California Independent
System Operator Corporation

Initial Recommendation on

Potential Changes in Market Design Rule

Limiting the Pool of Resources Considered in Integrated Forward Market

Department of Market Monitoring

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Summary

The California Independent System Operator (the ISO) is considering modifying a current market rule which limits the pool of bids considered in the Integrated Forward Market (IFM) to resources that are dispatched in the Local Market Power Mitigation (LMPM) procedures run prior to the IFM (ISO Tariff Section 31.2). The ISO's Department of Market Monitoring (DMM) issued a short whitepaper on this issue on June 12, 2009.[1] At the June 17, 2009, meeting of the ISO Market Surveillance Committee (MSC), DMM presented results of further analysis of the potential market impacts of modifying this market rule, and discussed three options for addressing this with the MSC and stakeholders.[2] The following three options were discussed:

1. **Continue to monitor market impacts.** Under this option, no change would be made in the current market rule, but DMM would continue to assess impacts under different market conditions.
2. **Modify the tariff/BPM to provide flexibility to respond to different market conditions.** Under this option, the default setting would be to limit the pool of resources to those clearing MPM. However, market operators would have the option of relaxing the rule if it is producing anomalous operational or market results in the IFM.
3. **Modify tariff to require consideration of all bids in IFM.** Under this option, the tariff would be modified to require use of all bids in the IFM.

Based on analysis of the market and operational impacts of this rule change, along with input from stakeholders and the MSC, DMM is recommending that no change be made in market rules at this time, and that DMM would continue to assess impacts under different market conditions (Option 1 above). As discussed in this report, DMM is concerned that increased solution times that would result from increasing the pool of bids considered in the IFM could negatively impact market performance by limiting the option of re-running IFM when problems occur. While this potential market impact cannot be quantified, DMM believes it has the potential to offset or even exceed the savings that may result from expanding the pool of resources considered in the IFM. However, DMM will continue to monitor and assess the impacts of the rule limiting bids considered in the IFM, particularly under higher summer load conditions and in any cases where the quantity of demand clearing the IFM exceeds the ISO's day-ahead load forecast.

[1] *Potential Changes in Market Design Rule Limiting the Pool of Resources Considered in Integrated Forward Market*, Department of Market Monitoring, June 12, 2009, **http://www.caiso.com/23cb/23cbe3da43a30.pdf**

[2] *Potential Change in Rule Limiting Bids Considered in IFM*, presentation by Keith Casey, Director, Department of Market Monitoring to the Market Surveillance Committee Meeting, June 17, 2009, **http://www.caiso.com/23cf/23cf91423c9c0.pdf**

Background

The ISO's new market design includes a mechanism for mitigating local market power in the Integrated Forward Market (IFM) through a series of pre-IFM Local Market Power Mitigation (LMPM) procedures. Under these pre-IFM LMPM procedures, the IFM market model is first run with only Competitive Constraints (CC) enforced. A second run of the IFM market model is then performed with All Constraints (AC) enforced (including both competitive and non-competitive constraints). Units that are dispatched to a higher level in this second AC run are then subject to bid mitigation. These pre-IFM runs are made using forecasted demand. A more detailed description of these pre-IFM LMPM procedures is provided in the ISO's February 9, 2006 Market Redesign and Technology Upgrade (MRTU) Filing.[3]

Under the ISO's current market design, the pool of bids considered in the IFM is limited to units that are dispatched in the pre-IFM market MPM runs (ISO Tariff Section 31.2). Specifically, the pool of resources committed in the AC run of the MPM process forms the pool of resources that is available for commitment in the IFM (ISO Tariff Section 31.2).

The rationale for limiting the pool of resources considered in the IFM in this manner is to avoid the potential for relatively high priced unmitigated bids to be dispatched and set prices in the IFM. In theory, this may occur due to the fact that the IFM market optimization minimizes total *bid costs*, rather than *total cost paid* (i.e., market clearing quantities × market clearing prices). This creates the potential for a scenario in which *bid cost minimization* when applied to clearing bid-in demand in the IFM (as opposed to forecasted load, which the mitigation was based on) would result in a relatively small quantity of high priced unmitigated bids being dispatched and setting locational marginal prices (LMPs) in the IFM – thereby raising overall costs.

In other cases, however, limiting the pool of units considered in the IFM to resources dispatched in the AC run could raise overall costs in the IFM by preventing lower priced unmitigated bids from being dispatched. For instance, this could occur if bid-in demand in the IFM was significantly higher than the ISO forecast of demand that was used in the pre-IFM MPM procedures.[4] Under this scenario, limiting the pool of units considered in the IFM to units being dispatched in MPM runs could result in high prices if a relatively extreme re-dispatch of resources was necessary to meet the higher level of demand bid into the IFM. However, if the pool of resources available in the IFM was not limited to those resources dispatched in the AC run, lower-priced resources may be available to meet bid-in demand in the IFM.

The potential advantages and disadvantages of limiting the pool of units available in the IFM were discussed and considered as part of the MRTU design process. It was decided that, on balance, it would be appropriate to include this limitation in the initial market design, but that the

[3] See *Prepared Direct Testimony of Keith Casey*, included as Attachment K (Exhibit No. ISO-6) of the ISO's February 9, 2006, MRTU Filing, *http://www.caiso.com/1798/1798f7656580.pdf*.

[4] Forecasted load (rather than bid-in demand) is used in the pre-IFM MPM runs for two reasons: (1) to accurately determine the appropriate level of dispatches for Reliability Must Run (RMR) units needed for local reliability, and (2) to determine local market power mitigation for non-RMR units. See *Prepared Direct Testimony of Keith Casey*, included as Attachment K (Exhibit No. ISO-6) of the ISO's February 9, 2006 MRTU Filing, (pp. 32) *http://www.caiso.com/1798/1798f7656580.pdf*.

ISO would monitor the impacts of this rule and be prepared to eliminate the limitation if it was determined that this would improve overall market performance. Given this approach, the MRTU software was designed with a feature that can be set to remove this limitation on bids considered in the IFM without the need to develop any additional software enhancements.

Analysis of Impact of Market Performance

Methodology

Now that the ISO's new market design has been in effect for over two months, DMM has been able to perform some empirical analysis to better assess the potential risks and benefits of removing the restriction on resources considered in the IFM.[5] In order to empirically assess the potential impacts of either maintaining or eliminating the rule, DMM re-simulated the IFM for numerous days *with* and *without* this limitation in effect. This analysis encompassed a sample of 13 days that were representative of IFM conditions during April and May 2009, in that the amount of load clearing the IFM ranged from about 95-100 percent of ISO peak forecast. [6]

Market performance under these alternative market scenarios is being compared in terms of a variety of measures or criteria, including:

- Average LMPs by load aggregation point (LAP);
- Total IFM market costs (including Ancillary Services and any Bid Cost Recovery payments for units committed through the IFM); and
- Changes in the number of resources committed in the IFM that would result if the pool of units considered in the IFM was not restricted to resources dispatched in the MPM runs.[7]

In addition, in order to assess potential operational difficulties that might be caused due to increasing the execution time of the IFM software, and the impact this may have on failing to meet the required level of optimality within the solution time allotted for execution of the IFM software, the following results were tabulated for each scenario:

- IFM execution times

[5] Concerns about the potential effects of the market rule limiting the pool of units considered in the IFM were raised to DMM with regard to IFM results for April 30, 2009. On this day, the load clearing the IFM within the San Diego Gas and Electric (SDGE) LAP was significantly higher than the ISO's day-ahead load forecast used in the pre-IFM MPM runs. During the peak hours of April 30, the ISO's load forecast for the SDGE LAP was about 3.5% (or 95 MW) less than the amount of energy clearing the IFM and actual loads. On this specific day, IFM prices for the SDGE LAP initially posted by the ISO reached $200/MWh for multiple hours. However, analysis by the ISO has subsequently determined a different cause for these high prices, namely a software error in treatment of forbidden regions in the IFM. Analysis by DMM also explicitly eliminated the limitation placed on bids considered in the IFM as a cause of the high prices.

[6] The sample selection was limited by the ability to reproduce IFM results for some days due to modifications made to IFM software/systems.

[7] Specifically, results were compared to identify units that were *not* committed in MPM that would be committed in the IFM if these units had been in the pool of units considered in the IFM, and units that were committed in the MPM and IFM with the restriction in place that would *not* have been committed if the pool of units considered in the IFM had *not* been restricted.

- The Mixed Integer Programming (MIP) gap[8]

Results

Results of this analysis are summarized in Attachment 1 of this report. As shown in Attachment 1:

- Total IFM costs decreased slightly in 7 of 13 days (- .1 to -.9%)
- Total IFM costs increased slightly in 6 of 13 days (+.1 to +2.1%)
- Overall costs increased slightly (+.17%) due to relatively high increase in cost on one day (2.1%)

The increase in costs observed for some days with the rule limiting bids considered in the IFM removed can be attributed to the fact that, in come cases, the broader pool of resources creates a different "search path", which can result in higher costs at the point that the minimum MIP gap requirements are met and the software stops. Meanwhile, the decrease in costs observed in other days can be attributed to two factors:

- Broader pool of resources
- More optimal substitution between energy and Ancillary Services (A/S) due to availability of additional energy and A/S bids

As shown in Attachment 1, the bid rule did not typically have a major impact on actual unit commitments, with an average of only about .5 additional thermal units committed per day with the pool of units considered in IFM expanded.

Meanwhile, removing the limitation on the pool of resource bids considered in the IFM did significantly increase the run times for the IFM software. Specifically:

- Run times increased by 30 to 50 percent (from about 10 minutes to 15)
- The maximum increase in run time was 67 percent (from 18 minutes to 30 minutes)

DMM is concerned that the increased solution times could negatively impact market performance by limiting the option of re-running IFM when problems occur. While this potential market impact cannot be quantified, we are concerned that it has the potential to offset or even exceed the savings that may result from expanding the pool of resources considered in the IFM.

[8] The MIP gap is a measure of the optimality of a solution relative to a theoretical optimal that could be achieved without integer constraints. The MIP gap is measured in two ways. The absolute MIP gap is calculated based on the difference in the objective function value of a given solution (i.e. total bids costs of resources dispatched to meet load) and the minimal value of the objective function that could be achieved without integer constraints. The MIP is also measured on a percentage basis (i.e. the absolute MIP gaps as a percentage of the minimal value of the objective function that could be achieved without integer constraints.

Options under Consideration

Market Design Options

At the June 17, 2009, MSC meeting, DMM presented results of this further analysis of the potential market impacts of modifying this market rule, and discussed three options for addressing this with the MSC and stakeholders.[9] The three options were as follows:

1. **Continue to monitor market impacts.** Under this option, no change would be made in current market rules, but DMM would continue to assess impacts under different market conditions.
2. **Modify tariff/BPM to provide flexibility to respond to different market conditions.** Under this option, the default setting would be to limit the pool of resources to those clearing MPM. However, market operators would have the option of relaxing the rule if it is producing anomalous operational or market results in the IFM.
3. **Modify tariff to require consideration of all bids in IFM.** Under this option, the tariff would be modified to require use of all bids in the IFM.

The MSC concurred with the general conclusion that conditions did not warrant eliminating the rule limiting the pool of bids considered, in the IFM at this time particularly given the uncertainty over the potential market and operational impacts of such a change.

Stakeholder comments

Written comments were received from stakeholders on June 24, 2009, and were posted on the ISO website.[10] A summary of stakeholder comments is provided in Table 1 below. As shown in Table1:

- Option 1 (Continue to Monitor) garnered the most support from entities submitting comments, with five entities preferring this option (BMAx, CDWR, CPUC, PG&E and SCE). In their comments, these entities generally expressed the concern that it would be premature to modify this rule at this time given the limited amount of market data currently available to assess the impacts of this rule and the potential detrimental impacts on operational performance.

- Option 2 (Flexible Bid Rule) was not preferred by any participant, with three entities expressly opposing this option (Morgan Stanley, Dynegy and WPTF). These entities opposed Option 2 on the grounds it would create uncertainty about market rules and allow the CAISO the discretion to affect prices. One entity (SDG&E) supported Option 2 as a second best alternative to its preferred option (Option 3 - Modify Bid Rule).

[9] *Potential Change in Rule Limiting Bids Considered in IFM*, presentation by Keith Casey, Director, Department of Market Monitoring to the Market Surveillance Committee Meeting, June 17, 2009, **http://www.caiso.com/23cf/23cf91423c9c0.pdf**

[10] http://www.caiso.com/23d8/23d8bb9a6ee20.html

- Option 3 (Modify Bid Rule) garnered support from two entities submitting comments (SDG&E and Morgan Stanley).

Table 1. Summary of Stakeholder Comments

Participant	Preferred Option/Comments
BAMx[11], CDWR, CPUC, PGE, SCE	Prefer Option 1 (Continue to Monitor)
SDG&E	Prefers Option 3 (Modify Rule) ▪ Finds Option 2 (Flexible Rule) acceptable
Morgan Stanley	Prefers Option 3 (Modify Rule) ▪ Opposes Option 2 (Flexible Rule)
WPTF	Strongly Opposes Option 2 (Flexible Rule) ▪ No position on Option 1 vs. Option 3 at this time
Dynegy	Opposes Option 2 (Flexible Rule) ▪ Does not oppose Option 3 on market design principles, but concerned about potential implementation problems

[11] City of Palo Alto Utilities, Alameda Municipal Power and Silicon Valley Power.

DMM Recommendation

Recommended approach

Based on its analysis of this issue and the input from the MSC and stakeholders described above, DMM is recommending that the ISO adopt Option 1, that no change be made in market rules at this time, and that DMM would continue to assess impacts under different market conditions. As previously noted, DMM is concerned that increased solution times could negatively impact market performance by limiting the option of re-running IFM when problems occur. While this potential market impact cannot be quantified, DMM believes it has the potential to offset or even exceed the savings that may result from expanding the pool of resources considered in the IFM. At the same time, DMM will continue to monitor and assess the impacts of the rule limiting bids considered in the IFM, particularly under higher summer load conditions and in any cases where the quantity of demand clearing the IFM exceeds the ISO's day-ahead load forecast.

In addition, DMM notes that the ISO is already scheduled to implement changes to the LMPM process so that the pre-IFM mitigation process is based on bid-in demand rather than the ISO's forecast of load.[12] Once implemented, these modifications should lessen the potential benefits of eliminating the limitation on bids considered in the IFM, since additional resources should be available in the IFM in cases where the quantity of demand clearing the IFM exceeds the ISO's day-ahead load forecast. The ISO is scheduled to implement the modification to base pre-IFM mitigation on bid-in demand rather than forecasted load within the first twelve months of the operation of the ISO's new market design.

Relaxation of IFM bid rule to avoid market disruptions

Although DMM is not recommending a change at this time to the market rule limiting the pool of units available in the IFM to those that have cleared LMPM procedures, DMM has conferred with ISO Legal concerning the ISO's existing tariff authority to consider bids that have not cleared LMPM procedures. Based on this review, DMM and ISO Legal believe that the ISO's existing tariff authority includes the authority, in limited circumstances, to consider bids that have not cleared LMPM procedures. For example, pursuant to Section 7.7.15.1 of the tariff, the ISO has the authority to take certain actions in the event of a Market Disruption, to prevent a Market Disruption, or to minimize the extent of a Market Disruption.[13] Those actions include "clos[ing] the applicable CAISO Market and us[ing] submitted Bids, including Self-Schedules, to the extent possible."[14]

To date, the ISO has exercised this authority on one occasion to consider bids that did not clear the LMPM procedures in circumstances where a Market Disruption created system operation

[12] In its September 21, 2006 Order, FERC granted rehearing to allow the CAISO to use Forecast Demand, rather than Bid-in Demand for the MPM-RRD process, but :directed the CAISO to develop systems and tariff language so that Bid-in Demand can be implemented no later than Release 2 (see Sept 21, 2006 Order, P 1089)

[13] Market Disruption is defined as, "An action or event that causes a failure of a CAISO Market, related to system operation issues or System Emergencies referred to in Sections 7.6 and 7.7, respectively."

[14] Section 7.7.15.1(d) of the CAISO Tariff.

issues which ISO operators concluded could lead to real-time reliability concerns. Specifically, on June 21, 2009, (for Trading Day June 22), the ISO was experiencing a number of failures of the LMPM procedures which were preventing a successful completion of the IFM and preventing the ISO from issuing a Day-Ahead Schedule. Relaxation of certain ramping constraints allowed certain bids to clear the LMPM procedures, but not a completion of the IFM. The ISO then used bids submitted in the IFM that had not cleared the LMPM procedures, resulting in a successful run of the IFM and a valid Day-Ahead Schedule.[15]

Next Steps

The next steps in this process are as follows:

- Stakeholders may submit any initial written comments on this issue by July 9, 2009.
- DMM will continue to monitor and assess the impacts of the rule limiting bids considered in the IFM.
- Further steps on this issue will be taken, as appropriate, based on results of DMM's monitoring activities and any further input from stakeholders.

Any questions or comments on this issue may be directed to Eric Hildebrandt at ehildebrandt@caiso.com or 916-608-7123.

[15] This exercise of the ISO's Market Disruption authority will be identified in the ISO's monthly Market Disruption report.

Attachment 1. Summary Results of Analysis of Impact of Removing Limitation on Pool of Bids Considered in IFM

				Change in Avg. LAP LMPs with All Resources in IFM Pool				Additional Units Committed in IFM (Not Dispatched in MPM)		Additional Units Not Committed in IFM (Dispatched in MPM)	
Trade Date	Peak CAISO Forecast (MW)	Peak Demand Clearing IFM (MW)	Peak IFM vs Forecast (%)	PGAE LAP	SCE LAP	SDGE LAP	Change in Avg. IFM Cost ($/MWh)	# Units	MWh Energy	#Units	MWh Energy
4/11/2009	24,967	24,960	-0.03%	-0.22%	-0.24%	-0.24%	-0.23%	0	0	0	0
4/19/2009	28,989	27,600	-4.79%	0.24%	0.10%	-0.56%	-0.28%	1	508	1	148
4/20/2009	36,273	33,859	-6.65%	2.59%	1.61%	2.17%	2.12%	0	0	4	713
4/23/2009	28,837	28,817	-0.07%	0.55%	0.05%	0.68%	0.43%	0	0	0	0
4/25/2009	25,941	25,351	-2.27%	-0.75%	-0.74%	-0.70%	0.08%	0	0	1	366
4/26/2009	25,627	26,130	1.96%	0.62%	0.61%	0.58%	0.36%	0	0	0	0
5/5/2009	31,321	29,776	-4.93%	0.25%	0.24%	0.24%	0.34%	1	120	0	0
5/10/2009	29,016	28,774	-0.83%	-0.18%	-0.27%	-0.27%	-0.30%	0	0	0	0
5/14/2009	31,406	31,138	-0.85%	-0.10%	-0.13%	-0.14%	-0.09%	0	0	0	0
5/26/2009	32,664	31,546	-3.42%	-0.02%	-0.04%	-0.05%	-0.06%	1	5	0	0
5/28/2009	34,374	33,214	-3.37%	-1.59%	-0.18%	-0.13%	-0.87%	0	0	0	0
5/30/2009	28,624	28,211	-1.44%	-0.14%	-0.22%	-0.15%	-0.12%	1	20	1	573
5/31/2009	28,189	28,012	-0.63%	1.20%	-0.54%	-0.62%	0.66%	2	1,178	0	0
Avg.	**29,710**	**29,030**	**-2.23%**	**0.20%**	**0.04%**	**0.10%**	**0.17%**	**0.5**	**136**	**0.6**	**142**

Green (negative) = Decrease in IFM costs with pool of bids considered in IFM expanded to include all bids.
Yellow (positive) = Increase in IFM costs with pool of bids considered in IFM expanded to include all bids.