



Memorandum

To: Market Issues/ADR Committee
From: Kellan Fluckiger – Chief Operations Officer
Zora Lazic - Vice President, Client Services
Donald L. Fuller - Director, Client Relations
CC: ISO Board of Governors, ISO Officers
Date: March 14, 2000
Re: Market Redesign 2000 - 10-Minute Markets

This is a Project Status Report Only. No Board action is required at this time.

EXECUTIVE SUMMARY

This report provides an update to the Board on 10 Minute Market progress since the February Governing Board meeting. In February the Board voted to continue with the August 1 implementation of 10-minute markets and also directed Management to consider simplifications and phasing that might be possible within this timeframe.

This memo will outline Management's activities to address suggested simplifications and phasing. A key deliverable for the August 1 implementation by Scheduling Coordinators was the delivery of the final settlement file templates on March 13, 2000. Any changes after this date will result in a delay in the August 1 implementation. Management did incorporate three recommended changes into the design as noted below, and recommends continued dedication to implementing 10-minute markets on August 1.

It should be noted that there is little support from stakeholders for the ISO proposed 10-minute market design and/or its implementation on August 1. However it provides a comprehensive solution to several market inefficiencies. While correcting these inefficiencies, the annual savings based on regulation and imbalance market savings are estimated in the range of \$160-220 million annually. Further, the proposed 10-minute market design actually provides full implementation of the interval markets (5-10 minutes) envisioned in the original design of the ISO markets.

BACKGROUND AND SCHEDULE – 10 Minute Markets

Recent activities regarding 10-minute markets include:

- The ISO completed and issued the white paper describing the market inefficiency problems, criteria for a solution, and the estimated economic savings that will accrue with the comprehensive solution proposed. The white paper is included as Attachment 1 to this memo.
- The ISO completed 5 participant workshops designed to help participants understand the 10-minute market design proposed by the ISO. Feedback from participants about the workshops was positive in providing a smaller forum for better dialogue. Participants raised several questions and

recommendations in addition to expressing concern about whether the ISO would make any changes to its design.

- Settlement file templates and the detailed settlement equations were issued to participants.
- The consolidated list of questions/issues raised by the participants was compiled and issued to the participants. Major recommended changes and simplifications were discussed at the March 7 stakeholder meeting. ISO Responses were developed for the other items in the consolidated list and issued to participants.
- On March 7, the ISO conducted a large stakeholder meeting to review recommended simplifications made by stakeholders. The stakeholder recommendations and a brief discussion are included in Attachment 2.
- Draft tariff language was issued March 3 addressing earlier stakeholder comments. Also included was a matrix showing specific questions and ISO responses. Comments on the draft language are due to the ISO March 17, 2000.

CHARACTERISTICS OF THE 10-MINUTE MARKET SOLUTION

While investigating the recommendations it is important to keep in mind the characteristics of the solutions sought through implementation of the 10-minute market. The ISO believes that any solution must:

1. Improve the efficiency of the Imbalance Energy Market to provide the load following function it was originally intended to provide, so that the ISO can reduce Regulation requirements. This would resolve several inefficiencies including "stuck price".
2. Create an incentive to submit bids, and to respond to Dispatch instructions.
3. Establish an incentive to deliver Instructed Imbalance Energy during the specific BEEP Intervals in which it is instructed.
4. Provide an incentive for remaining uninstructed Energy to be delivered in the BEEP Intervals in which the ISO needs the deviations.
5. Establish an incentive for smooth transition from hour-to-hour schedules.
6. Mitigate disincentives to follow ISO instructions.

MARCH 7 STAKEHOLDER MEETING AND FOLLOW-UP REVIEW OF SCE/PG&E PROPOSAL

At the March 7 Meeting the ISO presented key recommendations and simplifications suggested by stakeholders. Topics were discussed on their merits and whether they could be incorporated into the design while still meeting the August 1 implementation date. One day prior to the March 7 meeting, Edison and PG&E presented a revised and joint recommendation, that was supported by others in the meeting. To better understand the proposal, the ISO met with key representatives of Edison, PG&E, IEP, and EOB on March 9 to review and understand the proposal and to determine where changes could be made. Attachment 4 presents the joint

participant proposal and discussion in its entirety. Attachment 3 shows the key points taken from the joint participant proposal and the ISO responses.

Based on stakeholder inputs, the ISO has incorporated the following modifications to the design:

- A temporary initial simplification at the ties : A participating flag will be provided for supplemental energy bids at the ties, that would specify that whatever is not pre-dispatched in the first interval is removed from the BEEP stack for the remainder of the hour. This simplification is an accommodation for neighboring control area concerns regarding mid-hour dispatch.
- No-Pay is modified for Participating Loads
- Price transparency – The ISO will incorporate a functionality to provide price information during the interval and also will publish prices before the hour indicating pre-dispatch prices. A high priority is given to including this in the August 1 implementation.

SUMMARY

The ISO is progressing with software development with the above changes incorporated. Any further changes after March 13 will delay the August 1 implementation. The ISO will present the revised tariff language to the Board at the March Governing Board meeting based on comments from stakeholders during early March. The 10-minute market design will be incorporated into the April 3 tariff filing with FERC.

The Technical Standards Working Group will be working closely with scheduling coordinators to facilitate the software implementation. Further, the ISO will be conducting client/regional settlement training sessions to allow greater participation by SC personnel.

Attachment 1

California ISO's 10 – Minute Settlement Proposal:

Background and Economics

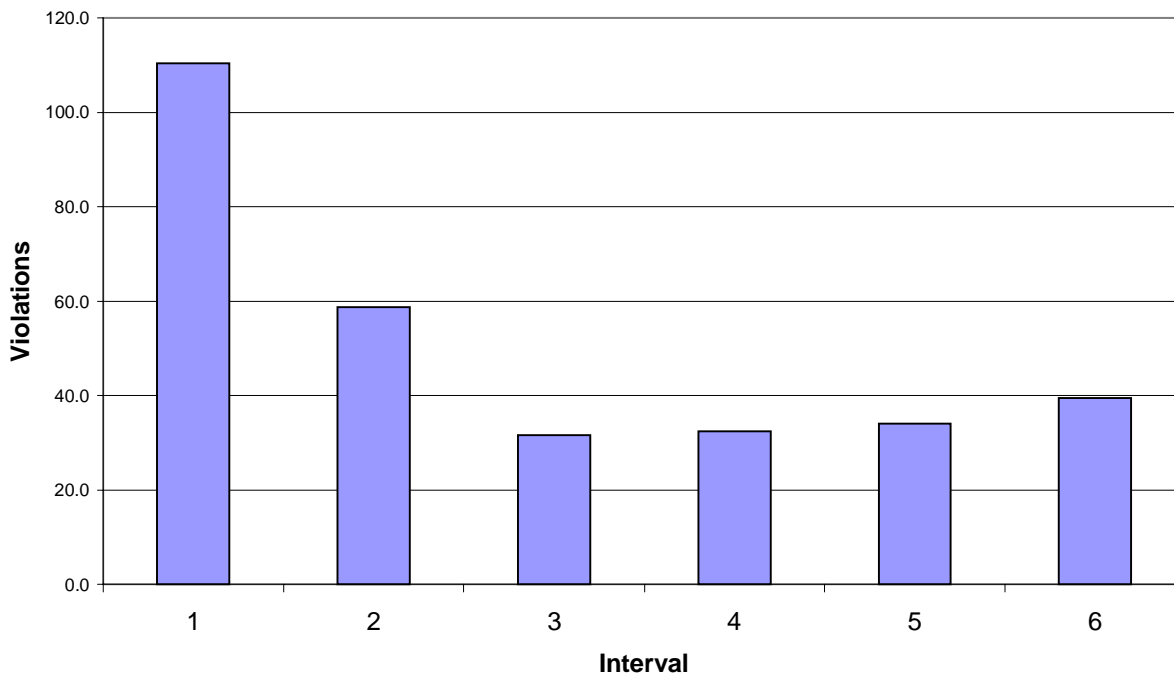
The purpose of this paper is to provide Market Participants with a more complete understanding of the problem of uninstructed deviations, and existing inefficiencies in the Imbalance Energy market, as well as the benefits of the ISO's proposal for 10-minute dispatch and settlement. This analysis will provide a basis for our discussions on March 7 regarding the merits of alternative proposals suggested by Market Participants.

BACKGROUND

The National Electric Reliability Council (NERC) establishes criteria for two Control Performance Standards (CPS1 & CPS2). Of particular concern is CPS2, by which the average ACE in each 10-minute interval is monitored relative to a control area specific benchmark. Although the ISO currently meets the NERC standards for allowable CPS2 performance, the ISO experiences an unacceptably large number of CPS2 violations, particularly during the first, second and sixth BEEP Intervals, as illustrated in the figure below.

More than half of the CPS2 violations occur in just two intervals, which represents an unacceptable distribution of performance across the average hour.

**Average Monthly CPS 2 Violations by Interval
September 1999 through January 2000**



Why does the ISO experience such a lopsided distribution of CPS2 violations?

Ramping anomalies and hourly settlement of 10-minute services are the principal factors contributing to the frequency of CPS2 violations in these intervals. Together, these problems contribute to the ISO's need to use between two and five times as much Regulation (measured as a % of Load) as was required to operate the system prior to industry restructuring.

Ramping Anomalies

System operations benefit from a smooth linear ramp between hourly schedules, beginning at the top of the sixth interval of one hour, and ending at the end of the first BEEP Interval of the next. Since there is presently no incentive to follow a smooth linear ramp between hours, resources follow a range of ramping conventions. Although the ISO procures additional Regulation to provide more regulating range during the ramp, Regulation response is often inadequate to avoid CPS2 violations attributable to ramping anomalies.

Hourly Settlement of 10-Minute Services

A second factor contributing to the unacceptable distribution of CPS2 violations is that performance according to 10-minute instructions is evaluated based on hourly data.

Resources dispatched by BEEP in the 1st interval have substantial flexibility in fulfilling that instruction since the associated Energy may be delivered (or consumed) in that interval, or any of the five succeeding intervals. Similarly, an instruction issued in the second interval may be met in that interval, or any of the succeeding four intervals. The Automated Dispatching System (ADS), while essential, does not solve this problem, since it only assures that the instruction is communicated. There is no existing incentive to assure that service is provided in the interval to which the instruction applied.

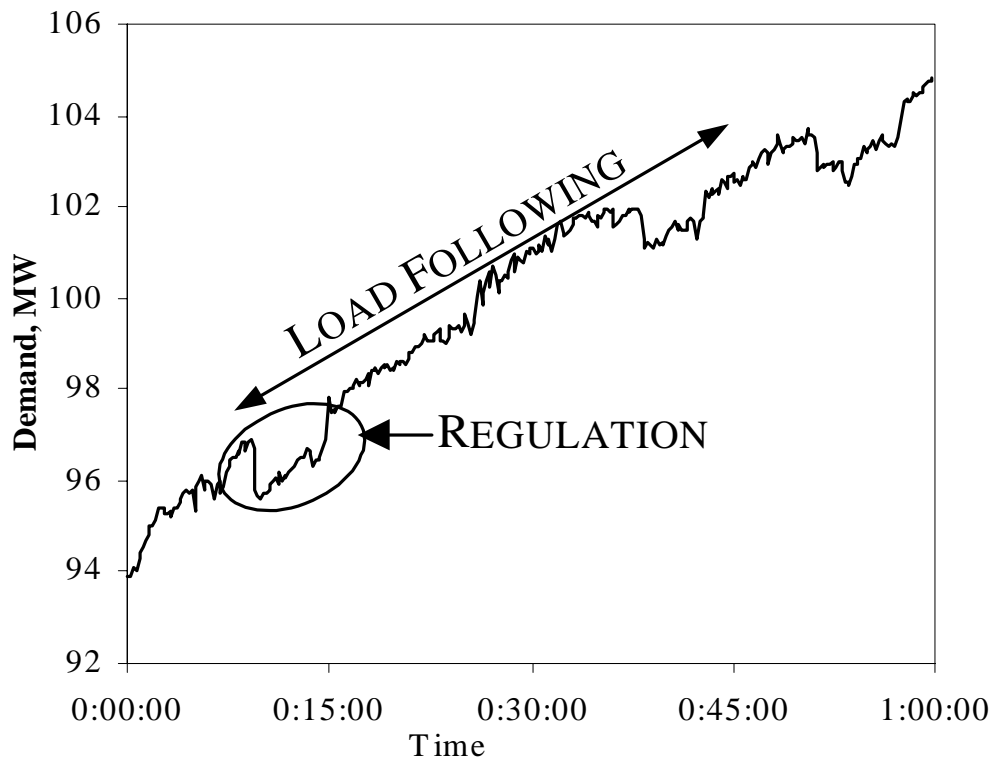
Load Following

An essential function of the Imbalance Energy market is to provide load following. Since no incentive currently exists for instructed (or uninstructed) Energy to be delivered (or consumed) in the specific intervals in which the ISO has an Imbalance Energy need, the Imbalance Energy market fails to fulfill the load following function for which it was originally designed.¹ Instead, the ISO must rely on high-priced Regulation to follow load.

Using Regulation to provide load following is grossly inefficient because it unnecessarily substitutes high-priced resources on Automatic Generation Control for lower quality services dispatched on a 10-minute basis. The load following function can be entirely provided by a reasonably efficient Imbalance Energy market.

¹ The need to some day align the dispatch interval with the settlement period has been acknowledged since before the ISO started operations. FERC accepted Amendment No. 6 to the ISO Tariff, in which tariff changes affecting the Imbalance Energy Market were made in temporary sections, recognizing that the ISO would later work with stakeholders to develop and implement a sub-hour settlement interval.

The following figure illustrates the distinction between load following and Regulation. Use of the Imbalance Energy Market to provide Load following is consistent with NERC's definition, under which load following is provided by resources that are dispatched within a scheduling period (i.e., within an hour).



Problems with Settling Uninstructed Deviations Using a Single Price

An additional issue is that resources without bids in any market are also paid the Hourly Ex Post Price for deviations from schedule. The Hourly Ex Post Price is the weighted average of prices paid (or charged) to resources that are instructed. Two significant problems arise due to the use of this single, hourly price for settling uninstructed deviations:

- First, there is limited incentive to submit bids, since a resource can earn approximately the same payments for uninstructed deviations as for providing Instructed Imbalance Energy.
- Second, it provides no direct incentive to deliver uninstructed deviations during the intervals in which the ISO requires the Energy.

One particular practice the ISO frequently observes is that generators will "chase the price", by over-generating when the Hourly Ex Post Price is expected to be favorable. This can cause prices in one BEEP Interval to influence behavior in other 10-minute intervals, confounding the ISO's efforts to use the Imbalance Energy Market to follow load.

“Stuck” Price

The price chasing problem is exacerbated during hours in which the ISO experiences a “stuck price.” This problem arises when a Supplemental Energy bid on a tie is pre-dispatched, and then during the hour the ISO subsequently needs to decrement that bid. Since such bids are often not dispatchable within the hour, the BEEP Interval Price for incremental instructions remains “stuck,” at the higher price and the ISO must then drop the decremental price lower and lower to balance the system. The “stuck” price encourages additional price chasing, exacerbating the over-generation condition the ISO is seeking to resolve during such events.

The stuck price phenomenon is one problem caused by the inability to dispatch Supplemental Energy bids on the ties on a ten-minute basis. A second problem is that ISO operators sometimes err on the side of calling too few Supplemental Energy bids on the ties as they seek to avoid the stuck price problem caused by calling too much inflexible Energy from such resources. This conservative dispatch sometimes causes prices in the hour to go higher than they otherwise would, as the ISO must go deeper in the BEEP stack to call more resources within the control area than would normally have been necessary if the ties were 10-minute dispatchable.

Poor Response to Instructions

Yet another problem contributing to the inefficiency of the Imbalance Energy Market is poor response to Dispatch instructions issued by the ISO to resources that have submitted bids. The ISO must often call between two and seven times as much Energy as required to resolve a system imbalance. The impact of this problem on Imbalance Energy prices is estimated later in this paper.

Disincentive to Follow Instructions

One issue that may contribute to the poor response is that settlement for Instructed Imbalance Energy is entirely separate from one hour to the next. This may subject a resource in the BEEP stack to price risk if an instruction in one hour causes an uninstructed deviation in the next hour. This price risk may cause a resource to determine that its best interest is served by not fully complying with the ISO's instructions.

Problem Summary

The net effect of these problems is that the Imbalance Energy Market is inefficient, 10-minute prices are volatile, excessive Regulation must be procured, and excessive CPS2 violations are experienced, particularly in the first and second BEEP Intervals.

SOLUTION CHARACTERISTICS

The ISO believes that any solution must:

- 1) Improve the efficiency of the Imbalance Energy Market to provide the load following function it was originally intended to provide, so that the ISO can reduce Regulation requirements.
- 2) Create an incentive to submit bids, and to respond to Dispatch instructions.
- 3) Establish an incentive to deliver Instructed Imbalance Energy during the specific BEEP Intervals in which it is instructed.

- 4) Provide an incentive for remaining uninstructed Energy to be delivered in the BEEP Intervals in which the ISO needs the deviations.
- 5) Establish an incentive for smooth transition from hour to hour schedules.
- 6) Mitigate disincentives to follow ISO instructions.

ISO PROPOSAL FOR TEN-MINUTE DISPATCH AND SETTLEMENT

The ISO's proposal for 10-minute dispatch is consistent with the original market design, which was based on congruent dispatch and settlement intervals. Other essential features of the ISO's proposal for 10-minute dispatch and settlement include the following:

- 1) All Imbalance Energy resources are dispatched on a 10-minute basis.
- 2) Resources have an incentive to bid, and to be instructed.²
- 3) Imbalance Energy resources are held accountable for delivering Energy in accordance with a Dispatch instruction (i.e., on the same 10 minute basis).
- 4) Failure to follow a smooth linear ramp across the top of the hour will result in uninstructed deviations.
- 5) The "Residual Energy" concept eliminates price risk associated with uninstructed deviations that might occur in an interval subsequent to the interval in which the Dispatch instruction was issued, thereby mitigating a potential disincentive to following ISO instructions.

ECONOMICS OF 10-MINUTE SETTLEMENT

The benefits of 10-minute dispatch and settlement are principally the result of a more efficient Imbalance Energy Market, and fall into four categories. For two of these categories of benefits, the ISO has developed ranges of estimated annual values. These include:

- 1) Reduced Regulation requirements.
- 2) Reduction of Imbalance Energy prices, and elimination of pricing bias, including stuck price.

Two additional benefits of 10-minute dispatch and settlement that are extremely important, but more speculative as to the precise value, include:

- 1) Improved reliability due to a narrowing of the difference in frequency of CPS2 violations across the six intervals.

² Uninstructed deviations are priced based on the marginal cost of accommodating such deviations in each BEEP Interval (i.e., the 10-minute "inc" price is charged to uninstructed decremental deviations, and the 10-minute "dec" price is paid to uninstructed incremental deviations.) This means a resource owner that chooses to deviate in real time will maximize profit over the long term by submitting bids and being instructed, rather than by engaging in uninstructed deviations.

2) Reduced costs in other markets as decreased Regulation purchases make more supply available.

The value of reduced Imbalance Energy prices and reduced Regulation requirement is discussed below.

Reduced Regulation Requirement

A smooth linear ramp between hours will reduce the ramping anomalies the ISO experiences in the sixth and first intervals. Improved efficiency in the Imbalance Energy Market will better enable the ISO to manage any remaining ramping anomalies, and to follow Load throughout the hour.

What reduction in Regulation requirement can be reasonably estimated?

The ISO Regulation requirement currently varies from about 3% to 6% of Load, averaging about 5%. Prior to industry restructuring, Regulation requirements were equal to approximately of 1% to 1.5% of Load. A 33% reduction in Regulation requirement still leaves the ISO with a requirement of approximately 3.3%, representing 2 to 3 times as much Regulation as was previously required, while a 50% reduction would still leave the ISO with between 67% and 150% more Regulation than previously required.

For the purpose of developing an estimated range of savings attributable to 10-minute dispatch and settlement, a reduction in Regulation requirement of between 33% and 50% is used.

Recognizing the uncertainty related to any estimate of the value of this reduction in Regulation requirement, the following analysis assumes that savings are in direct proportion to the projected reduction in Regulation requirement.

Are these estimates conservative?

These assumptions are conservative for the following reasons:

- 1) Reducing Regulation requirements will reduce the Market Clearing Prices (MCPs) for Regulation, providing additional savings which we have not included in this estimate.
- 2) The ISO believes a properly functioning Imbalance Energy Market should allow the ISO to reduce Regulation requirements by 50% percent or more, so use of a range of 33% to 50% is conservative.
- 3) Reducing Regulation requirements will free more capacity to compete in the forward Energy markets, in other Ancillary Service markets, and in the Imbalance Energy market, reducing prices in those markets. These benefits are not quantified.
- 4) The supply curves for Energy and Ancillary Services tend to become steeper as supply is more limited (i.e. small increases in A/S requirements cause geometric increases in MCP when supplies are constrained). Cost savings resulting from 10-minute settlement will therefore be most significant during those times when prices are highest. This benefit is also not quantified, and will increase the savings estimated here.

In developing an estimate of annual savings in Regulation costs attributable to 10-minute settlement, the cost and quantity of Regulation procured during 1999, and during January and February 2000, were considered. The following explains how a very conservative forecast of the cost of Regulation in 2000 was developed.

Estimated Cost of Regulation in 2000

The total cost of Regulation in 1999 was just over \$300 million. Certain factors suggest that the Summer 2000 costs could be higher. These include:

- 1) Summer 1999 was unexpectedly cool, with light loads, while substantial Load growth is forecast for Summer 2000.
- 2) Price caps of \$750 may be extended through Summer 2000, while price caps of \$250 were in effect during Summer 1999. Price spikes that will inevitably occur during the hottest days of the summer will be more expensive with a higher cap.

Other factors tend to suggest downward pressure on costs. These include:

- 1) Regulation Up and Regulation Down markets were split on August 18, 1999, reducing quantities procured and MCPs.
- 2) Regulation imports may be available in Summer 2000, increasing available supply.

Although these two factors will provide important moderating influences on Regulation costs in 2000, the ISO believes that without 10-minute dispatch and settlement, Regulation will likely cost more in 2000 than in 1999. This expectation notwithstanding, a very conservative estimate of Regulation costs has been developed for the purpose of estimating savings attributable to 10-minute dispatch and settlement. The following assumptions have been made:

- 1) October, 1999 was the first full month in which both the split markets for Reg Up and Reg Down, and the \$750 price cap, were in effect. October was also unseasonably warm, and is used as a very conservative proxy for the average monthly cost of Regulation for May through October, 2000.
- 2) Actual values were used for the cost of Regulation in January and February, 2000.
- 3) Average Regulation costs across four months (Nov 99, Dec 99, Jan 00, and Feb 00) were used to estimate the average monthly cost of Regulation for March, April, November and December, 2000.

Table 1 documents the estimated cost of Regulation in 2000 based on these extremely conservative assumptions (rounded to \$0.5 million per month).

Table 1
Estimated Cost of Regulation
in 2000

Month	Basis for Estimate	Estimated Cost (millions of \$)
Jan	Actual	9.5
Feb	Actual	8
Mar	Nov 99 to Feb 00 Avg	11.5
Apr	Nov 99 to Feb 00 Avg	11.5
May	Oct 99	29.5
Jun	Oct 99	29.5
Jul	Oct 99	29.5
Aug	Oct 99	29.5
Sep	Oct 99	29.5
Oct	Oct 99	29.5
Nov	Nov 99 to Feb 00 Avg	11.5
Dec	Nov 99 to Feb 00 Avg	<u>11.5</u>
Total	-	<u>240</u>

Estimated Regulation Savings

The ISO believes that using an estimated annual cost of \$240 million for Regulation is very conservative. As noted above, the ISO believes that if a normally hot summer occurs in 2000, actual Regulation costs in the absence of the proposed changes in 10-minute market could exceed the \$300 million spent in 1999.

Based on the range in Regulation savings of 33% to 50%, savings of \$80 million to \$120 million are projected. This range does not include any assumption about decreases in MCP. To illustrate the effect of reasonably expected reductions in Regulation MCPs, a modest decrease of 12.5% in average MCPs matched with a reduction in Regulation requirement of 33% to 50% would result in an estimated range of savings of \$100 million to \$135 million.³

Savings will be greatest on the hottest days when A/S costs are highest, the decrease in Regulation prices is most significant, and the mitigating effect of the increased supply available on other market prices is most pronounced. This effect causes 10-minute dispatch and settlement to be an important moderating influence on price spikes, which may be three times as large as price spikes experienced in Summer 1999.

Additional savings would also result as MCPs are reduced in other markets due to the increase in available supply made possible by the reduction in Regulation requirement.

³ Assuming an annual Regulation cost of \$240 million, and no change in MCPs, a reduction in requirement of 33% yields savings of \$80 million [$.33 \times \240], while a reduction of 50% yields savings of \$120 million [$.5 \times \240]. Including a reduction in MCPs of 12.5% decreases the net cost of a 33% reduction in requirement from \$160 million to \$140 million [$(\$240 - \$80) \times (1 - .125)$], while the net cost of a 50% reduction in requirement is reduced from \$120 million to \$105 million [$(\$240 - \$120) \times (1 - .125)$], resulting in a range of estimated savings of \$100 million to \$135 million.

In summary, the savings from Regulation can be very conservatively estimated in the range of \$80 million to \$120 million.

Imbalance Energy Savings

As noted earlier, the ISO must often call between two and seven times as much Imbalance Energy as needed to achieve the desired response. This causes the ISO to go through the BEEP stack, often increasing prices significantly.

Improvement in response to the ISO's instructions on a 10-minute basis should provide a moderating influence on the volatility in 10-minute prices, and should decrease the cost of Imbalance Energy. A survey of the price and quantity of Energy in the BEEP stack over several hours suggests that prices are increased by between 10% and 70% when the ISO calls two to five times as much Imbalance Energy as needed.

The ISO estimates that this increase in prices causes an increase in Imbalance Energy costs of between 30% and 40%. To develop a very conservative range of savings in Imbalance Energy costs, a reduction in prices due to improved response of 20% to 25% is used. Based on the 1999 cost of \$336 million for Imbalance Energy in 1999, an estimated reduction in Imbalance Energy costs of between \$67 million and \$84 million is projected to result from improved response to ISO instructions.

Stuck Price

Based on an analysis of hours in which the stuck price phenomenon holds Imbalance Energy prices artificially high, it appears that resolving this problem will reduce prices by approximately 20% to 25%. The stuck price occurs between 3 and 5 times per day, which means it happens 1000 hours in a year. An estimate of the reduction in Imbalance Energy prices associated with this change is about \$15 million per year.

Attachment 2
Summary of Simplifications discussed at March 7 Stakeholder Meeting

Changes possible with August 1 implementation

- Implementation should be phased in; as an example implement 10-minute dispatch with ADS early in the summer. Then implement 10-minute settlement in August. (Continue with No-Pay to start with 10-minute settlements)

ISO Response: Although phasing is possible, starting with 10-minute dispatch fixes only one problem, the stuck price issue. While this would be helpful, it only resolves a small part of the market inefficiency that is being addressed with the comprehensive 10-minute market design. Also acceleration of 10-minute dispatch is not consistent with discussions with other control areas.

- Simplification at the ties for first phase (ties that are bidding A/S imports agreed to 10-minute dispatch. This is only an issue for supplemental energy)

ISO Response: The ISO will incorporate a placeholder tag to better facilitate intertie bids for supplemental energy. There is more discussion on this option in attachment 2. Other suggestions for limiting mid-hour calls, i.e. one mid-hour per tie, or one mid-hour per supp energy bid, appear complicated and possibly discriminatory.

- Eliminate netting?

ISO Response: The ISO was open to eliminate netting but there was not a strong voice by participants at the March 7 meeting to eliminate it, so it will be kept. Netting of deviations by SC by region was incorporated originally at participant request. Although somewhat complicated for SCs to distribute the netting impact to their clients, it reduces the impact of imbalance charges and does provide SCs an incentive to follow their load in real-time.

- Modify No-Pay for load

ISO Response: The ISO made this change. Loads will be exempt from No-Pay after they are curtailed, in the hour of Dispatch and for the following two hours for the trial period.

- Modify No-Pay for generators Some have argued that No-Pay should be relaxed for constrained resources, since some accommodations are being made for loads and ties.

ISO Response: The ISO does not support this since accommodations since start-up for constrained resources have diluted the effectiveness of 10-minute dispatch for Ancillary Services.

Changes that would delay August 1 timeframe

- Settle on 10-minutes but simplify statements. This suggestion would have provided for 10-minute settlement as proposed, and also present settlement data aggregated to the hour.

ISO Response: This has merit for some participants but cannot be accomplished for August 1 implementation.

Major changes/starting over

- Modify the entire design to pay nothing for uninstructed deviations (with bandwidth)

ISO Response: Similar to the New York design. This approach is not a market solution and does not meet the criteria for a solution

- Edison's (original) proposal: one energy price for every 10 minute interval, dispatch and settle every 10 minutes. No residual energy, no inc/dec differentials, no 10-minute min/ max, no instructed/uninstructed differentials, no imputed ramps on ISO generation schedules, no netting-out.

ISO Response: This is a major change to the design that would mean starting over. The revised proposal developed jointly by Edison and PG&E is described elsewhere.

- Simplify or eliminate residual energy

ISO Response: This is discussed in Attachment 2 that outlines the discussion of the joint Edison/PG&E proposal.

- Two tiered bid Give resources the ability to bid both an inc and dec price, e.g. a resource is called at inc bid of \$60. Once on, they want to stay on until the price drops to \$20.

ISO Response: This is an interesting concept that would give participants greater flexibility, and it is a major rework of the market design and a complete redesign of BEEP

- Two separate real-time markets, hourly and 10-minute. Use the same BEEP stack and create two separate MCP. Ex-Post would be an average of hourly price and 10-minute

ISO Response: This further fragments the real-time market.

Attachment 3

Features from Joint Participant Proposal and ISO Responses (Joint Participant proposal was developed by SCE/PG&E/IEP/Dynegy/SDG&E/BPA on March 9, 2000)

1. The Real-time market will produce one 10-minute price for each interval
 - a) A single 10-minute price will be used to settle, on a 10-minute basis, all instructed, uninstructed, ramping and Ancillary Service dispatched energy

ISO Response: The advocates of the Joint Participant Proposal acknowledged that their proposal would in fact require as many as three prices per interval. This is because a single price fails to assure that all resources will be paid at least their bid price. The advocates therefore revised the Joint Participant Proposal to use the inc price for settling incremental instructions, the dec price to settle decremental instructions, and a weighted average interval price to settle uninstructed deviations. This is an increase in complexity as compared to the ISO proposal. In most intervals, the ISO proposal and the Joint Participant Proposal will provide only one price. In cases where there is an Inc and Dec in the same interval, then the ISO proposal produces two prices, while the Joint Participant Proposal produces three.

- b) Nonparticipating load will be settled on an hourly basis at an ex-post price equal to the simple average of the 10-minute prices within that hour

ISO Response: This concept is very similar to the ISO's proposal. Each hourly deviation is attributed proportionately to each interval, and is then priced at the appropriate ten-minute price under the ISO's proposal. The outcome is identical to using the simple average of the 10-minute prices. If there is an incremental hourly deviation, then the simple average of the 10-minute dec prices is effectively used, and if there is a decremental hourly deviation, then the simple average of the 10-minute inc prices is used. .

- c) The 10-minute price is calculated as the highest INC bid or the lowest DEC bid dispatched in the 10-minute interval

ISO Response: The ISO proposal accomplishes the same thing except where there is an Inc and Dec in the same interval as noted below.

- d) In the event the ISO issues INC and DEC bids in the same 10-minute interval, dispatched participants will not be paid less than their INC bid nor pay more than their DEC bid. The 10 minute price for all uninstructed energy is calculated as the weighted average of the INC and DEC prices.

ISO Response: This principle leads to three prices as described in 1) above.

- e) The ISO should eliminate dispatch practices that result in unnecessary INC and DEC dispatches within the same 10-minute interval.

ISO Response: The ISO agrees and believes the ISO proposal accomplishes this. If there is a specific issue that the participants can identify regarding unnecessary dispatch practices, this should be remedied regardless of the 10-minute proposal selected.

- f) When zones are split there will be separate 10-minute prices in each zone

ISO Response: The ISO agrees. This is accomplished with either proposal

2. The ISO will continue to pre-dispatch inter-ties in a manner consistent with present practices
- a) Predispatch will be considered an instruction and ties will receive a price for the first ten-minute interval not less than their bid
 - b) To prevent "stuck" prices inter-ties will be paid an ex-post price equal to the simple average of the 10-minute interval prices within the hour

ISO Response: The ISO continues to work with other control areas to work out the details of 10-minute dispatch. As long as a bid on a tie is instructed, it will be settled as instructed energy. If that instruction is reversed, and no operational adjustment is made, then it will be settled as uninstructed energy.

3. Energy associated with the dispatch of Regulation shall be treated as an instructed deviation

ISO Response: The ISO believes that the 10-minute settlement proposal shifts the reliance for load following from regulation to the 10-minute real-time market, greatly reducing the situations that have occurred where reg units have been off their POP for significant periods of time. This change is one that involves a major market redesign which is not directly related to the 10-minute markets.

4. Participants will not be subject to "No Pay" as a result of following ISO dispatch instructions
- a) The ISO will publish and use fixed "deadbands" representing a fixed percentage of the MW quantity sold in calculating "No Pay"
 - b) The ISO should determine the appropriate deadband for the start of the market. A smaller deadband should be implemented after market participants have gained experience. "No Pay" will apply if deadbands are exceeded.

ISO Response: The ISO believes that participants can avoid No-Pay risk by following ISO dispatch instructions. The ISO has changed the No-Pay for Participating Loads for the summer 2000 trial period; all other resources will be subject to the No-Pay provisions that allow a dead-band to cover changes that occur in GMMs/TMMs.

Attachment 4

(This document was developed by Participants as noted below)

10-Minute Dispatch/Settlement "One Price" per Instruction Proposal

PG&E, SCE, [SDG&E], IEP, Dynegy, and BPA have reached agreement on the following "One Price" proposal related to 10-minute dispatch and settlements:

1. The Real-time market will produce one 10-minute price for each interval
 - a) A single 10-minute price will be used to settle, on a 10-minute basis, all instructed, uninstructed, ramping and Ancillary Service dispatched energy
 - b) Nonparticipating load will be settled on an hourly basis at an ex-post price equal to the simple average of the 10-minute prices within that hour
 - c) The 10-minute price is calculated as the highest INC bid or the lowest DEC bid dispatched in the 10-minute interval
 - d) In the event the ISO issues INC and DEC bids in the same 10-minute interval, dispatched participants will not be paid less than their INC bid or pay more than their DEC bid. The 10 minute price for all uninstructed energy is calculated as the weighted average of the INC and DEC prices.
 - e) The ISO should eliminate dispatch practices that result in unnecessary INC and DEC dispatches within the same 10-minute interval.
 - f) When zones are split there will be separate 10-minute prices in each zone
2. The ISO will continue to pre-dispatch inter-ties in a manner consistent with present practices
 - a) Predispatch will be considered an instruction and ties will receive a price for the first ten-minute interval not less than their bid
 - b) To prevent "stuck" prices inter-ties will be paid an ex-post price equal to the simple average of the 10-minute interval prices within the hour
3. Energy associated with the dispatch of Regulation shall be treated as an instructed deviation
4. Participants will not be subject to "No Pay" as a result of following ISO dispatch instructions
 - a) The ISO will publish and use fixed "deadbands" representing a fixed percentage of the MW quantity sold in calculating "No Pay"
 - b) The ISO should determine the appropriate deadband for the start of the market. A smaller deadband should be implemented after market participants have gained experience. "No Pay" will apply if deadbands are exceeded.

Comparison of ISO and One Price Proposals

ISO Proposal	One Price Proposal
10 minute settlements	10 minute settlements
Separate treatment/settlements for ramping	No treatment of ramping
Separate treatment/settlements for "Residual" energy	No treatment of residual energy
10-minute dispatch and into the hour dispatch of inerties	Inerties predispatched as today; price takers after first interval
Multiple prices for instructed energy	One price per instruction
Possible payment below bid (residual)	Paid bid or higher for instructed energy
Uninstructed pays highest INC or paid lowest DEC (10-minute min/max)	Uninstructed paid weighted average of 10- minute INC/DEC
"No Pay" settlements incorporate hourly ramping and residual energy	"No Pay" deadbands based on percentage of service sold

One Price Measured against ISO White Paper Solution Characteristics

1) Improve the efficiency of the Imbalance Energy Market to price the load following function it was originally intended to provide, so that the ISO can reduce Regulation requirements.

One Price provides significant incentives for Market Participants to follow the instructions given by the ISO by implementing 10-minute dispatch and settlements. With a strong incentive to follow ISO dispatch instructions there will be less undesirable uninstructed deviations and therefore the purchase of Regulation will be reduced. The 10-minute market will allow the to follow load throughout the hour. ADS will further enhance load following.

One Price also provides a clear price signal to the entire market, which will encourage behavior consistent with the ISO's instructions.

2) Create an incentive to submit bids, and to respond to Dispatch instructions

With a clear transparent price signal set forth by having one price per instruction there will be a clear incentive to participate in the market.

There will also be a clear incentive to follow specific dispatch instructions because a Market Participant can be guaranteed their bid price or higher for all increments in which they were instructed without being concerned with 3 different prices associated with one instruction as per the ISO proposal. Participants have an incentive to bid since the uninstructed payment may be less than the instructed payment.

One Price is superior to the ISO proposal in that instructed generation will be paid as bid or higher. The ISO proposal, specifically residual energy, can result in payments significantly below a bid.

3) Establish an incentive to deliver Instructed Imbalance Energy during the specific BEEP Intervals in which it is instructed.

One price sends a clear price signal for each 10-minute interval, eliminating hourly price chasing and “stuck” prices. Market Participants that bid in the Imbalance markets will be provided an incentive to follow instructions and receive their bid price or higher within each instructed interval. Uninstructed deviations will also be reduced in that the price risk to deviate into the imbalance market exposes the Market Participant to the average price.

4) Provide an incentive for remaining uninstructed Energy to be delivered in the BEEP Intervals in which the ISO needs the deviations.

One Price sends a clear 10-minute price signal. The clear price signal will result in uninstructed energy when the ISO needs the energy.

5) Establish an incentive for smooth transition from hour to hour schedules.

The clear price signal of One Price, not complex settlement accommodation, is the correct method to achieve desirable ramps. Units within the control area who’s POP changes from one hour to the next will generally not begin ramping as the ISO believes they will based on the ISO’s proposed ramping payment method.

- a) If they have dispatch discretion (IE no fuel/transmission issues) they will move their units based on supplemental/uninstructed deviations and “No Pay”. When following an uninstructed deviation, they will wait until the first interval price is published to “see” what the ISO is doing.
- b) If they do not have dispatch discretion they will begin ramping in a manner that maximizes revenue based on their ramping characteristics and an expectation of prices.

6) Mitigate disincentives to follow ISO instructions

One Price provides a clear price signal so that behavior will be rational and predictable.

Objectives of Real-time Market Enhancements

1. Reduce CPS2 violation
2. Reduce AGC procurement cost
3. Eliminate “stuck price”

Causes of the problems:

Problems	Causes
CPS2 Violation	a) Large uninstructed deviation b) Inter-hour ramping
AGC over procurement	Same as above
Stuck price	a) neighboring control area transmission arrangement b) allowing “stuck price”

- Large uninstructed deviation is what we need to focus on!
- Inter-hour ramping problem is primarily caused by inter-tie ramping too fast. In the past, this was offset by moving fast ramping (hydro) in the opposite direction in anticipation of the inter-tie schedules. This problem will not go away by instituting INC/DEC punitive prices.
- “Stuck price” can be eliminated simply by not letting the pre-dispatched import to set the price.

Causes of uninstructed deviations and solutions:

1. Price chasing
 - will be discouraged by 10-min settlement even without INC/DEC punitive prices.
2. Non-performance
 - ADS will facilitate communication of instruction and response in a timely manner; non-performance will likely be predictable and easily be monitored.
 - Constrained resources are price takers and not expected to be dispatched on 10-min basis; the non-performance issue becomes predictable and therefore manageable.
 - Resources that are capable of following 10-min instructions will response to 10-min prices. There is no reason for an unit not to generate if the price signal is right. The price signal should be focused on encouraging performance rather than punishing non-performance.
3. Real-time load v.s. scheduled (non-participating) load
 - Real-time load is not step function as scheduled and neither is load controllable
 - The difference between real-time load and scheduled load needs load following which is provided by the 10-min dispatchable resources.
 - Once load following is done properly, uninstructed load deviation should not cause excessive AGC or CPS2 violation because real-time load forecasting is extremely accurate!

Why the single price 10-min settlement proposal is effective in discouraging price-chasing?

1. Currently a price-chaser can make a good estimate where the hourly ex-post price may be after seeing a few high BEEP interval prices at the beginning of the hour because the high BEEP prices contribute to the high hourly ex-post price. However once the 10-min dispatch and settlement is in place, it will be much more difficult to make price-chasing decisions because of the short time frame and the increased difficulty in forecasting 10-min interval prices.
2. A unit that chases a high price in one 10-min interval will likely be exposed to a low price in the next 10-min interval as a price taker. One would chase price only in the situation where one can predict a high price based on new information available after having submitted the bids. Since this situation is eliminated by 10-min settlement, price-chasing becomes very risky. Any reasonable player would prefer being dispatched according to its bid instead of taking the risk.