White Paper
Framework for Study of Marginal Loss Surplus Allocation Impact

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Marginal Loss Surplus Allocation Impact Study Framework

1. Introduction

Adoption of full Locational Marginal Prices (LMPs)[1] reflecting the marginal cost of transmission losses as well as congestion, as implemented in MRTU, will result in a surplus of revenue associated with marginal losses ("marginal loss surplus" or "MLS"). The original MRTU design as filed by the CAISO on July 23, 2003 proposed to allocate the MLS to the CRR Balancing Account to help ensure revenue adequacy for settlement of CRRs.[2] Some Market Participants, particularly Existing Transmission Contract ("ETC") and Transmission Ownership Rights ("TOR") holders, expressed dissatisfaction with that design since they did not expect to be CRR holders and therefore would not benefit from allocation of the MLS to the CRR Balancing Account, although they would contribute to the MLS. Others were concerned about delaying the refund of surplus MLS funds in the CRR Balancing Account until the annual balancing of that account. In the course of discussions with the stakeholders during 2005, the CAISO proposed its now current proposal for the distribution of MLS, which is included in the MRTU Tariff filed on February 9, 2006 (CAISO MRTU Tariff 11.2.1.6). The current proposal is to allocate the MLS pro-rata to all Measured Demand, i.e., based on each Scheduling Coordinator's (SC) internal demand plus exports relative to the total CAISO control area demand plus total exports.

In filed comments on the CAISO's filed MRTU Tariff, PG&E stated that the proposed pro-rata allocation method is unfair and unjust in that it fails to recognize the significant differences in transmission losses for different regions within the CAISO Control Area. PG&E maintains that to maximize fairness, the allocation of the MLS should reflect such regional differences and their impacts on CAISO marginal loss charges. PG&E states that as one possible alternative, the CAISO should consider the regional approach that has been developed and accepted by FERC for MISO[3] and that is also currently under consideration in PJM[4].

Since filing its May 16 Reply Comments, the CAISO has undertaken a preliminary assessment of PG&E's concerns. In its June 2 Answer to Reply Comments[5], the CAISO stated that it would conduct a stakeholder process to decide on the framework of a study to determine if there is indeed a significant regional difference. The study framework must define the threshold for "significant regional MLS difference". CAISO would then use available LMP study results to compare the impacts of a regional MLS scheme versus the filed proposal, and would share the results with the stakeholders to determine if further action is needed.

This white paper is intended to set the stage for the stakeholder discussion that will be held on July 19 to design the study.

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1 By full LMP, we mean LMPs that reflect the impact of both marginal losses and congestion.

2 Both the July 23, 2003 filing and the February 9, 2006 MRTU Tariff filing specified that any surplus in the CRR Balancing Account on an annual basis will be allocated to Participating Transmission Owners toward recovery of their Transmission Revenue Requirements.

3 Midwest Independent Transmission System Operator, Inc., 109 FERC ¶ 61,285 at PP 171-175 (2004); reh'g. denied, 111 FERC ¶ 61,053 at P 46 (2005); reh'g. denied, 112 FERC ¶ 61,086 at P 18 (2006).

4 Atlantic City Electric Co. v. PJM Interconnection, L.L.C., 115 FERC ¶ 61, 132 at 27.

5 Answer to Reply Comments of the CASIO June 2, 2006, P 44.

2. Straw Proposal for the Design of the Study

2.1 Scope of the Proposed Study

The study will compare the impacts of regional versus system-wide allocation of the MLS to Measured Demand (metered CAISO Demand plus Real-Time interchange export schedules), utilizing two regions: Northern California (NP15 plus ZP26) and Southern California (SP15). More specifically, the study will attempt to compute the MLS contribution of each of the two regions and the MLS allocation to those regions based on the filed MRTU methodology.

2.2 Proposed Study Framework

The study will attempt to determine the marginal cost of losses to serve the demand in each of the two regions, and the commensurate actual cost of losses in each region. The difference will then be the marginal loss surplus in each region. This computation will be conducted for each hour of the year using available LMP study results. An annual MLS contribution ($ amount) will then be computed for each region as the sum of the hourly LMS amounts for the region. This sum will be compared to the annual MLS allocation ($ amount) to the same region based on the filed Tariff. As an alternative and equivalent measure, an annual average marginal loss surplus rate ($/MWh) may be computed for each region by dividing the total annual surplus contribution ($) by the total annual demand (MWh) in each of the two regions. An annual system-wide rate will also be computed based on the filed CAISO Tariff by computing the system-wide annual marginal loss surplus and system-wide annual demand[6]. The difference between the annual and regional rates will then be reported. The threshold to determine if the difference between the MLS contribution (based on zonal accounting of actual and marginal losses) and MLS allocation (based on filed allocation of MLS) is significant will be established taking into account uncertainties as to whether the actual and marginal losses in a region are attributable to serving the regional demand in the same region or the other region.

2.3 Proposed Study Approach

The main question for the study design is how to determine the marginal loss surplus and cost of losses for each region on a commensurate and comparable basis, given the fact that a portion of the losses in each region is caused by flows of power to serve demand within or exports from another region. In the context of the proposed study, some of the losses in the Northern California region may be due to North to South (N-S) flow of power in that region to serve Southern California demand, and vice versa. The following sub-sections outline the proposed approach to deal with this phenomenon.

2.3.1 Identification of Regional Loss Quantities

The CAISO proposes for the purposes of this study to utilize the hourly direction and magnitude of Path 26 flows to estimate the amount of transmission losses in each region that were incurred to serve demand in or exports from the other region. The proposal is to assume that in hours when the Path 26 flow were in the N-S direction, some of the losses in the Northern California region were incurred to serve demand in or exports from the Southern California region, and vice versa when the Path 26 flows were in the S-N direction. This assumption has two implications. First, in each hour the transmission losses on Path 26 will have to be accounted as

[6] This is in fact a weighted annual average rate, with weights being the hourly Measured Demand.

losses in either the Northern region or the Southern region depending on the direction of the Path 26 flow. Second, in each case a share of the transmission losses within the Northern or the Southern region will be deemed to be caused by the demand in the other region, depending on the direction and magnitude of the Path 26 flows. (Losses on the ties will be included in the relevant region regardless of the direction of the flow on the tie since those will be either serving internal regional demand (if in the import direction) or exports (if in the export direction), both of which are included in the relevant regional Measured Demand.

The central issue is to determine what fraction of the losses in each region should be allocated to the other region given the direction and magnitude of the Path 26 Flow. For example, for a N-S Path 26 flow, if the source of power serving the Southern region load is deemed to be in the NW region, it will have a significant contribution to Northern Region losses to serve Southern Region load. However, if it is deemed to be at or close to the Mid-way substation, its contribution to Northern region losses is negligible. Given this uncertainty, and to simplify the study we propose to conduct two bookend computations for each hour, one assuming a proportional impact of the Path 26 flow on regional losses, and the other assuming minimal or no impact. To determine the proportional Path 26 impact, we define the Path 26 interregional adjustment factor (P26 Factor) as follows:

- If Path 26 Flow is N-S then it is assumed that the proportional fraction of the Northern region losses incurred to serve Southern region Demand is equal to

  P26 NS Factor = Path 26 Flow/(Northern Region Load + Path 26 Flow).

  Accordingly,

  Adjusted NR losses = Unadjusted NR losses * (1-P26 NS Factor)

  Adjusted SR losses = Unadjusted SR losses + Unadjusted NR losses * P26 NS Factor

  where

  Unadjusted NR losses exclude the losses on Path 26

  and

  Unadjusted SR losses include the losses on Path 26

- If Path 26 Flow is S-N then it is assumed that the proportional fraction of the Southern region losses incurred to serve Northern region Demand is equal to

  P26 SN Factor = Path 26 Flow/(Southern Region Load + Path 26 Flow).

  Accordingly,

  Adjusted NR losses = Unadjusted NR losses + Unadjusted SR losses * P26 SN Factor

  Adjusted SR losses = Unadjusted SR losses * (1-P26 SN Factor)

  where

  Unadjusted NR losses include the losses on Path 26

  and

  Unadjusted SR losses exclude the losses on Path 26

The above formulas establish one bookend for the regional loss quantities. Another bookend is established by setting the P26 Factors to 0. In this case, only the Path 26 losses are included in one or the other region depending on the direction of the Path 26 flow, but without any other adjustment of regional losses.

2.3.1 Determination of Actual Regional Loss Costs

Strictly speaking the price ($/MWh) for actual losses in each region would be somewhat different, but it is unclear what the right price is. We will use the System Marginal Energy Cost (MEC) component of the LMPs (same throughout the system) to compute the actual cost of losses in each region based on the regional loss quantities determined above.

2.3.2 Determination of Regional Marginal Loss Costs

The computation of the marginal loss cost for each region will have to consider the direction of flow on Path 26. First, in each hour the sign of the Path 26 flow will be taken into account in determining the unadjusted Northern and Southern Marginal Loss costs. Second, in each hour a share of the marginal loss costs within the Northern or the Southern region will be deemed to have been caused by the demand in the other region, depending on the direction and magnitude of the Path 26 flows. Consistently with what was stated above for computing the bookends for actual losses in section 2.3.1, two bookend computations will be performed for each hour as follows:

- If Path 26 Flow is N-S then

  Adjusted NR marginal loss cost = Unadjusted NR marginal loss cost * (1-P26 NS Factor)

  Adjusted SR marginal loss cost = Unadjusted SR marginal loss cost + Unadjusted NR marginal loss cost * P26 NS Factor

  where

  Unadjusted NR marginal losses exclude the marginal losses on Path 26

  and

  Unadjusted SR marginal losses include the marginal losses on Path 26

- If Path 26 Flow is S-N then

  Adjusted NR marginal loss cost = Unadjusted NR marginal loss cost + Unadjusted SR marginal loss cost * P26 SN Factor

  Adjusted SR marginal loss cost = Unadjusted SR marginal loss cost * (1-P26 SN Factor)

  where

  Unadjusted NR marginal losses include the marginal losses on Path 26

  and

  Unadjusted SR marginal losses exclude the marginal losses on Path 26

The above formulas establish one bookend for the regional marginal loss costs. Another bookend is established by setting the P26 Factors to 0.

2.3.3 Determination of Regional Marginal Loss Surplus Contribution

The difference between the regional marginal and actual costs determined above will determine the marginal loss surplus contribution in each region. Since there are two bookend numbers for each, there will be two corresponding bookend MLS contributions for each region for each hour.

2.3.4 Determination of Regional Demand

The sum of the regional load and tie exports from each region for each hour will be the relevant Demand for the region. The flow on Path 26 is not considered in this computation since Path 26 flow is not included in determination of Measured Demand.

2.3.5 Determination of Regional Annual Marginal Loss Surplus Rates

Add the regional demand computed in section 2.3.4 for the hours of the year to compute the annual demand for the region. Call this the regional annual demand (RAD).

Add the maximum hourly surplus amounts (higher $ bookend) computed in section 2.3.3 for each region for a year. Call this the higher marginal loss surplus amount (HMLS) for the region. Divide HMLS/RAD to get the higher marginal loss allocation rate ($/MWh) for the region commensurate with marginal loss contribution computed in section 2.3.3. Call this the higher marginal loss surplus allocation rate (HMLS Rate) for the region.

Add the minimum hourly surplus amounts (lower $ bookend) computed in section 2.3.3 for each region for a year. Call this the lower marginal loss surplus amount (LMLS) for the region. Divide LMLS/RAD to get the lower marginal loss allocation rate ($/MWh) for the region commensurate with marginal loss contribution computed in section 2.3.3. Call this the lower marginal loss surplus allocation rate (LMLS Rate) for the region.

2.3.6 Determination of System-wide Annual Marginal Loss Surplus Rate

Compute the hourly marginal loss surplus based on the filed proposal. This is already available from the LMP studies. Add the amounts for the hours of the year to compute the total annual system-wide MLS. Call this the system-wide marginal loss surplus amount (SMLS).

Compute the hourly system-wide demand as the sum of system-wide load and exports. Add up for the hours of the year, and call it system-wide annual demand (SAD). Note that this should match the sum of the regional annual demand (RAD) for the two regions.

Compute the system-wide annual average marginal loss surplus rate (SMLS Rate) accordingly (SMLS/SAD). This is in fact the weighted average (weighted by hourly system-wide demand) of the hourly system-wide MLS allocation rates for the year based on the filed Tariff.

2.3.7 Analysis of the Results

The difference between the higher and lower regional rates (HMLS Rate and LMLS Rate) for each of the two regions is suggested as the impact threshold to determine if there is a material difference between the filed proposal and a regional allocation methodology based on LMS contribution outlined above. In other words:

1. If the system-wide rate (SMLS Rate) falls between the higher and lower regional rates (HMLS Rate and LMLS Rate), the possible impact of the filed MLS allocation scheme is less than the uncertainty in the outcome of a regional MLS allocation scheme for “more equitable” allocation of MLS.

2. If the system-wide rate (SMLS rate) exceeds the higher regional rates (HMLS Rate) beyond a threshold or falls below the lower regional rate (LMLS Rate) beyond a threshold, then the filed MLS allocation scheme would have to be revisited to work out a "more equitable" regional based MLS allocation scheme. The thresholds would have to be decided based on stakeholder input.

3. Stakeholder Inputs

To be completed after the stakeholder meeting.

4. Next Steps

To be completed after the stakeholder meeting.