California Independent
System Operator Corporation

Draft Final CAISO
Integrated Balancing Authority Area (IBAA) Proposal
April 18, 2008

1. Executive Summary

Since early in the Market Redesign and Technology Upgrade (MRTU) process the CAISO recognized the need to model in detail certain neighboring Balancing Authority Areas (BAAs). The affected systems are those in which the power flows on these systems have a large impact on power flows within the CAISO Controlled Grid. The CAISO determined that in order to accurately and reliably manage congestion on the CAISO Controlled Grid under MRTU, the CAISO had to accurately model and capture these power flow or network effects in the CAISO's MRTU market systems – that is, to integrate detailed models of these areas into the CAISO's Full Network Model (FNM) for MRTU. The CAISO originally referred to these entities as Embedded Control Areas and Adjacent Control Areas, but now refers to them as Integrated Balancing Authority Areas or IBAAs.

Under the CAISO's IBAA proposal, the CAISO is proposing to establish:

1) the Sacramento Municipal Utility District (SMUD) BAA[1] and the Turlock Irrigation District (TID) BAA as an Integrated Balancing Authority Area (IBAA) effective as of the go live date for MRTU;
2) the specific method of modeling and pricing transactions to and from the SMUD and TID BAAs;
3) the measures necessary to address the impact on Congestion Revenue Rights (CRRs) in the event that future IBAAs are adopted during the term of released CRRs; and
4) the proposed process for creating new, or modifying approved, IBAAs.

Specifically, the CAISO proposes to model the IBAA systems in a manner that allows the CAISO to determine as accurately as possible the effect of intertie transactions between the CAISO and the IBAA in the CAISO's MRTU Full Network Model (FNM).

[1] In addition to SMUD's transmission system, the SMUD Balancing Authority Area also includes the systems of the Western Area Power Administration (Western), the Modesto Irrigation District (MID), the City of Redding (Redding) and the City of Roseville (Roseville).

Such detailed modeling is necessary to manage congestion as accurately as possible on the CAISO Controlled Grid. The CAISO's IBAA modeling methodology is explained in Section 2 of this paper.

With respect to pricing, the CAISO proposes to establish a "single-hub" default pricing rule for pricing intertie transactions between the CAISO and the SMUD and TID IBAAs. As further explained in Section 3 below, all imports to the CAISO from the SMUD and TID IBAAs will be priced based on the Locational Marginal Price (LMP) calculated at the Captain Jack Sub-Hub or Proxy Bus, while all exports from the CAISO to the SMUD and TID IBAAs will be priced at the LMP calculated at the SMUD Sub-Hub or proxy bus. The CAISO proposes that alternative pricing options will be available if the CAISO is provided more detailed information regarding the resources supporting a specific scheduled intertie transaction. While the CAISO originally contemplated adoption of a more granular system resource-specific based pricing regime, the CAISO has now concluded that such pricing is inappropriate absent specific identification and verification of the resources supporting intertie transactions. Absent such a demonstration, the CAISO is concerned that it would schedule and pay intertie transactions on a basis that does not reflect their value to the CAISO and its customers for purposes of accurately and efficiently managing congestion on the CAISO Controlled Grid.

With respect to CRRs, with the transition from the more granular approach contemplated previously to the single-hub approach and the default pricing rule (with different prices for imports and exports), it will be appropriate for the CAISO to view the CRRs that were released in the first annual CRR release process conducted during 2007 as "previously-released" CRRs and to apply the provisions outlined in Section 4, below regarding the reconfiguration of such CRRs to comport with the Single-Hub approach.

In conclusion, the CAISO believes that the adoption of the SMUD and TID IBAA, the proposed modeling and pricing mechanisms and other associated IBAA changes will best support the following important objectives of MRTU:

1) feasible forward market schedules;
2) more effective congestion management solutions that will reduce uplift costs and other market inefficiencies; and
3) eliminate inappropriate scheduling incentives and pricing signals likely to result if the IBAA modeling and pricing mechanisms are not aligned.

For purposes of initial implementation, the CAISO is clearly placing greater weight on objective (3) above. This is in large part due to the lack of detailed information regarding the location of the marginal resources supporting intertie transactions between the CAISO and the proposed IBAAs. On an interim and long-term basis, once more information is available the CAISO intends to further refine the IBAA modeling and pricing methodology to further enhance the accuracy of the CAISO's overall congestion management solutions. The CAISO discusses those enhancements in Sections 2 and

3, below. As the CAISO moves forward with these enhancements, the CAISO will adhere to the consultation, stakeholder and FERC process outlined in Section 5, below.

2. Proposed IBAA Modeling Methodology

The CAISO's FNM is a detailed mathematical representation of the physical transmission system operated by the CAISO, including the constraints and interfaces of the CAISO Controlled Grid. The FNM incorporates a representation of the interconnections between the CAISO and other BAAs both in California and in neighboring states that are not part of the CAISO Controlled Grid. Intertie transactions (imports and exports) between the CAISO BAA and these other BAAs can affect the flows and constraints on the CAISO Controlled Grid. In order to manage congestion as accurately as possible on the CAISO Controlled Grid it is important to accurately reflect the effect of intertie transactions in the FNM to the extent feasible.

In trying to accurately reflect the effect of intertie transactions with other BAAs in the FNM, it is important to recognize that the CAISO neither controls the dispatch, nor necessarily knows the location of the generation and loads located in the other BAA that are dispatched to implement intertie transactions. Stated differently, the CAISO cannot ensure that an intertie transaction scheduled day-ahead at any particular Intertie Scheduling Point is consistent with the location of the generation and loads actually dispatched to implement the intertie transaction in real time. One intended purpose of the IBAA modeling and pricing provisions is to ensure that there will not be large differences between scheduled intertie transactions (and scheduled flows) with the IBAAs and actual interchange transactions (and actual flows) with IBAAs.

The CAISO's proposal for the adoption of the SMUD and TID IBAA as of MRTU go live is consistent with its already filed tariff language regarding the modeling of embedded and adjacent external balancing authority areas. [2] Under the MRTU market design, which employs Locational Marginal Prices (LMPs) for the purpose of ensuring accurate congestion management, the CAISO has found it necessary, and the FERC has approved in principle, that the CAISO will model external Balancing Authority Areas that are closely interconnected with the CAISO Controlled Grid differently than the radial modeling currently contemplated for all other external control areas. More detailed

[2] See the FERC's September 21, 2006 Order on that filing, *California Independent System Operator Corporation*, 116 FERC ¶ 61,274 (2006) ("September 2006 Order"). In the September 2006 Order, the Commission conditionally-approved Section 27.5 of the MRTU Tariff dealing with the FNM. Id. at PP 45, 46. Section 27.5 read as follows: "To the extent sufficient data is available or adequate estimates can be made for the embedded Control Areas and adjacent Control Areas, the FNM will include a full model of embedded Control Areas and adjacent Control Areas used for power flow calculations and congestion management in the CAISO Markets Processes. The CAISO monitors but does not enforce the network constraints for embedded Control Areas or adjacent Control Areas in running the CAISO Markets Processes. The CAISO models the resistive component for transmission losses on embedded Control Areas and adjacent Control Areas but does not allow such losses to determine LMPs." See Section 27.5 as filed on February 9, 2006 in Docket No. ER06-615-000 *(emphasis added)*.

modeling is necessary because of the high level of interconnection between the CAISO's Balancing Authority Area and the proposed SMUD/TID IBAA, and will enhance the accuracy of the CAISO's MRTU congestion management solutions. For these reasons, the CAISO ultimately needs to achieve accurate modeling of flows within IBAAs regardless of the pricing options discussed in section 3.

It is important to note that the CAISO ultimately would like to model each of its interconnections with other BAAs in a closed loop or highly integrated manner. A closed loop model would mean that the BAAs would share detailed information about the dispatch of resources (generation and loads) internal to each BAA with the other BAAs. Closed loop modeling requires the agreement of the other BAAs and currently there is a great deal of reluctance to implementing a closed loop model in the West. While the ultimate goal of closed loop modeling is not achievable in the near term, this should not deter the CAISO from making improvements where sufficient data is available. The CAISO's IBAA proposal means that at the start of the MRTU markets interchange transactions using the SMUD and TID BAAs would be modeled in a more detailed manner reflecting the greater amount of information and data the CAISO has due to the fact that the SMUD and TID BAAs formerly were part of the CAISO BAA. The non-SMUD and non-TID Intertie Scheduling Points will be modeled in an open loop or radial manner at the start of the MRTU Markets.

The CAISO summarizes below the salient details of IBAA modeling approach under both the previously recommended Multiple Hub or Sub-Hub based IBAA methodology as well as the now recommended Single-Hub based IBAA methodology. It is important to note that certain core aspects of the modeling methodology are common to both the Sub-Hub and Single-Hub IBAA methodologies. These core elements to the IBAA modeling methodology are discussed in the next section (Section 3.1, below).

2.1 Core Elements of the IBAA Modeling Methodology

The CAISO's IBAA modeling methodology is intended to improve the FNM's accuracy in modeling the IBAA in order to increase the accuracy of the congestion management process on the CAISO Controlled Grid. As noted above, improved modeling will lessen discrepancies between: (i) modeled flows and congestion in the Day-Ahead Market, and (ii) actual flows and congestion in real time on the CAISO Controlled Grid. Improved modeling of external systems in the FNM and lessening discrepancies between modeled and actual flows means increasing the accuracy of the LMPs in reflecting system conditions and managing congestion.

The CAISO's core modeling approach appropriately reflects the degree of coordination currently obtainable with the other BAAs. For some of the BAAs with which the CAISO is interconnected, the FNM models the BAAs in an "open loop" (or radial) format that treats each intertie Scheduling Point independently of the others and does not try to represent power flows at physical sources in the external BAAs. Using a radial model, intertie transactions are modeled to flow over individual interties and the congestion impacts are modeled based on this assumption. There are limitations with an open or

radial loop format as compared to a closed loop format for modeling BAAs, but implementing a closed loop model can be inaccurate without the additional data that is part of an IBAA model. For some interties that are not yet modeled as IBAAs, certain New Participating Transmission Owners (New PTOs) have turned over their rights on external network branches that extend beyond the CAISO Controlled Grid. The CAISO has found it necessary to model additional external network branches even before the connected BAAs are modeled in more detail as IBAAs. (See Section 27.5.1 of the MRTU Tariff) This approach has been labeled as a "partial loop" model. As the CAISO has demonstrated in its discussion paper on "Implementation of 'Partial Loop' Intertie Network Configuration for MRTU" (available at http://www.caiso.com/1f42/1f42e565fff0.pdf), the "partial loop" model is an improvement over the radial model in some instances, but can be inaccurate in other instances.

Despite the limitations, the radial and partial loop models are satisfactory for determining the impact of flows internal to, and between, some BAAs (*i.e.*, those BAAs that are not IBAAs), until further IBAA modeling can be developed. However, use of a radial or partial loop model is not sufficient for highly integrated BAAs such as SMUD and TID. To not implement the CAISO's proposed adoption of the SMUD and TID IBAA would mean larger discrepancies between scheduled and actual flows, more inaccuracies in LMPs reflecting the actual physical operations of the CAISO Controlled Grid, and a concomitant increase in redispatch and uplift costs borne by participants in CAISO markets. In order to avoid the adverse impacts of modeling such highly interconnected BAAs radially, the CAISO has determined to use available data to better model the SMUD and TID BAAs as a single IBAA.

The proposed basic approach for modeling the SMUD and TID IBAA will not be either a closed loop or a radial format.[3] Rather, the proposed modeling approach in the FNM builds upon existing available information and uses a simplified or reduced model of the actual SMUD BAA and the TID BAA.[4] A closed loop model would reflect the flows between the IBAA and the CAISO based on information regarding the actual location and physical operating characteristics of the generation and load within the interconnected BAA. In contrast, the proposed approach models the physical resources internal to the IBAA network using individual or aggregated System Resource injections at dominant transmission bus locations within the IBAA network.[5] The individual or

[3] *See Modeling & Pricing Discussion Paper* at 20-26 (Appendix 3 describing "Modeling Option 2" that is similar to modeling a BAA in a closed loop fashion).

[4] The SMUD, Western, MID, and TID transmission systems were formerly part of the CAISO BAA. Prior to the establishment of their own control area, the CAISO had the modeling information for the SMUD and Western transmission systems that will be used in modeling the SMUD and TID IBAA. Additional data is available from WECC base case power flow models.

[5] The CAISO notes that the term it is using for modeling IBAAs is an "aggregated System Resource", and in this defined term, the word "resource" is broader than generating resources. As noted however, the use of System Resources in modeling of an IBAA will include other facilities (e.g., substations and dominant transmission buses) that are not literally generating resources.

aggregate System Resources will be used to distribute and model import and export transactions between the CAISO and the IBAA.[6]

The CAISO will associate the System Resources with particular Scheduling Points using resource identification information ("Resource IDs") for the SMUD and TID IBAA. The CAISO will use the defined Resource IDs (*i.e.*, the System Resources mapped to the Intertie Scheduling Points) to place injections into the network.[7] This process allows the CAISO to model the actual flows that will result from the generation within the two IBAAs for purposes of managing congestion on the CAISO Controlled Grid.[8] In addition, it is important to note that the proposal does not alter the ability of entities to establish either a Dynamic Resource-Specific System Resource or a Non-Dynamic Resource-Specific System Resource.[9]

The CAISO will enforce thermal and capacity constraints on the Interties between the CAISO BAA and the IBAA as necessary for the reliable operation of the CAISO Controlled Grid. However, an IBAA is responsible for congestion management within its own network. The CAISO will not enforce transmission constraints within the SMUD and TID IBAA and will only address marginal losses within the CAISO footprint.[10] In other words, the LMPs produced in the CAISO markets will reflect conditions on the CAISO Controlled Grid, but will not attempt to reflect the impact of congestion within the IBAA. The CAISO will not be managing congestion within, or attempting to reveal prices internal to, either the SMUD BAA or the TID BAA.

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[6] Initially, the CAISO contemplated using a model that approximated a closed loop model and a detailed exchange of information. After discussion with the BAAs and further consideration by the CAISO, the CAISO developed the proposed approach and determined that its use can achieve accurate congestion management outcomes.

[7] *Modeling & Pricing Discussion Paper* at 16.

[8] Multiple System Resources can use an Intertie Scheduling Point, and a Resource ID would exist for each System Resource. The pre-defined Resource IDs can identify supporting generation within the SMUD BAA or the TID BAA, or from other System Resources external to the SMUD and TID IBAA, that represent wheeling transactions to or from the CAISO and that use IBAA transmission facilities.

[9] Scheduling Coordinators may submit Bids for imports of Energy and Ancillary Services from Dynamic System Resources located outside of the CAISO BAA provided that the dynamic scheduling is technically feasible, consistent with all applicable NERC and WECC criteria and policies, and consistent with all CAISO operating, technical, and business requirements for dynamic scheduling. *See*, *e.g.*, MRTU Tariff § 4.5.4.3. Among the requirements for establishing a Resource-Specific System Resource is the provision of telemetry that allows the CAISO to validate the resource's compliance with Schedules in the CAISO Markets. *Modeling & Pricing Discussion Paper* at 16.

[10] Although transmission losses within each IBAA (and the losses on the Interties between each IBAA and other BAAs) will be fully accounted for in power flow calculations, the marginal impact of those losses will be ignored in the loss penalty factor calculations for setting the CAISO's LMPs. This is done because each IBAA is responsible for the transmission losses within its network. The contributions to the loss penalty factors from network branches within the each IBAA (and from each of the IBAA Interties) will be ignored by setting these contributions to zero. This adjustment only applies to the CAISO's marginal loss rates and does not alter the transmission losses within the IBAA, which will be accurately represented in the full AC power flow solution in the market optimization.

Although network constraints within the SMUD and TID IBAA will not be enforced, any constraint violations observed will be reported by the CAISO's market applications. If transmission overloads are observed in the Day-Ahead Market within the IBAA (or at the Intertie boundaries), the CAISO may communicate such events to the SMUD Balancing Authority and/or the TID BA and will coordinate with the respective BAs regarding any manual re-dispatch that is necessary in real-time. If the SMUD BA and/or the TID BA are unable to resolve the overloads in real-time on its own, the CAISO may issue Exceptional Dispatches to resources within the CAISO BAA to assist in resolving the overloads. The use of Exceptional Dispatches ensures that the associated re-dispatch will not directly affect the CAISO's LMPs.[11]

In summary, the proposed core modeling approach will improve the accuracy of modeling flows internal to the SMUD and TID IBAA and the accuracy of modeling flows between the IBAA and the CAISO -- both for the purpose of capturing the effects of such power flows on the CAISO Controlled Grid. The proposed approach also maintains the existing scheduling practices between BAAs and avoids the exchange of additional, more detailed data between the two BAAs and the CAISO for the purpose of running the CAISO markets.

2.2 Specific Details of the IBAA Multiple Hub or Sub-Hub Modeling Methodology

As discussed above (p.5) and in the December 14 Discussion Paper, the CAISO's Sub-Hub IBAA Modeling approach would map submitted interchange schedules (i.e., those schedules submitted into the CAISO's MRTU SiBR and CAS systems) back to the identified supporting System Resource (either Aggregated or Individual). Initially, under the Sub-Hub approach, these would be the SMUD, Western, MID, Roseville, TID, and Captain Jack System Resources or Hubs. Once the schedules are mapped back, the CAISO would model injections as coming from the identified System Resource. For aggregated System Resources, such as the SMUD and Western Hubs, the injections would be distributed to the locations/facilities that comprise the Aggregated System Resources (see footnotes 14 and 15) pursuant to pre-determined Intertie Distribution Factors (IDFs). This process allows the CAISO to model the actual flows that will result from the scheduled interchange for purposes of managing congestion on the CAISO Controlled Grid. As noted elsewhere in this paper, the degree of modeling accuracy with this approach is of course dependent on an accurate representation of the supporting System Resource (e.g., SMUD Hub, Western Hub, Captain Jack, etc.) by the scheduling entity.

2.3 Specific Details of the IBAA Single-Hub Modeling Methodology

The Single-Hub IBAA methodology utilizes the core modeling approach outlined above in Section 2.1 and is similar in application to the Multiple Hub based modeling approach described in Section 2.2. The primary difference in application between the Single and Multiple Hub based modeling methodologies is whereas the Multiple Hub would allow

[11] *Modeling & Pricing Discussion Paper* at 17-18.

an entity to specify the underlying System Resource (initially based on the six System Resources discussed above), the Single Hub would map all scheduled *import*s from the IBAA to the CAISO to a common location (such as the Captain Jack System Resource or an aggregation of supply resources), and all scheduled *exports* from the CAISO to the IBAA to a different location (such as the SMUD Hub System Resource or an aggregation of demand resources). The CAISO acknowledges that this approach will reduce modeling accuracy (and thus the accuracy of the CAISO's congestion management solutions), but the CAISO believes that the Single-Hub approach both mitigates arbitrage concerns and maintains consistency between scheduling and pricing.

2.4 Future Enhancements to IBAA Modeling

The CAISO recognizes that both the Multiple or Sub-Hub and Single- Hub based IBAA modeling approaches have limitations with respect to modeling accuracy. Both approaches ignore the potential effects of unscheduled loops flows from both within the IBAA systems (base load schedules of internal IBAA generation on-line to serve native load) as well as from regional schedules/transactions. This includes the impact of schedules on the large non-CAISO Controlled Grid portion of the California Oregon Transmission Project (COTP). The COTP Schedules are schedules that the CAISO does not see (for purposes of running the CAISO's markets) today but that we know have an impact on not only the COTP itself, but the balance of the California Oregon Intertie (COI), a large portion of which is part of the CAISO Controlled Grid. In addition, as explained above, the Single-Hub modeling approach will model all import and export intertie transactions scheduled between the CAISO and IBAA as originating at specific points when in fact we know that not all intertie transactions (import or export) are sourced from one location.

To address these deficiencies, the CAISO proposes to implement future enhancements to the IBAA methodology. Based on the frequency and severity of the inaccuracies resulting from the implementation of CAISO's initial IBAA methodology (Single Hub), the CAISO may elect to implement these enhancements as soon as several months after MRTU start up. The enhancements would entail including a certain level/representation of IBAA internal schedules in the CAISO's market models so that the CAISO can capture the impact of internal IBAA flows on the CAISO Controlled Grid. While the CAISO would include the representation of the base flows in its markets systems, the CAISO would not settle on these base schedules. This approach would also enable the CAISO to distinguish between the *base flows* on the IBAA system and the *marginal* flows/impact from scheduled intertie transactions. This is similar in concept and objective to the more preferred longer-term IBAA methodology previously described in the CAISO's December 14 IBAA Discussion Paper (wherein the IBAA provides detailed load forecast and internal resource schedules), but would likely be implemented via other means. For example, in order to implement this in a timeframe soon after MRTU start-up, the CAISO may rely on estimates of these base flows using historical real time information.

3. Proposed IBAA Pricing Methodology

3.1 *Multiple or Sub-Hub Based IBAA Pricing Methodology*

As outlined in its December 14, 2007, IBAA Discussion Paper (available at **http://www.caiso.com/1f50/1f50ae5b32340.html)** the CAISO initially proposed a pricing methodology that it believed complemented, and aligned with, the more detailed modeling of the proposed IBAAs. The CAISO originally proposed to establish discrete prices for each of six initially identified System Resources or Aggregated System Resources anticipated to support intertie transactions between the CAISO and SMUD and TID IBAAs. This was referred to as "sub-system hub" pricing in the CAISO's December 14 IBAA Discussion Paper. The CAISO's proposal would have established prices for the following Sub-Hubs: SMUD, Western, MID, Roseville, TID and Captain Jack.

The proposed Multiple Hub IBAA pricing mechanism relies on "proxy bus" pricing of the individual interconnections with the IBAAs. Proxy buses are used by the eastern regional transmission organizations (RTOs) and independent system operators (ISOs) to price intertie transactions.[12] Proxy bus pricing collapses some or all of the individual interconnection points with other BAAs into a single, combined bus with a weighted-average price. The use of proxy buses allows RTO/ISOs that have LMP based systems to manage a number of possible effects including the fact that entities can schedule intertie transactions at points that may be inconsistent with, or not accurately reflect, the actual dispatch and location of the resources used to implement the intertie transactions.

As further described in the CAISO's December 14 IBAA Discussion Paper, the CAISO believed that the proposed Multiple Hub based pricing reflected an appropriate balance of accuracy (i.e., aligning prices with schedules and dispatch) and the need to mitigate opportunities for inappropriate arbitrage between pricing points when such price differences do not reflect the true value of the resources supporting the scheduled intertie transactions for purposes of managing congestion on the CAISO's system.

The pricing approach used for the SMUD and TID IBAAs followed the modeling approach described in Section 2, above. The CAISO would have modeled the physical resources internal to the IBAA network using individual or aggregated System Resource injections at transmission bus locations within the IBAA and the individual or aggregate System Resources would have been used to distribute and model import and export transactions between the CAISO and the IBAA.

In the Multiple Hub methodology, the CAISO's modeling and pricing proposal would have established four aggregated PNodes or proxy buses for subsystems within the SMUD BAA, plus its intertie to Captain Jack. The TID BAA would have a single, aggregated set of PNodes or a single proxy bus.

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[12] The PJM, NYISO, ISO-NE and MISO RTOs all use similar methods to model and price net interchange (imports and exports) with some or all adjacent dispatch regions.

The aggregated PNodes or proxy buses within the SMUD area would correlate to the transmission system of SMUD (the "SMUD Sub-Hub"), the transmission system of Western (the "Western Sub-Hub"), the City of Roseville (the "Roseville Sub-Hub"), and the transmission system of the Modesto Irrigation District (the "MID" Sub-Hub). The SMUD Sub-Hub would have been comprised of System Resources at four substations.[13] The Western Sub-Hub would have been comprised of System Resources at three substations.[14] The MID Sub-Hub would have been comprised of a System Resource at one substation,[15] the Roseville Sub-Hub would have been comprised of a System Resource at one substation[16] and imports to the CAISO delivered over the California Oregon Transmission Project would have been comprised of System Resources at one substation.[17] The TID Sub-Hub would have been comprised of a System Resource at one substation.[18]

The CAISO's pricing approach for the two IBAAs would have been aligned with: (i) the aggregate and individual System Resources that would have been used to distribute and model import and export transactions between the CAISO and the SMUD BAA (with its individual PNodes/Intertie Scheduling Points and its Sub-Hubs with aggregated PNode/proxy bus pricing, respectively), and (ii) the individual System Resources that would have been used to distribute and model import and export transactions between the CAISO and the TID BAA. The CAISO would have priced transactions based on the LMPs for the applicable aggregated PNode/proxy bus and the individual PNodes/Intertie Scheduling Points in the two IBAAs. The purpose of the design is to have the prices

[13] The SMUD Sub-Hub would have been comprised of the following transmission buses (using CAISO naming conventions) and would have the following Intertie Distribution Factors ("IDF"): (i) 37005_ELVERTAS 230kV with an IDF of 0.14; (ii) 37010_HURLEY S 230kV with an IDF of 0.31; (iii) 37012_LAKE 230kV with an IDF of 0.19; and (iv) 37016_RNCHSECO 230kV with an IDF of 0.36. *See Power Point Presentation* at slide 38. These weights would be updated seasonally.

[14] The Western Sub-Hub would have been comprised of the following transmission buses (using CAISO naming conventions) and would the following IDFs: (i) 37545_COTWDWAP 230kV with an IDF of 0.76; (ii) 37548_FOLSOM 230kV with an IDF of 0.07; and (iii) 37585_TRCY PMP 230kV with an IDF of 0.17. *See Power Point Presentation* at slide 38. These weights would be updated seasonally.

[15] The MID individual PNode/Intertie Scheduling Point would have had the following transmission bus (using CAISO naming conventions): 38204_PRKR MID 230kV and an IDF of 1.0. *See Power Point Presentation* at slide 38.

[16] The Roseville individual PNode/Intertie Scheduling Point would have had the following transmission bus (using CAISO naming conventions): 37567_ROSEVILL 230kV and an IDF of 1.0. *See Power Point Presentation* at slide 38.

[17] The individual PNode/Intertie Scheduling Point at the Captain Jack Intertie would have had the following transmission bus (using CAISO naming conventions): 45035_CAPTJACK 500kV and an IDF of 1.0. *See Power Point Presentation* at slide 38.

[18] The TID individual PNode/Intertie Scheduling Point would have had the following transmission bus (using CAISO naming conventions): 38400_WALNT 230kV and an IDF of 1.0. *See Power Point Presentation* at slide 38.

better reflect (as closely as possible) the locations where the transactions are being sourced or sink within the IBAA.[19]

For the SMUD Sub-Hub and Western Sub-Hub within the SMUD IBAA, the aggregated PNode/proxy bus prices would be based on the weighted average price using the pre-determined Intertie Distribution Factors of the prices at the substations that comprise the aggregated PNode/proxy bus.[20] The pricing for the individual PNodes within the two IBAAs will be based on the individual LMPs at those points.[21] When registering Intertie Market Resources IDs, a Scheduling Coordinator will be required to identify the individual PNode and the aggregated PNode/proxy bus (*i.e.*, the relevant SMUD IBAA Sub-Hub) that is the source or sink of the market transaction.[22]

The benefit of this pricing and settlement approach is that prices will be aligned with the operational reality (or more specifically, the pricing will be aligned with the improved modeling that better reflects the actual flows associated with intertie transactions between the CAISO and the IBAA). The use of sub-hubs for modeling and pricing the SMUD IBAA reflects the operational differences between the SMUD and Western systems that are within SMUD's BAA.

The CAISO's initial thinking was that to not establish sub-hub modeling and pricing within the SMUD IBAA would mask or ignore the differences in impact on the CAISO Controlled Grid of transactions to or from the SMUD and Western transmission systems.[23]

3.2 *Single Hub IBAA Pricing Methodology*

Over the last month, based on both feedback from the CAISO Market Surveillance Committee (MSC) and examination of the experience in the Eastern markets, the CAISO has reevaluated the proposed Multiple Hub IBAA pricing methodology to determine if the use of multiple hub prices would establish inappropriate pricing scheduling incentives. In particular, the MSC has raised concerns that without more complete and verifiable information regarding the operation of IBAA systems and identification of the resources supporting scheduled intertie transactions, the CAISO should minimize or further confine the pricing options available to entities scheduling intertie transactions between the CAISO and the proposed IBAAs. The MSC represents that it would support more granular pricing (i.e., pricing on a sub-hub basis) if the

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19 *IBAA Implementation Discussion Paper* at 6. As Dr. Harvey put it: "Under market-based systems, it is also necessary to value interchange power, including its impact on transmission congestion. . . . A fundamental feature of LMP pricing systems is that when transmission constraints are binding, location matters, and this is true for external as well as internal generation." *Proxy Bus & Congestion Pricing Paper* at 1.

20 *IBAA Implementation Discussion Paper* at 6.

21 *IBAA Implementation Discussion Paper* at 6.

22 *Id*.

23 *Modeling & Pricing Discussion Paper* at 8.

CAISO was provided more specific and verifiable information regarding the resources truly supporting scheduled intertie transactions. Based on the MSC's feedback, and as supported by the "proxy bus" experience of the Eastern RTOs/ISOs, the CAISO is now proposing to consolidate the pricing points for intertie transactions between the CAISO and the proposed IBAAs.

Therefore, in the absence of detailed information regarding the resources supporting scheduled intertie transactions, as discussed in the CAISO's presentation to the MSC regarding Monitoring Requirements for Integrated Balancing Authority Areas (available at http://www.caiso.com/1fa5/1fa5b8cd6b2e0.pdf) , the CAISO now proposes to establish a new default Single Hub IBAA rule. Under this rule, all transactions between the CAISO and the proposed IBAAs would be priced as a single hub, combining the SMUD, Western, MID, Roseville, TID, and Captain Jack subsystems, as follows:

1) All imports to the CAISO from the proposed IBAAs would be priced based on the LMP at the Captain Jack proxy bus; and
2) All exports from the CAISO to the proposed IBAAs would be prices based on the LMP at the SMUD hub.

The proposed default pricing rule is designed to minimize uncertainties for CAISO Market Participants, i.e., those participants who would pay the costs should the CAISO establish an IBAA pricing methodology that established inappropriate pricing incentives and resulted in uplift (redispatch) costs. The proposed default pricing rule would apply in the absence of an alternative arrangement, which would require that the CAISO obtain more detailed information regarding the resources supporting the scheduled intertie transactions and there is a demonstrative benefit to the CAISO Market of such an arrangement. In instances where an entity provides more detailed information, the CAISO may support alternative, i.e., more granular pricing, Multiple Hub IBAA through the development of case-by-case agreements.

3.3 *Impact of IBAA Proposal on Non-CAISO Controlled Grid Facilities*

It is important to note here that regardless of the pricing option, in no case is the CAISO establishing prices for points outside of the CAISO system. Rather, for deliveries (imports and exports) *scheduled* at the existing and *retained* CAISO-IBAA Intertie Scheduling Points, the CAISO is determining the price (value to the CAISO for purposes of managing congestion and losses *on* the CAISO Controlled Grid) for those scheduled transactions based on the price of the resources identified as supporting the transaction. While the identified resources may reside outside of the CAISO Controlled Grid (e.g., are System Resources, as defined under the CAISO Tariff), the price or value of that System Resource will be determined by a combination of its associated bid price and its location on the larger CAISO-IBAA network (i.e., where it is injecting power) for purposes of managing congestion and calculating losses *only* on the CAISO Controlled Grid. While IBAA entities have raised concerns that under the sub-hub based pricing option the CAISO would establish prices on facilities outside of CAISO control,

the CAISO's proposal would not have the effect it would establishing the rates, terms, and conditions of service over only the CAISO Controlled Grid for schedules submitted at the CAISO-IBAA interchange points and sourced from the identified System Resources. While, from a traditional "contract path"[24] perspective, the CAISO understands that there may be some confusion regarding the CAISO's need to determine the point of injection (source) of a transaction – especially when that point is outside of the CAISO Controlled Grid - for purposes of assessing the impact of such an injection on the CAISO Controlled Grid, the CAISO is not establishing a price for the use of that facility or any other facility outside of CAISO control. The rates, terms and conditions of use applicable to those facilities will be those defined under the applicable transmission providers transmission tariffs. The CAISO established price is only relevant for those scheduling or using the CAISO Controlled Grid.

3.4 *Resource Specific System Resources*

As detailed in the CAISO's December 14, 2007, IBAA Discussion paper, the CAISO proposed to expand the Resource Specific System Resource (RSSR) concept already included in the MRTU design and supporting CAISO Tariff provisions. The RSSR concept outlined in the CAISO MRTU Tariff permits System Resources (resources outside of the CAISO Balancing Authority Area) to submit three-part bids in the CAISO's Day-Ahead Integrated Forward Market, and to be eligible for recovery of start-up and minimum load costs when these are incurred in response to dispatch by the CAISO. In order to qualify as a RSSR, the specific resource must provide telemetry or other information to the CAISO so that the CAISO can verify that the resource satisfied its performance obligations to the CAISO, in order to receive bid cost recovery for start-up and minimum load costs. In the CAISO's December 14, 2007, IBAA Discussion Paper, the CAISO proposed that a RSSR located within an IBAA could receive the LMP at their location, similarly to how the separate sub-systems' hubs would be settled at their LMPs. In other words, the CAISO proposed to allow RSSR to be paid their resource-specific LMP, as opposed to the "proxy bus" price (the weighted average price for the applicable IBAA sub-system), based on telemetry and other information to verify their response to the CAISO's dispatch. Certain stakeholders expressed concern that by permitting and establishing RSSR LMPs, the CAISO may create incentives for entities to both arbitrage between the RSSR LMP and the "proxy bus" weighted average price and to strategically designate high-priced resources as RSSRs in order for those resources to receive the higher LMP at their location while simultaneously decreasing the weighted average price of the hub (since the RSSR LMP would not be used to establish the weighted average hub price), and thus creating an incentive to schedule load (buy) at the hub location. In light of the fact that, at this time, there are no

[24] A "contract path" methodology assumes that power flows over designated transmission facilities between one point (point of receipt) and another (point of delivery) on a transmission system. The CAISO's approved MRTU LMP based system does not assume that power flows over a pre-designated or identified path, but rather determines the impact of power flows over the entire network from injections at one point (source) and withdrawals at another (sink).

proposed RSSRs in either SMUD or TID, and because of the concerns that the CAISO's proposal may create opportunities for inappropriate arbitrage, the CAISO proposes to not establish separate LMPs for each RSSR, without case-by-case development of agreements to provide adequate data to demonstrate that the RSSR is being made available to meet the CAISO's resource needs rather than displacing other IBAA resources. However, resources within the established IBAA may still qualify to become RSSR under the established provisions of the MRTU Tariff, and retain the established recovery of start-up and minimum load costs.

3.5 Rules for Pricing Exceptions

As noted above, the CAISO may agree to specific exceptions to the default pricing rule provided that the CAISO is provided detailed information that either supports identification and verification of the marginal resources (System Resources) supporting the applicable scheduled intertie transaction or otherwise supports CAISO efforts to increase the accuracy of its congestion management solutions and a reasonable determination and cost-causation based allocation of CAISO costs.

In addition to the information submitted by the participants in the regular market scheduling process or obtainable by the CAISO through operational data (such as those from the CAISO Energy Management System) and public data, the following illustrative list details the type of information that may be provided to the CAISO by the participants to support alternative, i.e., more granular, pricing:

- Scheduled flows by participant on COTP into SMUD/TID IBAA and associated e-tags.
- Scheduled flows between various sub-areas (hubs) within the SMUD/TID IBAA and associated e-tags if applicable.
- Disclosure of quantities of load served and generation resources controlled by SCs scheduling imports/exports by location.
- Identifying the generators that provide the import to the CAISO, which claim more granular pricing treatment.
- Identifying the loads that are the sinks for the export from the CAISO, which claim more granular pricing treatment.
- Reporting of bilateral transactions including both sales and purchases (including options) using FERC EQR protocols.
- Providing other data available by SCs upon CAISO request pursuant to CAISO Market Monitoring authority.
- Integrated quantity of the schedule-deviation portion of the ACE (Area Control Error) of the SMUD control area (covering all its entities) over appropriate time intervals consistent with CAISO markets.

The CAISO will work with entities on a case-by-case basis to determine if pricing exceptions are warranted and can be supported by the provision of additional data. The entities and the CAISO would agree that the CAISO has the right to audit the additional data supplied by an entity receiving a pricing exception.

4. Impact of the IBAA Proposal on CRRs

In addition to using the FNM for scheduling power flows and determining locational energy prices in the core MRTU market systems, the CAISO uses the FNM in the allocation and auction of CRRs. The CRR FNM includes the modeling of Existing Transmission Contracts (ETCs), which provide a "perfect hedge" against congestion costs associated with usage of ETC rights between the locations of the ETCs' sources and sinks, including sources and sinks in an IBAA. For other schedules, the allocation of CRRs provides an opportunity for Load Serving Entities (LSEs) and Out of Balancing Authority Area Load Serving Entities (OBAALSEs) to obtain CRRs to manage their congestion costs between locations within the CAISO Controlled Grid from sources or to sinks in an IBAA.

Accuracy of the FNM in the CRR process is critical to the CAISO's ability to balance the competing objectives of releasing as many CRRs as possible to market participants, while minimizing the risk of CRR revenue shortfall that could occur if the CAISO collects insufficient congestion revenues from the Day-Ahead Market to cover CRR settlements fully on a monthly basis.

During the stakeholder process on the IBAA modeling and pricing approaches, participants raised three primary issues regarding how the adoption of IBAAs may affect the release and settlement of CRRs. Each of those issues is discussed further below.

4.1 *Impact of an IBAA change (either the creation of a new IBAA or the modification of an existing IBAA) on the future release of CRRs*

In general, and as further outlined in the CAISO's Issue paper entitled *Congestion Revenue Rights (CRRs) Associated with Integrated Balancing Authority Areas* (available at **http://www.caiso.com/1f50/1f50ae5b32340.html**), the CAISO expects that IBAA changes will undergo extensive study and analysis before they are implemented in the FNM. As outlined in Section 4.2.6.3 of the draft and illustrative FNM Business Practice Manual (FNM BPM), the CAISO will strive to synchronize future IBAA changes with the annual CRR release process. That is, the CAISO intends to schedule new IBAA changes to take effect on January 1 of a new year (i.e., in the Day-Ahead Market that is run on December 31), and to provide to market participants all the IBAA modeling and pricing details as part of the FNM information package that is made available for CRR purposes prior to the conduct of the annual CRR release process for that year. As a result, all CRRs released – including one-year Seasonal CRRs as well as Long Term CRRs – would be released using the same basic FNM that will be used in the Day-Ahead and Real-Time markets when those CRRs become effective. In some instances there may be a need to implement an IBAA change mid-year because of a

need for improved accuracy in the Day-Ahead and Real-Time Market congestion management processes. In such a case the CAISO would incorporate the IBAA change into the FNM for the first monthly CRR process in which the IBAA change will take effect, and will follow the proposed provisions described below for assessing and mitigating impacts on the previously-released Seasonal CRRs for the remainder of that year.

4.2 *Impact of an IBAA change on the settlement of previously-released CRRs*

The term “previously-released CRRs” refers to those CRRs that were released based on a CRR FNM that did not include the IBAA change in question and that will continue to be in effect – either as active financial instruments or as allocated CRRs eligible for renewal nomination in the Priority Nomination Process (PNP) – when the IBAA change is implemented in the CAISO spot markets. If the IBAA change is implemented to coincide with the beginning of a calendar year and is coordinated with the annual CRR release process for that year, as described in the previous sub-section, then the provisions discussed here would apply to previously-released LT-CRRs plus those previously-allocated Seasonal CRRs eligible for PNP nomination. Alternatively, if the IBAA change is implemented in the spot markets in mid year, then these provisions would apply also to any previously-released Seasonal CRRs still in effect, for the remainder of their term.

One concern that several stakeholders expressed relates to the potential for an IBAA change to create a discrepancy between the source or sink location of a previously-released CRR and the new source or sink that is adopted based on incorporating the IBAA transmission and pricing provisions into the FNM. The CAISO considered two possible approaches for addressing this concern.

> Approach 1: Allow the holder of a previously-released CRR whose source or sink is affected by the IBAA change to make a one-time election either to (a) modify the settlement of the CRR to be congruent to the revised IFM pricing associated with the IBAA change, or (b) retain the original source or sink specification of the CRR.
>
> Approach 2: Modify all relevant CRR settlements to reflect the IBAA change, as in option (a) of approach 1.

Based on feedback from stakeholders and the CAISO’s careful consideration, the CAISO recommends Approach 1, as outlined above, subject to the requirement that affected CRR Holders make their elections prior to the start of the CAISO’s process to release any new CRRs for the period when the IBAA change will be in effect. The CAISO believes that Approach 1 is balanced, enables CRR Holders to maintain their intended hedge against potential congestion costs for purposes of serving load, yet allows those CRR Holders that procured a CRR for purely financial purposes to keep their original financial instruments.

The annual CRR allocation and auction process conducted in 2007 for the release of 2008 CRRs used the multiple-hub IBAA model described in section 3.1. Implementation of the single-hub model described in section 3.2 would entail a departure from the CRR FNM assumptions under which 2008 CRRs were released having sources or sinks within the IBAA. Thus the provisions of this sub-section would enable a holder of affected CRRs to make a one-time election, for each affected CRR they hold, either to retain the IBAA source and sink specification as originally awarded, or to reconfigure the affected CRR source or sink to match the revised pricing locations of the single-hub IBAA approach. These provisions would apply to (a) Seasonal CRRs that are in effect during the months of 2008 for which the MRTU markets are operating, (b) previously-allocated Seasonal CRRs that are eligible for PNP nomination, and (c) previously-released Long Term CRRs.

4.3 *Impact of an IBAA change on the revenue adequacy of previously-released CRRs*

One consequence of modifying the sources or sinks of previously-released CRRs to match the new pricing locations associated with the IBAA change is that the entire set of previously-released CRRs may no longer be simultaneously feasible. Such a departure from simultaneous feasibility could increase the risk of – but would by no means definitively cause – a shortfall in the CAISO's collection of the IFM congestion revenues used to settle with CRR Holders. Because the MRTU Tariff requires that all CRRs be fully funded, any revenue shortfall that results from IBAA-related changes to CRR sources and sinks would have to be funded somehow to prevent any direct impacts to the CRR Holders. The CAISO proposes to use the CRR Balancing Account – which has already been approved by FERC as the means to ensure full funding of CRRs – to cover any IBAA-related shortfall that occurs in a given month. It is important to recognize that revenue inadequacy is not a problem if the IBAA change is incorporated consistently into the CRR network model that is used in the release of CRRs applicable to all time periods. In the case of the proposed SMUD and TID IBAAs, the multiple-hub IBAA approach was incorporated into the CRR FNM for the annual CRR release processes (allocation and auction) that were conducted during 2007. Under the single-hub approach now proposed, holders of affected CRRs will have the opportunity to reconfigure their affected sources or sinks as discussed in the previous sub-section. Thus it will be necessary to consider potential impacts on CRR revenue adequacy as described here.

In cases where IBAA changes are implemented after some Seasonal and Long-Term CRRs have been released based on different FNM assumptions, the CAISO would be able to test for any potential failure of simultaneous feasibility and, if it exists, to estimate its magnitude. The CAISO proposes to perform this assessment in accordance with the procedure outlined in the CAISO Issue Paper entitled "Congestion Revenue Rights (CRRs) Associated with Integrated Balancing Authority Areas (IBAAs)". (The CAISO's Issue paper can be found at **http://www.caiso.com/1f50/1f50ae5b32340.html**.)

It is important to point out that previously-allocated CRRs that are reconfigured only for purposes of PNP nomination will not create any increased risk of revenue inadequacy. The reason for this is that CRRs nominated into the PNP are awarded subject to the Simultaneous Feasibility Test (SFT). When an IBAA change is involved, the SFT associated with the PNP will utilize a CRR FNM that incorporates the IBAA change, so any reconfigured CRRs that are awarded in the PNP will be simultaneously feasible.

As noted above, the CAISO proposes to use the CRR Balancing Account to cover any shortfall that occurs in any given month. There are several reasons why the CAISO believes it is appropriate to use the CRR Balancing Account to manage this risk. First, the Tariff requires that all CRRs be fully funded, and FERC has approved the use of the CRR Balancing Account and associated allocation of any resulting shortfall to measured demand for ensuring full funding of CRRs. Second, because any given IBAA change will occur in a limited area of the grid, it can be expected to affect a relatively small share of the total released CRRs, and hence any impact on revenue adequacy should be small relative to the total volume of congestion revenues and CRR settlements. Third, although any particular IBAA change will typically occur in a specific area of the grid, the benefits of the IBAA change in terms of improved accuracy of congestion management and pricing will benefit users of the entire CAISO BAA. Fourth, it will not be possible to specifically assign any net CRR revenue shortfall at the end of each month to the IBAA change in any reliable, non-arbitrary manner.

5. Process for establishing New, or Modifying Existing, IBAAs

Finally, in response to stakeholder concerns, the CAISO is also proposing a process for the adoption and implementation of additional IBAAs in the future (or a modification of then existing IBAAs). The proposed process requires the CAISO to seek collaboration and conduct a consultative process with the affected BAAs and CAISO stakeholders.[25] Specifically, the CAISO is proposing to include in its Tariff provisions that, except under exigent circumstances, would require that the CAISO follow a consultative process with the affected BAA and its stakeholders. As part of this process, the CAISO will engage in direct discussions with the affected BAA and seek to develop modeling specifications that most accurately reflect the affected BAA. In addition, the CAISO will be required to stakeholder the modeling and pricing of the new or changed IBAA and would also be required to seek board approval to the extent that implementation of the new or changed IBAA requires changes to the IBAA provisions already reflected in the Tariff and BPMs. Finally, the CAISO would be required to make a FERC filing to modify its tariff to actually add a new IBAA or change any of the elements regarding the existing IBAA reflected in its Tariff. The CAISO believes this consultative process with the appropriate Board and FERC approvals provide market participants sufficient reassurance of process should any new IBAAs be adopted or existing ones change.

[25] The CAISO proposes to include this process requirement in its tariff and provide further details of the actual procedures in the Business Practice Manuals for the Full Network Model.