CAISO Response to Questions
Integrated Balancing Authority Areas (IBAAs)

TANC

1) Please provide the data that supports the ISO's answer on page 6 of the February 15 Response that provides in pertinent part, "The CAISO determined that injections at Captain Jack (Northern terminus of the COTP) have a materially different impact on the CAISO Controlled Grid than injections from either the SMUD hub (as defined) or the Western hub."

CAISO Response

The CAISO provides below the results of a powerflow simulation that demonstrates the fact that injections at Captain Jack have a different impact on flows on the CAISO Controlled Grid than injections from either the Western or SMUD hubs.

To produce the results summarized below, the CAISO ran optimal power flow simulations that build from the base case that was previously used to construct the table on page 10 of the white paper "Discussion Paper: Modeling and Pricing Integrated Balancing Authority Areas Under the California ISO's Market Redesign and Technology Upgrade Program". To compare the impacts of different physical sources of imports on flows into the CAISO Balancing Authority Area, the base case used here is modified in three ways:

1. The COI branch group constraint has not been enforced, because it was a binding constraint in the examples in the white paper. Thus, enforcing it would mask the impact of additional imports on flows into the CAISO.
2. The Ravenswood Cutplane transmission constraint has not been enforced, because it is less than 0.5 MW from its limit in the base case. Adding load in the PG&E area, as discussed below, makes this a binding constraint that would impact dispatch within the PG&E area.
3. Because the base case in the white paper is a simulation from a period before MID and TID moved from the CAISO Balancing Authority Area to the SMUD Balancing Authority Area, and before COTP was moved from the CAISO to SMUD, the original base case included losses of these transmission systems. At that time, MID and TID schedules in the CAISO market netted these areas' generation and load, which is in essence the same process that would be used if the current IBAA proposal were implemented in the LMP Study model. Thus, approximation of MRTU's omission of marginal losses in IBAA areas is the only identifiable change that would occur if the LMP Study had modeled MID, TID, and COTP as part of IBAA areas. To use an approximation of MRTU's treatment of losses in IBAA areas, the base case has been modified to set the

resistance of lines and transformers in these systems to zero. The overall impact on LMP Study results is a reduction in LMPs, by varying amounts, in the CAISO control area and at its interties, because (1) the cost of these losses is removed from the overall market costs, and (2) the cost of some resources is reduced, making more economical supply available to the CAISO. However, the fundamental relationship among the prices at different .locations in the network does not change significantly. It should be noted that the LMP of some locations located within the IBAA have increased slightly. This is not a surprise since the exclusion of losses within the IBAA would indeed increase the value of such sources with respect to the CAISO. The LMPs appearing in the white paper for the IBAA areas are affected as follows:

	White Paper Base Case ($/MWh)	Base Case Without IBAA Losses ($/MWh)
SMUD Hub	98.45	94.11
WAPA Hub	91.05	91.06
MID Hub	97.01	93.96
TID Hub	97.28	93.97
Roseville Hub	99.17	93.48
37012 LAKE 230 KV	98.68	93.99
37016 RNCHSECO 230 KV	98.21	94.71
37545 COTWDWAP 230 KV	89.66	89.98
30035 TRACY 500 KV	93.46	91.89
37585 TRCY PMP 230 KV	94.05	92.49
30670 WESTLEY 230 KV	95.51	93.56
38230 STANDFRD 115 KV	98.64	95.17
38432 OAKDLTID 115 KV	98.92	95.54

Using the revised base case without losses, the table below compares four scenarios to the base case: (1) 100 MW of imports are added from Captain Jack to serve increased CAISO load that is distributed proportionally through the PG&E area, (2) 100 MW of imports are added from the WAPA hub to serve the same increased CAISO load, (3) 100 MW of imports are added from the SMUD hub to serve the same increased CAISO load, and (4) 100 MW of hypothetical imports are added at the Tracy 500 kV to show how flows would be affected if there were supply at Tracy to serve the same increased CAISO load. Out of the total 100 MW of added schedules, each MW is 1% of the difference in flow patterns. The general pattern of flow in the base case is that (1) significant

amounts of imports come into the CAISO area from Malin and 230 kV lines at Tracy, and small amounts of imports come into the CAISO area at Cottonwood and 500 kV lines at Tracy, and (2) significant amounts of exports go from the CAISO to serve SMUD and other points, primarily MID and TID. (Significant flows occur on the 500 kV lines to Tracy, but in opposite directions, so the net flow across this intertie is smaller.) For presentation purposes, 19 branches across the CAISO to SMUD and TID boundaries are aggregated into a smaller number of categories.

	Base Case	Add 100 MW at Capt. Jack		Add 100 MW at WAPA Hub		Add 100 MW to SMUD Hub		Add 100 MW at Tracy 500kV	
	Flow	Flow	Difference	Flow	Difference	Flow	Difference	Flow	Difference
Malin to Round Mt. 500 kV	2374.9	2441.1	66.2	2380.3	5.4	2376.0	1.1	2377.8	2.9
Cottonwood WAPA to Cottonwood PG&E & Round Mt. 230 kV	40.6	42.7	2.1	81.7	41.1	50.5	9.9	44.3	3.7
Rancho Seco to Bellota & Lake to Gold Hill 230 kV	-473.3	-469.6	3.7	-463.7	9.6	-416.5	56.8	-470.2	3.1
Tracy to Tesla & Los Banos 500 kV	78.9	94.2	15.3	101.2	22.3	92.1	13.2	149.9	71.0
Tracy to Tesla 230 kV	475.6	484.4	8.8	491.2	15.6	491.6	16.0	489.4	13.8
Other tie points	-463.7	-460.2	3.5	-458.0	5.7	-461.2	2.5	-458.7	5.0

Changes that occur in the three scenarios are that:

- For schedules that are sourced at Captain Jack, 66% flows through the Malin to Round Mountain intertie, 21% enters the CAISO at Tracy 500 kV, and much less flows through other tie points with the SMUD and TID control areas.
- For schedules that are sourced at the WAPA hub, 40% enters the CAISO at Cottonwood, 28% enters the CAISO at Tracy 500 kV, and much less flows through other tie points with the SMUD and TID control areas.

- For schedules that are sourced at the SMUD hub, 56% enters the CAISO from Lake and Rancho Seco, and much less flows through other tie points with the SMUD and TID control areas.
- If scheduled were treated as being sourced at the Tracy 500 kV bus, 71% would enter the CAISO directly from the Tracy 500 kV bus, which is significantly different from the actual physical sources and would consequently cause modeled flows within the CAISO to differ from actual flows.

These results are independent which contract path would be used on e-tags, because power flows depend only on sources and sinks, not on contractual arrangements.

2) Please reconcile the ISO's statement on page 28 of the February 15 Response that it does not intend to "establish prices internal to the IBAAs system" with its establishment of the Captain Jack price point.

CAISO Response

It is true that Captain Jack is a point external to the CAISO Balancing Authority Area (it is in fact a point external to the SMUD/Western BAA located in the Bonneville Power Administration's BAA). However, it is also true that the CAISO has 154 MW of rights over the COTP and the capacity is part of the CAISO Controlled Grid. Since Captain Jack represents the northern terminus of the COTP and since a portion of the COTP is ISO Controlled Grid, it is necessary and appropriate to establish a CAISO PNode at that location.

The CAISO will not establish prices for transactions internal to an IBAA's system. The CAISO will establish prices at IBAA hubs that will be used to price interchange transactions in and out of the CAISO Balancing Authority Area and the IBAA.

As with other RTOs/ISOs that use LMP pricing systems (and with the CAISO's proposal), the proxy bus is not a radial Intertie Scheduling Point. Rather, the FNM modeling extends beyond the CAISO Controlled Grid and, in a simplified or equivalent manner, represents the transmission network in the adjacent BAA. The external proxy buses are the locations on the external transmission grid of the BAA that have been selected by the CAISO to calculate the likely impact on the CAISO Controlled Grid of the combined effect of all changes in generation in the external IBAA that would occur to support a change in the level of scheduled net interchange. As noted above, the IBAA hub prices will be the prices for interchange transactions in and out of the CAISO Controlled Grid and the IBAA.

3) Please provide the ISO's studies and data quantifying cost to the ISO or its markets from pricing COTP transactions by TANC and its Members at Tracy versus Captain Jack?

CAISO Response

The CAISO has not performed any detailed studies quantifying the cost to the CAISO (and its market participants) from pricing imports/exports to/from the CAISO from/to the SMUD/Western IBAA scheduled at Tracy at the Tracy PNode versus the Captain Jack PNode. As previously explained by the CAISO, the CAISO is proposing to increase the accuracy of the FNM and the resulting LMPs by a better modeling of the IBAA systems. The CAISO has provided its studies in support for the modeling approach. See papers and questions and answers posted at http://www.caiso.com/1f50/1f50ae5b32340.html. The modeling changes will better align the LMPs with the physical flows/operation of system.

As noted in a previous response, the Tracy Intertie is unique in that it is a high-capacity intertie in the middle of the CAISO Controlled Grid at which no physical generation is located. While Tracy serves multiple alterative sources and sinks that are not electrically near Tracy, it would be inaccurate to treat Tracy as a "source" point under the CAISO's IBAA proposal. A transaction at Tracy does not represent a physical delivery of supply at Tracy, but rather is representative of an adjustment to net interchange between the CAISO and another Balancing Authority Area. Therefore, the source of a transaction/schedule is in fact the sending BAAs entire portfolio of resources used to control net interchange. In instances where transactions at Tracy are sourced from the Northwest, it is more accurate to model such transactions where BPA is measuring and managing its net interchange – at Captain Jack - because of the proximity of that point of interchange with the point of interchange between BPA and the CAISO – at Malin.

While other Intertie locations do not have physical generation similar to Tracy, Tracy is unique with respect to its network location and capacity in that the Node is located in the middle of the CAISO Controlled Grid as opposed to being located on the perimeter of the CAISO Controlled Grid. The network proximity and the resultant parallel transmission, as well as the multiple number of the alternative interties with the SMUD/WAPA Balancing Authority Area, creates more significant powerflow modeling and accuracy issues and potential for dispatch inefficiencies than other intertie locations with other BAAs. Therefore, in using the Tracy Intertie Scheduling Point it is necessary to recognize the source of physical flows in the CAISO network for CRR and LMP purposes.

Having inaccurate assumptions about the source of transactions using Tracy can lead to discrepancies between scheduled and actual flows and increase the CAISO's cost of resolving such discrepancies. It is inappropriate to have a continued expectation of market outcomes that are based on a less accurate modeling of external systems and interchange transactions.

4) **Please provide the ISO's studies and data quantifying the incremental benefit to the ISO or its markets from modeling COTP deliveries at Captain Jack versus Tracy?**

CAISO Response

See response to Question 3, above.

5) **Please confirm that scheduling at Tracy will be unaffected by pricing COTP transactions at Captain Jack.**

CAISO Response

Similar to today, market participants will be able to schedule and submit e-tags for interchange transactions at "Tracy". However, while in today's market interchange schedules are deemed delivered at Tracy, under the CAISO's IBAA proposal, interchange schedules to/from the CAISO BAA and the SMUD/Western IBAA, will be modeled and delivered consistent with the modeling detail and representation, including the Intertie Distribution factors that are part of the CAISO's IBAA proposal and methodology. As the CAISO has previously represented, by changing (improving the accuracy) the underlying modeling detail, the representation of power flows on the CAISO Controlled Grid will change and thus the resultant prices may change. This is to be expected.

6) **The ISO acknowledges that a significant factor in its determination to establish the SMUD/Western and TID IBAAs was based on data of a time period prior to the COTP's relocation to the SMUD/Western Control Area. See February 15 Response at p. 20. Please explain: (1) has or will the ISO revise its studies with current data reflecting the COTP's location in the SMUD/Western Control Area, and if so, what were the results or those studies; and (2) if not, what is the basis for the ISO's belief that reliance on the old data is reasonable?**

CAISO Response

The CAISO based its determination on an examination of the CAISO and SMUD/Western and TID systems, including the multiple number and proximity of interconnection points, the integrated nature of the topology of the two systems, and the information and modeling detail of the two systems. These characteristics and the electric topology of the system are relatively static and thus the definition of BAA boundaries has little impact on these characteristics. As represented in the 2006-2007 scheduled/unscheduled flow data posted on the CAISO website, current data supports the CAISO's need to better align forward-market schedules with anticipated real-time flows

through the application of more accurate modeling and market prices aligned with such more accurate modeling.

As discussed in the CAISO's response to Question 1, above, the CAISO has reviewed the inputs to the LMP Study simulations for the January to April 2005 period, when SMUD and WAPA were modeled as an IBAA. Because MID and TID schedules in the CAISO market at that time netted these areas' generation and load, the only identifiable change for these areas is the removal of marginal losses in the IBAA areas. Data presented in the CAISO's resonse reflect this removal of marginal losses, and show that the fundamental relationship among LMPs at different locations in the network has not changed.

7) Reference page 35 of the ISO's Modeling and Pricing of IBAAs Presentation (1/22/08 Update) where the ISO provides thee reasons as to why the ISO claims it is "important to settle schedules where they are modeled." Please explain in detail how the ISO's IBAA proposal as it applies to the COTP: (1) ensures LMP of schedules are consistent with the bid used; (2) minimizes Bid Cost Recovery Uplift; and (3) ensures price signals are consistent with the system needs.

CAISO Response

See response to Questions 1, 2, 3, and 5 above. The CAISO has previously explained that to the extent the CAISO dispatches at one location and price and settle at a different location it either creates: 1) revenue shortfall for the CAISO in the case where the location at which the CAISO settles is a higher price location then the location of the schedule, in the case of supply to the CAISO or 2) revenue shortfall for the participant in the case where the location at which the CAISO settles is lower than the location of the schedule in the case of supply to the CAISO. In the first case, the higher price settlement location provides an incentive to schedule more, thereby causing more congestion in order to earn a higher settlement price for the supply. In the second case, there is a disincentive for an entity to deliver on its bid unless there is a mechanism for bid cost recovery to make up for the shortfall. The data provided in response to question 1 and response to question 3 makes it clear that the impact of a Captain Jack injection is not the same as a injection at Tracy. As a result Captain Jack and Tracy, depending on the location of congestion in the system will have different impacts and thus different prices. For illustrative purposes, assume an average quantity of schedules using the CAISO grid beyond the COTP Terminus of 400 MW being sourced at Captain Jack and an average price differential between Captain Jack and Tracy of $4, the cost difference of settling a schedule at Tracy versus Captain Jack would be about $14 million annually.

8) Please provide the ISO's quantification of the difference in bid price recovery uplift for pricing TANC and its Members COTP use at Captain Jack versus Tracy.

CAISO Response

See response to Question 3, above.

9) Please explain how "compensating injections" as described on page 9-10 of the February 15 Response helps minimize Bid Cost Recovery Uplift as it applies to the COTP.

CAISO Response

The CAISO did not and has not represented that it uses compensating injections to minimize bid cost recovery uplift as it applies to the COTP.

10) On page 20 of the February 15 Response, the ISO lists the indicative criteria that, among others, is used to identify and determine IBAAs. Please provide for each of the six listed criteria on page 20, and any other criteria considered, all data and analyses that the ISO used to model and treat the SMUD/Western and TID systems as IBAAs. If the information has previously been provided for each of the criteria, please indicate specifically when the information or data was provided.

CAISO Response

The information included in the CAISO's January 8, 2008, presentation provides certain information related to criterion 1, 3, 4 and 5, all of which support demonstrate a conclusion regarding 2 that the SMUD/Western and TID IBAAs run in parallel to the CAISO system. In addition, the CAISO provided additional data in support of criterion 3 and 4 that is posted on the CAISO website. Both the CAISO's presentation and the additional data can be found at http://www.caiso.com/1f50/1f50ae5b32340.html. Finally, with respect to criterion 6 and the CAISO's ability to achieve a converged AC power flow solution, the CAISO never intended to, nor has it ever, modeled the SMUD/Western and TID systems as radially-connected systems and therefore has not experienced any problems achieving a converged AC power flow solution. The CAISO does believe, however, that should it be directed to model the SMUD/Western and TID systems as radially-connected systems, it very well may be unable to achieve a converged AC power flow solution.

Goldman Sachs

11) Please describe how the CAISO's modeling and pricing of Integrated Balancing Authority Areas (IBAA) differs from the approaches used in the eastern ISOs, which all have the same issue. This question applies generally to both the draft tariff language and the draft illustrative Business Practice Manual language.

CAISO Response

The CAISO's proposed IBAA methodology is similar to the "proxy bus" methodology used in the eastern ISOs in that it employs a modeling detail or representation of the neighboring Balancing Authority Area (BAA) that accurately captures the flow impact from transactions to and from that neighboring BAA. Similar to the CAISO's IBAA methodology, the "proxy buses" used in the east are intended to effectively represent the "electrical centers" of the neighboring systems and thus how those systems would increase or decrease generation to support an export/import from that system, i.e., the source of that transaction. All export/import from/to that system are settled at the proxy bus. One feature or characteristic that distinguishes at least the PJM-NYISO proxy bus arrangement from the CAISO's IBAA proposal, is that all export/import "schedules" are submitted/tagged to the PJM-NYISO proxy bus, whereas the CAISO is proposing to retain the existing Scheduling Points.

The tariff provisions regarding proxy buses, external nodes and external sources and an RTO's/ISO's ability to change proxy bus rules are set forth below.

New England ("ISO-NE")

The ISO New England ("ISO-NE") defines an external node as:

> "a proxy bus or buses used for establishing a Locational Marginal Price for energy received by Market Participants from, or delivered by Market Participants to, a neighboring Control Area or for establishing Locational Marginal Prices associated with energy delivered through the New England Control Area by Non-Market Participants for use in calculating Non-Market Participant Congestion Costs and loss costs."

Section III.2.7(i) of the ISO-NE Tariff provides that:

> External Nodes are the nodes at which External Transactions settle. As appropriate and after consulting with Market Participants, the ISO will establish and reconfigure External

> Nodes taking into consideration appropriate factors, which may include: tie line operational matters, FTR modeling and auction assumptions, market power issues associated with external contractual arrangements, impacts on Locational Marginal Prices, and inter-regional trading impacts.

PJM

PJM has used the following provision in its Operating Agreement and in its OATT to make changes to proxy bus rules and configurations.

> For pool External Resources, the Office of the Interconnection shall model, based on an appropriate flow analysis, the hourly amounts delivered from each such resource to the corresponding interface point between adjacent Control Areas and the PJM Region.

See § 3.3.1(d) of the PJM Operating Agreement and PJM OATT; *see also*, the August 12, 2002 PJM Report to FERC on Interface Pricing Policy, at p.1 (http://www.pjm.com/markets/market-monitor/downloads/mmu-reports/200208-report-ferc1.pdf); and the February 28, 2003 PJM Report to FERC on Interface Pricing Policy, at p.1 (http://www.pjm.com/markets/market-monitor/downloads/mmu-reports/20030301-interface-pricing.pdf).

NYISO

The NYISO defines a Proxy Generator Bus as follows:

> A proxy bus located outside the NYCA that is selected by the ISO to represent a typical bus in an adjacent Control Area and for which LBMP prices are calculated. The ISO may establish more than one Proxy Generator Bus at a particular Interface with a neighboring Control Area to enable the NYISO to distinguish the bidding, treatment and pricing of products and services available at the Interface."

See § 1.35g of the NYISO OATT and § 2.149 of the NYISO Market Services Tariff.