Watchlist for PJM’s 2022-2023 BRA

By Ilkka Kovanen, Shubhangi Sharma, Himanshu Pande, and George Katsigiannakis, ICF

Introduction

The Base Residual Auction (BRA) is the primary capacity procurement mechanism in PJM’s capacity market, known as the Reliability Pricing Model (RPM). The BRA is scheduled to occur three years prior to each Delivery Year, with subsequent incremental balancing auctions held in the lead up to the start of the Delivery Year. In the BRA, PJM uses a series of downward-sloping demand curves to procure capacity obligations on behalf of the PJM Load Serving Entities (LSEs). Existing PJM generating resources are required to participate in the BRA, with exemptions for intermittent resources, capacity storage resources, and environmentally-limited resources. BRA pricing may vary across the PJM system, with multiple Locational Deliverability Areas (LDA) defined to account for import limitations between PJM regions.

PJM is scheduled to hold the BRA for the 2022-2023 Delivery Year in May 2021, two years later than initially planned because of delays in finalizing the buy-side capacity market mitigation rules (i.e., Minimum Offer Price Rules [MOPR] in PJM).

The three years since the prior BRA have resulted in several key changes to the PJM capacity market design along with a number of other market changes, all of which are expected to impact the auction results.

The most publicized change to the capacity market design has been the expanded MOPR, which now applies to all resources that receive state subsidies, with a handful of exceptions. However, in addition to the expanded MOPR, PJM has also made changes to the Cost of New Entry (CONE) assumptions and the Variable Resource Requirement (VRR) curve shape, following the 2018 Quadrennial Review process. The methodology to estimate the Net Energy and Ancillary Services (E&AS) margins has also changed, following changes to the reserves markets. The load forecast for the 2022-2023 Delivery Year has also been revised significantly over the past three years, and the reserve requirements and LDA-specific Capacity Emergency Transfer Limit (CETL) values have also been updated.

There have also been substantial changes in the PJM market at large since the prior BRA was held in May 2018. Several gigawatts of new combined-cycle gas turbine (CCGT) projects have closed financing and have begun construction, with most expecting to come online in time for the 2022-2023 Delivery Year, while many gigawatts of renewables projects are also looking to enter the market. Meanwhile, several gigawatts of existing generators have retired or announced plans to retire over the next few years, while low power prices in both 2019 and 2020 have squeezed the margins for resources throughout the market.

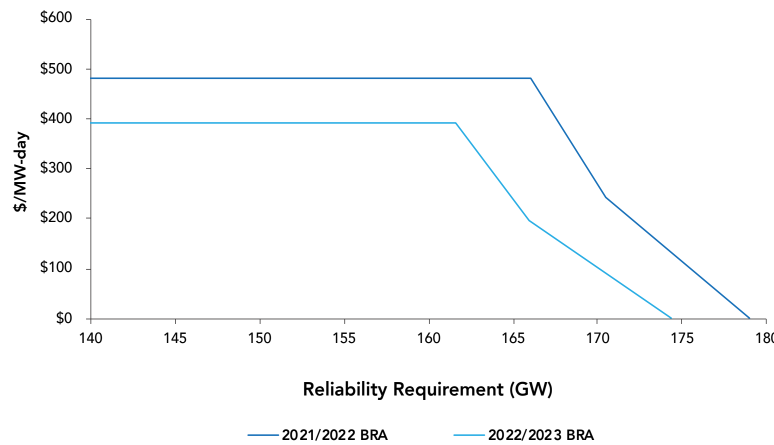
Despite the multitude of market changes that have occurred over the past three years, many of these changes are expected to have opposite and offsetting impacts.

Demand-side changes

Demand curve shift

The capacity demand curve in the BRA, called the VRR curve, is impacted by several factors, including the peak load forecast, the Net CONE values, the reserve requirements, and the overall shape of the curve. The cumulative impact of these factors is a reduction in RTO-wide capacity demand for the 2022-2023 BRA when compared to the 2021-2022 BRA. This impact is illustrated in Exhibit 1, which shows the RTO VRR curve for the 2021-2022 BRA and the 2022-2023 BRA.

EXHIBIT 1. COMPARISON OF RTO VRR CURVE FOR 2021-2022 BRA AND 2022-2023 BRA



The 2022-2023 Delivery Year is the first using updated Net CONE values following the 2018 Quadrennial Review process. These updated values reflect a change in reference technology, from an F-class combustion turbine to an H-class combustion turbine. Compared to the older F-class turbines, the H-class turbines are larger and more efficient, resulting in an overall reduction in the capital costs of the reference technology. The financial assumptions have been updated, including revising the tax rates following the Tax Cuts and Jobs Act of 2017, which reduced the highest-level federal corporate rate from 35% to 21%. The Net E&AS margin estimates have also changed to use a forward-looking approach, reflecting expected values for the 2022-2023 Delivery Year in place of the previously-used historical backcast approach. With all of these changes incorporated, the RTO Gross CONE value has decreased by $85/MW-day (21%) while the Net CONE value has decreased by $61/MW-day (19%) when compared to the 2021-2022 Delivery Year.

PJM has made refinements to their load forecasting approach, which is used to develop the annual PJM Load Forecast Report.

These refinements have led to year-over-year declines in the load forecast, bringing the projections more in-line with the load levels observed in recent years. As a result, the projected RTO peak load for the 2022-2023 Delivery Year has decreased by 2,418 MW (2%) compared to the RTO peak load values used in the BRA for the 2021-2022 Delivery Year. In addition to the modeling refinements, COVID-19 impacts have depressed the near-term economic outlook, which has also reduced the projected RTO peak load for the 2022-2023 Delivery Year.

There have also been updates to the VRR curve shape, the Installed Reserve Margin, and the Pool-Wide Average EFORd that have also contributed to overall reduced capacity demand on the RTO level and have shifted the curve leftwards.

Changes to import limits

For the individual LDAs, local capacity prices are impacted by both the local VRR curve and the CETL values. The CETL values determine the amount of capacity that can be imported into the individual LDAs from elsewhere in PJM, thereby reducing the need for additional local capacity. PJM updates the CETL values for each Delivery Year, based on power flow analysis using the expected transmission system topology for the Delivery Year.

Among LDAs that separated in one or more of the previous three BRAs, the majority saw increases in the CETL values compared to the values for the 2021-2022 Delivery Year. The only decrease was for BGE, where the CETL value fell by 5%, while the CETL values for MAAC, EMAAC, PSEG, ATSI, ComEd, and DEOK increased by 9%, 2%, 25%, 8%, 23%, and 10%, respectively. All else equal, an increase in the CETL value makes an LDA less likely to separate in price from the RTO.

Supply-side changes

Expanded MOPR

In December 2019, FERC ordered PJM to expand the MOPR to cover all resources that receive state subsidies. This ruling concluded a series of proceedings regarding the impact of state subsidies on the PJM capacity market, stretching back to 2016, that had already delayed the Base Residual Auction for the 2022-2023 Delivery Year from its originally scheduled May 2019 timing. While the long-term future of the expanded MOPR is still uncertain, PJM appears set to conduct the BRA for the 2022-2023 Delivery Year in May 2021 under the current market rules, including the expanded MOPR.

Under the expanded MOPR, resources that receive state subsidies are required to bid into the capacity auctions at a competitive price level that does not reflect any subsidy payments. For such resources, these incremental subsidy payments reduce the amount of "missing money" that they need to recover from the capacity market, enabling them to bid into the capacity auctions at lower bid prices than would otherwise be economically justified. Removing the impact of these subsidy payments will cause the bid prices of these resources to increase, all else equal.

The default MOPR price floor for existing resources is set at the Net Avoidable Cost Rate for each resource. PJM has established default Gross Avoidable Cost Rate values for each resource class, while the Net E&AS margin is calculated separately for each resource. The MOPR price floor for new resources is set at the Net Cost of New Entry for each resource. PJM has established default Gross Cost of New Entry values and Net E&AS margin estimates for each resource class and each transmission zone. Exhibit 2 below shows PJM wide average Net CONE values for select new resources types. As an alternative, both new and existing resources can instead request a resource-specific MOPR price floor, which is individually justified based on the resource-specific financials and could potentially be lower than PJM's default MOPR floor for that resource type.

EXHIBIT 2. PJM AVERAGE DEFAULT NET CONE FOR SELECT NEW RESOURCE TYPES

Resource Type	Net CONE ($/MW-day)
Combined Cycle	146
Combustion Turbine	264
Solar PV (Tracking)	203
Onshore Wind	1146

The resources most impacted by the expanded MOPR for the 2022-2023 Delivery Year are existing nuclear resources that receive subsidies and new-build renewable resources that meet state RPS program requirements. While in prior auctions these resources could enter the market as price-takers, they must now participate at higher MOPR bid prices. These MOPR bid prices may be sufficiently high to prevent these resources from clearing in the capacity auction. All else equal, the MOPR is expected to result in an increase in auction clearing prices.

Resource changes

Several new CCGT projects have closed financing and begun construction since the prior BRA was held in May 2018. Many of these projects are expected to come online in time for the 2022-2023 Delivery Year. Of the 7 GW of CCGTs that are currently under construction, ICF expects 3.9 GW to participate in the Base Residual Auction for the 2022-2023 Delivery Year.

There are also a multitude of new solar and wind projects that are expected to enter the market in time for the 2022-2023 Delivery Year. While these projects are not required to participate in the capacity market, ICF expects many will nevertheless elect to participate. However, the ability of these projects to clear in the auction may be constrained by the MOPR, though some of the projects may be able to clear by qualifying for one of the available MOPR exemptions, or by justifying sufficiently low offer prices through the unit-specific MOPR floor process.

Since the prior BRA was held in May 2018, a total of 20 GW of resources have either retired or announced plans to retire before the 2022-2023 Delivery Year. Some, though not necessarily all, of these resources have likely cleared in prior auctions, which implies that retirement of some these units is expected to decrease the overall cleared supply and put upward pressure on capacity prices. The majority of these retirements consist of coal and nuclear generators.

Challenging market conditions

The bidding behavior and bidding strategies of various resources are a major driver of capacity prices. The PJM market dynamics over the prior three years may cause resources to change their bidding behavior compared to recent auctions, with potential price impacts.

The PJM market has seen record-low power prices in 2019 and 2020. Per the 2020 PJM State of Market Report, the energy prices reached the lowest level in the history of PJM markets during 2020 in both the real-time and day-ahead markets. These low power prices have been driven in part by low gas prices, with gas resources setting the power prices in PJM in an increasing number of hours. This market environment has been particularly challenging for existing coal and nuclear resources, with many resources failing to recover their avoidable costs in recent years, per the 2020 State of the Market report[1]. As a result, these units may bid higher in the upcoming auction to better reflect their cost recovery requirements.

For coal resources in particular, these challenging conditions may continue. Further new CCGT and renewable builds are expected to enter the market, combined with relatively minimal expected demand growth. Alongside these market challenges, the coal fleet in PJM is aging, with over 42 GW of coal units in PJM that are over 50 years in age. Additionally, existing and potential state-level or federal-level policies that target clean energy or renewable energy resources may create further downsides for the PJM coal fleet.

Fixed Reserve Requirement (FRR) changes

The FRR Alternative is an existing component of the PJM capacity market that was preserved by FERC in their December 2019 MOPR order. The FRR Alternative allows for LSEs to remove their load from the central PJM capacity market and instead self-procure resources to meet their capacity obligation for a delivery year. The FRR Alternative gives LSEs the freedom to obtain capacity resources as they see fit. This procurement can be independent of the competitive resource economics in the central PJM capacity market, including the impacts of measures such as the expanded MOPR.

[1] For details see 2020 State of the Market Report for PJM, Volume 2, Section 7, Table 7-38, prepared by Monitoring Analytics, LLC.

FRR is a "fixed" requirement in that LSEs are only required to procure up to the minimum PJM target reserve margin, which is a fixed value. In contrast, the RPM market design uses VRR curves to procure a variable amount of capacity based on offer prices. This variable resource procurement may exceed the minimum PJM target reserve margin levels. The final capacity procurement in the PJM BRA auction has consistently exceeded the minimum PJM target reserve margin levels in recent auctions. For example, the last auction cleared at a reserve margin of approximately 22% compared to the target levels of around 15%.

Each FRR entity must submit an FRR Capacity Plan one month prior to the BRA for the Delivery year. All resources in the FRR Capacity Plan must consist of resources that can participate in the central PJM capacity auction, and any resources included in an FRR Capacity Plan will then be removed from the central capacity market for the Delivery year.

For the upcoming 2022-2023 auction, Dominion utility has elected the FRR alternative. Our prior expectations have been that a state or utility FRR election would put downward pressure on capacity prices. This is mostly because ICF has conservatively assumed that any utility that elects FRR would end up procuring at the target reserve margin level (around 15%), which is the minimum requirement and is significantly lower than 22% at which the auction cleared in the past. Such an assumption results in lower demand for supply due to FRR procurement being at minimum target levels—and thus puts downward pressure on capacity prices by increasing the overall available capacity reserves or supply in the auction. However, the impact of Dominion electing FRR is actually the opposite, and it results in relatively no change or marginally higher capacity prices.

This is mainly because Dominion is removing a significant amount of supply from the auction compared to its load and is procuring much more than the minimum target reserves. Based on the auction parameters, Dominion is removing approximately 16.8 GW of load from the auction. In contrast, based on the FRR supply posted by PJM, the total supply that is being removed by Dominion is around 21.3 GW. This implies a reserve margin of approximately 26.7% for the Dominion FRR load, which is significantly higher than the target reserve margin of approximately 15% and even higher than the reserve margins at which the system cleared in the past auction i.e.,~22%. ICF assumes that a resource, included in the FRR supply list posted by PJM, will be fully committed to FRR and therefore included its full capacity in the Dominion FRR supply calculation.

Capacity price outlook

ICF expects that the RTO capacity price will clear in the $120/MW-day to $160/MW-day range, with expectations centered around $135/MW-day. Some of the market developments since the prior auction, such as the expanded MOPR, the existing resource retirements, and the challenging energy market conditions, are expected to put upward pressure on capacity prices, all else being equal. However, the reduced capacity demand and incremental CCGT new entry are expected to offset this upward pressure.

ICF expects that the MAAC, EMAAC, PSEG, BGE, and ATSI LDAs will clear around the same price level as the RTO, as the reduced capacity demand and increased import limits reduce the likelihood of price separation. However, there is still potential for price separation, given the different resource mix and the overall smaller size of these LDAs relative to the RTO. Meanwhile, ICF expects that the ComEd LDA will continue to separate in price from the RTO, with an expected premium in the $30/MW-day range.

One key uncertainty is how impactful the expanded MOPR will be on the competitiveness of subsidized resources. For instance, if existing subsidized nuclear and new-entry subsidized renewables are easily able to clear in the auction, despite the MOPR, then prices may be lower than what ICF expects.

Another key uncertainty is the bidding behavior of existing resources, many of which have struggled in recent years given the challenging market conditions. Resource owners may be unwilling to exit the market in the immediate term and may prefer to continue to clear in the auction, enabling their resources to at least receive some amount of capacity revenue. If substantial amounts of resources under-bid compared to their expected net going-forward costs, then prices may be lower than what ICF expects. However, if most resources bid their full expected net going-forward costs, then prices may even be higher than what ICF expects.

About the authors

Ilkka Kovanen
Senior Consultant,
Energy Markets - Power

Ilkka specializes in quantitative modeling and analysis of power markets and individual market resources, market research, thought leadership, and model development. His primary focus is the Pennsylvania-New Jersey-Maryland (PJM) market, with additional experience in the other U.S. power markets. Ilkka closely follows market developments in PJM and helps model and quantify their impacts. His work in PJM has covered the energy market, capacity market, ancillary services markets, transmission congestion, hedging agreements, and state energy policies.

Ilkka has supported a range of thermal, renewable, and storage clients in mergers and acquisitions transactions, development projects, and various internal analyses within the PJM market and across the U.S. He joined us in 2018 after completing his Master's in Industrial and Operations Engineering from the University of Michigan, Ann Arbor.

George Katsigiannakis
Vice President,
Energy Markets - Power

George Katsigiannakis joined ICF in 1997 and is an expert in U.S. electricity markets, with deep understanding of all factors affecting U.S. wholesale electric markets including market design, environmental regulations, fuel markets, transmission, renewable, energy efficiency, and demand side management (DSM). He has been involved in a large number of projects including several forward price curve assessments, development support, and financial performance of generation assets. He works in the areas of energy modeling, wholesale market assessments, asset valuations, restructuring, and litigation support, as well as contract evaluation and risk assessments.

Mr. Katsigiannakis has a bachelor's degree in Industrial Engineering from Technical University of Crete, Greece, and an M.Sc. in Operations Research from The George Washington University.

Himanshu Pande
Director,
Energy Markets - Power

Himanshu Pande joined ICF in 2007 and is an expert in U.S. electricity markets. Himanshu has several years of experience in modeling and analysis of the power markets in U.S., U.K., Singapore, and Australia. Himanshu has expertise in statistical, optimization, and simulation modeling, along with power market asset valuation and risk analysis.

Himanshu has been involved in several projects involving power market valuations, cash-flow forecasts, and energy market forward price curves for many different types of clients, including independent power producers (IPP); investment firms; utilities; and state, federal, and local governments and regulators.

Himanshu has a bachelor's degree in civil engineering from the Indian Institute of Technology, Delhi, and a master's degree in operations research from the London School of Economics.

Ilkka Kovanen
ilkka.kovanen@icf.com
+1.571.459.4180

George Katsigiannakis
george.katsigiannakis@icf.com
+1.703.934.3223

Himanshu Pande
himanshu.pande@icf.com
+1.703.218.2726

icf.com/work/energy

twitter.com/ICF
linkedin.com/company/icf-international
facebook.com/ThisIsICF
#thisisicf

About ICF

ICF is a global consulting services company, but we are not your typical consultants. We help clients navigate change and better prepare for the future.

Our experts have been embedded in every corner of the energy industry for over 40 years, working at the intersection of policy and practice. We work with the top global utilities, plus all major federal agencies and relevant energy NGOs, to devise effective strategies, implement efficient programs, and build strong relationships with their customers. From creating roadmaps to meet net zero carbon goals to advising on regulatory compliance, we provide deep industry expertise, advanced data modeling and innovative technology solutions, so the right decisions can be made when the stakes are high.