

REVIEW OF PJM'S RELIABILITY PRICING MODEL (RPM)

The Brattle Group
June 30, 2008

EXECUTIVE SUMMARY

The Brattle Group has been commissioned by PJM Interconnection L.L.C. ("PJM") to review the performance of its Reliability Pricing Model ("RPM") and assess whether RPM is addressing the infrastructure investment needs that it was intended to address. Specifically, the scope of our assignment was to: (1) assess the overall effectiveness of RPM in encouraging and sustaining infrastructure investments to maintain resource adequacy consistent with reliability requirements; (2) review the key RPM design elements for their effectiveness in achieving RPM goals; (3) review RPM interactions with related PJM market design elements to identify potentially adverse incentives or barriers to entry; and (4) recommend possible modifications to the RPM. The report finds that RPM has been successful in encouraging and sustaining infrastructure investments to maintain resource adequacy consistent with reliability requirements both on an RTO-wide as well as on a local basis. However, the report also identifies a number of concerns and makes recommendations for possible improvements of the RPM design.

A. SUMMARY OF RPM RESULTS TO DATE

RPM introduced a capacity market design based on three-year forward-looking, annual obligations for locational capacity under which supply offers are cleared against a downward sloping demand curve (the VRR curve). RPM is designed to improve price stability, enhance reliability, and force existing resources to compete with a potentially large supply of new resources.

The first base auction took place in April 2007 and procured capacity for the 2007/08 delivery year. Since then, four more base auctions have been conducted. The most recent one, the May 2008 auction for the 2011/12 delivery year, was the first to procure capacity under a full three-year forward commitment.

Despite this very compressed time frame, the five base auctions conducted to date have been successful in achieving the stated reliability and economic objectives of RPM. The report finds that since RPM was implemented: (1) at least 4,600 MW of capacity has been retained that otherwise would have retired; (2) almost 10,000 MW of incremental capacity has been committed; and (3) the volume of generation interconnection requests has grown to make an additional 33,000 MW of new generation projects eligible to participate into future RPM auctions.

More specifically, the following incremental commitments—which amount to over 14,500 MW of resources that likely would not have been available in the absence of RPM—have been made under RPM to date:

- 4,248 MW of generation additions of various types, including 3,069 MW of new gas, coal, and renewable generation committed through RPM auctions, 580 MW of new generation committed to meet Fixed Resource Requirement (“FRR”) obligations, and 599 MW of reactivated generating units that were previously retired; excluding renewables and FRR capacity for which RPM likely was not a primary driver, 3,274 MW of commitments from new generating units can reasonably be attributed to RPM;
- Over 2,900 MW of uprates to existing generating capacity, which exceed derates by more than 1,260 MW;
- Close to 1,800 MW of demand resources (“DR”) in addition to approximately 1,400 MW of interruptible load for reliability (“ILR”) resources;
- Decreases in net exports of almost 2,200 MW (not counting almost 3,200 MW of committed imports from generating units in the Duquesne service area); and
- Withdrawn requests to deactivate 1,170 MW of existing resources and an additional 3,500 MW of planned retirements that were cancelled or deferred due to RPM; moreover, RPM helps retain over 20,000 MW of other existing resources that likely would *not* be financially viable in the absence of capacity payments.

In addition to RPM-related incremental resource commitments, market participants competed with an additional 6,000 MW of resources that did not clear in the most recent auction for the 2011/12 delivery year. This substantial amount of *uncleared* capacity included approximately 500 MW of uncleared new generating units, almost 300 MW of uncleared DR resources, and 670 MW of uncleared import offers. The remainder represented uncleared offers from existing generating units.

As a result of the more than 14,500 MW of new or retained resources committed under RPM to date and with the help of planned transmission upgrades, target reserve margins have been achieved both on a PJM system-wide and Locational Deliverability Area (LDA) basis. On an RTO-wide basis, committed capacity consistently exceeds target reliability levels by at least one percent in each year through the 2011/12 delivery year. Importantly, capacity margins have markedly improved within LDAs. The increase in generation, demand response, and transmission capacity committed to serve Southwestern MAAC (“SWMAAC”) and Eastern MAAC (“EMAAC”) LDAs has integrated these regions into the RTO-wide capacity market and improved reserve margins within these regions from levels that were one percent to two percent *below* target to RTO-wide levels of one percent to two percent *above* target reliability levels. A significant portion of improved LDA reliability is associated with planned new transmission facilities that were projected to be operational for the 2010/11 and 2011/12 delivery years.

To attract and retain these resources and improve reliability levels, customers have paid capacity prices that are consistent with reserve margins and the administratively-determined marginal cost of capacity for the RTO—the Net CONE of approximately \$170/MW-day. RTO-wide capacity prices have increased from levels below Net CONE as reserve margins declined from above-target levels until the most recent auction. In contrast, LDA-internal capacity prices have decreased from levels that were above Net CONE through the 2009/10 delivery year to the RTO-wide level of \$174/MW-day for the 2010/11 delivery year and \$110/MW-day for the 2011/12

delivery year as LDA reserve margins increased from below-target levels. If Duquesne had not withdrawn its load from PJM, however, or generation in the Duquesne zone had chosen not to offer its capacity into RPM, the 2011/12 clearing prices would have been approximately \$150/MW-day.

The first four base auctions attracted new capacity primarily in the form of additional demand response, reduced net exports, and cancelled or delayed retirements. While almost 2,000 MW of new generation was committed in the first four auctions, it accounted only for a relatively small portion of the overall resources that were added or retained. In contrast, the most recent auction for the 2011/12 delivery year not only experienced a more significant increase in total supply offers, but it also *more than doubled* the amount of new generating resources committed in the four previous auctions combined.

The positive impact of RPM already extends beyond the 2011/12 delivery year. RPM has stimulated an unprecedented amount of proposed new resources, which include approximately 33,000 MW of effective capacity in PJM's interconnection queue that is already eligible to offer into future RPM auctions. The vast majority of these proposed new generation projects did not exist before 2006, the year in which RPM was approved and finalized.

The impacts RPM has had on new and existing resources show that capacity price signals are important for facilitating the most cost-effective entry, investment, and retirement decisions. RPM capacity prices have also been important for stimulating demand-side investments that can effectively compete with supply-side resources.

B. SUMMARY OF RECOMMENDATIONS

Despite the success of RPM in attracting resources and achieving reliability targets, the report offers several recommendations that, if more fully developed and implemented, could enhance the effectiveness of the RPM market design. The report recommends maintaining the basic design elements, including the sloped VRR curve, the three-year forward time frame, and the one-year commitment periods. Other recommendations would modify rather than fundamentally change the basic design elements of RPM. Specifically, the report recommends that PJM and its stakeholder community consider and further evaluate the following options:

1. Implement changes to certain market rules and design elements that would increase the pool of resources able to offer capacity into RPM by: (1) reducing capacity that is "excused" from RPM, in particular the excluded excess capacity of FRR entities; (2) streamlining the generation interconnection process; and (3) adopting various measures that allow energy efficiency and price-responsive demand resources to be reflected in RPM on a more timely basis. These changes would increase the future supply of capacity resources.
2. Revise the deficiency and unavailability penalty provisions of RPM. Current penalties faced by generating capacity resources seem overly punitive, while penalties faced by demand resources seem too lenient. We recommend changes to the penalty structure that would reduce the risks faced by suppliers, while maintaining performance incentives for all resource types.

3. Improve processes to maintain and cost-effectively provide reliability within LDAs by: (1) defining LDAs electrically based on proximity to major transmission constraints; (2) modifying or eliminating the pre-auction screening of LDAs; (3) reevaluating the current reliability criterion applied to LDAs; (4) adjusting for LDA capacity shortfalls due to delays in planned transmission projects; and (5) offering to resources within LDAs an option to “lock in” capacity prices for three to five years.
4. Redesign incremental auctions so that they are more liquid, more able to address decreases in load and changes in LDA import capabilities, and more consistent with the base auctions by: (1) creating a single type of incremental auction; (2) adding into incremental auctions the portion of the VRR curve that did not clear in the base auction, updated for changes in load forecasts; and (3) integrating ILR resources into the incremental auctions.
5. Reevaluate RPM’s project investment cost provisions and evaluate potential modifications to how capital expenditures (cap-ex) may be included in suppliers’ offers, including: (1) allowing cap-ex adders to offer caps only in the first delivery year in which the particular capital addition is operational; (2) reevaluating investment recovery periods, particularly for major capital expenditures; and (3) allowing exemptions from offer caps for existing resources, based on a showing by a supplier that a higher offer cap is justified.
6. Evaluate how reliability targets and Net CONE values are selected to anchor the VRR curve by: (1) reviewing the reliability targets; (2) improving administrative updates to Net CONE, including an update to gross CONE and the use of forward-looking offsets for energy and ancillary service margins with ex post true-ups; and (3) refining the empirical adjustment option to update Net CONE.

More specific recommendations for consideration and further evaluation by PJM and its stakeholders are developed and discussed in Sections IV and V of the report.