WHITE PAPER

PJM CAPACITY PERFORMANCE IS HERE. DON'T BELIEVE THE MYTHS.

Dann Price
Executive Director of Market Development
CPower Energy Management
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CPower

SUMMARY

As we're all aware by now, this past May PJM ushered in a new era for Demand Response (DR) with the Delivery Year (DY) 2020/21 Base Residual Auction (BRA). This marked the first auction offering 100% Capacity Performance (CP). The legacy summer DR programs of the past, such as the popular Limited and Summer Extended programs, will soon be gone.

In the foreseeable future, Capacity Performance will be PJM's only game in town for forward capacity Demand Response. Leading up to the May BRA, we at CPower were taking a close, hard look at PJM's capacity market and what it means to organizations participating, or planning to participate, in Demand Response. In the course of our research we've discovered some misconceptions--you could call them "myths"--surrounding the BRA, CP, and DR. We fear that some of the more notable myths, taken alone or together, could prevent forward-looking organizations from participating in DR and earning potentially significant revenue.

So let's do some DR mythbusting. In this paper, we'll examine the history of "traditional" DR in PJM, the January storms that sank those programs, and what CP is--and isn't. We'll tackle three significant myths: The decline of cleared DR in the RPM; new requirements and penalties make it too difficult to participate; and the move to 100% CP means PJM is moving away from DR.

Like many myths, these have some basis in fact. But we believe they are not causes for alarm. Although the program rules may seem more challenging, the ability to participate remains high. Capacity Performance is here -- let's explore just what it is, and how to realize its potential.

A BRIEF HISTORY OF DR IN PJM

As histories go, Demand Response in PJM is a young one, just 10 years old. "Traditional" DR wasn't introduced until 2007, with the creation of the Reliability Pricing Model, or RPM. PJM created the RPM as an auction-based forward capacity market to allow capacity resources the ability to meet PJM's forecasted reliability needs three years in advance. PJM made two programs available, DR and Interruptible Load for Reliability (ILR).

DR resources had to offer their capacity into the RPM along with other capacity resources (such as generation) and take on an RPM Commitment. These DR Resources were exposed to RPM collateral requirements and deficiency penalties for not meeting their obligation. In contrast ILR didn't require resource to have a forward commitment in the RPM to capture essentially the same capacity value as any other capacity resource. Of course, this meant the far majority of DR capacity resources entered the market as ILR and not DR. Needless to say, ILR was a very easy program for Curtailment Service Providers (CSPs) to administer and for retail customers to participate in.

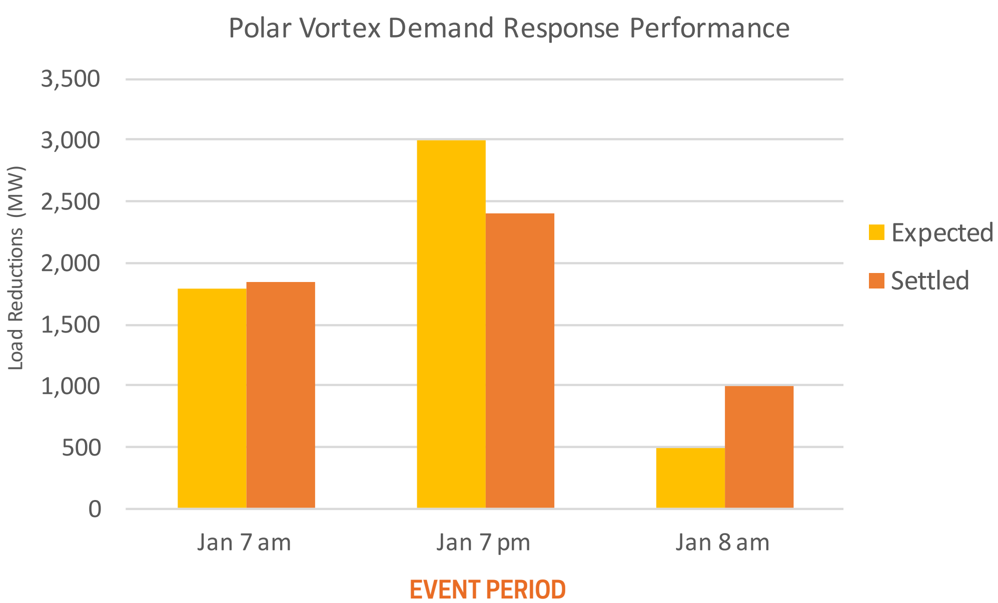
ILR achieved success beyond any expectations. But this success led to costs that were not anticipated. ILR was therefore eliminated starting with the 2012 DY. CSPs had to offer their DR capacity into the RPM with the start of the 2012/2013 DY BRA in May, 2009, as DR capacity resources and would have a forward DR RPM Commitment that they would have to manage against customer enrollments.

Ahead of the 2011/2012 DY, PJM made a change to the Measurement and Verification (M&V) calculation used to determine capacity reductions for DR customers participating as Guaranteed Load Drop (GLD). This M&V change would no longer provide capacity load reduction credit for meter read reductions made above the customer's Peak Load Contribution (PLC). Many organizations were reducing their capacity charges by managing down their PLC and then receiving DR capacity revenue for the same reductions. This change removed many DR MW from the RPM and the ILR and DR programs.
At the same time, PJM began a redesign of the RPM for Demand Response. The only DR program available spanned

four months in the summer (June-Sept) and was known as Limited DR. Stakeholders encouraged PJM to limit the amount of summer-only DR that could clear the RPM, which drove the creation of a three-tiered DR product structure Limited DR, Summer Extended DR, and Annual DR. These new products were meant to properly manage the amount of summer DR that could clear in the RPM.

Fast forward to January 2014 and two major events: The well-known "Polar Vortex" early in the month, followed by an even bigger winter storm a few weeks later.

These two weather events brought extremely cold temperatures to the PJM region. PJM experienced several reliability issues due to generation outages and resources being unavailable. To avoid this occurring in the future, PJM proposed to FERC an RPM redesign whereby they eliminate all existing capacity products and introduce two new ones: Capacity Performance and Base Capacity.



You can read PJM's full post-mortem report on the [January 2014 Cold Weather Events here](). It includes one important point that often gets left out of discussions about the January storms, but I feel should be pointed out: The availability and response of voluntary demand response exceeded PJM's expectations in real-time. "In fact," the report says, "the total amount of demand response provided was larger than most generating stations… Even though demand resources were not obligated to respond during this period, close to 25 percent of the demand response resources registered in PJM did respond and helped PJM manage the grid on the all-time winter peak day. This experience demonstrates the year-round value of demand response." You might even say that Demand Response saved the day!

This market redesign was approved by FERC very quickly, and left all capacity resources scrambling to come up to speed. PJM held two CP Transitional Auctions for 2016/2017 and 2017/2018 to introduce CP into the market early and allow already committed Annual capacity resources to recommit as CP resources. The two new products were introduced into the BRA starting with the 2018/2019 DY, and all existing capacity products were eliminated. Base Capacity, designed to serve as a transitional product between a full plate of capacity products and one single product, was eliminated for the 2020/21 DY BRA.

WHAT CAPACITY PERFORMANCE IS — AND ISN'T

PJM wants to ensure that it will never be in the dire emergency situations it was in during the Polar Vortex. The Capacity Performance product is designed to increase system reliability by enforcing more stringent compliance and availability requirements on all capacity resources. Failure to do so could yield higher noncompliance penalties.

PJM describes CP as a "no excuses" approach to ensuring the system's reliability. Its stricter performance requirements, coupled with a high non-performance rate that can result in having to pay back capacity revenues are designed to ensure 100% grid reliability in times of unexpectedly high demand. Even though CP is largely designed to address generation shortcomings, and despite the critical role DR played during the early 2014 storms, these requirements appear to reduce and remove much needed and reliable DR capacity resources from the market.

This brings us to what CP isn't. For those who participated in comfy summer-only programs, it isn't the low commitment-high return program of DYs past. But that doesn't mean it isn't a smart investment. There is substantial revenue to be had if you prepare for the stricter requirements. CP balances these new stricter requirements against opportunities for increased market revenues to drive investment, a higher default offer cap, and bonus payments.

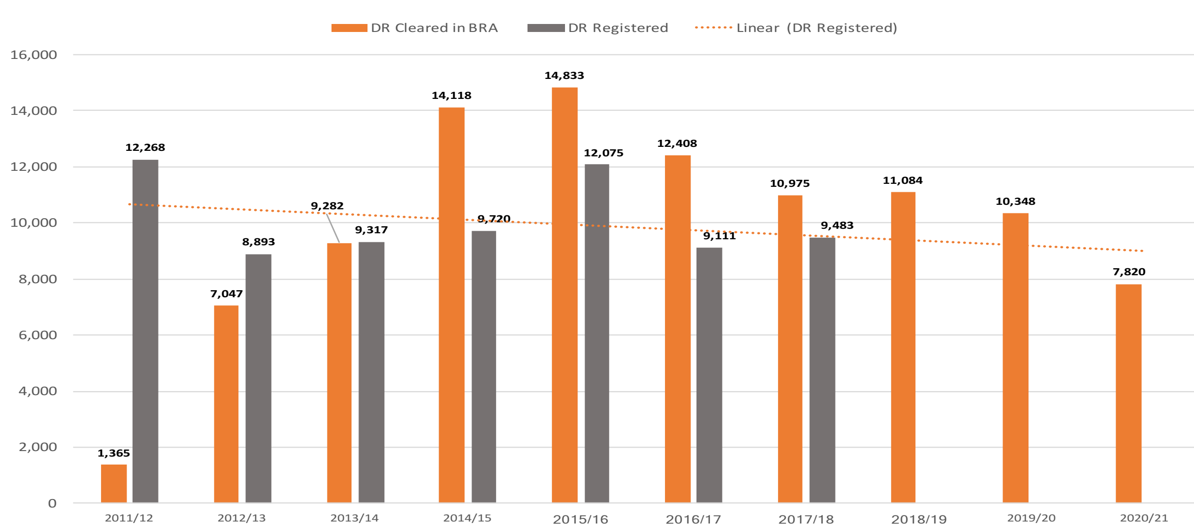
Capacity Performance, in short, will reward DR customers for participation. Period. Before we get to just how to reap the greatest share of those rewards, let's bust a few myths that can divert attention away from this one central fact.

MYTH #1

Demand Response had declined over the past six years.

You've probably heard this one. Cleared capacity is in decline, which means DR is in decline, which means you might as well just forget it. This is one of those pernicious myths that can prevent organizations from opening a rewarding and potentially substantial revenue source.

Let's look at some numbers.



The problem with this myth is the huge disparity between what is cleared in the RPM and what is enrolled. Although the amount of cleared DR has generally declined over time, and declined in 2020/21, the amount of actual enrolled DR participating in the market each year has stayed steady, hovering around 9,000 MW each year.

Historically, there has been more DR cleared than enrolled. Most of that excess DR was bought out in Incremental Auctions and bilateral markets over the three years prior to the start of the delivery year in response to declining PJM Load Forecasts. (This flexibility is a favorable characteristic of DR that helps reduce costs to all customers.) There were some fixes needed to assure that overly optimistic CSPs did not contribute to potential reliability issues. For example, CSPs could potentially clear the same DR MW for the same customers. Adjustments were made to early RPM rules to improve how CSPs can sell DR into the RPM, which helped remove the excess DR from being offered and cleared. With experience, CSPs have enhanced anticipating customer needs to the benefit of customers and the system.

The big takeaway from this chart is that, despite changes in PJM products and market conditions over the last decade DR is not in decline or at least not to the extent some will have you believe. Real DR is steady and holding strong. Enrolled DR in the past six years has been between 9,000-9,500 MW, and 2020/21 shouldn't be much different. Although only 7,820 MW of DR cleared the BRA, additional DR could clear in the Incremental Auctions or even be enrolled beyond that amount.

MYTH #2

New CP requirements and penalties make it difficult to participate in DR.

The stakes are definitely high in a 100% CP world -- for generators. Remember, CP is primarily designed to ensure that generator resources have the upgrades and fuel they need year-round. Unfortunately, that year-round requirement applies to all capacity, including DR, and that year-round provision seems daunting. Fortunately, though, the upside to CP is that, with the increased requirements for compliance and availability on generation, there potentially could be less of a chance that PJM would enter into an emergency situation where demand response would be called to assist the grid's reliability.

The reality is that PJM is still a summer-peaking electric grid, with the vast majority of DR event risks still in those same summer months, today, tomorrow and three years from now. The additional non-summer months of compliance should be risk-adjusted as PJM takes steps to insulate themselves from using DR often in the summer, and using it at all in the winter. Remember that old "Traditional" DR program called Limited that everyone loved? That program required that DR participants commit to up to 60 hours of DR events. Sixty hours in just four months!

I'm not suggesting that it isn't possible that 60 DR event hours could be called in the summer months, or across the entire year for that matter. I'm just saying it's very unlikely, especially all in the same zone. So, take that into consideration along with the amount of historical DR events called, and the requirements imposed on generators, when you think about potentially being called for a DR event during non-summer months.

What about penalties? Again, those penalties are there to ensure that any CP resource that commits to the market understands that compliance is not only mandatory, but it is expected. If you have a huge concern about how that penalty impacts your business, then you may want to revisit how you're participating. They would be incurred only if an event was called and your load reduction was not available. (For context, note that PJM has not called a mandatory summer event in the past four years.)

Let's not forget about emergency energy payments. Every hour that an emergency DR event is called you earn emergency energy payments consistent with the amount of energy reduction that is credited. This revenue, in addition to your capacity revenue, needs to be taken into account with any non-compliance offsets you may be fearing.

While requirements appear daunting and penalties high, their impact on DR should be negligible, if at all. Any organization partnered with an experienced demand-side energy solutions provider should have no problem meeting requirements and avoiding penalties, all while continuing to receive capacity payments.

MYTH #3

100% CP means PJM is moving away from DR.

No. If anything, PJM is even more committed to DR. Here's what PJM says, from their PJM Demand Response Strategy, released in June of this year.

> "Consumer response to price is essential to efficient and competitive market outcomes, a principle that holds as true for wholesale electricity markets as other markets. The more that demand actively participates in electricity markets, the more competitive and robust the market results. Additionally, demand response (DR), if visible and dependable, has proven to be a valuable operational tool that assists in maintaining reliability both for real-time grid stability and long-term resource adequacy."

Capacity Performance is, for now, a forward capacity generation-focused product that also applies to DR. If, in the years ahead, PJM sees a more competitive solution for the DR portion of the RPM equation, their history suggests that they will bring those solutions to market. If you follow the PJM capacity market then you probably know that just about every year there is some adjustment made to either a DR program, the RPM, or the capacity market in general.

And just because PJM is moving to a year-round Capacity Performance program does not mean that summer only customers will no longer be able to participate. Yes, some may see their summer Demand Response reductions decrease when they move to CP and some may find that they cannot continue to participate year-round based on their operation, but all hope is not lost. There are opportunities to participate as part of a CP aggregation using your excess seasonal load drop capabilities.

GET THE MOST FROM PARTICIPATING IN PJM'S DR AND DM PROGRAMS

Now that we've busted the myths, let's take a look at how else you can participate in energy management programs that can generate substantial revenue and energy savings in PJM that will compliment your emergency capacity participation.

ADDITIONAL DEMAND RESPONSE PRODUCTS

While Capacity Performance is the future of forward capacity products, PJM currently offers two demand response programs that allow hourly real-time participation. They depend on a customer's ability to respond quickly to changing market conditions, while allowing customers to not only generate additional revenue but also avoid high cost electricity prices. These programs can be great complements to your CP enrollment and stacked to maximize financial return from your total DR participation.

The Economic Program is an energy based program that enables organizations to actively increase demand response earnings by voluntarily responding to price triggers, as opposed to being on call for grid emergencies. While enrolled in this program, customers can choose specific hours to curtail load when the $/kWh reaches a predetermined price trigger. Customers can also significantly save on energy costs due to reduced consumption during these periods of high electricity prices. CPower can help participants forecast these high-priced hours and can work with you to adjust your operations to reduce your consumption accordingly.

Synchronized Reserve (or Synch Reserve) is an ancillary program designed to help the grid react to short-term disturbances. Similar to the Economic Program, each hour customers offer in their available load reduction to be on standby if needed by PJM. If their offer is accepted, they receive the hourly clearing price and must be on-call to curtail within 8 minutes of an event notification with events lasting up to 30 minutes in duration. Typically, events last 12-15 minutes on average and historically customers have been called anywhere from 15-30 times a year if they participate in every hour for the year. Although Synch Reserve requires much quicker response, participants earn revenue each hour they are accepted not just when they are dispatched to curtail.

CAPACITY REVENUE IN ENERGY EFFICIENCY MONETIZATION

Energy Efficiency (EE) projects are continuously being completed at customer sites and although they provide great cost savings and potentially utility or state rebates, they may also qualify for PJM capacity credits. PJM recognizes these projects as permanent capacity reductions and will provide organizations with additional capacity revenues.

Eligible EE projects, such as lighting retrofits, HVAC upgrades, variable frequency drives, LEED buildings, and many other common energy efficiency improvements can be rewarded for their reduction in energy use in the forward capacity market. After a project is completed, the demand reduction must be measured and verified by an authorized provider. Accurate validation of the change in electricity demand that your project generates serves to authenticate its value in the PJM market. Once a project's eligibility has qualified, CPower will offer it into the RPM (just like DR). The program can pay organizations capacity revenue for up to four years following the completion of a qualified project.

For larger projects, this means there could be significant revenue waiting to be captured with very little effort. This revenue can be rolled back into additional energy efficiency projects that produce even more financial value upon completion as well as the long-term savings realized in the permanent reduction of energy use by efficiency upgrades.

Remember, these revenues are in addition to potential EE incentives and the immediate and long-term energy saving benefits. Combining EE capacity payments with EE savings and demand response capacity payments provides an unbeatable revenue stream for your organization.

DISTRIBUTED ENERGY RESOURCES: GENERATION AND STORAGE

By providing you with energy behind the meter when the grid is at its most vulnerable, distributed energy resources (DER) such as emergency generators and intelligent storage networks, pay you for your preparedness. Both allow participants to curtail grid energy usage without having to reduce demand. This, in turn, allows participants to adjust their forward capacity bid to reap even higher rewards.

Retrofitting and upgrading onsite diesel emergency generators can ensure continued or expanded participation in demand response programs, resulting in significant additional revenue. Just as important, existing DR program revenues can be used to offset capital costs. This can reduce up-front costs for the upgrades and even make it cash positive from the beginning.

Energy storage can save organizations money by storing electricity when prices are low and using it when prices are high. By shifting energy use away from times when it is most expensive, intelligent storage lowers costs, protects against changing rates, and supports a sustainable grid. A combined energy storage and demand response solution helps organizations save and earn money with demand response, all the while keeping the PJM grid reliable and sustainable.

100% CAPACITY PERFORMANCE IS HERE. CPOWER IS HERE TO HELP 100%.

Demand Response is here to stay in PJM, and Capacity Performance is, for now, their preferred method of maintaining grid reliability. PJM considers DR central to its long-term strategy. We believe it should continue to be central to your long-term energy strategy as well. DR in PJM is, and will continue to be, a great market for energy cost offsets for organizations who pair with the right demand-side energy management solutions provider – like CPower.

We have the most knowledgeable and capable team in the PJM market. We're here to take you through every twist and turn of the Capacity Performance program and assess your options for participation. We can help you stack EE with demand response for maximum long-term revenue and cost-saving benefits, and advise you on how to best capitalize on the lucrative Economic and Synch Reserve demand response programs.

Find out more about how CPower can put Capacity Performance to work for you.
Call 844-276-9371 or visit cpowerenergymanagement.com.

ABOUT THE AUTHOR: *Dann Price has specialized in PJM Demand Response for the last ten years. As CPower's Executive Director of Market Development for the PJM market, Dann is responsible for keeping hundreds of customers up to speed on market conditions, energy prices, program particulars, and regulatory issues in the ever-changing PJM Demand Response market.*

About CPower: CPower is a demand-side energy management company. We create optimized energy management strategies that help businesses streamline their energy usage, offset costs through demand response participation, and reach their sustainability goals. CPower is a leading provider of demand side management services to commercial and industrial customers across the US and has 25+ years of knowledge and experience in helping customers implement intelligent energy management programs.

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Contact us at **844-276-9371**