PJM Long-Term Capacity Issues Symposium

Panel 2: Challenges and Uncertainties in an Uncertain Regulatory Environment

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Executive Summary

The electricity industry is facing an operating environment with enormous uncertainties. Fuel and commodity cost volatility accompanied by a highly uncertain regulatory and policy environment characterizes the future that market participants face. This uncertainty affects expectations regarding capacity market prices and net energy market revenues that can be earned going forward.

In the absence of a capacity market construct, uncertainty makes it difficult for potential new resources and existing resources to make decisions to enter or remain active in wholesale power markets. Potential new entrants and existing ones can mitigate that uncertainty by waiting for more information to be revealed before committing to investments that allow them to enter or remain active in the wholesale markets and help provide reliability. However, such mitigation strategies may result in greater risks to resource adequacy, especially if the regional transmission operator cannot mandate resources to remain available.

PJM's Reliability Pricing Model (RPM) Capacity Market mitigates some of the uncertainty and thus reduces the risk of resource inadequacy. RPM reduces the "real-option" value to waiting for information to be revealed regarding future operating conditions and resulting revenues streams by providing a revenue stream that is known three years in advance of actual delivery of the resource. The 27,000 MW of cumulative, additional resources made available to PJM shows RPM has reduced the value to waiting.

Large policy shifts may impact the ability of RPM to mitigate uncertainty as such policy shifts can change the expected net energy market revenues after resources have been committed through the Base Residual Auction three years ahead of the delivery year. However, RPM -- through its penalty structure for non-performance and its flexible structure that allows participants to buy back capacity commitments through Incremental Auctions -- ensures that resources either maintain or cover their capacity commitments that help maintain reliability.

Significant policy shifts will likely have impacts on RPM prices and may affect decisions for resources to enter or remain available in PJM's wholesale markets. This effect is driven by the use of historic net energy market revenues as the expected future net energy market revenues for determining the Net Cost of New Entry of the reference resource used to define the Variable Resource Requirement Curve and to define Market Seller Offer Caps for resources. A potential solution to this problem is the use of forward-looking net energy market revenues. This concept has been discussed previously within the PJM stakeholder process, but it is controversial due to the multitude of assumptions that go into modeling and estimating forward looking revenues.

Introduction

The electricity industry is facing what might be considered an unprecedented operating environment in terms of future uncertainties. Fuel costs have been quite volatile over the past several years, hitting near record highs by the summer of 2008 and plummeting to levels not seen since 2002-2003. There have been increases in commodity costs that have made it more expensive to bring new generation resources into commercial operation in recent years. The current recession has led to decreases in net energy for load (total MWh of electricity consumption) in PJM for two consecutive years. Furthermore, the industry operates in a regulatory and policy environment that is highly uncertain across a wide spectrum. There is the prospect for federal climate change policy, possibly a national renewable portfolio standard (RPS), the final forms of which are not yet known. The debate is on-going regarding transmission expansion policy at the federal level which may have profound effects on the generation mix, especially renewable resources such as wind power. At the state level, there is the implementation of RPS, energy efficiency goals, requests for proposals to provide new resources to serve load and meet reliability requirements, and the prospects for re-regulation in states that have already moved to retail competition. Within the wholesale market, some participants feel the prospect of market rule changes, especially in capacity markets, introduces yet another dimension of uncertainty.

From the perspective of potential new resources and existing resources such uncertainty makes it difficult to make decisions to enter, or remain active in, wholesale power markets such as PJM. In the presence of such uncertainty, potential new entrants can mitigate that uncertainty by waiting for more information to be revealed about certain outcomes before committing to investments that allow them to participate in the wholesale markets and help provide reliability. For existing resources that are at the margin of financial viability, the decision is whether to retire the resource or make investments to continue operating in the market. Some resources can also mitigate the uncertainty by choosing to mothball while waiting for information about future operating conditions to be revealed.

PJM's RPM Capacity Market is designed to help mitigate some of the uncertainty created by shifting operating conditions such as volatility in fuel costs, movements in demand, and some small policy and market rule uncertainties. RPM should help overcome uncertainty and attract new resources and retain existing resources that might not otherwise make their resources available to the wholesale market and meet capacity adequacy requirements. However, with such profound uncertainty surrounding the future direction of policy and possibly certain market rules, the ability of the RPM Capacity Market to mitigate future risks may be eroded.

This paper addresses the role of uncertainty in making investment decisions to enter or remain in PJM's wholesale markets and to help meet capacity adequacy requirements. The paper first addresses the type of uncertainty resources face when making investment decisions, how resources mitigate that uncertainty in the absence of capacity markets like the RPM Capacity Market, and how the RPM Capacity Market is designed to mitigate the uncertainties associated with commercial operation. The paper then discusses the possible effects of various policy and market rule uncertainties, the ability of the RPM Capacity Market to mitigate those uncertainties, and any possible incentives for resources already committed through the RPM Capacity Market to back out of their commitments.

Uncertainty Facing Potential New Entrants and Existing Resources

Clearly, potential new entrants face uncertainties during the planning and construction phase of a project. To some extent even existing resources that may be contemplating major overhauls or retrofits may face these same uncertainties. MIT Professor Robert Pindyck has identified two types of uncertainty during the planning and construction phase of a project: 1) technical uncertainty; and 2) input cost uncertainty.[1]

Technical uncertainty is related to the amount of time, effort, and materials required to bring a new project to commercial operation given the cost of inputs and future policies affecting construction costs are known. This type of uncertainty is usually related to innovative processes or technologies with which there is little experience. For the most part, new resources in the PJM interconnection queue, or planned to be offered into RPM probably don't face a lot of technical uncertainty as these technologies are widely known and understood.[2]

Input cost uncertainty is related to the cost of construction inputs (land, labor, material) due to market conditions or regulatory policies directly affecting construction given the amount of time, effort, and materials required to bring a new project to commercial operation is known. To some extent all new projects and overhauls/retrofits face this type of uncertainty.[3]

New and existing resources also face "*revenue and operation uncertainty*" in commercial operations.[4] Revenue and operating uncertainty can manifest itself in future wholesale prices in energy and capacity markets; the price of fuel inputs for the new entrant, existing resources, and potential competitors; the structure or configuration of generating resources in the wholesale market in the future; demand growth (peak, total energy, and load factor); and of course potential regulatory policies and market rule changes that can affect all of the above going forward.

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[1] Robert S. Pindyck, "Investments of Uncertain Cost," *Journal of Financial Economics,* Vol. 34, No. 1, pp. 53-76, 1993.

[2] As Pindyck explains, developers may mitigate technical cost uncertainty by commencing with the project and learning about the actual nature of the time, effort, and materials necessary to complete the project. Subsequently developers have the option to abandon the project if it is shown that the amount of time, effort, and material is greater than expected. In essence, the option to abandon the project after starting planning and construction increases the expected value of the project because of the valuable information that can be gained by starting the project.

[3] If the uncertainty is due to market conditions, a developer can mitigate this risk by signing contracts for inputs providing certainty about cost if it is possible. However, if the uncertainty stems from regulatory policy affecting construction or it is not feasible to contract for inputs, a developer may more easily mitigate this risk by waiting to see how input costs or regulatory policies affecting input costs evolve before committing to the project. That is, there is a real-option value to waiting to allow more information to reveal itself before moving forward. This real-option to wait increases the expected value of the project because of the information that can be revealed about input costs through waiting.

[4] Lynne Holt, Paul Sotkiewicz and Sanford Berg, "(When) To Build or Not To Build?: The Role of Uncertainty in Nuclear Power Expansion," *Texas Journal of Oil, Gas, and Energy Law*, Volume 3, Number 2, pp. 174-217, 2008. This paper expands upon the model of Pindyck 15 years earlier by also considering "revenue and operating uncertainty".

The Reliability Pricing Model (RPM) Capacity Market, while accounting for some input cost uncertainty related to commodity costs for construction,[5] does not help mitigate any remaining uncertainties faced by developers related to planning and construction, nor is it designed to do so. The RPM Capacity Market is designed to help mitigate revenue and operating uncertainty by providing a revenue stream, known three years in advance of delivery that provides more certainty regarding revenues once a project is in commercial operation. In this way the RPM Capacity Market makes other non-financial-instrument risk mitigation options less attractive, thereby making reliability commitments three years in advance less risky and financially viable in expectation.

Mitigating Revenue and Operating Uncertainty in the Absence of a Capacity Market

Long-Term Contracts

Resources, new or existing, may mitigate or hedge this type of uncertainty in the short-term through financial instruments and in the long-term through contracts with load that provide greater certainty regarding revenue streams as operating conditions change. Long-term contracts with load shift some or all of the risk associated with revenue and operating uncertainty to the load that is the counterparty to the long-term contract.

Real-Option of Waiting in the Absence of a Capacity Market

Another way in which a potential, new entrant can hedge revenue and operating uncertainty is to wait to make the investment commitment and allow more information to be revealed about future revenues and operating conditions. That is, the option to waiting on additional information before making a commitment to invest in this case is known as a "real-option".[6] The real-option to wait to commence a project based on revenue and operating uncertainty, especially as it relates to policy driven uncertainty, increases the expected value of the project because of the added value of information that is revealed through waiting. This can be seen in the following hypothetical example in the absence of any capacity market.

Suppose a potential, new entrant can invest in a project with a cost of $150/MW-day. The potential, new entrant has expectations about net revenues from the energy market that with a probability of 0.8 (80 percent) net energy market

[5] The RPM Capacity Market has provisions that update the Cost of New Entry (CONE) used in deriving the demand for capacity as represented by the Variable Resource Requirement Curve using the Handy-Whitman Index of Public Utility Construction Costs. The Handy-Whitman Index is also used to update the default Avoidable Cost Rates (ACR) used to determine Market Seller Offer Caps for the RPM auctions. Moreover, resources can submit their own data that supports increases in costs in their ACR that determine the Market Seller Offer Cap.

[6] See Avinask K. Dixit and Robert Pindyck, *Investment under Uncertainty,* Princeton University Press, 1994.

revenues will be $100/MW-day, and with a probability of 0.2 (20 percent) net energy market revenues will be $200/MW-day.[7] If the potential, new entrant commits immediately to the project before realizing the net energy market revenue outcomes, the project has an expected value of -$30/MW-day based on the expected revenues of $120/MW-day (0.8 x $100/MW-day + 0.2 x $200/MW-day = $80/MW-day + $40/MW-day) less the investment cost of $150/MW-day. With the negative expected value, the investment is not financially viable in expectation and will not get made in advance.

However, waiting to make the investment decision (the real-option) to observe net energy market realizations can increase the value of the project. With probability of 0.8 (80 percent), the net energy market realizations ($100/MW-day) are less than the investment cost ($150/MW-day) and the project will not get built and no revenues are earned. With probability of 0.2 (20 percent), the net energy market realization ($200/MW-day) is greater than the investment cost and does get built. Exercising the real-option to wait, which has effectively a zero cost, yields a project value of $10/MW-day [0.8 x $0 + 0.2 x ($200/MW-day - $150/MW-day)] which is greater than committing the project in advance of the realization and makes the project financially viable. In effect, the value of the real-option to wait is the difference in project value between waiting and not waiting which is $40/MW-day ($10/MW-day - -$30/MW-day).

Mothballing or Retiring and Existing Unit in the Absence of a Capacity Market

For some existing units, a way of mitigating revenue and operating uncertainty is to mothball or retire a unit from service rather than making further investments to continue operating. That is, for some existing units, the real-option of waiting entails mothballing or retiring which has a higher value (zero) than making investments to earn uncertain net energy market revenue, the expectation of which is negative. If the existing resource retires or mothballs, it does not incur any further costs to continue operating, but also does not earn any energy market revenues for a known value of $0/MW-day. Another hypothetical example without a capacity market shows how this could happen.

In order to continue operating into the future, an existing resource must incur costs of $50/MW-day. The existing resource has expectations about net revenues from the energy market that with a probability of 0.8 (80 percent) that net energy market revenues will be $30/MW-day, and with a probability of 0.2 (20 percent) net energy market revenues will be $70/MW-day. If the existing resource commits today to paying the cost to continue operating in order to earn the realization of the net energy market revenues the project has an expected value of -$12/MW-day based on the expected revenues of $38/MW-day (0.8 x $30/MW-day + 0.2 x $70/MW-day = $24/MW-day + $14/MW-day) less the cost of continuing operations of $50/MW-day. With the negative expected value, it does not pay the existing resource to pay the costs to continue operations and mothballing or retirement, in expectation, is the best financial option.

Implications for Achieving Capacity Adequacy Requirements and Energy Market Prices

Mitigating risk associated with revenue and operating uncertainty in the absence of a capacity market construct means that potential new entrants will exercise their real-option to wait before making an investment, and some existing resources will retire rather than pay to continue operating when its expectation about being profitable going forward are not good. With these dynamics, the amount of available capacity resources could fall below the level required for meeting the system's

[7] Net energy market revenues are revenues from the energy and ancillary service market less the cost of supplying energy as represented by cost-based energy and ancillary service offers.

capacity adequacy requirement. With fewer resources, all else equal, net energy market revenues and energy prices would rise during all hours, and there would likely be more hours of shortage conditions.

RPM Capacity Market and Mitigating Revenue and Operating Uncertainty

RPM helps mitigate or hedge revenue and operating uncertainty. RPM is designed to provide greater certainty about covering fixed costs (including investment costs and a return on investment) by providing a revenue stream known three years in advance of the delivery year, if the resource performs as expected. Moreover, as RPM functions over time, potential new entrants and existing resources will gain a better expectation about the streams of revenues that can be attained over the economic life of the project which can help mitigate long-term uncertainty.

RPM Reduces the Value of the Real-option to Waiting for Potential, New Entrants

RPM helps reduce the real-option value to waiting for information about future revenues and operating conditions before commencing a new project and offering it to the wholesale market. A continuation of the first example shows how this works.

Consider the potential, new entrant with a cost of $150/MW-day and expectations about net revenues from the energy market that with a probability of 0.8 (80 percent) that net energy market revenues will be $100/MW-day, and with a probability of 0.2 (20 percent) net energy market revenues will be $200/MW-day. Prior to RPM, an immediate commitment to the project would result in an expected value of -$30/MW-day.

Suppose for the ease of exposition, the RPM price for delivery 3 years forward is known and is $65/MW-day, but that the potential, new entrant will only receive this if it immediately commits to the project, otherwise it will receive no RPM revenues.[8] If the potential new entrant commits to RPM, the expected value of the project is now $35/MW-day based on the revenues from RPM of $65/MW-day, expected net energy market revenues of $120/MW-day (0.8 x $100/MW-day + 0.2 x $200/MW-day = $80/MW-day + $40/MW-day) less the investment cost of $150/MW-day.

In contrast, exercising the real-option and waiting on the net energy market realizations and foregoing RPM revenue results in an expected value of $10/MW-day as shown above, which is less than the expected value of making the commitment immediately. In this way RPM reduces the value of the real-option to wait, essentially making it negative ($10/MW-day - $35/MW-day = -$25/MW-day).

This effect is evident in the approximately 9,300 MW of new generation or capacity upgrades, over 10,000 MW of demand response and energy efficiency, and almost 4,000 MW of capacity imports made available to PJM in RPM through the 2012/2013 delivery year.[9] Even though not all of this offered capacity cleared in an RPM auction, it shows that resources are willing to make the commitment three years in advance.

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[8] This is consistent with the RPM rules that do not allow capacity to be offered in subsequent incremental auctions if not offered in the three-year-ahead Base Residual Auction (BRA) and the fact that incremental auction prices have been far below the prices in the BRA.

[9] See "2012/2013 RPM Base Residual Auction Results", Table 7 at 21, available at http://www.pjm.com/markets-and-operations/rpm/~/media/markets-ops/rpm/rpm-auction-info/2012-13-base-residual-auction-report-document-pdf.ashx.

RPM Decreases the Value to Make Immediate Retirement Decision for Existing Resources

The revenue certainty provided by RPM decreases the real-option of waiting to make the going forward investment decision and to earn expected net energy market revenues. This should result in existing resources that may have previously been expected to be mothballed or retired in the absence of RPM, to remain available to the market to help meet capacity adequacy requirements. A continuation of the second example related to the retirement decision helps show this dynamic.

Consider the existing resource that must incur costs of $50/MW-day to continue operating that with a probability of 0.8 (80 percent) that net energy market revenues will be $30/MW-day, and with a probability of 0.2 (20 percent) net energy market revenues will be $70/MW-day. Prior to RPM, if the existing resource committed to being available in the future, the expected value of doing so is -$12/MW-day as explained previously. Consequently, it was optimal for the existing resource to mothball or retire.

Suppose for convenience the RPM price is known and is $25/MW-day and that as in the previous subsection, a commitment to be available must be made immediately, otherwise RPM revenues are not available. If the resource decides to commit to being available and receives RPM revenues, the expected value of committing immediately is $13/MW-day based on RPM revenues of $25/MW-day and expected net energy market revenues of $38/MW-day (0.8 x $30/MW-day + 0.2 x $70/MW-day = $24/MW-day + $14/MW-day) less the cost of continuing operations of $50/MW-day. The presence of RPM has decreased the value of the option to wait to make the going forward investment and earn expected net energy market revenues, and consequently existing resources that may have retired before, remain available.

This effect of RPM is evidenced in the nearly 4,000 MW of cancelled or withdrawn retirements and reactivations seen through the 2012/2013 delivery year.[10]

The Effect of Uncertain Future Policy and Market Rules on Revenue and Operating Uncertainty and RPM's Ability to Mitigate that Uncertainty

Uncertainties in the final form of policies regarding climate change policy; renewable portfolio standards (RPS), production tax credits (PTC) and potential transmission policy as they relate to renewable resources, potential re-regulation and Request for Proposals for new resources in states with retail competition, and potential changes to wholesale market rules (stakeholder-driven or FERC-driven) all lead to increased revenue and operating uncertainty.

In the short-term following an RPM commitment, policy and market rule uncertainties, and their realizations, can change expectations regarding net energy market revenues. The changes in expectations, depending on technology type, may reconfirm the commitment that has already been made if net energy market revenues were to increase in expectation, or call into question the commitment made in RPM if expected net energy market revenues decrease. For resources that cleared

[10] Id.

the Base Residual Auction (BRA) and were subject to market power mitigation, the change in the expectation is based on historical revenues with the implicit assumption about stable policy and market rule regimes that influence those historical and now expected revenues as is the case in RPM today.[11]

In the longer-term prior to an RPM commitment by new resources or continued commitment by existing resources, the realizations of policy and market rule uncertainties can also change expectations regarding expected RPM revenues in addition to expected net energy market revenues due to the consequences the realizations of policy and market rule uncertainties.

The manner in which this revenue and operating uncertainty play out may differ by policy or market rule change. The possible effects of various policy and market rule uncertainties are discussed below.

Climate Change Policy

As a 2009 PJM white paper explained[12], climate change policy will have the effect of raising power prices. DOE's Energy Information Administration, in its analyses of various climate change bills, has also shown changes in fuel prices and decreases in demand as a result of climate change policies. Some technologies, with low CO_2 emissions, will see their net revenues from the energy market increase while others with higher CO_2 emissions will see a decrease, but the magnitudes are not known. There may be some existing resources that see climate change policy as increasing their real-option value to waiting to make going forward investments to such a point as to mothball their resource or retire in spite of RPM.

In the long-term, there also may be an increase in new entry resources to replace retiring resources that are lower emitting being committed as this form of policy uncertainty has now resolved itself, and expectation of revenues going forward may be considered by new entrants as more stable.

RPS, PTC and Transmission Policies

PJM's climate change whitepaper[13] showed how adding 15 GW of wind has the effect of lowering average LMPs in the wholesale market, all else equal. The policies driving wind and other renewable resource development are not certain in the form in the future. It is not known is how long the production tax credit (PTC) will remain in effect, whether RPS's will remain at the state level only or become federal policy and what the mandates will be, or how the debate regarding transmission policy will play out. Policies favoring renewable resources will likely reduce net energy market revenues in the future, all else equal. The potential for extremely low off-peak prices may flatten the load profile as well with net energy market revenue effects unknown.

[11] For resources that are subject to market power mitigation, the Market Seller Offer Cap is the Avoided Cost Rate (ACR) less the average of net energy market revenues over the past three years prior to the BRA. This implies that "expected net energy market revenues" for the delivery year are based on revenues from 4 to 6 years prior. The same logic applies to the Net CONE for the reference resource used to define the VRR Curve.

[12] "The Potential Effects of Proposed Climate Change Policies on PJM's Energy Market", January 27, 2009, available at http://www.pjm.com/documents/~/media/documents/reports/20090127-carbon-emissions-whitepaper.ashx.

[13] Id.

In the long-run, if net energy market revenues are reduced, then eventually RPM prices will likely rise, but with a lag given the current structure of RPM. That is, the expected net energy market revenues used to set the Net Cost of New Entry (CONE) or to compute Market Seller Offer Caps for RPM are based on history that is not reflective of the effects of policy in the future. As the penetration of renewable resources increase, RPM prices will continually be in "catch-up mode" to incent new entry or retain existing resources as there is a mismatch between the historic net energy market revenues used as expected net energy market revenues and the expected net energy market revenues given the uncertainty and realization of these policy outcomes looking forward.

Potential Re-regulation and State-driven in States

Potential re-regulation and state-driven RFPs can have the effect of mitigating revenue and operating uncertainty for any new entry resources that are contracted under these RFP or re-regulation proposals. Again, this shifts the risk to the load that would be the counterparty to these contracts. The effect on remaining the revenues for remaining resources is uncertain.

If the re-regulation and RFP proposals attract resources, be they generation or demand resources, that would be part of the least-cost mix of resources chosen in RPM and those resources were offered into RPM at their cost-based offer, the effect on the stream of revenues attained through RPM would not be materially affected. However, if those contracted resources would have set the RPM price, and they were offered in at well below their cost (in the extreme at zero), this offer behavior can reduce RPM prices and revenues for other resources.

Moreover, if those RFPs and re-regulation proposals result in attracting and signing contracts with resources that would not have been in the least-cost mix of resources in RPM, the parties signing the contract in effect are paying more for those resources than is optimal. If the contracted resources are offered in at below cost to ensure they clear the RPM auction, they can have the effect of driving down RPM prices into the future resulting in sub-optimal retirement or new entry decisions. The effects on the expected net energy market revenues going forward is hard to discern unless one looks at scenarios with specific technologies.

Potential Market Rule Changes

The continuing prospect of stakeholder-driven or regulatory-driven market rule changes, especially in the RPM Capacity Market, directly erodes RPM's ability to mitigate revenue and operating uncertainty. Continually shifting market rules creates uncertainty in future RPM prices over and above the uncertainty created by policy and commodity cost changes that RPM can mitigate.

For example, a resource could make an investment commitment through RPM under one set of market rules with expectations about the stream of RPM prices and revenues in the future. Market rules changes that are affected after the investment commitment has been made create uncertainty about future RPM revenues that may be difficult to mitigate. Some changes may have the effect of reducing RPM prices such as creating a holdback for demand response to commit through Incremental Auctions, or the elimination of the ILR option which has the effect of increasing supply in the BRA. Other changes may have the effect of increasing RPM prices such as allowing existing demand resources to make market-based offers into RPM rather than mitigating these offers to zero. While such the qualitative impact of such changes may be known with certainty, the magnitude and dominating effects are not known. There also remains uncertainty around how net energy market revenues related to pricing during periods of operating reserve shortage will be treated with respect to Market Seller Offer Caps and determining the Net CONE of the reference resource and hence the VRR Curve, with the direction and magnitude of such changes unknown.

If potential new and existing resources believe that market rules will continue to change, the best way to mitigate the uncertainty created by shifting market rules is to exercise the real-option to wait for more information to be revealed about the future RPM market design and wait until it stabilizes. By putting off investments needed to enter or continue in the PJM Market, the potential for risking capacity adequacy reliability increases again, which is the problem RPM was designed to mitigate.

Incentives to Honor RPM Commitments

If policy and market rule uncertainties, or realizations in those uncertainties, result in a decrease in expected net energy market revenues that would have led committed resources to not commit to RPM in hindsight, the question arises as to whether those resources will back out of their RPM commitments, the means by which resources might back out of their RPM commitments, and the capacity adequacy implications if resources did back out of their commitments.

RPM's penalty structure for non-performance and the Incremental Auctions between the BRA and start of the delivery year make the option of retirement without buying back the capacity position prior to the delivery year less attractive in the face of a major policy shift than if RPM did not exist. Because resources are locked into the RPM price three years in advance, the policy shift does not change the RPM revenue stream, but does change the expected net energy revenue stream. If the policy shift in question occurs after the investment has been made, then the investment is sunk and there is no incentive at all to back out of capacity commitments without buying replacement capacity. If the necessary investment to make the resource available for the delivery year has not yet been made, the penalty for non-performance must be less than the expected loss to be incurred by continuing to operate after the policy shift. The lower is the RPM price, all else equal, the greater is the incentive to back out of RPM commitments without buying replacement capacity if sunk investments have not yet been made. Clearly, the incentives are strong to maintain the RPM commitment or ensure replacement capacity is purchased.

Resources do have an option that maintains reliability, for backing out of their commitments made three years ahead through the Incremental Auction framework. Incremental Auctions allow a resource to retire if it believes it is financially wise to do so. As long as the cost of replacement capacity in the Incremental Auctions is less than the Daily Deficiency Charge, it is financially beneficial for a resource to buy replacement capacity in the Incremental Auctions, and help maintain capacity adequacy. Given the historical prices in Incremental Auctions have been less than prices in the BRA, resources have strong incentives to cover their capacity position through Incremental Auctions.

Longer-Term Changes that Undo RPM's Ability to Mitigate Uncertainty

Uncertainties and their potential realizations from policies that could affect the evolution of RPM prices over time may also affect the potential for new entry as well as keeping existing resources. For example, if potential new entrants believe there is a strong likelihood of policies that could reduce RPM prices as described above, or have perceptions that proposed market rule changes could reduce RPM prices going forward, then the ability of RPM to mitigate revenue and operating uncertainty is reduced because the underlying revenue streams are more uncertain than would be the case under a more stable, predictable policy and market rule environment.

Also, over time with some possible policy realizations, the evolution of expected net energy market revenues are such that for many resources they could be declining over time as the policy implementation continues. For example, RPS requirements that continually increase renewable resources would, all else equal, reduce net energy market revenues over time. Climate change policy that continually ratchets down allowed emissions may have the same effect for some resources.

Assuming such a path of policy implementation, expected net energy market revenues will not match up with the historic net energy market revenues which occurred in a different policy environment, and which are used to determine Market Seller Offer Caps and the net CONE used in the derivation for demand in RPM, the Variable Resource Requirement (VRR) Curve. Consequently, there will be a potential bias in RPM prices with extreme policy changes as the parameters used are based on history, but operating conditions do not match this. The issue of forward-looking net energy market revenues was explored in the PJM Stakeholder Process, but no consensus was reached on how to model forward looking net energy market revenues as it is a very difficult problem to model and to get agreement on assumptions.

Concluding Thoughts

Potential, new entry and existing resources face unprecedented uncertainties when faced with investment decisions to be available to PJM's wholesale markets and help PJM maintain resource adequacy requirements. Absent a forward capacity market, one way resources mitigate this risk is through the real-option to wait for more information to be revealed and have some of the uncertainty resolved before making investments. But given the resource adequacy needs, allowing risk mitigation to go on in this way may result in a violation of the resource adequacy requirement.

The RPM Capacity Market helps mitigate revenue and operating uncertainty during commercial operation by providing a revenue stream known three years in advance of delivery. The results of RPM is attracting new resources and maintaining existing resources has already been seen. However, with profound policy changes on the horizon, the final form of which is unknown, affects how well RPM can mitigate revenue and operating uncertainty. For units that already made commitments there is a strong incentive to maintain those commitments. Resources may buy back their capacity commitments through incremental auctions which not only maintains reliability, but is almost certainly less expensive than backing out of capacity commitments, paying the penalties for non-performance, and eroding capacity adequacy reliability.

Over the longer term, the use of historic net energy market revenues to construct Market Seller Offer Caps and the VRR Curve can bias RPM prices, probably downward given the policies under consideration, because there is a mismatch between what is used as the history and what will happen going forward. One solution is to introduce forward looking net energy market revenues, a concept that has been discussed in the PJM stakeholder process, but could not find a consensus method to move forward. While this approach is appealing, it is likely that the assumptions and modeling used to derive such forward looking net energy market revenues would be contentious as was seen in the previous discussion on this issue.