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Whitepaper on PJM Forward Energy Reserve A Centralized Call Option Market Proposal

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Table of Contents

Forward Energy Reserve Market - "FER"	1
Appendix A - Product Definitions	4

Forward Energy Reserve Market - "FER"

The need

As PJM moves forward as a fully functioning marketplace for electricity, it has become ever more apparent that the market for demand response resources has not kept pace with developments in markets for supply resources. While PJM has developed two key programs that allow for both emergency and economic real time market decisions, these programs have only seen limited utilization relative to the size of the overall market. While their growth has been noteworthy, more effective means of integrating demand response into the markets of PJM appears needed to build upon the existing programs' spot market base. The intent must be to enable a robust market for demand resource comparable to that of supply resources. This view was clearly endorsed by the PJM stakeholders in language approved at the April 15, 2004 Electricity Markets Committee meeting. At that meeting, while adopting an extension to the existing demand response programs, the membership insisted upon additional language that committed PJM to pursuing a more global approach. The clear intent was integrating demand response to the fullest degree possible into PJM's markets.

The issues

To this end, PJM is taking an across the board look at what about the demand side of the market requires additional attention. In that focus, it has become apparent that little, if any, forward price signals are provided by the secondary market to demand resources for the commodity they are capable of producing. In addition, the most common retail pricing paradigms do not encourage attention to use characteristics in a way that is either pricing transparent or resalable at the wholesale level. This results in a lack of understanding of what an end use customer is, in fact, entitled to consume and at what price. PJM believes both the forward price signals and retail pricing issues must be addressed. To do this requires action at both the wholesale and retail jurisdictional level. PJM's wholesale market initiatives are geared toward better enabling transparency and fungibility of the retail market products/tariffs that need to emerge in both areas.

Issue: In order to better understand the lack of forward pricing signals for demand response, it is important to describe the characteristics of the commodity DR generally has to offer. The resource demand responders can most commonly provide to the markets can best be characterized as small increment (1 Megawatt or less) short duration (5 hours or less) electricity sales through either on-site production or curtailments backed by previously purchased firm energy. No liquid or transparent forward price curve is available for this product.

By contrast, in today's markets a fairly robust forward price curve for firm flat electricity blocks has developed in the over-the-counter markets around the PJM trading hubs. These electricity blocks will tend to be for full month or greater terms sized in 50MW increments. This structure works reasonable well to commoditize the output capability of large central station generating plants. Forward prices for these large blocks of electricity can commonly be found as far out as 3-5 years.

Issue: The effect of a lack of forward pricing of the DR commodity has been to largely stifle investment in long term demand response capability in the market. Based on this basic premise, PJM has undertaken development of a forward market for a commodity that could reasonably, but not exclusively, be sourced from demand response. This market is designed around a financial derivative product commonly traded in other types of commodity markets; the "Call Option." It is important to note that Call Options are not an unheard of product in PJM's secondary markets. The problem in using the existing over-the-counter option market for demand response has been multi-faceted mostly tied to the desire for large increment (50MW) full month duration terms. As was stated earlier, this is not what DR has to offer.

The options

PJM's proposed "FER" is initially designed to be of a size and duration that more closely fits with what demand responders can reasonably offer to sell. The base product is configured in 1mw increments and 5 hour durations exercised with day-ahead notification. DR providers will more easily be able to match DR resources that they control with sales of this product. PJM would also provide a clearing house for notifications, electricity scheduling, and credit clearing for this product that, together, greatly reduce the overhead associated with buying and selling such a product.

In today's retail marketplace, consumers generally see only the extreme ends of the product price spectrum offered to them. These options are generally either a single fixed price with little to no transparency of the cost (if any) of over or under use; or an hourly variable price with no certainty of cost what so ever. In order to better enable end-use load to become demand responsive, the customer must see the impact of their use through pricing. It is not crucial, however, that they see that impact every hour of every day. The value of dynamic pricing is by far greatest when demand and prices are highest. Therefore, dynamic retail pricing only needs to be used when consumers are at the very limits of their potential power draw from the grid. As such, PJM believes that a retail pricing regime should have a dynamic component built as standard only once a user exceeds a firm service level assigned through retail contract or tariff. For that to be feasible, it will be crucial for a firm energy level product concept to first take hold at the wholesale level. This concept would have end-users and their load servers being assured of pricing up to a firm level. Beyond this level, they could be exposed to dynamic market pricing. More importantly, however, if they specifically curtail below this level they would have the option to sell it back to the grid on a forward or real time basis and reap the benefit. This structure, particularly if coupled with a forward market option contract such as the FER, could provide an explicit demand response resource for market price based system dispatch. PJM believes in and will support efforts at the state regulation level to shift the retail pricing paradigm to better enable this sort of demand response.

Before initiating the development of this market, PJM asked a threshold question. Given the intrinsic value to the marketplace of demand response, why haven't the wholesale secondary markets grown this sort of product mix organically as has occurred with large hub traded block energy products? There appear to be a number of impediments preventing such growth from occurring. Key impediments range from administrative burdens to lack of upfront profit potential to acquisition costs. In addition, historical retail pricing based on a non-market based approach to energy cost assignment has left the legacy of "all you can eat" price structures as the norm.

From an administrative perspective, significant bi-lateral trading of these sorts of products requires the ability to handle daily notifications of counter-parties in order to exercise purchased options. This represents a real administrative burden even to the most robust market participants. If any meaningful volume of transactions are put together in a single party's portfolio, that party has significant daily obligations to contact each of their counter-parties individually in order to exercise their option(s). In addition, once notification occurs, both parties would need to enter or confirm a transaction for their daily energy schedule with PJM. This problem is further magnified for marketing companies that will tend to stand in the middle of a chain of transactions. They would need to be ready to receive notifications from those they sold to, schedule the transactions, and then quickly turn around and notify those they have bought from and also schedule transactions. All of this must occur in what is generally a very short time-frame of a few hours or less. PJM, as the market operator, is in a good position to act as a clearing house for these notifications. In addition, PJM has the technical capability to automatically re-assign obligations through schedule transactions based on those notifications in a way no single market participant can easily accomplish. This greatly reduces the administrative burden of transacting this sort of product.

Profit potential is the first criteria upon which private business interests will evaluate a product. This potential is further honed to look at both short and long term viability and whether a long term return is likely if a short term loss is expected. Even if long term return is reasonable likely, many investing timeframes are not sufficiently long to justify the shorter term cost. In addition, unless a market or product is patentable, an early entrant that expends significant resources to create market demand for a new product may not be able to sustain their position. In energy markets of this sort you can be left with a "chicken and egg" problem for the development of certain products. No single entrant is willing to invest in the development of a product or market that they can not expect to remain the key supplier of when it finally matures and profit potential becomes greatest. Organic market development of a FER like product appears to suffer from the problems described above associated with profit potential.

Finally, when looking to sell the demand response resource, one must first be in a position procure it from its producers. Since most demand response is held in the hands of a highly disperse set of non-market participants, the acquisition cost can be high. In order to overcome those costs, there needs to be a clear profit opportunity to be captured. As was noted above, the profit potential risks may prevent any single market entrant from investing.

Conclusion

Given the clear directive of the market stakeholders, PJM views the creation of the FER market as an important step toward market maturity. Until the demand side of the purchase decision has sufficient opportunity to forgo and resell the electricity commodity they might otherwise consume, price stability and efficiency will be less than optimal. The FER market would offer a forward valuation to the market for this commodity that is not today available. Only when this commodity's valuation is made both transparent and actionable will Demand Response be fully integrated into the market.

Attached to this document in Appendix A is an overview of the proposed initial product definition and market structure.

Appendix A - Product Definitions

- 1) Forward Energy Reserve - "FER"
 - a) FER market; 5 hours/month/week in 1mw increments.
 - i) Buyer receives the right to buy from PJM 1MW of energy at the contract/strike price during any on-peak hour of the contract period up to the cumulative hour limit for their contract period.
 - ii) Seller has the obligation to deliver (or pay for at DA LMP) 1MW of energy to PJM transferred at the contract/strike price during any on peak hour called upon for the contract period up to the cumulative hour limit for the contract period.
 - b) Duration and Location.
 - i) Settled/Deliverable at Hubs or Zonal aggregates.
 - ii) PJM will determine 12 "trading" months for each year.
 - (1) Trading months may not correspond exactly with a calendar month (IE. A trading month may begin a few days before or after the start of the calendar month.
 - (2) Each trading month will include either 4 or 5 M-F weeks.
 - c) Settled/Deliverable at (hubs or) zonal aggregates.
 - d) Need not be backed by actual resource. Can be backed instead with real time or day-ahead purchases at LMP.
 - e) PJM market clearing auctions.
 - i) Auction held monthly for each of the succeeding 24 months on a rolling basis. Each of the 24 months' auctions will be cleared individually.
 - ii) Product traded in auction can be bundled together for over-the-counter trades. PJM will accept bi-lateral trades at one of the auction strike prices to be entered into its systems (ala eFTR) for PJM to manage the administration associated with execution.
 - iii) Market clears based on one variable, the "premium."
 - iv) The same strike prices will be used for all auctions.
 - (1) PJM will establish a single unchanging list of 6 strike prices that will be used for bids/offers in each and every auction. 2 additional strikes will be available for transactions delivered during the trading months of July & August.
 - (2) Each bid/offer by a Market participant must use one of the pre-defined strike prices.
 - (3) Discrete clearing will be done for each strike price for each delivery month based on the option premiums submitted by market participants.
 - f) PJM functions as "middle-man."
 - i) 9am EPT Day-ahead notification to PJM by buyer for exercise of FER for 1 or more 5 hour blocks the following day.
 - ii) 10am EPT Day-ahead notification by PJM to seller of the dispatch of a 5 hour block the following day.
 - iii) Once notification is received from Buyer, PJM will automatically schedule an electricity purchase from PJM to the Buyer at their pre-determined strike price.

- iv) Once PJM notifies a Seller that they have been exercised, PJM will automatically schedule an electricity sale from the Seller to PJM at their pre-determined strike price.

- g) PJM Settlement.
 - i) PJM will pay sellers their full "premium" x MWH sold in the first billing statement following the clearing of the market in which the FER was sold.
 - ii) PJM will charge buyers their full "premium" x MWH purchased in the first billing statement following the clearing of the market in which the FER was purchased.
 - iii) PJM will settle scheduled energy that was the result of a FER, as it does all other schedules, at the close of the month of delivery.