Potomac Economics, Ltd.
7620 Metro Center Drive
Austin, Texas 78744

Telephone: 512-225-7139
Facsimile: 512-225-7165

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Joel Mickey
ERCOT
2705 West Lake Drive
Taylor, Texas 76574

Re: MCPE and Offer Cap/Floor Consistency

Dear Joel:

The objective in establishing the initial CSC shadow price cap of $2,500/MW when the offer cap was $1,000/MWh, and the change to the $5,600/MW CSC shadow price cap when the offer cap increased to $2,250/MWh was to align the value of the shadow price cap with the existing offer caps such that resulting MCPEs remained within the bounds of the applicable offer caps, recognizing that the software allows only one CSC shadow price cap to be applicable to all CSCs under all circumstances.

The strongest shift factor differences between the most effective zones for all of the CSCs is typically approximately 0.40. Thus, a value of $5,600/MW for the CSC shadow price cap was selected to produce an MCPE at approximately the offer cap (0.40 x $5,600 = $2,240/MWh) when all available energy in the most effective zones was exhausted and a single CSC remained violated in the SPD solution. Selection of a CSC shadow price cap significantly lower than $5,600/MW would result in offers that are very high but valid under PUCT rules being rejected by SPD during intervals of zonal congestion, because at lower CSC shadow price cap values, the least-cost SPD solution would be to "pay" the penalty associated with the CSC shadow price cap rather than dispatch the high offer. For example, implementation of a CSC shadow price cap of $1,000/MW would establish a *de facto* offer cap of much less than $1,000/MWh in cases where zonal congestion exists.

Along with the issue of the "one size fits all" value for CSC shadow price caps, there is no ability in the current software to apply a circumstance-specific modification to the value of the CSC shadow price cap. In particular, when two or more CSCs are simultaneously binding, there is an additive effect that can produce MCPEs that are significantly higher than the existing offer caps, which is contrary to the objective of maintaining market clearing prices within the bounds of the offer cap. Ideally, in these circumstances it would be preferable to establish reduced CSC shadow price caps *ex ante* such that the objective of producing maximum MCPEs within the bounds of the offer cap is still achieved. However, the ability to apply an *ex ante*, circumstance-specific change of this nature does not exist.

Therefore, given the software limitations, we recommend that an *ex post* approach be adopted in circumstances where the MCPE in any zone exceeds the offer cap of $2,250/MWh. This result only has the potential to occur during intervals with zonal congestion. This approach would entail adjustments to the zonal MCPEs and CSC shadow prices that would limit the MCPE in any zone to $2,250/MWh. Ideally, this price cap could be implemented in the systems such that the maximum price initially posted does not exceed $2,250/MWh. In addition, to provide a consistent application of the objective of maintaining MCPEs within the offer cap, we recommend that an MCPE floor be applied at the level of the offer floor established in the ERCOT Protocols (currently negative $1,000/MWh) to any MCPE that is below the offer floor as established in the ERCOT Protocols.

In any case where the MCPE is adjusted to the cap of $2,250/MWh or the floor of negative $1,000/MWh, the CSC shadow prices will require administrative adjustment to better align them with the adjusted MCPEs. The most reasonable adjustment for the CSC shadow prices is to divide the adjusted MCPE difference between the two most effective zones for each binding CSC by the shift factor difference for the same two zones, as follows:

$$SP_{CSC_i} = \max\{0, (MCPE_k - MCPE_s)/(SF_{s,csc_i} - SF_{k,csc_i})\}$$

Where SP_{CSC} is the Shadow Price of the binding CSC_i;
$MCPE_k$ is the corrected zonal MPCE from the sink side of the CSC_i;
$MCPE_s$ is the corrected zonal MCPE from the source side of the CSC_i;
$SF_{s,csc}$ is the zonal shift factor from the source side of the CSC_i; and
$SF_{k,csc}$ is the zonal shift factor from the sink side of the CSC_i.

Finally, zonal MCPEs are a function of the load balance shadow price at the reference bus, the CSC shadow prices, and the zonal average shift factors relative to each CSC. With the increase in natural gas prices, there has been an increase in the load balance shadow price that has produced MCPEs in some zones that modestly exceed the offer cap even in the circumstance where only one CSC is binding and cannot be resolved. Also, in some months, the system topology is such that the maximum zonal shift factor difference is slightly in excess of the 0.40 assumption that led to the selection of the $5,600/MW shadow price cap. Therefore, to mitigate the need for MCPE adjustments in these circumstances, we recommend that the CSC shadow price cap be reduced from $5,600/MW to $5,000/MW.

In summary, our recommendations are as follows:

1. Reduce the CSC shadow price cap from $5,600/MW to $5,000/MW.
2. Implement a cap on the MCPE of $2,250/MWh.
3. Implement a floor on the MCPE of negative $1,000/MWh.
4. In any case where the MCPE is adjusted pursuant to (2) or (3) above, implement a CSC shadow price adjustment for any binding CSCs as described herein.

None of these proposed changes will change the level of the offer cap as specified in PUCT rules. Rather, these changes will better achieve under all circumstances the original objective, which is to produce MCPEs that remain within the bounds of the applicable offer caps (and floors). It is my opinion that these changes should be implemented immediately.

Sincerely,

Daniel L. Jones