

April 26, 2004

Mr. Les Pereira, P.E.
Director, Transmission Planning & Design
Northern California Power Agency
180 Cirby Way
Roseville, California 95678

Dear Mr. Pereira;

This is in reply to your letters of March 25 and April 8, 2004 where you provided comments and asked questions concerning Congestion Revenue Rights (CRR) Study 2 assumptions and methodology, ISO studies on Locational Marginal Pricing (LMP) and operation of the forward markets under MD02. Following are responds to your questions and comments one-by-one.

AC Vs. DC Models

As you know, the ISO plans to implement MD02 using an AC full network model (FNM) in the forward market and a DC full network model for the CRR allocation and auction. In your letter, you indicate that there is a problem with using an AC model in the forward market and a DC model for the CRR system. You suggest that the ISO should quantify the difference in shift factors and flows between the AC and DC models and the CRR coverage between them.

We do not agree that the use of an AC model in the forward market and a DC model for the CRR system is problematic, since the differences between the two models are understood and will be mitigated. In response to your concern, we wish to reiterate why we propose to use a DC model in the CRR software system and how the ISO plans to address the differences between the AC and DC models.

As mentioned in the CRR educational classes, the DC model for the CRR auction system is derived from the AC model used in the forward market. The transformation of the AC model results in a lossless, passive DC approximation of the AC model. A big advantage of the DC model over an AC model (and one reason why a DC model is used by all ISOs/RTOs in the United States (except the NYISO) for CRRs is its linear characteristics. As such, the principle of superposition may be applied, greatly simplifying the calculation of shift factors used to determine flow contributions of CRR requests on binding constraints in the FNM. Without superposition, the process of developing shift factors would be much more labor intensive, more complicated, less robust and non-repeatable under stress conditions. As such, replication of CRR allocation results would be practically impossible.

Since the CRR allocation and auction will use a DC model that does not model transmission losses and reactive load, using the same set of constraint limits as was used in the IFM (using an AC model) may allow more injection and withdrawal MWs to clear than would be the case in the AC model. Most constraint limits are MVA related or have a MVAR component imbedded if they are purely MW limits. An injection and withdrawal of x MW in the CRR allocation may not be feasible in the AC FNM since losses and reactive load are modeled in the AC FNM. However, in order to account for this discrepancy, the CRR injection and withdrawal MW will be scaled back to be consistent with the AC FNM and corresponding Day-ahead schedules that are subject to congestion charges. This scaling may be accomplished by scaling down the MVA and MW constraint limits on a system wide basis or by exception. The ISO plans to work with both our operations engineers and Market Participants in arriving at constraint limits that are reasonable and do not overstate the quantity of CRRs that should be awarded.

Loop Flow

You correctly state that the ISO proposes not to model loop flow. You go on to ask the ISO to quantify the extent to which the difference between a 4000 MW schedule at COI and a 3600 MW real-time power flow will not be covered by CRRs.

The ISO, upon proposing the MD02 market design, intended to model a closed-loop FNM. However, the introduction of unscheduled flow using a closed-loop FNM would require the ISO at times to limit schedules over COI (and other ties) to something less than the operating transfer capability of the path. Entities who own rights on paths such as COI have objected to this practice. Consequently, the ISO plans to use an open-loop FNM, upon implementation of MD02, and take action in the real-time market to mitigate any congestion associated with loop-flow.

With respect to your question about CRR coverage, it is important to keep in mind that CRRs exist as a financial hedging instrument only in the Day Ahead market. They are not considered in the Hour Ahead Market or in real time. The reason for this design is to provide an incentive for CRR holders to schedule most, if not all, of their entire forecasted load in the Day-ahead market. If most or all forecasted load is scheduled in the Day-ahead market, congestion will be cleared in the Day-ahead market and final schedules (generation, load, import and export) will be known going into real-time, thus lessening the burden of the control area operators.

In the situation that you mention, an owner SC of a point-to-point CRR from the scheduling point at COI to another point within the ISO control area, for example, will be paid by the ISO for the difference in Locational Marginal Prices (LMP) between the sink LMP and the source LMP in the Day Ahead market. If energy is scheduled between these two points in the Day Ahead market, the SC will receive from the ISO the LMP price at the source and be charged the LMP price at the sink. If the quantity of energy scheduled in the Day Ahead market between these two points equals the CRR amount owned by the SC, the charges and payments will be equal and the owner SC will have a

full hedge. This hedge in the Day Ahead market would happen regardless of what happened in real-time with loop flow.

Losses

You correctly state that losses are not considered by the DC model the ISO will use for the CRR system. You indicate in your letter that a particular WECC full-loop powerflow case suggests that losses could be 1800 to 1900 MW for peak time periods and you ask in your letter who the affected parties will be with respect to CRR coverage.

The CAISO is proposing to implement an Integrated Forward Market (IFM) that consists of simultaneously performing an energy and ancillary services market. The scheduling and bidding will be performed in a Day-ahead timeframe and an Hour-ahead timeframe similar to the current CAISO scheduling timeframes. The CAISO is also implementing a Real-time energy market. In all three markets (Day-ahead, Hour-ahead and Real-time) the CAISO will utilize a FNM that will be an accurate representation of the transmission grid within the CAISO control area (which may include other transmission as well, e.g., SMUD and Muni transmission). This FNM is an AC model with an open loop that will model transmission losses and reactive power load. By using the FNM, the CAISO will produce LMPs at every bus in the system in all three markets. The LMPs will be used to price, generation, load, imports and exports. The use of the FNM is to ensure that all final resource schedules from both the Day-ahead and Hour-ahead (i.e., schedules for generation, load, import and exports) are feasible with respect to Real-time.

In the IFM, the CAISO will (i) ensure that generation plus imports equals load plus exports plus transmission losses, (ii) procure ancillary services to meet reliability requirements and (iii) ensure that all final schedules (Day-ahead and Hour-ahead) are feasible with respect to the constraints that are being enforced in the FNM. The LMPs that are produced will have three components: reference energy, transmission loss and transmission congestion. Since the FNM contains transmission line resistance, transmission losses will always exist in the system, thus the component of the LMP associated with losses will be non-zero. The component of the LMP associated with transmission congestion will be non-zero only if constraints in the system are binding (i.e., there is transmission congestion).

Although losses will be considered in the forward markets and will be reflected in the LMPs for these markets, the ISO proposes not to consider losses with respect to CRRs. This proposal not to hedge losses with CRRs is intended, among other things, to ensure that the CRR balancing account will not be depleted. This is consistent with the practices of other ISOs such as PJM and NYISO.

LMP Studies

As you know, the ISO has embarked on an initiative to analyze the LMPs for the California transmission grid under various assumptions via very comprehensive LMP studies. These studies began some time ago when the ISO contemplated using a closed-loop FNM. Since then, the CAISO has changed its proposal for reasons explained earlier and plans to initially model an open-loop system upon implementation

of MD02. As seams issues are resolved and more data is available to model flows external to the ISO grid, we plan to begin using a closed loop system.

We think it is important that the allocation and auction of CRRs needs to follow the framework of the IFM, as close as possible, as it pertains to the FNM. As such, the FNM used in the allocation and auction must be modeled with an open-loop. Consequently, we also plan to use an open-loop FNM for CRR Study 2.

LMP- CRR Process

We appreciate your comments on the CRR educational classes and the importance of understanding the entire process for the forward and real time markets. The ISO looks forward to an opportunity in the future to provide additional information and learning opportunities for Market Participants. Although we do not have training materials at this time that comprehensively cover all of the topics you mention, we hope to share with Market Participants materials we developed as we move forward and more experience is gained from our LMP/CRR studies.

Thank you for taking the time to provide feedback to us concerning CRRs. Please call me at (916) 608-5987 if you have further questions.

Sincerely,

Scott Jercich, P.E., MBA
Project Lead
CRR Implementation