Enhancing the Efficiency of Resource Adequacy Planning and Procurements in the Midcontinent ISO Footprint

Options for MISO, Utilities, and States

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November 2015

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This report was prepared for NRG. As an independent power producer, NRG has an interest in the states' and regional mechanisms to ensure resource adequacy. Nevertheless, this report represents our independent view and assessment of the potential benefits from enhancing resource planning and procurement practices. The conclusions that we draw are based on our review and analysis of the performance of the resource planning activities in the Midcontinent as compared to other regulated and restructured regions throughout the U.S. and internationally.

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Table of Contents

Executive Summary

We have been asked by NRG, an independent power producer (IPP), to evaluate options for achieving resource adequacy more efficiently in the Midcontinent Independent System Operator (MISO) footprint. NRG is concerned that MISO's current non-forward capacity construct and utilities' procurement practices do not adequately recognize the value of IPPs' resources even when they cost less than utility-planned projects.

We are similarly concerned about the current resource adequacy construct and planning practices within MISO, but from a resource adequacy and total cost perspective. The MISO centralized resource adequacy construct is not likely to support sufficient market-based investment to meet the capacity needs of retail choice states, due to the mechanism's reliance on a non-forward auction with a vertical demand "curve" and a relatively low price cap. We anticipate that this design will not produce prices high enough to attract merchant generation investments until reliability is unacceptably low. Further, the lack of forward visibility means that the shortage might not be identified until it is too late to address through administrative intervention. Any resulting shortages for retail choice customers could impair reliability of the local zone (and possibly all of MISO unless traditionally regulated states maintain sufficient excess capacity).

Most of the MISO system is traditionally regulated, with utilities planning sufficient supply to meet their own needs. Thus, regulated utilities do not face the same under-investment challenges as retail choice states. However, utility planning is hindered by a lack of transparent information about neighboring utilities' commitments, regional supply and demand, and transmission availability. Resulting plans could end up being resource-inadequate if they have counted on procuring resources and using transmission that turns out to be unavailable. To avoid this possibility, utilities may plan conservatively, without relying on resources that they do not own or that are remote. But such uncoordinated planning can come at the expense of economic efficiency. Utilities may incur extra costs by investing in retrofits or new generation without comparing to a transparent forward capacity price (no such price yet exists in MISO) and without conducting competitive solicitations to see whether lower-cost alternatives are available from IPPs or neighboring utilities.

To address these concerns, we propose a set of possible solutions at both the regional MISO level and at the regulated state and utility levels. The solutions we propose recognize the predominance of regulated states in MISO, with only a minority of states relying on unregulated merchant investment under retail choice. We recognize that any enhancements to traditional mechanisms need to maintain the regulated states' ability to oversee utility resource planning decisions while ensuring that these decisions are cost effective, support state policy objectives, and complement MISO mechanisms. Thus, we do not consider the mandatory forward capacity market approach that we have found to be effective in largely restructured regions. We recognize that regulated states do not want to be required to participate in centralized capacity auctions. Their biggest concern appears to be the risk that state-approved resources might not clear in the auctions and thus might not be counted toward capacity obligations. Such an outcome would undermine state and utility planning processes designed to meet resource adequacy needs and other policy objectives.

At the MISO regional level, we identify three complementary options to increase forward capacity transparency to inform planning for regulated customers and to support merchant investment for retail choice customers:

(1) Hold forward capacity auctions that are mandatory for retail choice loads but voluntary for regulated entities;

(2) Develop a more active and transparent voluntary forward capacity market beyond the period of auctions noted above, by supporting the bilateral market support and/or administering voluntary centralized auctions; and

(3) Enhance the current resource adequacy survey by the Organization of MISO States (OMS) and MISO so that it will represent a binding plan rather than a voluntary indication.

At the state and regulated utility level, we recommend more fully incorporating "market tests" into resource planning, particularly to test the timing and cost-effectiveness of major investments against market alternatives. Such market tests would either confirm the cost effectiveness of a resource plan, or else identify alternative ways to meet resource adequacy needs and other policy objectives more cost-effectively.

In its most simplified form, a market test would compare the levelized investment costs (minus net energy value) of proposed utility generation investments against a transparent forward capacity price. Currently, transparent prices are only available from MISO's centralized non-forward auctions, and little capacity pricing information is available one or more years forward. We therefore recommend that utilities compile market data on capacity prices by either: (a) gathering quotes from third-party brokers with visibility into bilateral bids or offers several years into the future; or (b) regularly procuring or selling at least small quantities of the standard capacity product for up to five or more years forward. (We do not recommend relying solely on simulated or estimated capacity price projections without real market information.) Such improved capacity pricing data would help utilities and commissions better evaluate short- and medium-term resource planning decisions. In many cases, the market data may support utility plans such as low-cost plant uprates. In other cases, the market data may suggest that a major new generation project should be delayed.

For major long-term generation investments or those that do not clearly pass the simplified market test, a formal solicitation for capacity can be conducted to help determine whether the investment is cost-effective. Some utilities already conduct solicitations, but very few we are aware of in MISO result in selecting a competitive market alternative over a self-build project.

Ideally, a solicitation would be open to many types of solutions to the identified need, and it would apply fair and transparent evaluation criteria. However, there are often tradeoffs between openness and transparency. For example, a more open solicitation may allow for solutions that differ so much in their attributes that comparing them becomes quite complicated. We recognize that there is not a single recipe for conducting a cost-effective and productive solicitation, but there are several guiding principles and best practices that can be considered.

Solicitations would ideally allow offers over a range of terms and resource types to determine: (1) whether the in-service date for a new build can be postponed by procuring lower-cost supplies on a short- or intermediate-term basis, thereby reducing investment costs; and (2) whether market-based capacity purchases are less expensive than building new generating plants, as in cases where long-term power purchase agreements (PPAs) might be available at a lower cost. To ensure the most cost-effective solution is selected, it is also important that competitive solicitations be designed to provide a level playing field among all potential bidders. Solicitations for capacity should ideally be open to offers from new and existing resources of all technology types, including generation and demand response. Ideally, solicitations should also admit capacity-only offers as well as bundled energy plus capacity offers, and they should consider allowing contracts of any term including as little as one year.

When evaluating long-term market-based supply offers against a utility's self-build option, the evaluation criteria would be similar to those applied in existing integrated resource plan (IRP) processes. Similar to the short-term market test described above, this longer-term resource evaluation would compare the levelized capacity costs of each offer. However, any offers that are not for a standard capacity product would need to be adjusted for economic equivalence by translating the offers into an equivalent capacity-only offer that accounts for the expected energy value as measured against energy forward curves. The utility may also wish to evaluate the relative costs by comparing the present value of revenue requirements (PVRR) across a range of scenarios. Full PVRR comparisons are more complicated, however, making it difficult for competitive bidders, commission staff, and consumer advocates to fully understand or validate the results of competitive solicitations. We therefore emphasize the importance of complementing this exercise with the simpler capacity cost test.

Other adjustments to offers obtained in utility solicitations may also be needed to allow for an apples-to-apples comparison, accounting for factors such as: (1) costs not included in the offer price, such as network upgrade costs; (2) the "imputed debt" effect of PPA payment obligations that increase the risk of utility debt and equity, similar to the effects of adding debt to the utility's books; (3) the option value of using short-term market-based supply to defer a major investment until uncertainties are resolved; and (4) other non-price attributes such as environmental objectives and risk profiles. The solicitation should clearly define these factors in advance so that competitive bidders will have a reasonable opportunity to address them in their offers.

Pursuing some or all of these solutions has the potential to mitigate the concerns regarding reliability and economic efficiency within the MISO footprint.

I. Background and Motivation

We have been asked by NRG, an independent power producer (IPP), to evaluate options for enhancing the economic efficiency of resource adequacy planning and procurements within the Midcontinent Independent System Operator (MISO) footprint. From the perspective of NRG and other IPPs, the primary concerns are that: (1) the centralized MISO resource adequacy construct will not allow them to monetize the fair value of their capacity; and (2) regulated utilities in MISO do not always conduct competitive solicitations that provide IPPs an opportunity to fill upcoming needs, even when some IPP capacity supplies might be available at low cost.

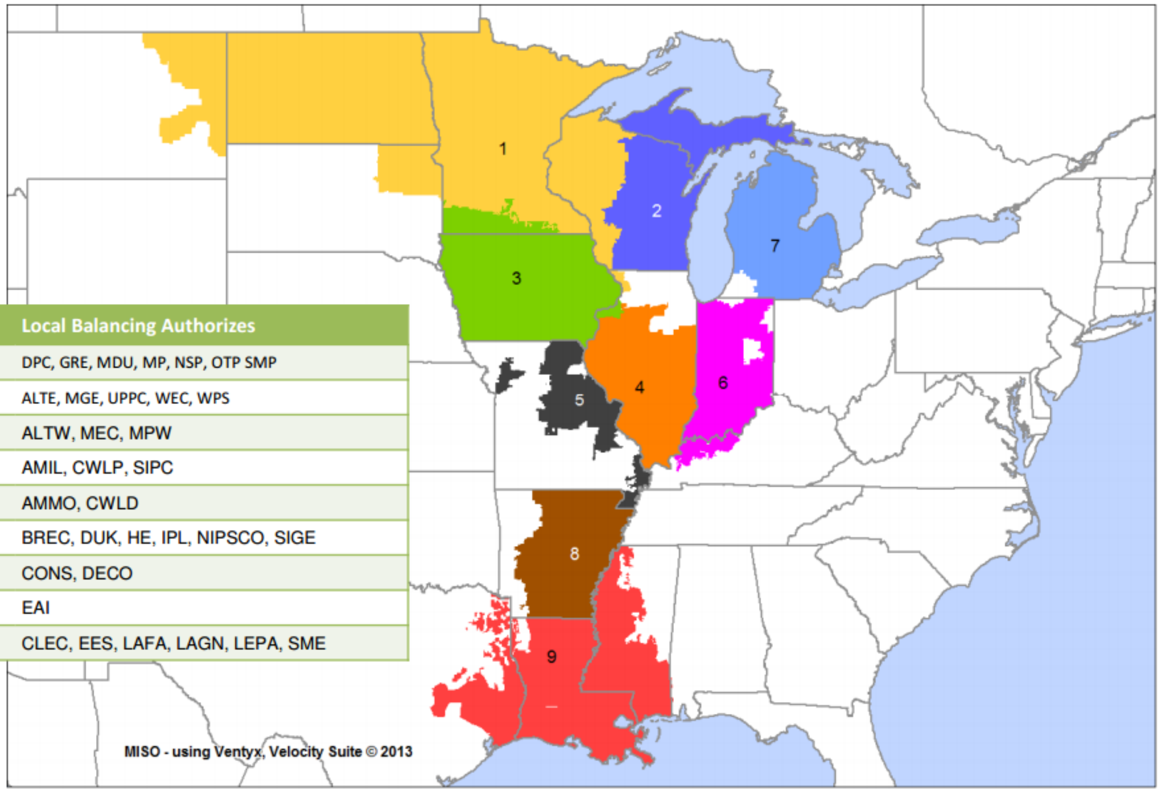
These concerns may appear to reflect the needs of just one sector of the MISO market, but these same concerns are mirrored by the reliability and economic consequences for customers in both retail choice and regulated states. From a reliability perspective, if the MISO resource adequacy construct does not fully recognize the value of merchant capacity, it will not support the merchant investment needed to meet the capacity needs of retail choice states, and this will reduce reliability and increase costs for both retail choice and regulated states. From an economic efficiency perspective, if regulated utilities do not test their investment decisions against market alternatives, they may undertake costly investments in retrofits or new generation even when lower-cost alternatives are available from IPPs or neighboring utilities, thereby raising costs to customers.

In reviewing potential enhancements to address these concerns, we consider the unique regulatory structure of the MISO region. MISO is predominated by regulated states that rely on integrated planning, with only a small minority of states relying on retail choice and merchant investment. In this context, any enhancements to traditional mechanisms will need to maintain the regulated states' ability to oversee utility resource planning decisions while ensuring that these decisions are cost effective and support state policy objectives.

A. Overview of the Current Resource Adequacy Construct

The MISO region has a uniform resource adequacy standard that requires an aggregate quantity of installed capacity sufficient to meet peak demand plus a mandatory minimum reserve margin. The requirement is set at the level expected to produce a loss-of-load event (LOLE) no more than once every ten years (one-day-in-ten years, or 1-in-10). To ensure this aggregate requirement is achieved, each utility or load serving entity (LSE) is obligated to procure sufficient capacity resources to meet their own coincident peak load plus a reserve margin. MISO also imposes some restrictions on the locations of capacity procurements according to the planning resource zones shown in Figure 1, such that there are no import-constrained zones with insufficient local supply and no export-constrained zones with an excess of supply that cannot be delivered to loads.

Figure 1
Midcontinent ISO Capacity Local Resource Zones



LRZ	Local Balancing Authorizes
1	DPC, GRE, MDU, MP, NSP, OTP SMP
2	ALTE, MGE, UPPC, WEC, WPS
3	ALTW, MEC, MPW
4	AMIL, CWLP, SIPC
5	AMMO, CWLD
6	BREC, DUK, HE, IPL, NIPSCO, SIGE
7	CONS, DECO
8	EAI
9	CLEC, EES, LAFA, LAGN, LEPA, SME

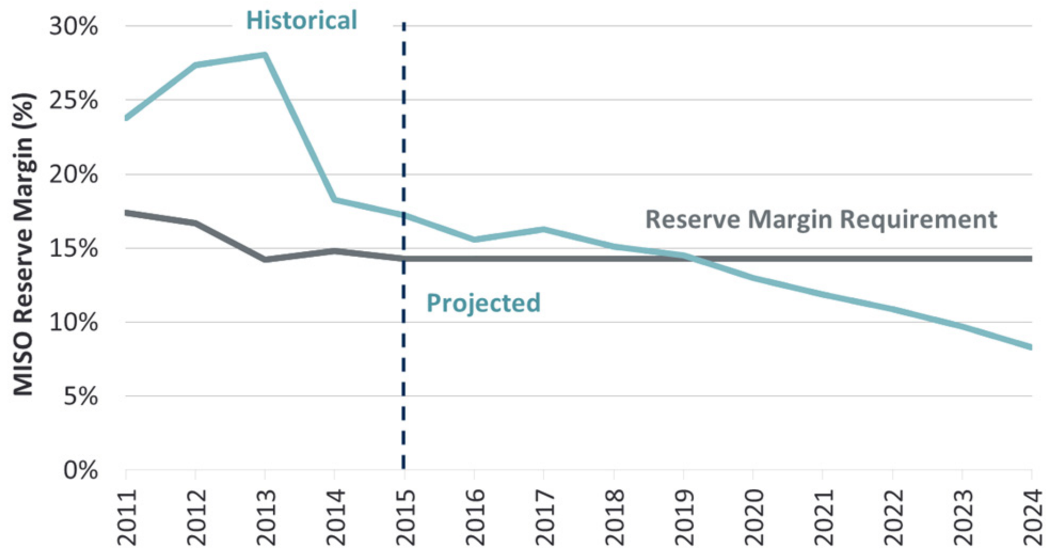
Source:
Figure reproduced from MISO (2014a).

Each LSE has flexibility to meet this requirement under a combination of self-supply, bilateral contracting, and residual procurements through MISO's centralized Planning Resource Auctions (PRAs). Because the majority of LSEs are regulated utilities, almost all of the resource commitments are selected within integrated resource plans well in advance of the delivery year. The PRA is then conducted immediately prior to the delivery year, and represents the LSEs' last opportunity to fill any deficiency in capacity obligations. Within the PRA, MISO clears all previously committed self-supply and uncommitted supplies against system and location-specific load requirements. This auction is also the only opportunity for MISO and market participants to observe the aggregate impacts of locational supply and demand balance and to ensure that local obligations are met.

B. Upcoming Challenges to Resource Adequacy

The MISO region has enjoyed high reserve margins for many years, but the capacity excess is declining, as summarized in Figure 2. As recently as 2012 and 2013, MISO enjoyed ample summer reserve margins of 27% and 28% respectively.[1] But generation retirements have changed that. MISO's current supply projections show a substantially lower reserve margin that only modestly exceeds the reserve margin requirement, and drops below the requirement by 2020.[2]

Figure 2
MISO's Projected Supply, Demand, and Reserve Margin Outlook



Sources and Notes:
Historical reserve margins for 2011-13 from MISO Summer Resource Assessments, see MISO (2013c), p. 1; MISO (2012), p. 4; MISO (2011), p. 1.
Projected reserve margins for 2016-24 from MISO's transmission plan, see MISO (2015g).

The reserve margin is tightening primarily due to retirements associated with environmental regulations and suppressed market revenues relative to what is needed to keep plants online.[3] The largest and most immediate retirement drivers have been low gas prices combined with the Mercury and Air Toxics Standard (MATS). MATS forced existing coal plants to decide whether to install costly environmental controls or else retire by the compliance date of April 2015. Combined with low gas prices and other factors, MATS will have contributed to

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[1] From MISO Summer Resource Assessment 2012, see MISO (2012), p. 4 and MISO Summer Resource Assessment 2013, see MISO (2013c), p. 1.

[2] See MISO (2015f).

[3] Some accounting and other secondary factors have also contributed to MISO's projection of reserve margin shortfall, including increased exports, discounting anticipated contributions from uncertain planned resources and other low-certainty resources, and removing non-firm imports. From MTEP 2014, see MISO (2014e), p. 13.

approximately 13,000 MW of known retirements in MISO between 2010 and 2016.[4] MATS has since been remanded by the Supreme Court, but most of the retirements were already complete or underway.

Additional retirement challenges will emerge in the future under the combined effect of other environmental regulations including: (a) the Cross-State Air Pollution Rule (CSAPR), which establishes SO_2 and NO_X emission caps along with a trading mechanism; (b) the Coal Combustion Residuals Rule, a proposed rule which would regulate coal ash waste under the Resource Conservation and Recovery Act (RCRA); (c) the Regional Haze Rule, especially under tighter SO_2 and ozone National Ambient Air Quality Standards (NAAQS); (d) new rules under the Clean Water Act Section 316(b), which regulates the design and operation of cooling water intake structures; and (e) the proposed Clean Power Plan (CPP), which will impose CO_2 emission rate standards on existing units. MISO expects CPP alone to contribute to another 14,000 to 20,000 in coal retirements (on top of the MATS-driven retirements) over the 2020-25 timeframe.[5]

However, MISO may experience capacity shortfalls sooner or later than forecasted. Retirement pressures will change along with environmental regulations and market conditions, with coal and nuclear units being most at risk. MISO's forecast also includes more than 6,000 MW of uncontracted merchant supplies which are also at risk to retirement, mothball, or export.[6] When needed, regulated states will likely sponsor new generation or shorter-lead-time resources such as uprates, delayed retirements, new imports, or demand response to meet their own needs. Merchant suppliers could potentially invest too, but their investment will likely be quite limited unless the concerns identified in this paper are addressed.

MISO has expressed concern about the lack of forward visibility about retirements and other uncertainties. This lack of forward visibility limits MISO's ability to determine if system-wide and locational resource adequacy needs are likely to be met. It also creates transmission planning challenges if MISO has insufficient information to determine what transmission upgrades will be necessary to accommodate retirements and support new resources. To help address this lack of forward visibility, MISO and the Organization of MISO States (OMS) have begun conducting quarterly surveys of LSEs in an attempt to increase transparency.[7] However, the survey is voluntary and provides only non-binding indicators of system-wide and

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4 Includes units retired between 2010 and 2014 and units with owner-announced retirement dates by 2016, from ABB (2015).

5 MISO (2015c), p. 14.

6 MISO forecasts 7,000 MW of uncontracted merchant resources in 2016 and 6,200 MW in 2020, see MISO (2015f).

7 For example, see MISO (2014b) and MISO (2014g).

locational resource adequacy.[8] Further, the survey itself does not provide direct economic incentive or regulatory enforcement for market participants to identify creative, non-conventional opportunities for filling the supply gap.

II. Risks and Concerns under the Current Framework

The current resource adequacy framework in MISO has the essential elements of an enforceable construct, but it does not guarantee economically efficient compliance nor eliminate all reliability risks. Potential risks and inefficiencies differ between states that rely on utility planning and those that have restructured with retail choice. Regulated states can rely on integrated utilities to meet the resource adequacy standard and state policy objectives, but utilities have incomplete information on the rest of the grid that impairs their ability to optimize supply planning and ensure local resource adequacy. Retail choice states do not conduct similar forward planning and will therefore rely on the ability of MISO PRA prices to attract sufficient merchant entry, which it is not currently designed to do on a long-term basis. This leaves retail choice loads at a risk of shortage, consequently also introducing system-wide shortage risks unless the utilities maintain an excess. On a system-wide basis, these reliability and economic risks will affect all states through less efficient MISO transmission planning, less economic utility planning and resource investments, and reliability risks to the system and local zones.

A. Concerns for Regulated States that Rely on Utility Planning

MISO's resource adequacy construct was introduced in several phases over the better part of the past decade, and has thus far proved sufficient to sustain resource adequacy in the footprint. However, the apparent success of the construct has been bolstered by the fact that it was implemented when supplies exceeded requirements. Reserve margins also remained relatively high because of the predominance of integrated resource planning in the region, under which utilities conduct their own individual forward planning exercises to invest in new or retrofit capacity when needed. We expect that most or all regulated utilities will continue to meet their own reserve margin requirements through similar processes despite the environmental retirements and other reliability challenges facing the region over the coming years.

However, we see a number of reliability and economic efficiency concerns for regulated states, even if they have robust planning mechanisms. Regulated utilities lack the level of information and forward price transparency that would facilitate the most cost-effective investment decisions. Regulated utilities also have incomplete information on other LSEs' supply plans that may affect their own reliability.

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[8] MISO has noted concern that because the survey is voluntary, there is no guarantee that all generation owners will participate, see MISO (2015b), p. 5.

The three most material reliability risks are:

- **Shortages in Retail Choice States** (Imposing Reliability and Cost Impacts on Regulated States). As we explain in Section II.B below, the MISO construct is not likely to sustain resource adequacy on behalf of retail choice loads in the long run once new generation investments are needed. But the consequences of a shortage on behalf of retail choice loads would affect all customers across the MISO region, including in regulated states.[9] This is because reliability is a "common good" that helps or hurts all customers equally.[10] Any involuntary load shedding events caused by a shortage will be applied indiscriminately to customers regardless of whether their representative LSEs met their resource adequacy requirements.[11] Similarly, shortages in retail choice states will also have *cost* impacts on regulated state customers, as the tighter reserve margin will drive up wholesale energy prices, for example by increasing the frequency and severity of scarcity pricing events.[12] Therefore, regulated states have a material interest in ensuring that the MISO resource adequacy construct be designed to support the needs of its neighboring retail choice states.
- **Locational Shortages under Utility Planning.** Utility resource plans will typically have comprehensive and detailed information on the size and locations of their own existing and planned resources, sufficient to show whether they have lined up enough capacity to meet their own reserve margin requirements. However, utilities would not typically be able to determine whether their resource plans are sufficient to meet *locational* resource adequacy requirements in their capacity zone, which would require a complete understanding of other utilities' plans that may rely on the same MISO internal transmission capability.[13] As two examples where this limited information could lead to locational shortages, consider: (1) a case where two utilities in the same zone both wish to rely on imports, but because the total capacity import capability is limited the two plans are simultaneously infeasible (amounting to a locational shortage that will not be discovered until the PRA when there is no time left to resolve the

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9 System-wide reliability concerns could be postponed as long as regulated utilities maintain a capacity excess large enough to meet the needs of retail choice customers. This would impose excess costs on regulated utility customers however.

10 Reduced bulk power system reliability will affect all distribution utility customers' reliability in the same way, although the economic costs of any reliability events will vary depending on the customer classes affected.

11 See Newell *et al.* (2014), p. 14.

12 This effect is largest for any customers that are relatively dependent on market purchases for energy, and is modest (but non-zero) for utilities that have relatively well-balanced supply compared to their own customers' needs.

13 Capacity zones in MISO are consistent with state boundaries in many cases, but are sometimes defined according to other considerations such as utility boundaries, major transmission constraints, or natural borders such as rivers and lakes.

shortage); or (2) a case where two utilities in separate parts of MISO both wish to source capacity from an export-constrained zone, but the capacity export limit from that source zone is insufficient to support both export plans simultaneously (resulting in a system-wide shortage due to bottlenecked supply). Thus far, these locational issues have been possible to resolve in MISO's non-forward PRA only because there has been sufficient excess supply in the constrained regions to readjust utility commitments as needed. Once MISO's supply excess becomes depleted in most locations, it may not be possible to resolve such locational shortages unless the aggregate locational resource position is known with sufficient forward time to develop alternative supplies.

- **Aggregate Shortages under Utility Planning** (Less Likely). While we view this risk as less pressing than the other two reliability risks given the utilities' mandate to meet needs backed up by state regulatory oversight, it is also possible that some utilities may come up short of their own reserve margin requirements. For example, in the face of MATS retirements several utilities requested and received waivers from the Federal Energy Regulatory Commission (FERC) that have excused them from meeting their resource adequacy requirements over a six-week window, with the utility waivers being granted despite MISO's protest that it introduced reliability risks.[14] Another risk is that if some quantity of the resource need is left for very short-term bilateral procurement or procurement through the PRA, utilities could fall short if they incorrectly projected that short-term supplies would be available for purchase. The flip side of the problem of potential utility shortages (and in our view the more likely case) is that utilities could be overly risk-averse by building and maintaining an excess of capacity relative to the need, thereby imposing excess costs on customers.

The economic efficiency of resource planning decisions may be an even greater concern for regulated states in the MISO region. Utilities and their state commissions currently have limited and insufficient information with which to guide the most cost-effective investment decisions because the MISO capacity market does not provide forward pricing or liquid trading opportunities with which to: (a) accurately assess the supply-demand balance on a system and locational basis; or (b) provide a benchmark on capacity prices that would help to test whether particular investment decisions are economical. The lack of transparent forward prices leaves state commissions with little or no basis upon which to review the cost-effectiveness of utilities' resource planning and investment decisions, making it likely that customers will end

[14] We note that these utilities have argued that the spring window over which the waivers would apply should not pose any substantive resource adequacy risk given the timing in shoulder season, while MISO has argued that even shoulder months can experience shortage risks in some cases because of the planned outages in that period (particularly in the spring of 2015 as plants go on outages associated with MATS retrofits). We have not independently analyzed the magnitude of these risks. See FERC waivers that have been granted to three MISO utilities in FERC (2014b, and 2015a-b).

up paying excess costs. A few examples of how this lack of transparency can lead to excess customer costs include:

- **Retire vs. Retrofit.** A utility may request approval to retrofit a coal plant for compliance with environmental regulations, typically with a cost justification that the cost of the retrofit is less than the presumed alternative of building a new replacement plant. But without information on the alternative costs of sourcing capacity from the market (i.e., without a transparent forward market price for capacity), the state commission will have insufficient information with which to determine whether the retrofit is cost-effective. It may be that other lower-cost capacity could have been purchased from other utilities or IPPs.[15] Further, some utilities likely feel pressure to extend the lives of assets even when those re-investments are not economic, e.g. to avoid perceptions of waste by retiring a units that do not "seem" to have reached the end of their useful life, or to avoid risking their ability to recover costs on an asset that was deemed prudent when it was built.
- **New Investment vs. Existing Market Source.** Similarly, a utility may project a supply adequacy gap and propose to build a new plant to fill the need. But without a market test or market reference price point against available short-, medium-, and long-term supplies it is not possible for a commission to evaluate whether it is most cost effective to meet the need with new investment or bilaterally-sourced existing supplies. Rather than building now, it may be more cost-effective to procure excess capacity from neighboring utilities or uncontracted IPPs. Such a test would also help determine whether a new build should proceed immediately, or be postponed for a number of years until a new development is the most cost-effective option.
- **New Build through Self-supply or Power Purchase Agreement.** When new capacity is needed, a utility self-supply generation project may be the most cost-effective option. However, it is unlikely that utility self-supply will *always* be able to meet resource adequacy and other objectives at lower cost than procuring new supply under a power purchase agreement (PPA). An IPP may sometimes be able to develop a project at a lower-cost site, with more competitive construction costs, or by identifying a more economical technology type such as demand response or cogeneration. Or an IPP

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15 Extending the example further, the lack of forward transparency can impose excess costs on customers for both utilities that are long and short. For example, consider two utilities both facing a retire-vs.-retrofit decision on an environmental plant upgrade. Utility A has an excess of supply and so decides to retire the plant, even though only a modest investment would have been needed to environmentally retrofit. In contrast, Utility B would be in shortage without the plant and so decides to invest in a costly retrofit, based on an analysis that the retrofit is less expensive than the presumed alternative of building an entirely new plant. Thus, a low-cost retrofit opportunity is lost for one utility, while a high-cost retrofit is pursued by another utility. A better, cost-saving alternative for the customers of both utilities would be for Utility B to retire its plant and procure the needed supply from the low-cost plant of Utility A.

might simply have a more optimistic view of the energy market, translating to lower capacity costs in procurement. Such possibilities may be discovered through transparent markets or through solicitations, as we discuss further in Section IV below.

In sum, regulated states face a number of reliability and economic efficiency concerns under the current resource adequacy construct. Customers may run the risk of local reliability shortfalls even if utilities have planned carefully and met their own aggregate reserve margin requirements, because their plans cannot accurately predict how heavily neighboring LSEs might rely on the same limited transmission. Nor does utility planning protect against the possibility that LSEs in retail choice states might fail to meet their resource adequacy requirements. Regarding costs, customers are at risk of paying more than they need to absent forward liquidity and price transparency for capacity. Some of these concerns can only be addressed through system-wide protective measures, while others can be addressed by independent state-driven efforts to adopt best practices in resource procurements.

B. Concerns for Retail Choice States that Rely on Merchant Supply

Retail choice states are a minority of the MISO region, but make up a non-trivial 9% share of the regional demand between the MISO portion of Illinois and the 10% of Michigan under retail choice.[16] Additionally, there are a diversity of municipalities and cooperatives within the MISO footprint, some of which are more dependent on market purchases than regulated utilities that conduct full integrated planning exercises.

Retail choice loads draw capacity and energy from the wholesale market on an unregulated basis, with no long-term resource planning. LSEs in these states do not have long-term commitments to supply customers, who may elect to switch to another provider at any time. As such, the LSEs in retail choice states cannot accept the risk of making long-term capacity purchases, and instead rely on capacity supplies being available on a short-term basis through the non-forward MISO PRA. In Illinois, some capacity needs are also met through the near-term procurement activities of the Illinois Power Agency (IPA).[17]

Because LSEs in retail choice states are not in a position to commit to self-supply, the supply to meet the resource adequacy needs of these customers can come from either: (a) excess supply from neighboring utilities' portfolios; or (b) IPPs within the MISO footprint whose generating

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16 Calculated consistent with 2015/16 coincident peak loads, which were 9,518 MW and 20,522 MW in the MISO portion of IL and MI respectively, and 124,097 MW for MISO system-wide. Retail choice load as a fraction of MISO load is then (9,518 + 20,522 * 10%) / 124,097 = 9.3%, see MISO (2015d), p. 6. 10% of Michigan under retail choice, see Michigan (2008), Sec. 10a (1) (b), p. 7.

17 For example in its 2015 procurement plan, the IPA recommended a procurement schedule for least 50% of the second delivery year's forecast capacity requirement and at least 25% of the third delivery year's forecast requirement, see ICC (2014), pp. 3-10.

resources are not otherwise contracted.[18] Historically, a system-wide excess has provided for retail choice loads, without needing to build any new generation supplies on their behalf. However, this will not be the case going forward given the tightening system reserve margin as discussed above. Instead, supply adequacy for retail choice loads will depend on the ability of the market to attract merchant generation investments to meet load growth.[19] Therefore, in the long run, approximately 9% (approximately 14,000 MW at current load levels) of the generation supply in MISO will need to be attracted or retained on a merchant basis in order to maintain resource adequate system-wide.[20]

Historical capacity prices have been too low to attract merchant generation entry, but this was an efficient result given the capacity surplus. As shown in Figure 3, MISO capacity prices have been far below the Net Cost of New Entry (Net CONE), which is the approximate capacity payment that merchants would need to expect on average over their asset life in order to build new generation. The Illinois price in the latest capacity auction did clear at higher levels closer to Net CONE, due to a combination of a binding local sourcing requirement and high supplier offer levels allowed by the market monitor, but a substantial 28% (or 3,100 MW) fraction of the primarily merchant supply in Illinois was left uncommitted and therefore earning no revenues for the 2015/16 planning year.[21] To attract new merchant generation investment in Illinois, prices would need to appreciate further to Net CONE even with all local resources clearing, and be expected stay at that level on average over many years.

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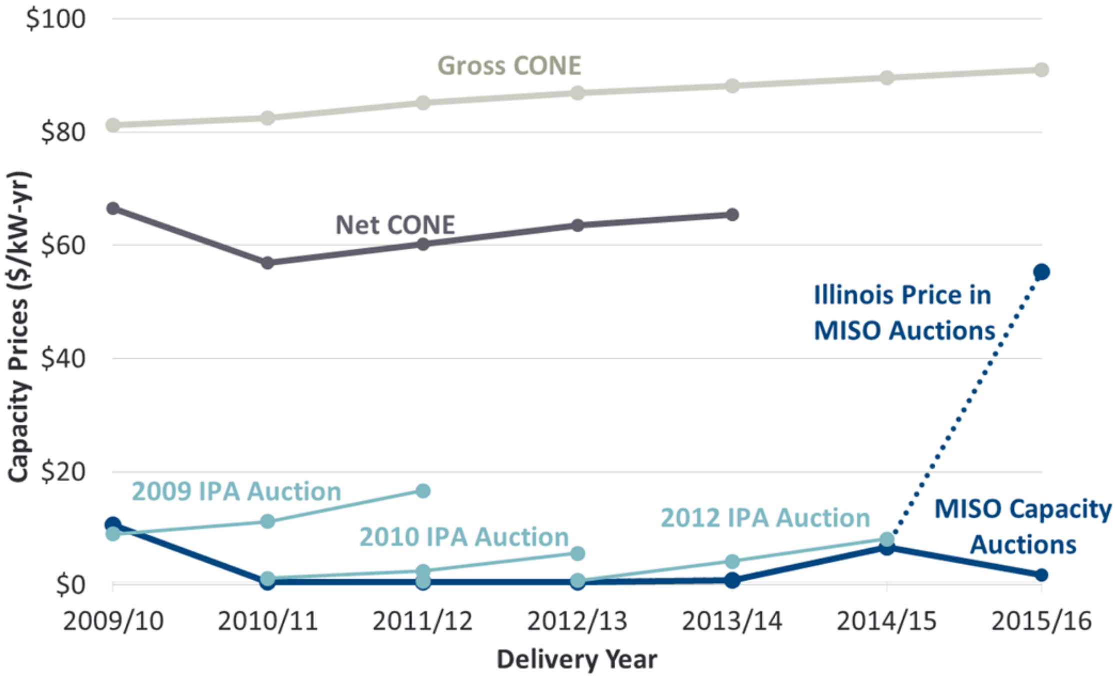
[18] For example, in its 2012 capacity procurement auctions, IPA procured excess capacity from regulated utilities and public power entities including Wisconsin Public Service Corporation, Minnesota Power, Consumers Energy, Exelon, Ameren Missouri, and DTE, and uncontracted supply from IPPs including GenOn (now part of NRG),and Dynegy, see ICC (2012b).

[19] Retail choice loads may also continue to rely on excess supplies from regulated utilities for a portion of their capacity needs, to the extent that these regulated utilities continue to maintain an excess of supply far into the future. However, retail choice loads cannot rely exclusively on utility excess because: (a) utility excesses will not be large enough in aggregate nor in the right locations to support all retail choice load needs, and (b) utility customers and commissions in regulated states will not likely be willing to subsidize these needs into perpetuity.

[20] See footnote 16.

[21] The Illinois price cleared at $150/MW-day ($55/kW-yr) compared to only $3.48/MW-day ($1.27/kW-yr) for most of the system. This Illinois price cleared just under the $156/MW-day ($57/kW-yr) "reference level" price which is the maximum offer price allowed by the market monitor without any offer review. This reference price is based on the market monitor's estimate of the opportunity cost of exporting capacity, and tied to the PJM capacity market clearing price in this delivery year. See Potomac Economics (2015), MISO (2015d).

Figure 3
Historical MISO Region Capacity Prices and Net CONE



Sources and Notes:

MISO capacity prices from MISO (2015e). IPA capacity prices from ICC (2009, 2010, 2011b, and 2012b).

2014/15 CONE estimates from MISO (2013a). 2009/10 – 2013/14 CONE estimates calculated by adjusting 2014/15 CONE estimates, using annual U.S. inflation rates from the Bureau of Labor Statistics.

Energy and Ancillary Service (E&AS) offsets from 2011 and 2013 MISO State of the Market Reports, see Potomac Economics (2012, 2014).

The key question is whether MISO's resource adequacy construct will allow prices to rise enough to attract new generation when the surplus disappears and new capacity is needed. Capacity markets can be designed to successfully support new merchant generation investments when needed, as we have observed over the past several years in both PJM and ISO-NE.[22] However, MISO's resource adequacy construct has some major design differences, and we believe it would not be able to attract merchant supply until reliability is at unacceptably low levels because of three problematic design features:

1. The vertical capacity demand curve at the reliability requirement imposed in the PRA;
2. The non-forward timing of the PRA; and
3. The low PRA price cap at 1× CONE.

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22 For example, in the past three capacity auctions, PJM has attracted almost 15,000 UCAP MW of gas combined cycle units, approximately 10,000 MW of which were merchant investments, see PJM (2015a). In ISO-NE, 800 MW of new generation cleared in 2016/17 and more than 1,000 MW cleared in 2018/19. Among these cleared new generation resources were two large merchant gas CC plants, the 674 MW Footprint Power and 725 MW CPV Towantic projects, see ISO-NE (2015b).

The non-forward PRA, vertical demand curve, and near-vertical supply curve all combine to create a structurally highly volatile pricing outcome. Combining a near-vertical supply curve with a vertical demand curve creates structural volatility, where even a small surplus drives prices to essentially zero, as observed in almost all historical MISO auctions.[23] Then as the market encounters even a minor shortage, prices would hit the "knife edge" and jump up to the price cap.

This knife-edge problem is illustrated in Figure 4, which shows the 2013/14 PRA supply curve, with an essentially vertical shape.[24] With 97% and 99% of supply offered below prices of $5/kW-yr and $10/kW-yr respectively, prices would be very low as long as there is even a modest surplus. But if the supply excess becomes small then the supply curve will become nearly vertical, meaning that a small change to supply or demand can result in an extreme price change. For example, in the steep part of the 2013/14 supply curve, a single small 250 MW offer could have made the difference between a low $24/kW-yr price and the $88/kW-yr price cap. Such extreme price sensitivity to small changes in quantity also mean that the market is susceptible to the exercise of market power, with both the volatility and market power concerns being greater at the individual zone level where supply is limited and structurally less competitive. These concerns about structural volatility and exposure to market power are the primary reasons that the independent market monitor (IMM) has consistently recommended that MISO adopt a sloped demand curve in its PRA.[25] The potential for enhanced price stability from a demand curve would make the market more attractive not only for merchant generation suppliers, but also for innovative technologies like demand response.

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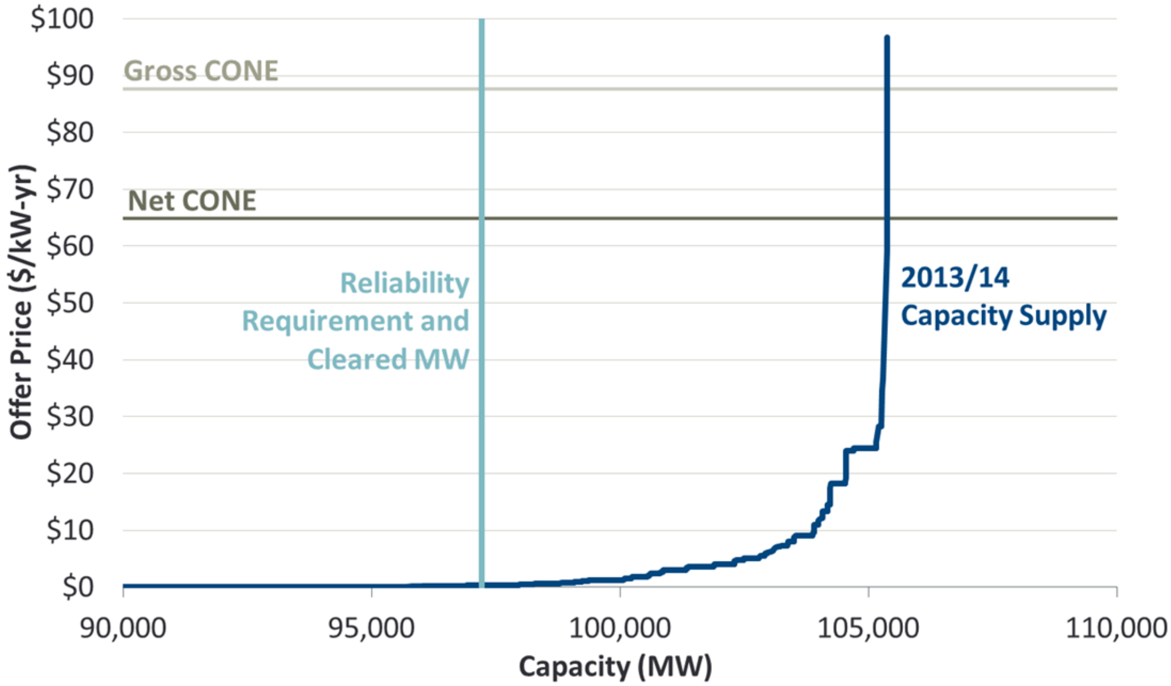
23 The only exception is the most recent capacity auction result as localized in the Illinois zone, where the high supplier offer cap translated into higher prices in the presence of local resource constraints. If similar effects persist over the long term, this could partly (but likely not fully) mitigate the knife edge problem that we describe here. This is because for prices to persist at or near Net CONE on average, several conditions would have to prevail over the long term, including: offer caps near or above Net CONE, binding local resource constraints in the relevant zones, and consistent supplier behavior of offering near that cap (despite this leaving many resources uncleared).

24 The supply curve was more elastic in 2014/15, likely because of a number of retirement-postponement decisions that some suppliers were making contingent on auction prices.

25 See Monitoring Analytics (2014), p. iv.

Figure 4
2013/14 Planning Resource Auction Offer Curve



Sources and Notes:

Supply and demand quantities exclude netted demand-side resources, but include Fixed Resource Adequacy Plan (FRAP) capacity. MISO 2013/14 PRA results, see MISO (2014c), (2013b).

Moving to a forward capacity auction (whether totally voluntary or mandatory for only a portion of MISO's load), would also help to alleviate this knife-edge problem by creating more supply elasticity. Non-forward capacity markets can always expect to have a near-vertical supply curve as all investment decisions have already been made prior to the auction and so the supply either exists (at a near-zero net going forward cost) or does not exist (because the investment decision would have been made some years prior).[26] In contrast, forward capacity auctions have more supply elasticity due to new generation, retrofit, demand response, and uprate investments that can be made contingent on auction results.[27]

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[26] Some exceptions will exist where suppliers have above-zero going forward costs and offer levels even in a non-forward market, for example in cases of: (a) high avoidable fixed or investment costs that do not need to be incurred prior to delivery year, but that can be avoided through retirement or mothball, (b) substantial risk of penalties that may be incurred with a capacity commitment, (c) opportunity costs if there is some ability to sell capacity off-system on a short-term basis, and (d) demand response resource costs, many of which are incurred as fixed annual costs or variable per-interruption costs rather than investment costs.

[27] Although substantially more elastic at low and medium price levels, even forward capacity auctions tend to have relatively inelastic supply curves at prices near or above Net CONE. For example, see Pfeifenberger, *et al.* (2014), Figure 12.

The practical effect of this structural volatility is that under MISO's current market design, prices will usually be either at the cap or else at very low prices near zero (*e.g.,* averaging only 4% of Net CONE historically on a MISO-wide basis, or 16% of Net CONE in Illinois as illustrated above). Further, the price cap in MISO is relatively low in MISO at 1× CONE, or only about 1.36× Net CONE.[28] This compares to other markets where the price cap is 1.5× Net CONE or more.[29] Therefore, to achieve prices that are Net CONE on average and therefore high enough to attract merchant generation investment, the MISO PRA would need to produce prices at the cap 3 years for every 1 year below Net CONE.[30] Because prices will only be at the cap during a supply shortage event, this also means that the aggregate MISO system would not attract new generation supply until the market was in shortage 3 of every 4 years.

Once the same concerns are narrowed to a single capacity zone like Illinois, the reliability and price volatility concerns are even more acute. In a small zone, the bimodal pricing problem is even worse because lumpy investments are large relative to the zone size, meaning that one new generator could be large enough to collapse any local price premium for many years to come. A developer dependent on market revenues would be unwilling to invest if local prices were always expected to be zero except in the difficult-to-anticipate conditions when local constraints are binding.In other words, to achieve prices high enough to attract new generation investments for retail choice loads, MISO as a whole would need to be willing to face persistent supply shortages. This is an undesirable and unsustainable outcome because: (a) the price volatility would be unacceptably high for retail choice loads (although it would not significantly affect regulated states), and (b) reliability would be unacceptably low and would very likely trigger a policy intervention by MISO or states that would undermine or revamp the design.

Further, the lack of accurate forward visibility into supply means that it will likely come as a surprise the first time a local zone clears the MISO capacity auction with a shortage. At that point it may be too late to resolve the shortage through a backstop procurement for the prompt year, since the auction is conducted immediately prior to the delivery.

Thus, the current MISO resource adequacy design is not suited to meeting the needs of retail choice loads and the merchant suppliers they rely on.

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28 Average MISO CONE divided by average MISO Net CONE over planning years 2009/10 – 2013/14. MISO price cap is 1× CONE, see MISO (2015a).

29 Specifically, 1.5× Net CONE in PJM (down to a minimum of 1× Gross CONE), 1.6× Net CONE in ISO-NE (down to a minimum of 1× Gross CONE), and 1.5× Gross CONE in NYISO. PJM (2014), Attachment DD, Section 5.10, ISO-NE (2015a), Section III.13.2.2, NYISO (2014), Section 5.14.1.2

30 This is an illustrative calculation; we have not analyzed the exact price that would be expected in surplus years nor long-run Net CONE. This illustrative calculation assumes that prices always clear at the cap or zero and that the cap is at 1.36× Net CONE. In that case the average price across four years is (3 yrs • 1.36× Net CONE + 1 yr • 0× Net CONE) / (4 yrs) = 1.01× Net CONE.

C. System-Wide Reliability and Economic Efficiency Concerns

The same economic and reliability concerns we described for individual states also affect the system as a whole, manifesting in system and local reliability risks and excess customer costs. It is important for each state to understand and be aware of these concerns even if they seem to primarily affect others in the region, because MISO is a highly integrated and interconnected system. Shortages in one state will create reliability concerns and higher wholesale energy prices that will equally affect all the neighboring states. Similarly, if a neighboring state in shortage makes uneconomic investments in high-cost retrofits or new builds it not only costs more for their customers, but also increases costs for neighboring states' utility customers that could have benefitted from selling their excess supplies.

Lack of forward visibility also introduces greater potential for inefficiencies in the MISO transmission planning process, as well as in gas pipeline expansion plans. These investment decisions must be made on a forward basis up to five years out, and must currently be based on potentially inaccurate information about where retirements and new builds are most likely. This may lead to unnecessary infrastructure development in some locations, and insufficient development in others. The voluntary OMS and MISO survey reports on supply plans do provide some of this information, but the information appears to have a relatively high level of uncertainty. For example, the supply demand balance has changed by up to 3,900 MW between quarterly reports in some MISO zones even for the two-year-out report, meaning that substantial guesswork must underpin the transmission plan.[31]

III. Addressing Challenges at the MISO Footprint Level

We have discussed the resource adequacy risks and economic efficiency concerns in the MISO footprint, and how they differ when viewed from the perspectives of regulated states, retail choice states, and the overall footprint. In this section, we present footprint-wide solutions that recognize these differences. For regulated states, this means developing solutions that will not interfere with state commissions' ability to maintain a standard of review over utility planning decisions and use that authority to act in the interests of customers and pursue other policy objectives. By comparison, in retail choice states, potential solutions must facilitate reliance on market forces to attract the most cost-effective investment decisions and attract new generation when needed, largely through competitive capacity auction mechanisms. The tension in developing robust solutions is that competitive auctions work best with broad participation, and many regulated states do not want to be forced into them or to subject their resources to the possibility of not clearing.

We attempt to reconcile this tension by identifying MISO-wide mechanisms that could help solve the reliability risks and economic efficiency concerns identified in Section II, while

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31 See MISO (2014g), p. 15.

accommodating both types of state policy structures. They key is to increase forward market visibility and enable more cost-effective transactions without imposing mandatory forward capacity auctions on regulated states. To that end, we propose three potential enhancements to the MISO-administered resource adequacy construct: (1) supporting the development of a more active and transparent voluntary forward market, whether bilateral or through voluntary centralized auctions; (2) enhancing the current OMS-MISO survey such that it is represents a binding forward showing of specific resource plans, rather than a voluntary indicator; and (3) holding forwarding capacity auctions that are mandatory for retail choice loads but voluntary for regulated entities.

All three of these options could be implemented in concert, or each one could also be implemented in isolation. Importantly, this proposed solution set does not include a mandatory forward capacity auction such as those in ISO-NE and PJM, given the concerns that regulated states and utilities have expressed with that design.

A. Voluntary Forward Market Transparency and Support

One important concern for utilities and state regulators is the lack of forward transparency in capacity prices. If it were possible to access a clear set of forward capacity prices for the upcoming three to ten years, this could prove extremely useful to utilities and state commissions in making resource planning and investment decisions. Similar to the value provided by gas and electric futures prices, a forward capacity price curve would represent a clear and transparent benchmark against which utilities and commissions could compare all resource planning, bilateral contracting, and investment decisions. For example, when evaluating a new generation investment, state commissions currently have few or no available reference points for evaluating alternative market supply options. But if a forward capacity price curve were available it might in some cases show that prices are quite low for several years, indicating that a new generation investment should be reviewed critically and likely postponed in favor of a medium-term bilateral contract.

To provide that forward transparency in capacity pricing in the MISO region, we see the following general options:

- Voluntary Forward Capacity Auctions. Utilities in MISO have expressed support for voluntary auctions that would provide price transparency and transaction opportunities to support their planning decisions.[32] The concept is to enable utilities, public power agencies, IPPs, and other market participants to voluntarily buy and sell a standardized zonal capacity product. The product would look like the existing MISO Zonal Planning Resource Credits (ZPRC) that LSEs use to demonstrate that they have fulfilled their capacity obligations, but terms could extend further into the future. Product terms

[32] MISO Transmission Owners (2015).

could vary from individual years (for each of several years into the future) to multi-year contracts with three-, five-, or ten-year delivery periods, for example.

MISO would be the natural entity to conduct such auctions. As the auction administrator, MISO could enable the widest participation of market participants, address counterparty risks with appropriate credit requirements, and integrate auction results into its current tracking system for transferring capacity obligations and settlements.[33] However, even if MISO did not administer the auctions, individual state entities and utilities could do so independently. For example, in Illinois the IPA has conducted such procurement auctions for up to two years forward. The published prices of those auctions provided a valuable reference point for all market participants including those not directly participating in the auctions.[34]

- **Exchange-Traded or Over-the-Counter Product.** Another option is for MISO, or possibly another entity such as ICE, to create and support a continuously-traded zonal capacity product. The going price for the product would then be publicly available for each forward year, just as with other commodity futures like wholesale energy or fuels. This would provide market participants one additional opportunity to adjust capacity positions, and provide a transparent forward price against which to benchmark contracting and investment decisions.

  If MISO supported this product, then settlement would be physical and tracked under MISO's current capacity tracking system, as in the voluntary auction mechanism option described above. However, MISO's software systems would need to be enhanced to support trading across future years and to enable the collection and publication of aggregate transaction pricing data. If an entity like the Intercontinental Exchange (ICE) supported the product, then settlement could be either physical or financial, but market participants' supply positions would not be integrated into MISO's capacity tracking system.

Under either of these options, the purpose would be to support the voluntary forward market for capacity, and create more pricing transparency to assist utilities, states, and merchant generators in making their investment and contracting decisions. If the underlying capacity product were actively traded with liquid volumes clearing in any auction or exchange, then it would also provide the additional material benefit of facilitating more and easier transactions with minimal overhead. These advantages could be achieved without any obvious downside and without introducing any inconsistency with traditional planning and procurement activities.

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33 The tracking system is referred to as Module E Capacity Tracking Tool (MECT), see MISO (2014d).

34 IPA has not conducted capacity procurement auctions since 2012, but plans to conduct an auction in September 2015, see ICC (2011a, 2012a, 2013, and 2014).

However, a forward price can provide useful information even if the traded volumes are relatively low. For example, it may be that a voluntary forward capacity auction would have material volumes for short-term products, smaller volumes for medium-term products, and no cleared volume for ten-year commitments. Though these auctions would not provide material opportunities for buying or selling large long-term capacity commitments, they would still provide valuable reference prices for forward prices. Even in the ten-year product with no cleared volume, valuable information can be provided by publicly posting information such as offered volumes, maximum buy bid price, and minimum sell offer price.

B. Binding Forward "Showing" for Regulated Utilities

As discussed in Section II.A above, we expect that regulated utilities will always or almost always meet their planning reserve margin requirements and provide a robust contribution to system-wide resource adequacy needs. However, there are still reliability risks associated with the non-forward and uncoordinated nature of utilities' resource plans, since each utility must plan with incomplete knowledge of other market participants' resource commitments and planned transmission usage, until it is too late to adjust. Shortages could occur in within a zone if uncoordinated utilities plan, in aggregate, on using more than all of the available transmission to import supplies from outside the zone. And, somewhat less likely, shortages could occur zonally or system-wide if some utilities hope to meet some of their short-term needs by procuring others' excess supplies, but then no such supplies turn out to be available. Both situations can also give rise to excess customer costs, as resolving shortages on a non-forward basis can be very costly or impossible, while over-procuring to protect against this possibility is also costly.

To address these concerns, states and utilities could work with MISO to transition the OMS-MISO voluntary supply survey into a mandatory forward "showing" on a two- to four-year forward basis. Utilities would have to demonstrate that they have sufficient resources to fully meet their resource adequacy requirements on a system and local basis. They would submit unit-specific commitments for self-supply or bilateral procurement, such that MISO could confirm the exact quantity and location of resources committed under each utility's resource plan. If the showing occurred prior to a forward auction (which would be conducted primarily for retail choice loads, as described in the following section), utilities could submit a showing for partial requirements, along with a commitment to procure the rest in the forward auction.

MISO would then test the aggregate resource plan commitments to confirm that they are simultaneously feasible on a locational basis, and alert any utilities affected by locational shortages (or local excesses in export-constrained zones). The utilities would then have a reasonable window of time within which to resolve these locational deficiencies and submit a finalized resource plan. Local deficiencies could also be resolved through the retail choice auction instead, at the utility's election.

This showing would substantially improve the quality of information available to MISO and market participants with which to conduct transmission planning, identify locational shortages that need to be resolved, and inform cost-effective utility resource planning for subsequent years. However, utilities would also need to maintain sufficient flexibility to adjust these plans on a shorter-term basis and comport with business needs. For example, in the event of an unexpected retirement or construction delay, the utility would need to have shorter-term opportunities to replace that resource in its plan either through alternative self-supply, bilateral arrangements, or shorter-term resource adjustment auctions. Current MISO capacity tracking mechanisms would already facilitate the first two types of supply adjustments, although short-term adjustment auctions would need to be developed.

C. Mandatory Forward Auction for Retail Choice Loads (Voluntary for Others)

The approach for addressing the concerns affecting retail choice loads would be quite different, given the very different nature of their situation compared to regulated states. LSEs serving retail choice customers do not have captive load and cannot know what their load obligations will be in the future; they cannot be expected to procure future supplies or develop resource plans on behalf of an as-yet undetermined customer base. They procure supplies on a short-term basis matching the terms of their load serving obligations. Unfortunately, their short-term procurements would not discover an aggregate supply shortage until it is too late for the market to develop new supply. MISO's current resource adequacy construct also will not support merchant investment, as we discussed in Section II.B.

These concerns can be resolved through a mandatory forward procurement of resources on behalf of retail choice customers. The auction would ideally be conducted by MISO, to ensure consistency with transmission limitations and utilities' resource plans. Demand in the auction would only be for enough capacity to cover the needs of retail choice customers (currently only in Illinois and Michigan), and be intended as the primary vehicle for attracting merchant generation supplies on their behalf when needed. Given the purpose and focus of this auction, it would be designed such that it best fits the merchant generation business model contemplated by retail choice states. Thus, the auction could incorporate a higher price cap and a price-stabilizing sloped demand curve, with the financial impacts of the resulting variability in capacity prices and quantities borne solely by retail choice customers.

Utilities and regulated entities would also have the *option* but *no obligation* to participate in the retail choice auction. Even though regulated utilities would not be required to participate, they may find it cost-beneficial to use the auction as one option for buying incremental capacity, selling excess capacity, or resolving a locational deficiency.

For supply-side entities, the determination of whether the auction would be voluntary or mandatory would depend on whether the auction is conducted before or after the utility resource showing described in the prior section:

- **Voluntary for Supply if Auctions Precede Utility Showings.** If implemented *before* the mandatory showing for regulated utilities (or if the mandatory utility showing does not exist), then the auction would also need to be voluntary for supply, with few or no mandates to offer capacity or restrictions on offer price levels.[35] The modest expected volumes reflecting only 9% of MISO load in this auction mean that it would be structurally competitive at the system level, without being susceptible to the exercise of market power.[36] In this case, we would expect prices to be efficient only if suppliers are *not* forced to participate or offer at cost, like they are in fully mandatory centralized auctions. In this case, merchant suppliers would generally offer at their opportunity cost of selling capacity into the auction, based on their net going forward costs or their expected ability to sell capacity off-system or on a bilateral basis to utilities. In contrast, utilities would withhold the vast majority of their supplies from the auction in order to use them in their mandatory showings of self-supply, submitting only a portion that they reasonably anticipate to be in excess.

- Mandatory for Supply if Auctions Follow Utility Showings. However, if implemented *after* the mandatory showing for regulated utilities, then the auction would need to be mandatory for any supply not already committed through a mandatory showing to protect against exercise of market power. In this case, utilities would already have a clear understanding of their resource commitments in each location and therefore a very accurate assessment of residual excess or need in each location. The result would essentially be similar to a mandatory full requirements auction for all net demand in the system, leaving the auction susceptible to the exercise of market power if all net supply is not also included. Such an auction would require sufficient monitoring and mitigation mechanisms similar to those that MISO currently imposes in its non-forward PRA.

If this voluntary auction were implemented by itself (with no mandatory utility showing), it would be likely to resolve the system and local shortage concerns introduced by retail choice loads under the current MISO construct. Even though the forward procurement quantity would only be for a minority of system demand, it would be a large enough quantity to ensure resource adequacy on behalf of those customers based on a design consistent with the merchant IPP business model supplying that subset of customers. This auction would also resolve the collateral reliability and customer cost impacts on regulated states that would occur in case of a

35 Participation should be entirely voluntary for system-wide supply, but some must-offer requirements and offer price mitigation may be appropriate for uncontracted merchant supply in zones that are structurally uncompetitive, *i.e.*, if there is a large quantity of demand in one zone where the local constraint is likely to bind while only one or a few pivotal suppliers would be able to contribute to that demand.

36 If alternately, all suppliers were forced to offer into such an auction at net going forward costs, this would artificially suppress the price and make the design unsustainable (because the auction would reflect only a small portion of system demand but force offers from all supply). This would also create a fundamental disconnect with the utility showing, since utilities would presumably need to withhold a substantial fraction of their capacity resources from the auction to meet their own resource needs.

shortage in retail choice states. It would also provide a useful price point for utilities and states to inform their forward planning decisions.

If implemented in concert with the mandatory utility showing discussed in the prior section, it would also supplement those showings to provide MISO and all stakeholders the most accurate possible picture of the system and local supply and demand balance on a forward basis. As noted previously, this would provide clarity in transmission planning and utility resource decisions for subsequent years.

IV. Potential Solutions for States and Regulated Utilities

While some concerns with the current resource adequacy construct can only be addressed by coordinated actions on a footprint-wide basis, there are a number of solutions that MISO states and regulated utilities can pursue independently. Specifically, states and utilities can more fully and effectively rely on market tests to improve the cost-effectiveness of their planning decisions and avoid costly investments at times when lower-cost alternatives may exist.

Many states across the U.S. have recognized that competitive procurements can help achieve policy goals at lower costs, although effectively incorporating procurements into planning has proved to be a challenge. Such competitive procurements have sometimes been used within MISO states, but it has been much more common to rely on utility self-supply for new conventional generation (in contrast, MISO states have widely used competitive procurements for new wind development).

While not every planning decision can be measured against a full competitive solicitation, we recommend that MISO states and utilities more regularly incorporate some level of "market test" to validate the timing and cost-effectiveness of investment decisions. The simplest and most transparent would be to compare the capacity cost of potential utility investments against a forward market price for capacity.

For major long-term investments or those that do not clearly pass the more simplified market test, a formal solicitation for capacity could be pursued to help determine whether the utility's proposed investment is cost-effective. A solicitation allowing a range of terms and resource types can reveal whether the investment is cost-effective, for example by confirming whether: (1) the *in-service date* for a new build can be postponed by procuring lower-cost supplies on a short term basis, thereby saving investment costs; and (2) *buying is cheaper than building,* as in cases where a long-term PPA offer might be available at a lower cost if the market can identify lower-cost opportunities such as unique low-cost sites, or alternative technologies.

Fully and fairly evaluating these market offerings against self-supply options is a complex analytical task that can be sometimes be less than transparent to competitive suppliers, commissions, and consumer advocates. Thus, perceptions that the solicitation will unfairly disadvantage competitive bids can discourage participation and compromise the credibility of results. To support transparency, best practices can include effective commission guidance, transparent selection procedures, an independent evaluator of offers, and simplified economic evaluations that allow comparison of different resource types/locations that make use of available energy (and if possible capacity) price reference points. As a further measure of transparency, we also recommend complementing any of the more complex and comprehensive cost-benefit measures with a very simplified comparison of capacity offer prices (or equivalent capacity-only value from any bundled offers).

A. Objectives of Effective Planning and Procurement Mechanisms

The most fundamental objective of integrated resource planning is to minimize the utility's total short-run and long-run costs while meeting reliability standards (often evaluated across a range of future scenarios). But utilities and states also use the IRP as a vehicle to support a range of other policy objectives, such as reducing the exposure of customers to volatile and uncertain prices, achieving state and national environmental policy objectives, and promoting innovative technologies such as demand response.[37] The more explicitly these policy objectives are defined, the more effective the utility will be in meeting those objectives.

Traditional IRPs focused on achieving these goals primarily through self-supply, making only limited use of market procurements and competitive solicitations. Many states have since recognized that incorporating bilateral market procurements and competitive solicitations into the IRP can sometimes meet the same policy objectives at lower cost. Third parties can sometimes identify creative solutions that the traditional utility would not reasonably be able to find, such as cogeneration at a manufacturing facility, excess supply from off-system resources, uprate opportunities at an existing IPP generation plant, or new demand response.

Effectively incorporating competitive procurements into the IRP also requires that procurements and underlying policy objectives be specified flexibly enough to admit creative and unexpected solutions. Thus one objective of an effective market procurement strategy should be to enable many different types of offers to compete with utility self-supply, as long as the competitive offers can also fill the underlying policy requirements. For example, when the objective is to procure enough capacity to meet resource adequacy needs, all types of capacity should be invited to respond, including: (a) generic offers for a standard capacity product, regardless of the underlying supply resource type; (b) new generation as well as existing resources and uprates; (c) any technology type, such as coal, gas CTs, gas CCs, imports, and demand response; (d) short-, medium-, and long-term contracts; (e) small or partial resources that fill only a portion of the need; and (f) capacity-only or bundled energy and capacity offers. In contrast, narrower definitions of objectives and the solution space could exclude many low-cost alternatives like existing resources and demand response. For example, if an RFP specifies a bundled energy and capacity contract with a pre-specified capacity factor and a 20-year

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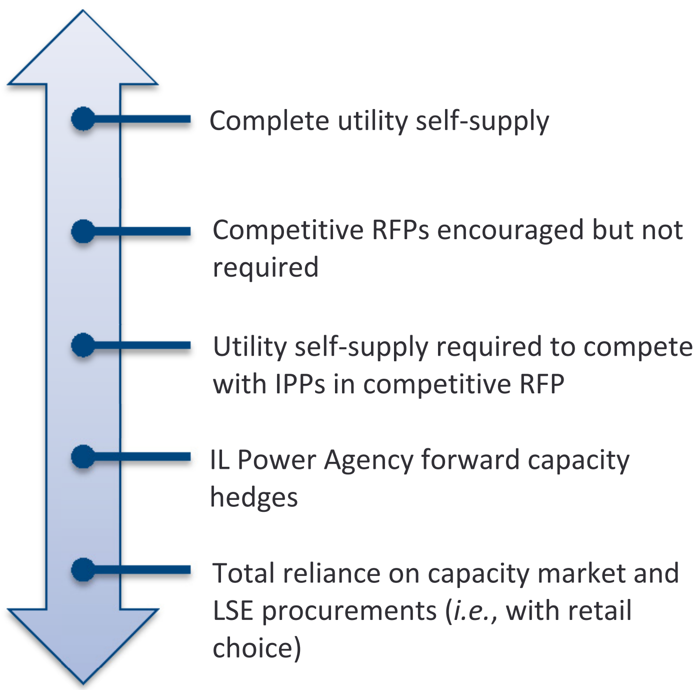
37 For a discussion of how IRPs can be used to combine least-cost goals with risk management objectives, see Graves, *et al.* (2004), pp. 20-21.

duration, it may unnecessarily narrow the types of offers so extensively that only new gas CCs can compete.[38]

B. Review of State Approaches to Encouraging Cost-Effective Procurements

More fully incorporating market procurements into resource planning can take a number of forms, with no one format fitting the needs and policy objectives of all states. There is a spectrum of procurement approaches as summarized in Figure 5, from total self-supply (as in traditional planning), to meeting needs through a combination of PPAs and self-supply, to total capacity market reliance (as in retail choice states). Most regulated utilities do not fall under one extreme or the other, but instead fall somewhere in between.

Figure 5
Spectrum of State Procurement Approaches



As one approach, some regulated states such as Florida and California, require competitive RFPs for new generation but allow the utility or an affiliate to participate in the solicitation on an equal competitive footing with competitive suppliers.[39] Some other states, such as Washington and Nevada, do not require competitive solicitations but have policies that

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38 We have observed this type of over-specification in procurements for resource adequacy under California's Long-Term Planning Processes and recommended similar adjustments in that state. See Pfeifenberger, *et al.* (2012).

39 Florida PSC (2003), Oregon PUC (2006), p. 17., Pfeifenberger *et al.* (2012).

explicitly state a preference for competitive procurements.[40] Nationwide, a 2006 analysis found that 17 of 34 regulated states had at least one utility that purchased a significant portion of their resource needs, with the percentage of long-term purchases from unaffiliated suppliers varying widely across utilities, with a median of 5%.[41] Another 2008 study found that 13 of the 32 non-restructured states had policies in place that explicitly required or encouraged competitive procurement.[42]

MISO utilities rely heavily on self-supply for long-term resource planning compared to utilities in some other regulated states. Anecdotally, we understand that MISO utilities do use the bilateral market actively for very short-term adjustments to their capacity positions, primarily through brokers.[43] For medium-term capacity procurements, utilities have fewer options and less visibility, partly because of the lack of a standardized capacity product that is qualified by MISO for more than one year forward.[44]

Utilities in MISO also rely on competitive procurements for many wind developments, with more than 60% of the wind capacity in MISO having been developed by IPPs and the remainder developed by utility self-build.[45] But for conventional generation, MISO utilities have competitively procured only one new generation project of which we are aware over the past five years.[46] Over the same timeframe, regulated utilities have developed approximately 6,000 MW of new generation as self-supply.[47] Some of those self-supply projects were compared to market alternatives through an RFP process, but the utility self-build option was ultimately chosen. Even if many or most of these utility developments are economic, the lack of a material quantity of PPA-supported new builds in MISO suggests that some low-cost opportunities may be available that have not been pursued.

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40 Basheda and Schumacher (2008), pp. 59 – 62.

41 34 regulated states includes states that had suspended restructuring as of September 2010, see EIA (2010). Pfeifenberger (2006).

42 Basheda and Schumacher (2008), p. 63.

43 See MISO Transmission Operators (2015), p. 5.

44 Some (but not all) utilities have therefore requested that MISO extend additional support to voluntary bilateral market for capacity in the region, through a forward capacity product that can be voluntarily transacted, see MISO Transmission Operators (2015).

45 Based on ABB data on regulated and merchant wind assets in MISO, from ABB (2015).

46 In 2015, Xcel received approval to enter into a 20 year PPA with Calpine for a 345 MW expansion of the existing Mankato natural gas combined cycle generator. The expansion is planned to begin commercial operation in 2018. See Calpine (2015). There are also examples of other utilities that have conducted competitive solicitations and ultimately chosen to proceed with a self-build option, as well as utilities that are currently or soon plan to proceed with competitive solicitations.

47 This includes approximately 400 MW of gas CTs, 3,200 MW gas CCs, 1,600 MW of coal, and 800 MW from other sources that came online since 2010, excluding all generators smaller than 25 MW, wind and solar, from ABB (2015).

By comparison, some regulated states outside of MISO have demonstrated a more balanced mix of IPP and utility development. The most aggressive state in this respect is California, where IPPs developed approximately 70% of the 8,300 MW of conventional generation built over the past five years.[48] However, California is the exception in that it has been more common for regulated states to continue relying on utility self-build for the majority of new developments even if they require competitive solicitations in some circumstances.

For states that do make an effort to incorporate more competitive RFPs, their processes vary by substantially.[49] Some of the features that might be considered in MISO states wishing to explore their competitive procurement options include:

- **Use of an independent evaluator.** The use of an independent evaluator is required in some states such as Arizona, Utah, and Georgia, to ensure that utility self-build projects are evaluated on an equal footing with IPP projects.[50] In other states, the use of an independent evaluator is optional unless the utility or an affiliate participates.[51]
- **Equal participation by the utility or an affiliate.** In some states, when a utility or its affiliates are competing, a firewall between the utility's bid team and evaluation team is required.[52] The participation of the utility or an affiliate may trigger a requirement for all RFP offers to be blinded to the evaluation team.[53] Florida allows utilities to modify the cost and performance parameters of the unit in their offer throughout the process. However, if they choose to do so, other participants are also given a corresponding opportunity to revise their offers.[54]
- **Exemptions from the competitive procurement process.** Several states waive the requirement for competition in some circumstances, including for emergency reliability procurements or in the case of "resources of extraordinary advantages that require immediate action."[55] Some states also exempt small procurements, with a threshold of 30 MW or smaller in Georgia, and 75 MW or smaller in Florida.[56] Oregon only requires

48 Based on data from ABB (2015).

49 For one more comprehensive analysis of lessons learned and best practices, see Tierney and Schatzki (2008).

50 Arizona CC (2007); Georgia PSC (2011), p. 6; Utah PSC (2012), p. 8.

51 Oklahoma CC (2014).

52 Oklahoma CC (2014); Georgia PSC (2011), p. 6; Utah PSC (2012), p. 5.

53 California PUC (2004), pg. 82; Oregon PUC (2006), p. 17.

54 Florida PSC (2003), p. 2.

55 Arizona CC (2007); Oregon PUC (2006), p. 7; Georgia PSC (2011), p. 12.

56 Georgia PSC (2011), p. 12; RRA (2014), p. 8.

competitive procurement for resource acquisitions larger than 100 MW and with durations greater than five years.[57]

- **Types of offers considered.** Some states make an effort to invite a range of different competitive offer types (although many others do not). Arizona specifies that purchases from third-party trading systems, energy brokers, and bilateral contracts are allowed.[58] California has recommended "a mix of contract lengths, sufficient to allow for new construction of power plants or transmission projects, is best."[59] Florida encourages bidders to "formulate creative responses to the RFP, such as responses which employ innovative or inventive technologies or processes."[60]
- **Consideration of non-price factors.** Most states allow non-price factors to be considered in the competitive RFP evaluation process.[61] These non-price factors may include risks to ratepayers; system effects such as transmission interconnection, integration, or congestion costs; and debt imputation (see further explanation below). Oklahoma requires analyses of the availability of firm transmission service to "use publicly available tools provided by the controlling entity, such as the Southwest Power Pool Scenario Analyzer".[62] In some states such as Florida, all non-price factors considered must be specified to bidders in the RFP.[63]
- **Publication of results.** Some states require details of the competitive process be released to the commission or the public. Oregon requires bidding information and bid scoring are made available by the IE to the utility, Commission staff, and non-bidding parties under confidential protection orders.[64] Washington requires a summary and final ranking of each proposal must be made publically available, and Florida requires utilities to make bid information on the finalists publically available.[65]

While there is no one-size-fits all approach that will work for every state, there are a range of options for MISO states to more fully and effectively incorporate market procurements into their resource planning activities.

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57 Oregon PUC (2006), p. 3.

58 Arizona CC (2007).

59 California (2004).

60 Florida PSC (2003), p. 2.

61 Oregon PUC (2006), p. 10; Washington (2006); Utah PSC (2012).

62 Oklahoma CC (2014), Section 165:35-34-3.

63 Florida PSC (2003), p. 2.

64 Oregon PUC (2006), p. 20.

65 Washington (2006); Florida PSC (2003), p. 2.

C. Simplified Market Tests Against a Forward Capacity Price

Ideally, utilities and state commissions would compare every investment decision for resource adequacy against market alternatives, to ensure that the investment is cost-effective. One relatively simplified and transparent market test would compare the levelized investment costs (minus net energy value) of proposed utility investments against a transparent forward capacity price extending at least five or more years forward. This type of test would be readily implemented if a transparent capacity price were available from voluntary forward market as discussed under Section III above.

However, because no transparent capacity price data currently exist for forward years, we recommend that utilities compile market data on capacity prices by either: (a) gathering quotes from third party brokers as long as those quotes reflect actual bilateral bids or offers, or (b) regularly procuring or selling at least small quantities of the standard capacity product for up to five or more years forward. We do not recommend relying on a theoretical capacity price projection as a substitute for real market data on the going price of capacity however, since these projections would be subject to substantial uncertainties and cannot guarantee that it is actually possible to transact capacity at the projected price.

Once compiled, market data on forward capacity prices could be used regularly by utilities and commissions to inform short- and medium-term planning decisions, to help predict when supplies will become less available on the market, and to support utility plans for any modestly-sized investments such as low-cost plant uprates. The forward capacity prices may also identify opportunities for substantial cost savings, for example if it showed that a major new generation project could be delayed for several years. In that case, lower-cost existing supplies could be procured for an interim period to meet the need, with capacity sourced from uncontracted IPPs or neighboring utilities holding an excess.

D. Competitive Solicitations to Test the Cost-Effectiveness of Major Investments

For major long-term investments or those that do not clearly pass the more simplified market test, a formal solicitation for capacity could be pursued to help determine whether the investment is cost-effective. In many cases, solicitations may confirm the cost-effectiveness of the utility's project. In other cases, solicitations might identify creative solutions or unique low-cost opportunities that a utility would simply be unable to identify or provide on its own.

A competitive solicitation can test the cost-effectiveness of the resource plan in at least two ways, by:

- **Evaluating the Investment In-Service Date.** First, the solicitation should determine whether a major investment is even needed in the planned online year, or whether the utility can reduce costs by postponing the investment for one or several years. For example, if the proposed online date for a new build is three to five years out, then a competitive solicitation should request offers for capacity supply starting in the year of need and for any duration (including as little as one year). Through this solicitation, the utility may find that neighboring utilities or uncontracted existing merchant suppliers have an excess of supply that they are willing to sell at low prices. The solicitation may also reveal unconventional low-cost resource opportunities such as imports, uprates, or demand response. The state of Illinois has effectively used such short-term procurements to excess capacity from neighboring utilities at very low costs, at the same time that other utilities in MISO have been pursuing much more expensive new builds.[66]

- **When New Supply is Needed, Evaluating Whether Buying is Cheaper than Building.** Even if delaying is not beneficial because there are now low-cost short-term supplies available, the utility can procure new resources through a competitive solicitation designed to determine whether self-build is the lowest-cost resource. Competitive procurements may reveal unique low-cost opportunities such as cogeneration, well-situated brownfield sites, or other innovative solutions not visible to the utility.

Subjecting major investments to a market test against competitive offers has the potential to substantially improve the cost-effectiveness of these decisions either by confirming when the proposed investment is the most economic opportunity or by identifying other lower-cost opportunities when they exist.

E. Evaluating Market Procurements Compared to Self-Build Options

When conducting a full competitive solicitation and comparing a utility self-build option against market alternatives, the evaluation criteria would be the same is within the IRP. The primary criterion is cost, based on an overarching objective to meet the reserve margin standard by buying capacity at the lowest available cost. Typically, utilities evaluate resource alternatives by comparing the present value of revenue requirements (PVRR) across supply alternatives, to determine which resource plan minimizes long-run customer costs accounting for the entire planned portfolio.

However, PVRR analysis can also sometimes be complex analyses relying on full system models that are not fully transparent to the commission, consumer advocates, or competitive bidders. To improve transparency, we also recommend that the utility or independent evaluator provide a more simplified present value analysis that compares offers on capacity price alone, and that can be readily replicated by third parties.[67] This highly simplified and transparent

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66 For example, in 2012 IPA procured 1,600 MW for the 2013/2014 planning year at $3.70/kW-yr and 1,110 MW for the 2014/2015 planning year at $7.64/kW-yr, see ICC (2012b).

67 While this analysis would be simplest for capacity-only offers of a common duration, it would also be possible conduct such an analysis for bundled energy and capacity offers and offers of different durations. Offers of different durations could be compared on a levelized-cost basis. Bundled offers

Continued on next page

analysis would readily demonstrate whether there are any large cost differentials and very promising low-cost procurement opportunities.

Both the PVRR and simplified present value analyses would likely need to account for some adjustments to the offers and self-supply to facilitate an apples-to-apples comparison. Appropriate adjustments may address:

- **Costs Not Included in the Offer Price.** Some cost adjustments may be necessary to fully compare across offers to account for differences in transmission upgrade costs, anticipated congestion, or other costs. In some cases, a utility self-build plant on a legacy brownfield site may not require network upgrades and may even avoid the need for local upgrades that would otherwise be needed for voltage support when old plants retire.
- **Imputed Debt Effects.** Signing long-term PPAs obligate the utility to future cash flows, affecting the utility in a way that is similar to taking on debt even though PPAs do not show up on the utility's books as debt.[68] Credit rating agencies recognize this economic reality in their credit ratings affecting the utility's cost of borrowing. Indeed, even if the credit rating does not change, the imputed debt increases the riskiness of the utility's debt and equity.[69] Commissions can compensate utilities for imputed debt through various rate adjustments that can be accounted for in a PVRR comparison.[70]
- **Option Value of Deferring Investments.** It may sometimes be cost-effective to pay more for short-term supply options in order to defer a major investment for a few years until a major uncertainty is resolved. For example, consider a hypothetical uncertainty regarding whether the federal carbon rule will be implemented or eliminated. A major energy efficiency and renewable generation initiative may be most cost-effective with the carbon rule, whereas a gas CC might be most cost-effective without the rule. In that case, a short-term capacity procurement (even at a high cost) may be the most cost-

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or tolling agreement offers would be more difficult to translate into an approximate capacity-only equivalent in a transparent manner, but this can be done by adjusting the offer by the projected energy value.

68 Vilbert, *et al.* (2008), p. v.

69 Vilbert, *et al.* (2008) discuss debt imputation for utilities, including effects on credit ratings. For example in a 2008 study, Vilbert, *et al.* found that for "the seven electric utilities whose data S&P publishes, average debt to equity ratio was 58 percent before imputation and 63 percent after. Even for utilities with a business risk profile of 'Excellent' or 'Strong,' a 58 percent ratio corresponds to an 'aggressive' financial risk indicator and a low BBB to high BBB- credit rating, while a 63 percent ratio corresponds to a 'highly leveraged' financial risk indicator and a BB to BB- rating." Vilbert, *et al.* (2008), p. 12-13.

70 Vilbert, *et al.* (2008), pp. 13-21.

effective solution to act as a bridge until the uncertainty is resolved so the best decision can be made for the larger, longer-term investments.

- **Other Non-Price Attributes.** The solicitation may also consider other non-price attributes such as environmental objectives and risk profile, but the solicitation will be most competitive and effective if those attributes are clearly defined in advance so that competitive bidders will have a sufficient opportunity to meet those same attributes.

While each of these adjustments can be an appropriate component of the overall evaluation, it is also important to avoid a large number of less-defined qualitative factors. Utilities may have a number of other reasons for preferring self-build to PPAs, such as maintaining operational control or avoiding certain types of PPA terms. To prevent such factors from unreasonably disadvantaging market-based solutions and discouraging participation in competitive solicitations, we recommend working to address them through contract negotiation where possible.

List of Acronyms

CC	Combined-Cycle
CC	Corporate Commission
CO_2	Carbon Dioxide
CONE	Cost of New Entry
CPP	Clean Power Plan
CSAPR	Cross-State Air Pollution Rule
CT	Combustion Turbine
E&AS	Energy and Ancillary Service
FERC	Federal Energy Regulatory Commission
ICE	Intercontinental Exchange
IL	Illinois
IPA	Illinois Power Agency
IPP	Independent Power Producer
IRP	Integrated Resource Plan
ISO	Independent System Operator
ISO-NE	Independent System Operator of New England
kW	Kilowatt
kW-yr	Kilowatt-Year
LOLE	Loss of Load Event
LSE	Load Serving Entity
MATS	Mercury and Air Toxics Standard
MECT	Module E Capacity Tracking Tool
MI	Michigan
MISO	Midcontinent Independent System Operator
MW	Megawatt
NAAQS	National Ambient Air Quality Standards
NYISO	New York Independent System Operator
NO_X	Nitrogen Oxides
OMS	Organization of MISO States
PPA	Power Purchase Agreement
PRA	Planning Resource Auction
PUC	Public Utility Commission
PSC	Public Service Commission
PVRR	Present Value of Revenue Requirements
RCRA	Resource Conservation and Recovery Act
RFP	Request for Proposal
SO_2	Sulfur Dioxide
ZPRC	Zonal Planning Resource Credit

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