

ISO Target Price: Problems with the New Methodology

Background

Since start-up the ISO has employed a concept referred to as Target Price to develop the INC and DEC bid curve for the real-time market. Scheduling Coordinators (SC's), submit INC and DEC bids to the ISO without knowledge of what other SC's are submitting. As a result, the ISO can receive positive decremental energy bids that are higher than the INC bids. The Target Price adjusts prices if the highest DEC bid is higher than the lowest INC bid. The authority for Target Price is discussed in the Scheduling Protocol, SP, Section 11.2.

On April 5, 2000, the ISO changed the methodology of calculating the Target Price in response to bidding behavior "which indicated that the Target Price was being manipulated and controlled. This behavior was clearly resulting in participant(s) controlling the imbalance energy price." The ISO believes that benefits of the new method outweigh its detrimental effects.

Original Target Price Methodology

In a memo release 4/4/00 the ISO states

The solution adopted since start-up was to modify INC and DEC bids to create a single continuously increasing supply curve. The original solution prior to April 4, 2000 was to determine the price at which the supply of decremental bids was equal to the supply of incremental bids. Mechanically, this could be viewed as taking the mirror image about the price axis to find where the mirror image of decremental supply curve crossed the incremental supply curve (see Figure 1). This intersection price was called the "Target Price". For the purposes of pricing the imbalance energy in the real time, all decremental bids greater than the Target Price would be modified down to the Target Price and all incremental bids less than the Target Price would be modified up to the Target Price. Although the bid prices are modified for pricing purposes, the original bid prices are maintained for the purposes of determining merit order.

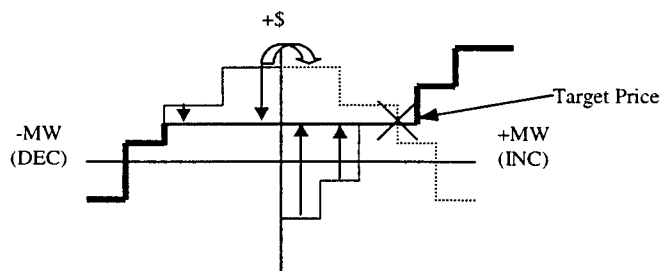


Figure 1
Target Price Methodology
Prior to April 5, 2000

After determining the Target Price, the ISO would set real-time prices based on the bold and red portion of the curve in Figure 1.

Potential for Gaming Under the Original Target Price Methodology

The ISO method used until last week provided the opportunity for gaming. One such game can be played by submitting a large quantity of DEC bids at a relatively high bid price. This strategy, as illustrated below in Figure 2b, increases the level of the Target Price and creates a large “flat-spot” in the INC/DEC curve. This would tend to increase the real-time price and support the real-time price as the ISO moved into the DEC bids. Thus generation, both instructed and uninstructed, providing energy in the real-time market would benefit from an increased probability of artificially high and artificially sustained prices.

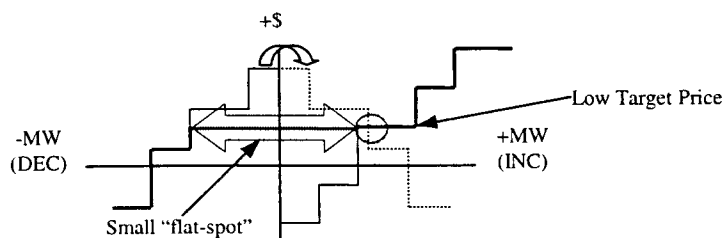


Figure 2a
Target Price without Gaming
(prior to April 5, 2000)

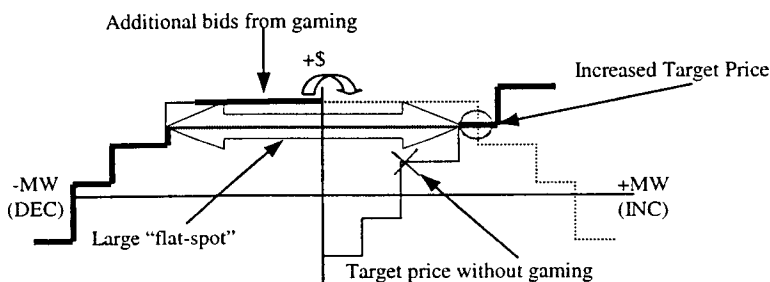


Figure 2b
Target Price with Gaming
(prior to April 5, 2000)

The New ISO Methodology

At approximately 7:00 PM, On the evening of April 4, 2000, the ISO sent the following e-mail to market participants:

“The ISO will be changing the Target Price methodology for the Real Time imbalance energy Market effective 0900 April 5, 2000. An explanation of the new methodology is stated below.

To provide a continuous price curve from which to settle Real Time imbalance energy, a Target Price is determined when the price of the highest decremental bid(s) is greater then the price of the lowest incremental bid(s). The new methodology will set the Target Price to be the greater of zero or the lowest priced incremental bid. Any decremental bid(s) greater than this Target Price will be set to the Target Price. Any incremental bid(s) below the Target Price will be set to the Target Price. Merit order selections of imbalance energy both Pre-Dispatch and intra-hour remains based on original bid price.”

In a memo dated 4/4/00, the ISO provided a graphical illustration of the new methodology 1) when the lowest INC bid is at or below \$0 (Figure 3a), and 2) when the lowest INC bid is above \$0 (Figure 3b).

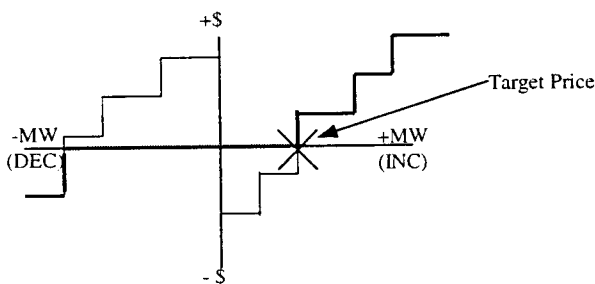


Figure 3a:
Revised Target Price
when Lowest INC bid is \leq \$0

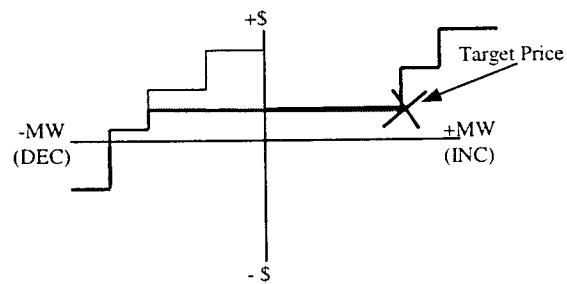


Figure 3b:
Revised Target Price
when Lowest INC bid is
Positive

Problems Resulting from the New Methodology

The new Target Price methodology addresses the gaming problem illustrated in Figure 2b. However, the solution creates a host of additional problems and gaming opportunities.

The DEC Price Signal has been Destroyed

The DEC price is intended to represent the marginal savings resulting from a reduction in generation output. Parties that DEC pay the ISO a price equal to, and in many cases less

than, their DEC bid. For example, if the marginal savings of reducing generation output by 1 MWh are \$30, a generator might submit a DEC bid of \$30 for 1 MW. If the ISO calls this DEC bid and dispatches 1 MW, the generator reduces its schedule by 1 MW and pays \$30 to the ISO. The generator is able to keep any revenue earned in the day-ahead or hour-ahead markets and is not subject to imbalance energy charges for this dispatch.

As illustrated in Figure 3a, the new Target Price methodology will in most cases limit the DEC price to \$0 or negative values. This lack of a DEC price signal distorts bidding behavior, harms efficiency, and increases costs in the real-time market. To see how this impacts the market, consider the payments received by the ISO under the original and new Target Price methodologies using the DEC bid example above. Under the ISO's original Target Price methodology, the generator bidding a \$30 DEC to the ISO would set the market clearing price and pay the \$30 to the ISO. Under the new methodology, the ISO sets the market clearing prices to \$0, and even though the generator is willing to pay \$30, the ISO only requires a payment of \$0. This may make the generator happy, but it does so at the expense of price transparency and parties supplying energy to the real-time market. And because price transparency is destroyed, the ISO will DEC generation on the basis of strategic bidding (e.g. parties bidding \$750 DEC bids go first) rather based on any reflection of savings resulting from decreasing generation.

Irrational Price Volatility

The new Target Price methodology has increased real-time price volatility, in an unnecessary and irrational manner. Whereas the previous methodology provided for a somewhat smooth transition from high to low prices, under the new method the ISO has introduced a virtual price cliff when transitioning from INC to DEC bids.

The resulting volatility has been extreme and economically irrational. Consider April 5: price dropped from \$126 in hour 16 to \$0 in hour 17. In the same day, price skyrocketed from \$0 in hour 19 to \$97 in hour 20. As illustrated in Figure 4, similar, although slightly less drastic price swings continue frequently.

Such wide price swings will likely result in large swings in physical generation output in real-time. If the price changes from \$100 to \$0, generators will reduce generation output or shut down. If prices then jump to \$100, generation that can respond will respond as quickly as possible. Large swings in physical production could be particularly dramatic in the case of hydro and quick start resources. Such wild volatility in the real-time output of generation presents operational hazards, and the ISO will likely have to resort to additional purchases of Regulation to help mitigate such swings. Furthermore, such swings are likely to reduce the reliability of the generation system resulting in increased forced outages of generating facilities attempting to chase the volatile price swings.

In addition to hourly price volatility, extreme price differentials between NP15 and SP15 have been observed since the introduction of the new methodology. For example, from

April 5 – 12 there were 12 hours when NP15 and SP15 zones were split and NP15 prices were \$0. During this period, SP15 prices averaged an absurdly high value of \$129. The most extreme price differential occurred on April 12, hour 15 when SP15 prices reached \$279 while NP15 prices were \$0. Although congestion and other transmission limitations contributed, these irrational price differentials are linked to price distortions resulting from the new Target Price methodology.

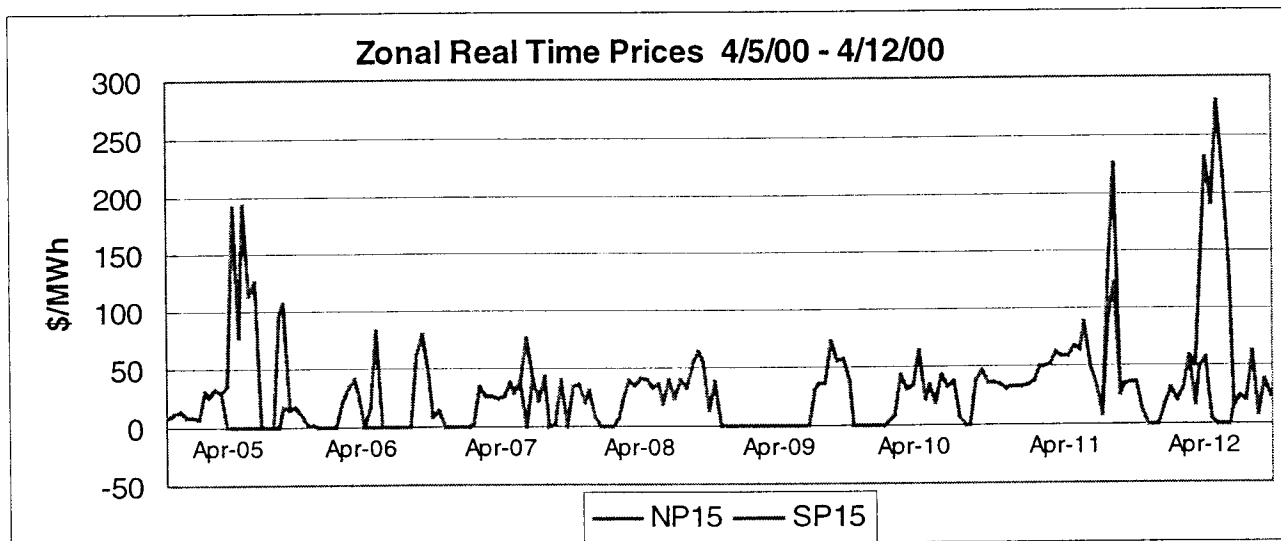


Figure 4: Volatile real-time prices

Dramatic Increase in Zero Prices

During the first nine days of the new methodology, the real-time market produced 51 hours of \$0 prices in SP15 and 64 hours in NP15. Moreover, many additional hours have contained \$0 prices in multiple 10 minute intervals. To put this in prospective, prior to the methodology change SP15 observed only 4 hours with \$0 prices since the beginning of the year 2000, with no observations in March or April.

Moreover, as illustrated in Figure 3a, any time there is an INC bid at or below \$0, the DEC price will be \$0 or negative. This \$0 price phenomena is likely not transitory, rather \$0 prices will continue at an inappropriately high frequency until the Target Price methodology is revised. This will remain true even when the ISO introduces 10-minute dispatch and settlements.

Increase in Regulation- Up Prices

In comparing a like period prior to the new methodology (3/27/00-3/30/00) and a period after the introduction (4/10/00-4/13/00) Regulation-up prices have increased 64% during off-peak hours (hours ending 1-6 and 23,24).¹ These higher prices are driven, at least in part, by the increased frequency of \$0 prices. When dispatched, generation providing

¹ Off-peak prices for SP15 Regulation-up during the period of 3/27-30 averaged \$12.81 and during the period of 4/10-13 averaged \$21.04.

Regulation-up receives the real-time price for the energy delivered. Thus bidders incorporate expected revenues for dispatched real-time energy when bidding capacity in the Regulation market. When the ISO dispatches regulation, and the real-time price is \$0, Regulation-up providers are giving away energy. Thus the risk of supplying energy and receiving \$0 payment for the energy must be incorporated in the Regulation capacity bids and is ultimately reflected in higher Regulation prices.

Creation of New Games

Although the new Target Price methodology eliminates one game, it creates the potential for new games. In the new methodology, any participant can set the DEC portion of the ISO's real-time price curve to zero for any hours by simply bidding 1MW INC at a zero or negative price. This will provide a gaming opportunity for participants to sell generation in the day-ahead market and buy energy back at a zero price when the ISO DEC's. This may significantly increase uninstructed deviation in the ISO real-time market and result in higher demand and higher prices for Regulation and other ancillary services.

Possible solutions

There are several possible solutions to the gaming and Target Price problem. First, the ISO could simply net-out positive DEC bids with negative INC bids. In effect, the ISO would collect money from both parties and simply eliminate the bids from the BEEP stack. Another possible solution could be argued from a reliability standpoint. Because of the possible operational impact gamed bids may create, the ISO, on the grounds of reliability, could call potentially hazardous bids out-of-merit and pay INCs, or receive payments for DEC's as bid. The mere threat of having to pay \$750 to DEC without otherwise influencing the market price should eliminate some gaming.

A new method of calculating the Target Price could mitigate gaming, while maintaining a reasonable price signal and eliminating excessive \$0 price. For example, the original Target Price methodology could be modified to linearly interpolate between the Target Price at the intersection of the INC curve and the flipped DEC curve and \$0 DEC's as shown in Figure 5. This solution also reduces the "flat-spot".

A combination of these methods could also be used if appropriate, and this list is by no means exhaustive. In any case, solutions more desirable than the current method must be considered.

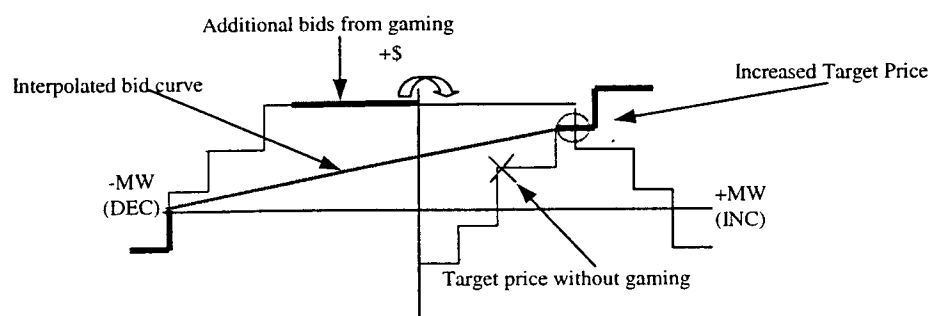


Figure 5
Interpolated Bid Curve

Concerns Regarding Process

In changing the Target Price methodology the ISO acted rapidly to mitigate a market abuse. For this rapid response the ISO should be applauded. However, the solution selected and implemented would have benefited from a more thorough review from the Department of Market Analysis in consultation with the Market Surveillance Committee. The ISO must be more diligent in seeking counsel from their internal market specialists prior to implementing market modifications. This is particularly evident when the “problem” that is being addressed is a market behavior and bidding problem.

Next Steps

Because of the negative consequences of the current Target Price methodology, the ISO should make immediate changes. We suggest using the Interpolated Bid curve approach, in conjunction with calling and paying participants out of sequence as an immediate fix. The ISO should then discuss long-term solutions with the DMA, the MSC and market participants and then make appropriate permanent solutions.