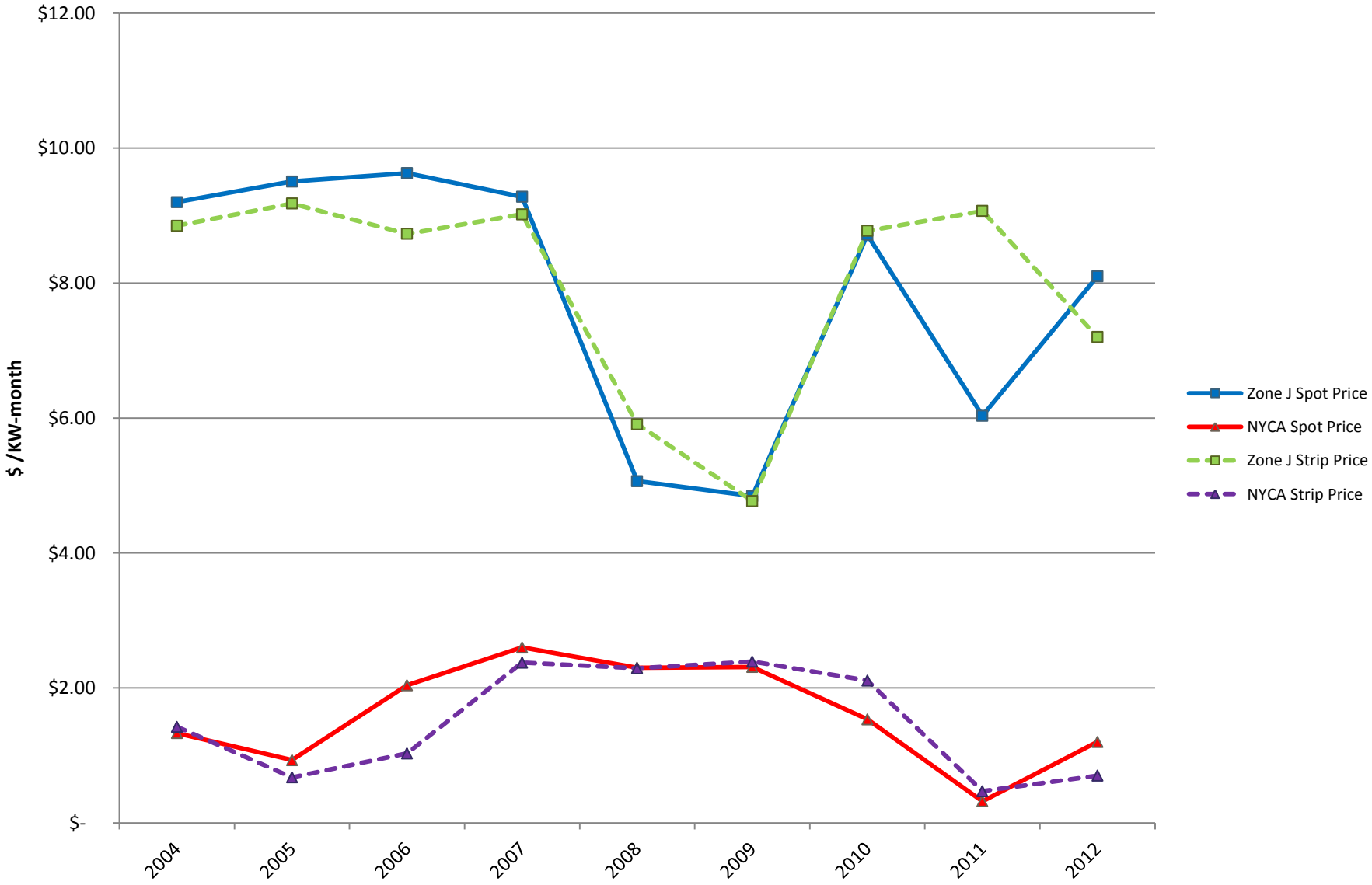
Capacity Markets

Potential advantages of capacity market based resource adequacy designs:

- Avoids the need for spot energy prices high enough to support generation investment;
- Capacity cost recovery is generally spread out more evenly in time, rather than concentrated in years with higher than expected load or other surprises; leading to more stable consumer costs, less regulatory risk?
- The nominal capacity target for resource adequacy is explicitly defined and enforced by regulators or the relevant reliability organization.

NYCA and Zone J (New York City) Auction Prices, 2003-2012 ($/kw-month)

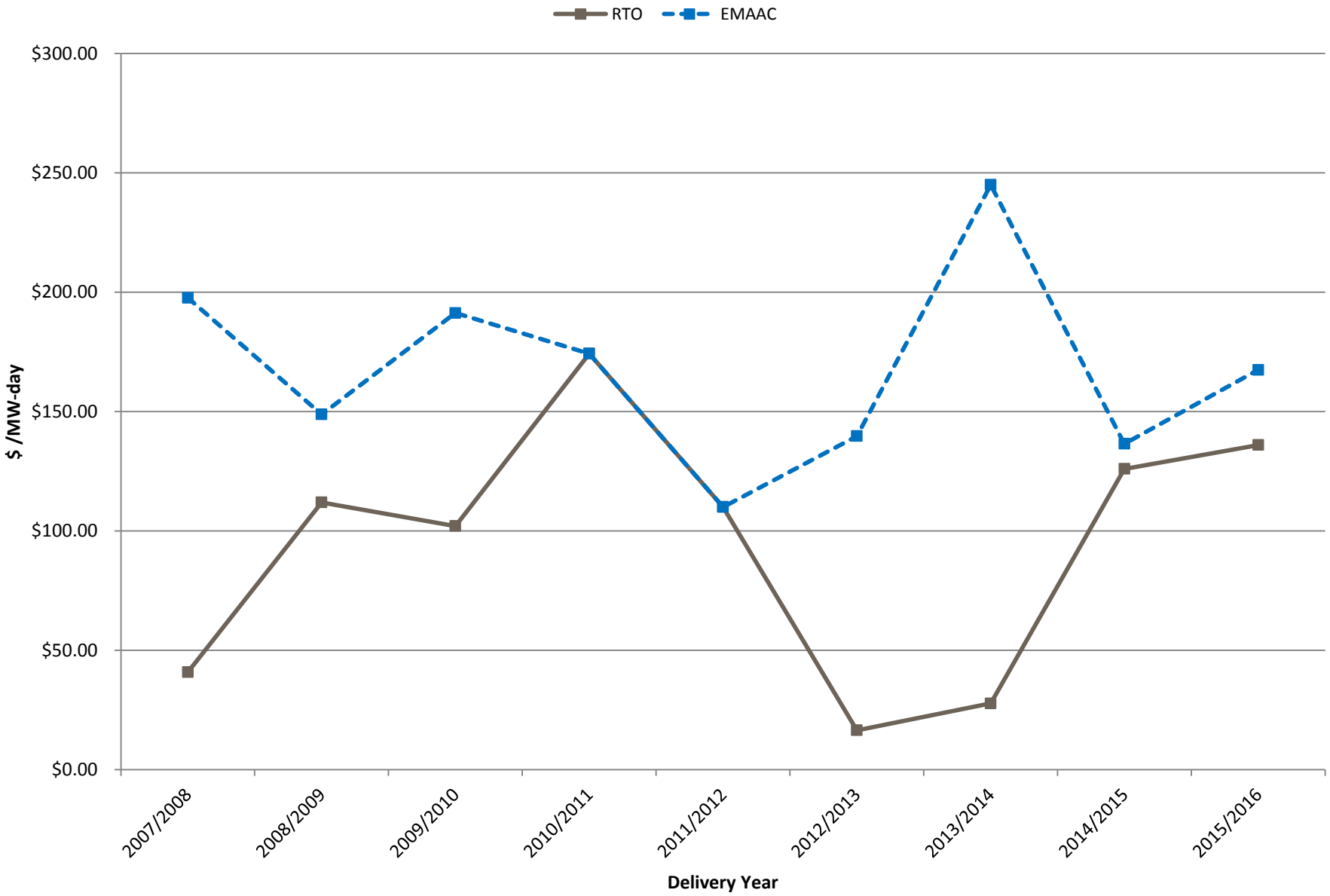


Price / Margin Variability

Energy-only markets will generally have the greatest variability in spot market margins.

- Current year capacity markets will also likely have quite variable spot market margins.
- The actual variability of capacity and energy costs depends on load serving entity hedging decisions.

PJM RTO and EMAAC RPM Base Residual Auction Clearing Prices



Price / Margin Variability

Forward capacity markets will likely produce more stable spot market margins than energy-only or current year capacity market designs.

- The degree of margin stability will still depend on the stability of market conditions;
- The degree of stability may also differ across capacity zones within an RTO.

Price / Margin Variability

The annual variability of spot energy market costs is a concern with energy-only markets.

- If retail power consumers that cannot reduce consumption in response to high energy prices are not hedged, perceived political or regulatory risk can deter needed generation investment.
- Political and regulatory risk can also deter market driven generation investment in a current year or forward capacity market (e.g. New Jersey, Maryland, New England…).

Limitations of Capacity Market Resource Adequacy Designs

- Supplier performance incentives must be provided through capacity market rules rather than spot energy prices;
- Identifying the exercise of buyer or seller market power is more complex than in the energy market;
- Resource requirements to meet power demand are determined based on planning forecasts rather than market based evaluations;
- Consumer conservation incentives must be provided through capacity market rules (demand response) rather than through consumer response to high energy prices.

Resource Requirements

In a forward capacity market design, load forecasts and capacity requirements tend to be determined by ISO planners, then contracted for by the ISO on behalf of power consumers.

	PJM Projected Peak Load	Weather Adjusted Peak Load*
2010-2011	144,592	135,080
2011-2012	142,390	131,325
2012-2013	144,857	
2013-2014	147,270	

*Adjusted for changes in RTO configuration
Source: RPM Base Residual Auction Parameters

Resource Requirements

PJM has a quasi financial forward auction design that has allowed capacity suppliers to buy out of their forward supply obligation when PJM reduces its load forecast.

	2012-2013	2013-2014
1st Incremental	-60.3	-2494.9
2nd Incremental	-2376.8	-3602.1
3rd Incremental	-1979.3	NA
Total	-4416.4	-6097.0

This is an efficient design but the ISO has to take steps to ensure that the forward market is supported by real resources that could be available if needed.

Source: PJM First, Second, and Third Incremental Auction Results 2012-2013; First, Second, and Third Incremental Auction Results 2013/2014

Resource Requirements

If load serving entities contract forward to cover their customers demand in an energy-only market, this would drive suppliers to have the necessary capacity available.

- If they don't, is it because load serving entities expect lower load than ERCOT?
- Or, are they not contracting forward to cover their obligations? Why, because their customers don't want them to?

In a capacity market, load serving entities will only find it profitable to buy the amount of the capacity mandated by the ISO, regardless of how much capacity they expect will be needed.

Incentives

In evaluating the possible benefits of a capacity market system it is critical to recognize that in providing generation suppliers with the "missing money," capacity markets also create "missing incentives" that have to be addressed through ISO rules. Two examples will be discussed:

- Demand Response
- Resource Performance

Demand Response

Capacity markets must rely on "negawatt" designs to incent demand response, reductions in power consumption during stressed system conditions, because energy prices do not reflect the cost of meeting incremental demand during shortage conditions.

- Very expensive- complex baselines and rules
- Limited response – works best for consumers with predictable consumption patterns that are always able to respond
- Cost – baselines require paying for nothing part of the time, sometimes most of the time

Demand Response

Energy-only markets allow lower cost demand response than a capacity market system because energy prices can reflect the cost of meeting load during shortage conditions. BUT:

- Design of load serving entity contracts must incent demand reduction when spot energy prices are high.
- The ISO must set appropriate shortage prices/penalty values.

Resource Performance

Capacity markets also require complex rules to specify capacity values and incent performance by generators during shortage conditions.

- Capacity value of wind, solar, limited hour demand response, energy limited generation
- Availability of gas-fired generation[1]

Energy-only markets are brutal, generators that do not operate during shortage conditions forgo the revenues during those hours, all of them.

1) See Monitoring Analytics, 2011 State of the Market Report for PJM, March 15, 2012, pp. 90-91, 115-117; ISO New England, Internal Market Monitor, "2011 Annual Market Report," May 15-2012, p. 74

Resource Performance

As the mix of generating resources available to meet load includes more and more intermittent and non-dispatchable resources, many regions are finding that the availability, commitment, and dispatch of flexible resources, not just capacity, is becoming more important.

- These needs for flexible resources are best met by providing suppliers with appropriate performance incentives through energy market shortage pricing.
- Trying to manage these needs in a forward procurement process is an outcome to avoid.

Resource Performance

The frequency of reserve shortage hours depends on the design of an energy-only market or of a capacity market, not whether it is an energy-only market or a capacity market.

- There is some level of reserve shortage prices that will incent the level of capacity needed to produce the desired level of reliability;

Resource Performance

- An energy-only market chooses shortage prices and gets a capacity outcome, capacity markets set a nominal capacity target and see what capacity they get and how much it will cost them.
- The level of reliability is not determined simply by the nominal reserve margins, it also depends on the characteristics of the resources providing capacity (such as intermittency, start-time, forced outage rate, ramp rate, energy limits) and their performance.

Shortage Pricing

The ability of an energy-only market to incent the construction of the resources needed to reliably meet load depends critically on the price signal provided by energy and ancillary service prices during scarcity conditions.

- This price signal is best provided by appropriate values of ISO/regulator determined shortage prices rather than by offer prices and offer price caps.

Resource Adequacy Alternatives

- Forward capacity market, with effective shortage pricing
- Current year capacity market, with effective shortage pricing
- Energy-only market, with effective shortage pricing
- Non-Market resource adequacy, with effective shortage pricing

	Forward Capacity	Current Capacity	Energy-Only
Demand Response	Costly and Complex	Costly and Complex	Depends on Market and LSEs
Resource Performance	Many Arbitrary and Complex Rules		No Performance, No Margin
Market Power	Very Very Complex / Impossible	Very Very Complex / Impossible	Hard
Political and Regulatory Risk	Yes	Yes	Yes
Price Variability	Low/Moderate	Moderate/High	Moderate/ Very High
Resource Requirements Determined By	Planners	Market/Planners	Market

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