Technical Bulletin

2010-01-03

Gas Price Index

January 19, 2010

Technical Bulletin
2010-10-03

Gas Price Index

I. Background:

The Gas Price Index (GPI) is the index that is used in the calculation of the Default Energy Bids, as well as the generated bids, including bids for Start-up Costs, and Minimum Load Costs. The ISO SIBR system calculates these generated bid prices from the GPI supplied from an independent entity. Because the independent entity directly uses the GPI to derive the Default Energy Bids and supplies these resulting bids to the ISO for use in the automated market power mitigation process, the Default Energy Bids are not affected by the ISO's GPI issues described herein. However, ISO uses the GPI to calculate ISO generated bids including proxy costs for Start-up and Minimum Load for gas fired resources. The GPI calculation timeline was designed to utilize the most up-to-date gas price data available for use in the ISO's market applications. Detailed information is provided in Attachment C to the Market Instruments Business Practice Manual (BPM), located on the ISO website at http://www.caiso.com/17ba/17baa8bc1ce20.html. The following is a high level summary of the GPI calculation timeline for the Day-Ahead (DA) and Real-Time (RT) markets in accordance with the BPM:

- For the DA Market run at 10:00 am on TD-1 for the Trading Date (TD), the GPI is updated between midnight and 3:00 am the same day (TD-1). This data payload typically gets processed at 2:00 am, and is referenced throughout this document as the 2:00 am GPI. This GPI is for the current (same day) Gas Flow Day (GFD), which is TD-1 for the DA Market.

- For the RT Markets, the same GPI is used for all hours of a TD, where the GPI is updated between 19:00 and 22:00 on TD-1. This data payload typically gets processed at 10:00 pm, and is referenced throughout this document as the 10:00 pm GPI. This GPI is for next GFD (TD).

The independent entity calculates the GPI from up to four available gas price sources, as outlined in the BPM. Based on the availability and timing of published data from the gas price vendors, and the need to ensure accuracy, reliability and consistency, the following principles were established and included in the BPM:

- The GPI should be a one-day index, not a multi-day index. This allows for a more accurate index to be used in the market systems.

- At no stage of the market process will the number of gas prices used to calculate the GPI fall below two. Should fewer than two current gas prices be available a previous GPI from a previous day will be used.

- The GPI will be different between DA and RT to allow for a more accurate gas price.

II. Actual practice in ISO production

As a result of analysis performed, the ISO has identified two issues with the calculation of the GPI and a data timing issue not previously identified by the ISO's independent entity.

A. Inability of SIBR to utilize 2:00 AM price.

The SIBR system is the recipient of the GPI data from the independent entity, and is where the generated Start-up and Minimum Load bids are calculated. Before launch of the ISO's new market, ISO and software vendor personnel recognized that due to daily Master File validation procedures, which are executed between midnight and 2:00 am on TD-1 for the DA market, it would not be possible without sacrificing critical validations performed on market data, for SIBR to utilize the 2:00 am GPI update and that no solutions could be implemented in time for go-live. In fact, the SIBR system was not configured to process the 2:00 am GPI pay load.

ISO and software vendor personnel concluded that this issue was not significant enough to delay market launch since the prior day's10:00 pm price could be utilized and the only difference between the two prices would be the possibility that the 2:00 am price would consist of an average of four published prices whereas the 10:00 pm price would likely consist of an average of only three prices as both prices would be for the same GFD.

In response to market participants' questions about how to validate the GPI used by the ISO, the ISO conducted an analysis of the September 2009 market data which revealed some unexpected but noteworthy differences in a few of the days.

B. 10 PM GPI Consistently Fallbacks to 2 AM GPI

Working with the independent entity that provides the ISO with the GPI data, it became apparent that the GPI provided on TD-2 at 10:00 pm for use in DA market appeared to chronically default to the previous GPI due to an insufficient number of source gas prices (i.e., less than the two index minimum). In this scenario, the previous GPI is the 2:00 am GPI for GFD TD-2. Consequently, instead of providing the ISO with a 10:00 pm GPI on TD-2 based on gas prices for GFD TD-1, the GPI provided at 10:00 pm was the previously calculated GPI

from 2:00 am which is based on gas prices for GFD TD-2. Thus between April 1 and November 6, 2009 there was a one-day lag in the GPI used in the DA Market compared to the BPM time-lines.

Effective TD 11/7/2009, the independent entity implemented an improved process for collecting the source gas price indices, which coupled with the fact that that more than one publication is now generally available in time to be included in the 10:00 pm update, greatly improved the likelihood that the 10:00 pm GPI and the subsequent updated GPI at 2:00 am the next day are the same. Consequently, the 10:00 pm GPI and GPI provided the following day at 2:00 am have been identical since TD 11/7/09.

C. SIBR designed to use one GPI for a Trading Day

An additional constraint in SIBR was also known prior to go-live namely that SIBR could only retain a single GPI at any given time for a given TD. The BPM indicates that the RT Markets will utilize an updated GPI (the 10:00 pm price provided by the independent entity at TD-1) than is used for the DA Market for the same TD. Prior to go live, the implications of this software limitation were not fully appreciated. That is, it was not clear at the time that this software constraint also meant that SIBR could only use one GPI for both markets in a given Trading Day. ISO personnel believed that once the new GPI was delivered by the independent entity, SIBR would utilize the new price for the RT Market but drop the prior GPI utilized in the DA Market from its records. In fact, however, once SIBR uses a GPI for the DA Market that same GPI is used for the RT Market.[1]

In other words, the consequence of this constraint is that once the GPI for the DA Market for TD is processed by SIBR (at 10:00 pm TD-2), the system cannot process the updated GPI provided to SIBR at 10:00 pm on TD-1 for the RT Markets. Thus, while the intended design of using the most up-to-date GPI for the RT Markets would be satisfied by having SIBR updating the GPI for TD using the 10:00 pm GPI on TD-1, which would have been based on gas prices for TD, currently and since go-live the RT Markets have run with the generated bids derived from the GPI provided at 10:00 pm on TD-2.

Furthermore, between April 1 and November 6, 2009, as described in the previous section, the GPI provided at 10:00 pm on TD-2 had chronically defaulted to the previous GPI, which is for GFD TD-2 thereby exacerbating the impact of this software issue Figure 1 below graphically depicts the timing of the utilization of the GPI as currently deployed in the DA and RT Markets, considering both (i) the SIBR database limitation and (ii) the Master File validation implication.

[1] . This issue was included in the variance list but moved to a lower priority and therefore was not fixed due to other higher priority issues at go-live.

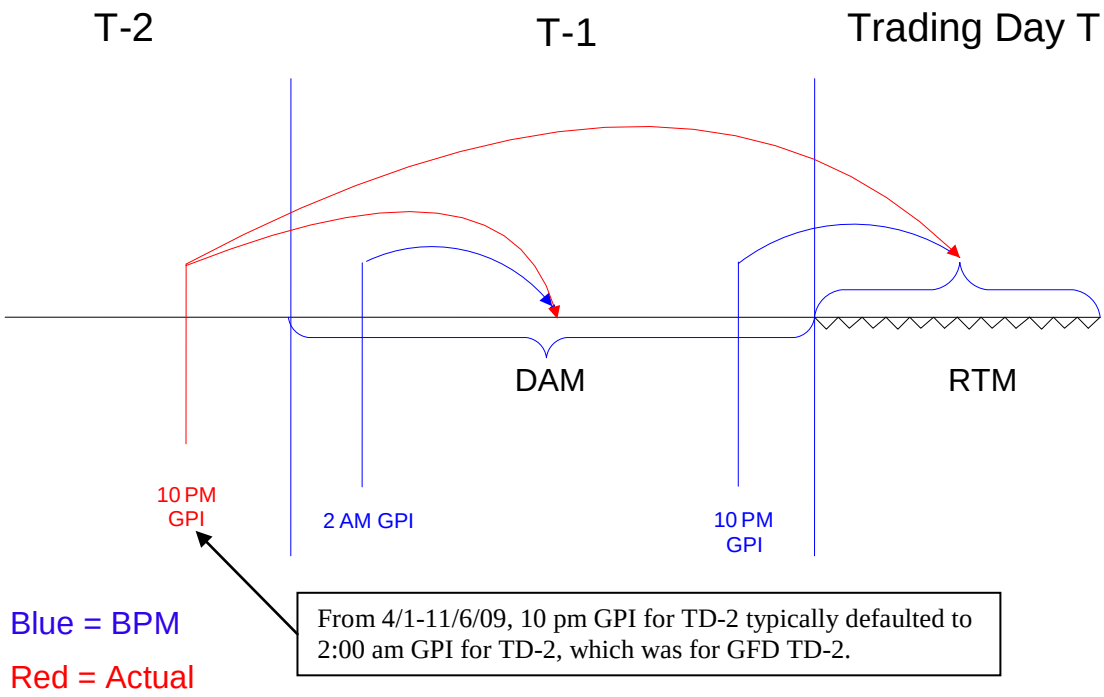

Figure 1
GPI Utilization Timing Used in CAISO Markets

III. GPI posting on OASIS

GPI information on OASIS accurately represents the most up-to-date GPI for each GFD, which is the 2:00 am updated calculation. Once the ISO is provided a GPI for a GFD, it overwrites the prior GPI for that GFD so that only one price for each GFD is posted on OASIS. This has been the case since MRTU go-live. This has caused some confusion for market participants that have attempted to validate market results as the posted GPI may not have been used for the market TD prescribed by the BPM specifications.

IV. Impact of GPI Timing Issues

Table 1 below summarizes the difference between the BPM description of how the GPI should be updated for DA and RT Markets and how it has been and is currently being updated in practice. As evident in Table 1, during April 1 through November 6, the GPI used in the DA Market was one GFD behind what was called for in the BPM (TD-2 instead of TD-1) and the GPI used in the RT Markets was two GFDs behind what was called for in the BPM (TD-2 instead of TD). The next section assesses the impact of these discrepancies.

Table 1 Comparison of BPM and Actual GPI Updates

		BPM	Actual Usage	
			4/1/09 to 11/6/09	11/7/09 to Present
DA	GPI Update	02:00 TD-1	02:00 TD-2	22:00 TD-2
	GFD	TD-1	TD-2	TD-1
RT	GPI Update	22:00 TD-1	02:00 TD-2	22:00 TD-2
	GFD	TD	TD-2	TD-1

V. Impact of GPI differences : BPM versus Actual

Below are some summary statistics on the differences between the daily GPIs calculated consistent with the BPM and the daily GPIs calculated in actual market operation. The first set of statistics pertains to the DA Market GPIs and the second set pertains to the RT Market GPIs. Positive differences indicate the GPI used is greater than the GPI that would have been used if the GPI timing in the BPM had been used.

DA Markets: 4/1/2009 to 11/06/2009:

Total number of Trading Days in study = 220

- 33% of Trading Days resulted in a $0.00 difference (72 days)

- 15% of Trading Days resulted in a $0.01 to $0.09 positive difference (33 days)
- 10% of Trading Days resulted in a $0.10 to $0.19 positive difference (23 days)
- 05% of Trading Days resulted in a $0.20 to $0.39 positive difference (11 days)
- 02% of Trading Days resulted in a $0.40 to $0.78 positive difference (05 days)

- 16% of Trading Days resulted in a $0.01 to $0.09 negative difference (35 days)
- 10% of Trading Days resulted in a $0.10 to $0.19 negative difference (21 days)
- 06% of Trading Days resulted in a $0.20 to $0.39 negative difference (13 days)
- 03% of Trading Days resulted in a $0.40 to $0.78 negative difference (07 days)

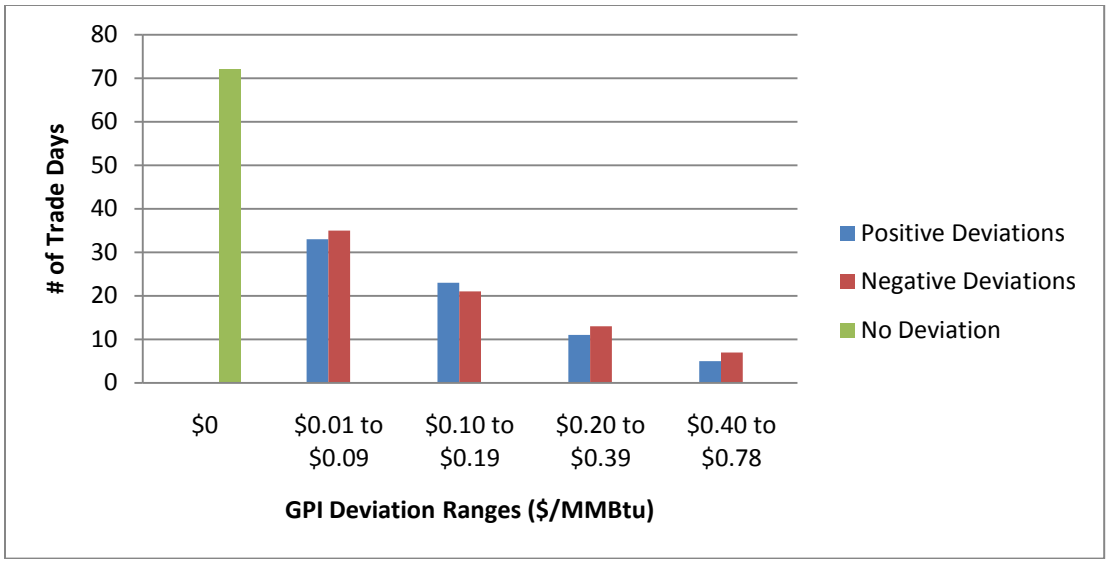

Figure 2
Summary of DA GPI Deviations

As evident from the above summary statistics, for the vast majority of Trade Days (84%) the difference in GPIs used in the DA Market (corrected versus actual) was less than $.20/MMBtu with 33% of the Trade Days having no difference. Moreover, the positive and negative differences were fairly symmetric (72 days with positive differences and 76 days with negative differences). The average prices differences for positive and negative deviations were similar as well with a daily average for positive deviations of $0.14 per MMBtu and a daily average for negative deviations of $0.16 per MMBtu.

DA Markets: 11/07/2009 to Present:

Since the correction to the source gas prices used in the calculation of GPI effective November 7th the 10:00 PM GPI has been the same as the 2:00am GPI resulting in no impact to the Market Participants.

RT Markets: 4/1/2009 to Present:

Total number of Trading Days in study = 288

- 35% of Trading Days resulted in a $0.00 difference (100 days)
- 13% of Trading Days resulted in a $0.01 to $0.09 positive difference (38 days)
- 10% of Trading Days resulted in a $0.10 to $0.19 positive difference (28 days)
- 07% of Trading Days resulted in a $0.20 to $0.39 positive difference (19 days)

- 03% of Trading Days resulted in a $0.40 to $0.86 positive difference (08 days)
- 14% of Trading Days resulted in a $0.01 to $0.09 negative difference (42 days)
- 09% of Trading Days resulted in a $0.10 to $0.19 negative difference (27 days)
- 05% of Trading Days resulted in a $0.20 to $0.39 negative difference (16 days)
- 03% of Trading Days resulted in a $0.40 to $0.91 negative difference (08 days)
- 1 Trading Day (10/8/2009) resulted in a $1.08 negative difference
- 1 Trading Day (12/1/2009) resulted in a $1.33 negative difference

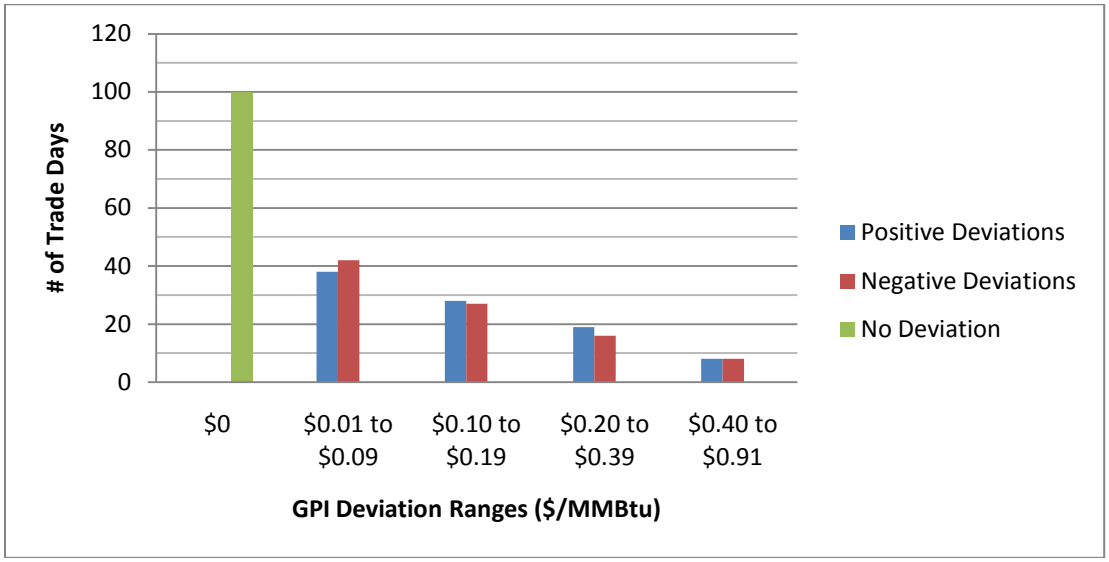

Figure 3
Summary of RT GPI Deviations[2]

Similar to the DA results, for the vast majority of Trade Days (81%) the difference in GPIs used in the RT Market (corrected versus actual) were less than $.20/MMBtu with 35% of the Trade Days having no difference. Similarly, the positive and negative differences were fairly symmetric (93 days with positive differences and 95 days with negative differences). Despite the two outlier negative GPI deviations cited above, the average prices differences for positive and negative deviations were similar as well with a daily average for positive

[2] The chart excludes the two negative deviation outliers cited above in the summary statistics. One 10/8/2009, the pay load from the independent entity failed to deliver a 10:00 PM, resulting in the ISO utilizing the prior GPI, which resulted in using a TD-3 GPI. On 12/1/09, the cause was related to the same recurring circumstance where the 2 AM TD-2 GPI was used due to lack of enough prices to produce a 10 PM TD-2 GPI.

deviations of $0.16 per MMBtu and a daily average for negative deviations of $0.18 per MMBtu.

Based on these statistics, the overall impact of this issue appears to be minor, particularly since days where generators may have been negatively impacted by this GPI discrepancy are offset by days where they benefited from the discrepancy. Based on these results, the ISO is not planning to undertake any retroactive market settlement adjustments.

VI. ISO Next Steps

ISO is addressing issues discussed in the technical bulletin as follows:

1. Since the TD-2 10:00 pm GPI has now converged to the TD-1 2:00 am GPI (both are for the same GFD), there appears little value in conforming the DA Market processes to the current BPM specification (to use the 2:00 am GPI). The ISO will issue by January 22, 2010an emergency amendment to the Market Instruments BPM to reflect that the DA Market is using the 10:00 pm GPI for GFD TD-1. The ISO intends for this change, ultimately, to become a permanent change to the BPM that would apply not only to generated costs but also to default energy bids, due to the convergence of the 2:00 AM and 10:00 am GPIs.

2. The SIBR database limitation causing the RT GPI to be the same as the DA GPI for the same TD is being resolved with the SIBR vendor. Once this patch is deployed, the RT Markets will use the 10:00 pm GPI on TD-1 as is currently specified in the BPM. Until this patch is deployed, the ISO will include in its emergency amendment to the Market Instruments BPM temporary modifications to reflect the current practice.

3. OASIS website will be modified to discontinue subscribing to the 2:00 am GPI such that only the 10:00 pm GPI is published.