CALIFORNIA ISO

California Independent
System Operator

November 15, 2002

Via Federal Express

Senator Joseph L. Dunn
California State Senate
State Capitol Building
Room 2080
Sacramento, CA 95814

Re: Senate Select Committee to Investigate Price Manipulation of the Wholesale Energy Market

Dear Senator Dunn:

Enclosed please find a report by the ISO's Department of Market Analysis entitled "*Did Any of Enron's Trading and Scheduling Practices Contribute to Outages in California?*" The report was prepared by Dr. Eric Hildebrandt, Manager of Market Investigations, and has been reviewed by the Market Surveillance Committee. It is marked as Bates Nos. 4685 -- 4701.

The ISO will make this report available to the public and will post it on our website within the next day or so.

Sincerely,

Beth Ann Burns
Litigation Counsel

cc: Senator Morrow
T. Winter
C. Robinson

Did Any of Enron's Trading and Scheduling Practices Contribute to Outages in California?

By Eric Hildebrandt, Ph.D.
Manager, Market Investigations
California ISO

This document addresses issues raised in the first two memoranda submitted as part of testimony by Robert McCullough before the California Select Committee to Investigate Price Manipulation of the Wholesale Energy Market.[1] McCullough's first memo (dated June 6, 2002) includes two (directly contradictory) hypotheses for how the Enron trading schemes outlined in internal Enron memos[2] may have contributed to blackouts during the winter of 2000-2001.

- **Phantom Congestion**. McCullough first contends that "evidence exists ...outside of the control of the ISO, that apparent congestion into Northern California may not have really existed and that the resulting blackouts may not have been necessary."(June 5 memo, p. 3). Thus, McCullough first suggests that blackouts may have been caused by the ISO's efforts to mitigate phantom congestion,
- **Phantom Relief of Real Congestion.** McCullough notes that the Enron schemes reviewed in his memos were designed to create "the illusion of transactions that could alleviate congestion" (June 5 memo, p.1), and suggests that such schemes could cause operational problems that could have lead to blackouts.[3]

McCullough also offers a third possible explanation for the blackouts during the winter of 2001:

- **Operational Error.** "Operational error that during a prolonged period when the ISO did not recognize the possibility to use the [interties connecting California to the northwest] to avoid Path 15 problems" and allow more power to flow from southern to northern California.

Our analysis of the practices reviewed by McCullough and other practices described in the Enron memos does not indicate, based on data available to the ISO, that blackouts during the winter of 2001 were attributable to any of these schemes, and were instead the result of a combination of two factors:

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[1] Memorandum on *Congestion Manipulation in the ISO California*, June 5, 2002 by Robert McCullough to McCullough Research Clients (June 5 memo) Additional comments submitted by McCullough in a second memo, entitled *Three Crisis Days at the California ISO*, submitted on September 16, 2002 (pages 1-14 only provided at hearing), addressed in an addendum to this document (September 16 memo).

[2] See Enron memoranda discussing Enron trading strategies in California wholesale energy markets and California ISO sanctions for such strategies., dated May 6, 200December 6, December 8, May 6 and undated Status Report, available on FERC website (http://www.ferc.fed us/electric/bulkpower/pa02-2/pa02-2.htm).

[3] Thus, McCullough first suggests that blackouts may have been caused by the ISO's efforts to mitigate phantom congestion, and then suggests that blackouts may have been caused by phantom relief of real congestion

- the limited supply of energy that was made available to the ISO by suppliers within and outside of the system, and

- the limited transmission capacity available to deliver energy from southern to northern California during the blackouts that occurred only in NP15 during January 2001.

In addition, as a general matter, it should be noted that all of the trading and scheduling strategies outlined in the Enron memos would cause detrimental financial impacts, primarily in the Day ahead and Hour ahead markets, but would typically not impact system reliability, particularly in the manner suggested by McCullough. For example, none of the strategies outlined in the Enron memos could ultimately constrict supply into the ISO system in real time by creating phantom congestion. In real time, the ISO manages congestion, dispatches real time energy, and declares system emergencies based on actual system loads and generation observed in real time, rather than by Day Ahead or Hour Ahead schedules submitted by participants. Thus, as discussed in more detail below, there is not indication based on information available to the ISO that the Enron trading and scheduling practices discussed by McCullough impacted system reliability in either the manner or degree suggested by McCullough.

Phantom Congestion

- *McCullough incorrectly assumes that during the blackouts in Northern California during the winter of 2000/2001, the supply from the Northwest was limited by "phantom" congestion on the California Oregon Intertie (COI).*

McCullough explains that "since two paths exist into Northern California – Path 15 and the California Oregon Intertie – it is logical that the ISO also believed it faced congestion along the California Oregon Intertie" during the six times that blackouts occurred in Northern California (p. 2). However, the ISO has never contended that during these blackouts supply from the Northwest was limited by congestion on the COI. On the specific day singled out in McCullough's memo as warranting additional explanation (January 17, 2001), ISO records indicate that there simply was not any additional supply available to the ISO over COI (see Figure 1). For example, for January 17th no bids for energy were submitted to the ISO from suppliers in the Northwest over the COI in the formal real-time energy market (commonly referred to as the "BEEP stack"). Due to the lack of supply bids offered through the real-time market, the ISO procured all the energy it could over the COI through out-of-market (OOM) transactions, and arrangements to circulate power from Southern California into Northern California via the Northwest using the NOB DC line (as discussed below and in Figure 2). At this time, all resources in the West were under a DOE Order issued at the request of the ISO to make all excess capacity available for sales to the ISO. Thus, on January 17, 2001 (as with other dates when blackouts occurred), the supply available over the COI was limited primarily by the lack of supply offered to the ISO, rather than by congestion – phantom or otherwise – on the COI. [4]

[4] Although the DOE Order required all sellers to offer excess capacity to the ISO, the date singled out by McCullough (January 17th, 2001) is also precisely the point at which CDWR began to make significant

- *Although two of the schemes outlined in the Enron memos (but not discussed in McCullough's memo) could have created "phantom congestion" in the Day Ahead market, none of these schemes could have contributed to blackouts.*

There are two gaming schemes outlined in the Enron memos involving "overscheduling of load" ("inc'ing load" and "load shifting to increase FTR revenues") that could increase congestion or create "phantom congestion" that would increase the ISO's perception of congestion in the Day Ahead and Hour Ahead markets. However, none of these practices could have contributed to the outages occurring in the winter of 2001 for several reasons.

First, overscheduling of load could only create or exacerbate congestion in the Day Ahead and Hour Ahead congestion markets, rather than in real time. While such schemes could have financial impacts on participants in the Day Ahead and Hour Ahead congestion markets, schemes based on "fictitious load" would only increase the amount of energy that is scheduled into a zone, and could therefore only impact reliability by creating an oversupply of energy in real time. While any activity that increases the ISO's need to adjust and manage resources in real time can have a negative impact on reliability or contribute to an outage, the outages during the winter of 2001 were clearly not due to an oversupply of energy in real time.

Second, the only scheme discussed in the Enron memos that involved the creation of "phantom congestion" was the strategy of oversheduling load within SP15 in order to create or exacerbate congestion in the north to south direction on Path 26 (the direction in which Enron owned FTRs on Path 26) in order to increase FTR revenues. This strategy would not have contributed to blackouts by limiting supply into NP15 since it would decrease, rather than increase congestion in the south to north direction on Paths 26 and Path 15. In addition, analysis by the ISO indicates this strategy was not successfully employed to increase FTR revenues.

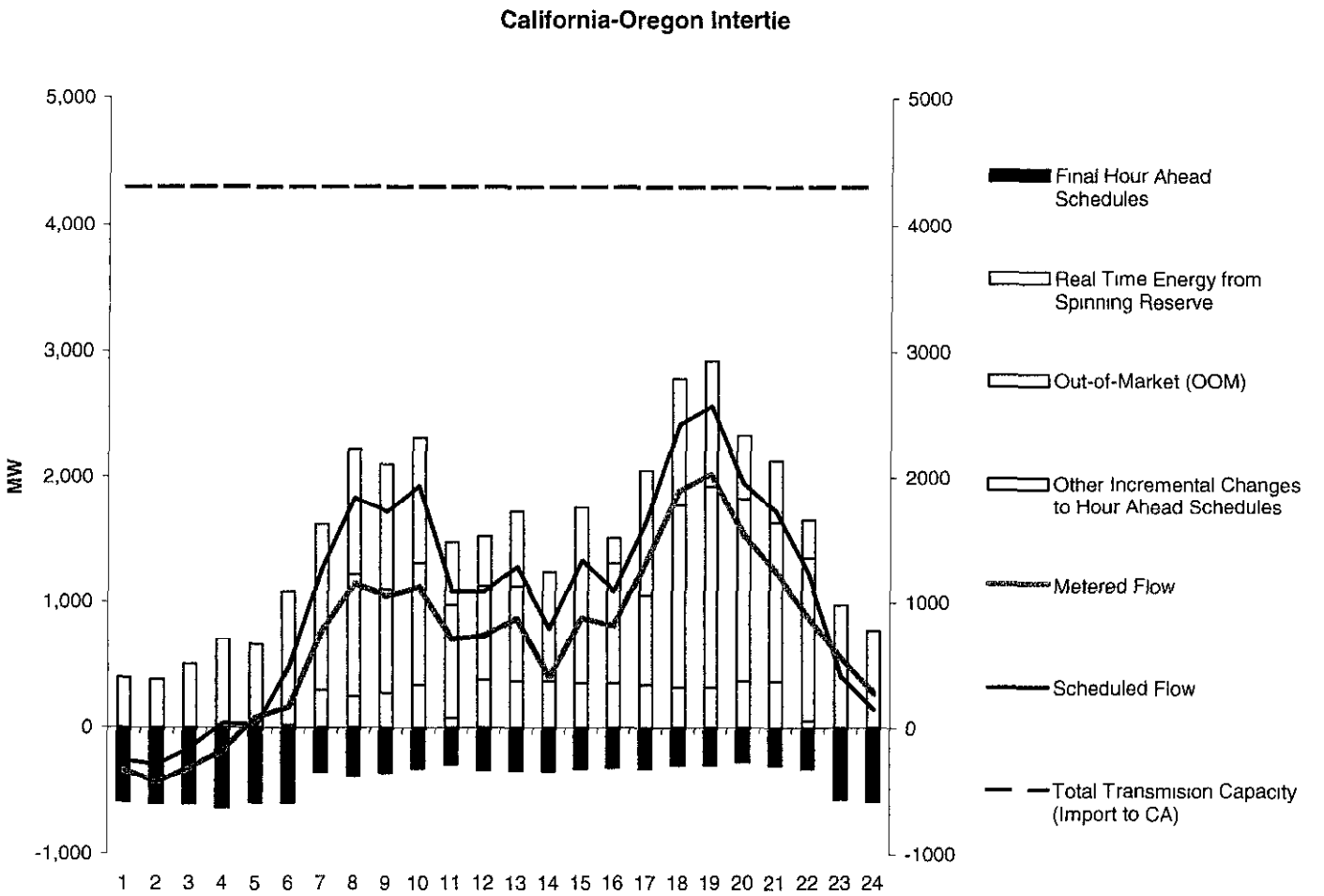
Finally, the ISO has examined these load scheduling practices and our review indicates that none of these appear to have been employed by Enron on January 17th. On January 17, 2001, Enron scheduled a moderate excess of energy over actual metered demand in both NP15 and SP15. (See Figure 3). Since load was moderately overscheduled in each zone, the net effect of this overscheduling on scheduled flows on Path 15 were minimal.[5] More importantly, however, the ISO monitors actual flows on Path 15 in real time and bases real time scheduling and dispatch decisions on these actual observed flows, so that any impact that overscheduling of load may have on scheduled flows on Path 15 would not limit actual supplies in real time.

OOM purchases of imports in order to address the problem of the lack of a credit worth buyers that sellers were willing to sell energy to meet California's "net short" load.

[5] The is due to the fact that overscheduled load in one zone has the effect of canceling out overscheduled load in the other zone insofar as the amount of flow over the tie connecting the two zones is concerned.

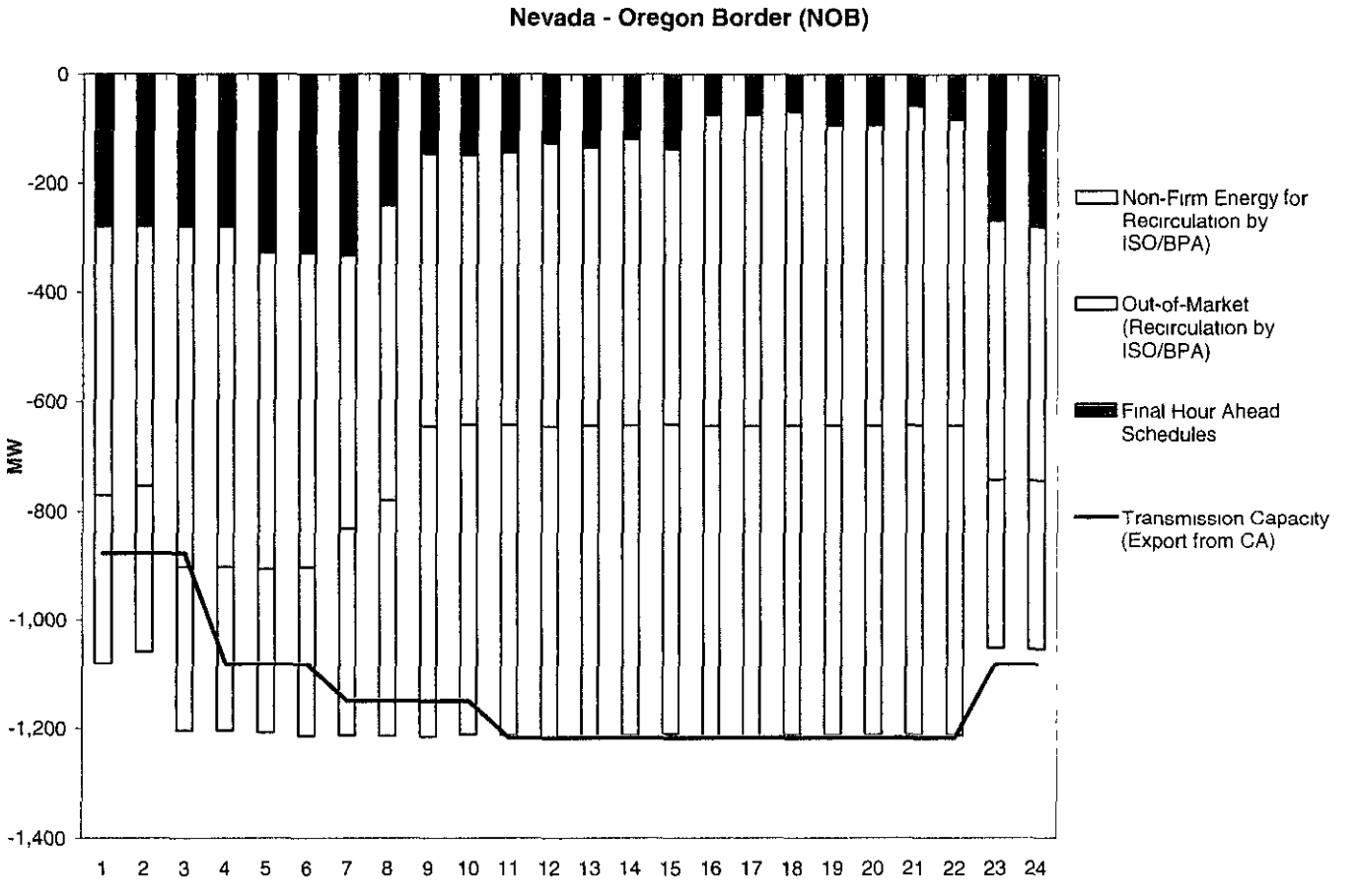
In addition, it should be noted that Enron in no way appears to have benefited from this overscheduling of load since for energy delivered for scheduled load in excess of its actual metered load, Enron received a relatively low decremental energy price, which was capped at the $150/MW soft cap during this period --- well below prevailing prices for energy the ISO instructed energy market (the BEEP "as-bid" market), OOM transactions, and other bi-lateral markets.

Figure 1: Scheduled and Metered Flows on COI, January 17, 2001



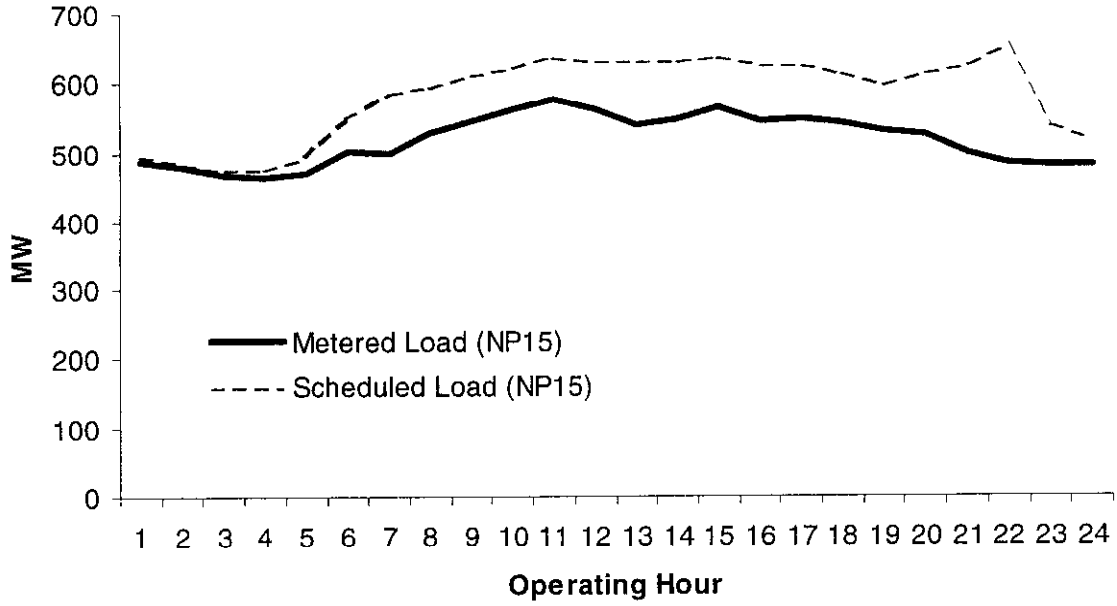
The figure above shows scheduled and actual metered power flows on COI for January 17, 2001. Final Hour Ahead schedules indicated a net flow in the export direction, with the final net Hour Ahead schedules averaging 468 MW in the export direction. Wheeling of energy through the ISO system accounted for about 60% of these net scheduled exports, with net exports of energy originating the ISO accounting for an average of less than 200 MW per hour. In real time, however, actual flows were in the import direction due to the large quantities of imported energy procured out-of-market (OOM) and other real time energy that was "re-circulated" by the ISO from Southern California to Northern California via the Northwest (exported from Southern California on NOB, and then imported into Northern California on COI). As shown above, scheduled and actual imports on COI were well below the total available capacity due to the limited supply that was offered for sale to the ISO by suppliers in the Northwest. In addition, the amount of power that could be recirculated by the ISO from Southern California to Northern California via COI was limited by the capacity available to export power from Southern California to the Northwest on NOB As shown in Figure 2, the ISO utilized NOB to export power for re-circulation via COI, but the quantity that could be re-circulated was ultimately limited by the amount of transmission capacity on NOB

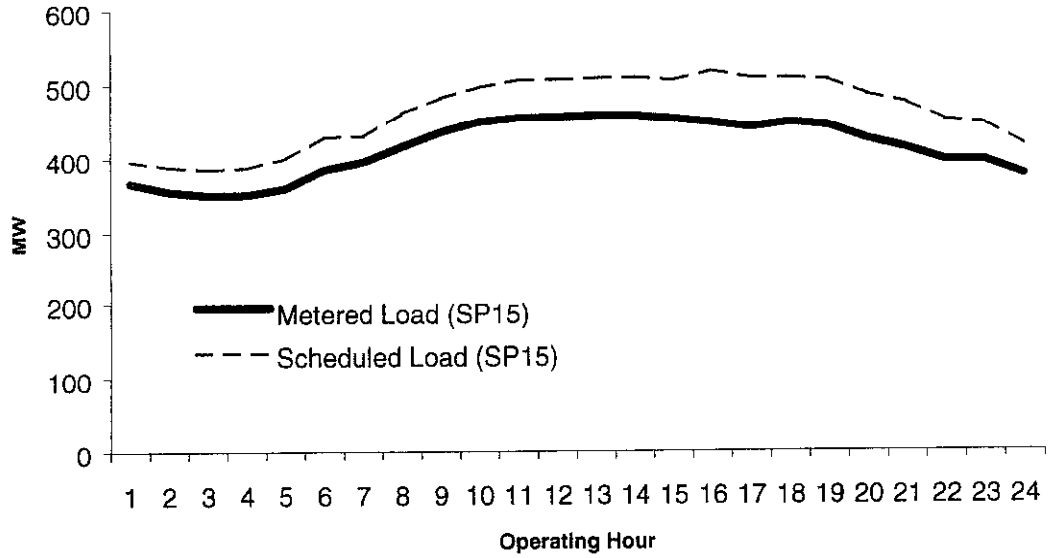
Figure 2: Scheduled Flows on NOB DC Line, January 17, 2001



The figure above shows that the full capacity of the NOB DC line was utilized on January 17, 2001 to export power from Southern California (SP15) to the Northwest, with virtually all of these exports being arranged by the ISO for re-import into Northern California (NP15) via the Northwest (see portion of exports from OOM purchases and other non-firm energy recirculated by ISO/BPA). This indicates that, contrary to suggestions of "operator error" by the ISO made by McCullough, the ISO made full use of the NOB DC line to maximize the amount of power that could ultimately be delivered from Southern to Northern California.

FIGURE 3. ENRON OVERSCHEDULED LOAD BY A MODERATE AMOUNT IN BOTH NORTH AND SOUTH ON JANUARY 17, 2001





Phantom Relief of Real Congestion

- *McCullough's fundamental argument is contradictory in that, rather than causing "phantom congestion" (which, McCullough suggests, led to blackouts), all the congestion schemes discussed by McCullough are designed to earn congestion revenues by providing relief of congestion.*

Each of the specific schemes discussed by McCullough would in fact lead the ISO to believe that there was less congestion than there actually was and/or allow a greater amount of energy to be scheduled on a Day ahead and Hour Ahead basis. Therefore, none of these schemes could have decreased the amount of supply ultimately available.

McCullough seems to support his alleged nexus between these schemes and the outages that occurred in the winter of 2001 by arguing that "if Enron, or any other market player, can alleviate congestion south to north, they can cause congestion to occur with identical methods by simply reversing the direction of the imaginary schedules." (June 5 memo, p.5). What McCullough's logic misses is that while it may be true that a market participant could "reverse" these schemes to increase congestion, there is simply no financial incentive to do so. On the contrary, a participant that reversed any of the schemes discussed by McCullough would simply get billed by the ISO for the additional congestion added to the system.

In addition, as discussed in other sections of this memo, there is simply no evidence that any of the schemes reviewed by McCullough and other practices described in the Enron memos contributed to the blackouts that occurred in the winter of 2001.

- *McCullough incorrectly assumes that all the Enron congestion practices discussed are based on a cycle of transactions that are canceled or "broken" prior to real time and therefore do not provide any congestion relief.*

McCullough's argument that each of the Enron schemes "are simply a modern version of check kiting" (June 5 memo, p.1) is based on the flawed assumption that:

> Each scheme is based on the fact that schedules can be broken before energy flows take place. This allowed Enron to create an imaginary cycle of trades through the ISO ...[akin to "check kiting"]. In this case, Enron knew that the ISO would trigger the adjustment bids and cancel the proposed transaction. (p.5)

However, none of the schemes discussed in McCullough's memo appear to actually rely on canceling of a schedule by Enron or the ISO, or any other party.[6] In addition, a

[6] The only scheme described in the Enron memos that did involve the actual cancellation of a schedule (Non-Firm Counterflows") is not discussed in McCullough's memo, and was identified and prohibited by the ISO through a Market Notice issued under its Market Monitoring and Information Protocol (MMIP) shortly after this practice was first employed. As part of a general review of all gaming strategies outlined in the Enron memos and related documents available to the ISO through the State Attorney General and FERC websites, the ISO is currently investigating other potential variations of any strategy based on canceled schedules. Results of this analysis indicate no other variation of this strategy (such as cancellation

review of records for the specific day singled out by McCullough (January 17, 2001) shows that no schedules were canceled by Enron and the other entities mentioned by McCullough as being potentially involved these various schemes.

- *McCullough incorrectly assumes that Death Star and other circular scheduling schemes create "phantom congestion".*

All of the basic schemes reviewed by McCullough appear to involve a "circular" series of schedules, which are eligible to earn congestion revenues under the ISO congestion management system because they create "counterflow" schedules that make additional transmission capacity available to other Market Participants in the Day Ahead and Hour Ahead markets. While it is true that circular schedules do not cause energy to flow in "circles", the net effect of these schedules, given the *contract path* method of scheduling used in the ISO and throughout the WECC, is to, in effect, allow other energy schedules to be "diverted" around congested interties and thereby increase the total amount of energy that can ultimately be scheduled to flow over congested paths into California. The fact that, in real time, power does not actually flow along each tie in accordance with the schedules submitted by each participant due to fundamental different between contract path flows used to schedule power throughout the WECC and the way power actually flows on an electrical grid or network under actual operating conditions. In real time, depending on system conditions, the type of circular scheduled described as the Death Star scheme in the Enron memos may or may not increase the actual loading on the branch group on which the circular schedule was designed to relieve congestion by providing a counterflow. If, due to the specific system conditions in real time, such circular schedules do mitigate congestion as is assumed by the simplified contract path models used for Day Ahead and Hour Ahead congestion management, critical transmission limits may be reached and could force the ISO to adjust resources in real time to relieve these line loadings. However, the circular schedules described under Death Star and other schemes discussed by McCullough do not as McCullough suggests, create "phantom congestion" that would cause the ISO to order curtailment of load when no congestion actually occurred. If anything, such schedules may have the opposite impact in that they may provide "phantom relief" of actual congestion.

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of wheeling or firm schedules) was widely employed, and that total congestion revenues earned from export/import schedules that were canceled prior to real time have totaled only $3 million from 2000 to June 2002. It is important to note that not all these revenues could be attributed to gaming, since in many cases schedules were canceled due to curtailments made by the ISO itself

- *The Red Congo scheme discussed by McCullough could only decrease actual or phantom congestion.*

The Red Congo scheme discussed by McCullough appears to have the functional effect of reducing congestion in the Day Ahead and Hour Ahead markets by, in effect, converting capacity that would need to be reserved for ETC rights into transmission capacity that is available for scheduling by any supplier through the ISO's congestion management market on a Day Ahead or Hour Ahead basis. Thus, it appears that the Red Congo scheme discussed by McCullough could only decrease, rather than increase, actual or phantom congestion. At the same time, it should be noted that information on the specific details of the Red Congo scheme discussed by McCullough appear to be based on materials obtained by the Senate Committee from Enron through discovery which the ISO does not have access to and has not reviewed.

Operational Error

- *Although McCullough suggests that the ISO did not recognize the possibility to use the interties connecting California to the Northwest (NOB and COI) to avoid Path 15 problems, records show that the ISO maximized use of the NOB DC tie to circulate additional power around Path 15 from Southern to Northern California.*

As shown in Figure 2, the full capacity of the NOB DC line was scheduled on the day singled out by McCullough (January 17, 2001). As shown in Figure 2, scheduling records for this day show that the ISO arranged with BPA and LDWP for the export of over 1,000 MW per hour from Southern California (SP15) over the NOB DC intertie for re-import back into Northern California (NP15) over the COI in order to maximize the amount of power that could be delivered from the south to the north by making full use of the NOB DC line).

Other Comments on McCullough's June 6 Memo

- **Cut Schedules.** Schemes based on cancellation of counterflow schedules could also threaten reliability – not by limiting supply, but by creating a need to reduce flows over ties in real time as congestion occurred. However, our review indicates that no schedules were canceled on January 17th and that in fact the incidence of such potential schemes has been relatively rare throughout the ISO's operating history.

- **MW Laundering.** Export and OOM schedules on January 17th do provide some evidence that a limited amount of energy could have been exported from California and then re-imported through out-of-market sales to CDWR and the ISO. Since there was no hard price cap in effect during this time, one reason for this "laundering" of MWs during this period was to seek to escape the cost review and refund obligation in effect under FERC's December 15 Order. At that time, it was uncertain whether this refund obligation would be applied to OOM sales, in addition to sales in the ISO's formal real time market (OOM). In addition, the ISO suspects that MWs were "laundered" into imports in order to allow the seller to claim a higher cost basis in the

event they were subjected to cost review and cost-based refunds. Finally, OOM sales that were made through CDWR rather than the ISO provided a means to receive immediate payment from CDWR and may have been perceived by sellers as being less likely to be subject to refund by FERC.[7] While this "MW laundering" served as a means of avoiding cost reporting and refund, such "laundering" does not appear to have had an impact on reliability. On the contrary, to the extent that this may have made sellers more willing to sell to the ISO and CDWR (albeit at an inflated price), such "laundering" would have increased supply ultimately offered given the lack of any other creditworthy buyer and the uncertainly about potential refunds that might ultimately be ordered by FERC.

- Very limited information is provided on the specific details of many – if not most -- of the schemes mentioned in McCullough's June 5 memo (e.g. Black Widow, Red Congo, Cong Catcher, Bid Fort). These references appear to be based on materials obtained by the Senate Committee from Enron through discovery which have been made available to McCullough but which ISO does not have access to and has not reviewed.

[7] In fact, under FERC's current refund rulings, sales made through the State of California's Schedule Co-ordinators (CDWR and CERS) have in fact been ruled to be exempt from refunds

Addendum:

Was "Fat Boy" Strategy Used to Help Cause May 22, 200 Price Spikes? Response to McCullough's September 6, 200 Memo and Testimony

This attachment addresses additional statements and allegations made by Mr. Robert McCullough as part of a second memo provided on September 16, 2002 to the California Select Committee to Investigate Price Manipulation of the Wholesale Energy Market.[8]

McCullough's second memo (dated September16, 2002) and oral testimony before the Senate Committee include extensive discussion of price spikes that occurred on May 22, 2000, and specifically implies that the "Fat Boy" strategy outlined in the Enron memos was utilized to create and profit from price spikes occurring in the ISO's real time market starting on May 22, 2000. McCullough proposes that "the question concerning May 22, 2000 and its following emergencies is 'where did the capacity go"', (September 16 memo, p. 6) and then goes on to conclude that "Fat Boy answers the question raised above concerning where the generation went." (September 16 memo, p.9) McCullough apparently reaches this conclusion based on the mistaken assumption or impression that practice of overscheduling of load could somehow lead the ISO to unnecessarily declare a system emergency due to a belief that this overscheduled generation was not available to meet project load or to believe that loads would be higher than the ISO forecast.[9]

However, overscheduling of load simply does not have any such impact on the ISO's assessment of operating reserves for the following reasons.

- First, it should be noted that the ISO's determination of operating reserves and whether to declare a system emergency is based on a combination of (a) the ISO's short-term projection of system loads, (b) the difference between projected loads and scheduled generation (i.e. the projected demand for imbalance energy), and (c) the ISO's assessment of the generation and reserve capacity that will be made available to the ISO by suppliers to meet system demand for energy and operating reserves.
- Within this framework, any generation that is "overscheduled" (i.e. scheduled by an SC against demand not served by that same SC) simply has the effect of reducing the ISO's projected demand for imbalance energy that must be procured by the ISO to meet real time load. Thus, generation that "overscheduled" is not hidden from the

[8] Memorandum entitled *Three Crisis Days at the California ISO*, by Robert McCullough to McCullough Research Clients, September 16, 2002 (pages 1-14 only provided at hearing).

[9] On page 9, McCullough explains that "Parking energy at the ISO allowed [Enron] to profit from the Stage 1 and Stage 2 declarations without preventing the emergency entirely," and that "Enron's overschedule was 2% of total loads --- all by itself – which normally is the full step between a Stage 1 and a Stage 2 Emergency for this level of loads" This implies that any load that was overscheduled by Enron affected the ISO's calculation of operating reserves by either "hiding" this generation from the ISO or causing the ISO to include this "fictitious load" in the load projection upon which it calculation of operating reserves is based.

ISO, as McCullough assumes or suggests, and is instead directly factored into the ISO's decision about how much generation would be required to meet real time demand (or avert a system emergency).

- Meanwhile, any "fictitious" load that is used to overschedule generation is in no way included in the ISO projection of system loads used in ISO's decision about how much generation would be required to meet real time demand (or avert a system emergency). Rather, the ISO projects short-term loads based on actual observed loads and trends, independent of the amount of load scheduled by SCs.
- Thus, the net effect overscheduling is to increase the amount of generation scheduled to meet system loads, and thereby decrease the amount of additional generation that the ISO is projects will be needed to meet the anticipated demand in real time (or avert a system emergency).

Figures 4 through 7 illustrate the impact overscheduling of load by Enron (and other SCs) based on actual system conditions during the May 2000 price spikes which McCullough contends were caused or exacerbated by overscheduling of load by Enron.

- One of the contributing factors underlying the price spikes of May 2000 was unexpectedly high loads on May 20-21, when system loads exceeded the Day Ahead forecast by several thousand MWs, as show in Figure 4.

- As shown in Figure 5, prices spiked in the ISO's real time market on May 21, reaching the $750 price cap for several hours, while prices in the PX Day Ahead market remained in the $40 to $50 range.

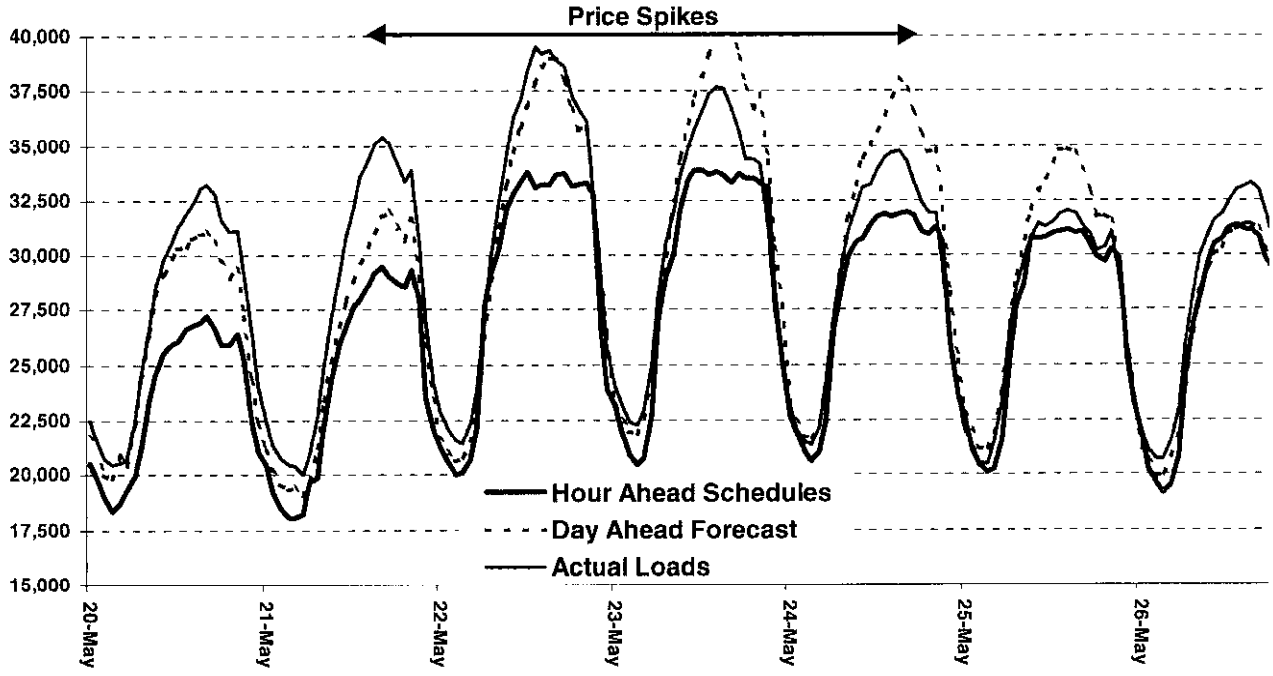
- Reacting to these prices, Enron and another SC overscheduled between 1,000 and 2,000 MW of generation as "price takers" in the ISO's real time market on May 22, as shown in Figure 6. On this day, prices in the ISO's real time market continued to exceed prices in the PX Day Ahead market by a significant margin, making this overscheduling strategy highly profitable relative to a strategy of selling in the PX on this day.

- On May 23, Enron and another SC continued to overschedule over 1,000 MW of generation as "price takers" in the ISO's real time market (Figure 6) . By May 23, however, prices in the ISO's market dropped to the $200 range, while prices in the PX rose to the $300 to $500 ranges (see Figure 5). Thus, by May 23, this overscheduling strategy had ceased to be profitable relative to a strategy of selling in the PX.

- As shown in Figure 7, the net impact of overscheduling generation by Enron and another large SC during this period was to reduce the difference between the amount of generation scheduled to meet ISO load and the ISO's projection of total system loads by about 1,000 to 2,000 MW. However, even with the additional scheduled generation by Enron and another SC, the ISO faced significant demand for real time energy, so that the net effect of this overscheduling of generation was to first reduce the ISO's projected shortfall of energy needed to meet real time demand, and, to then

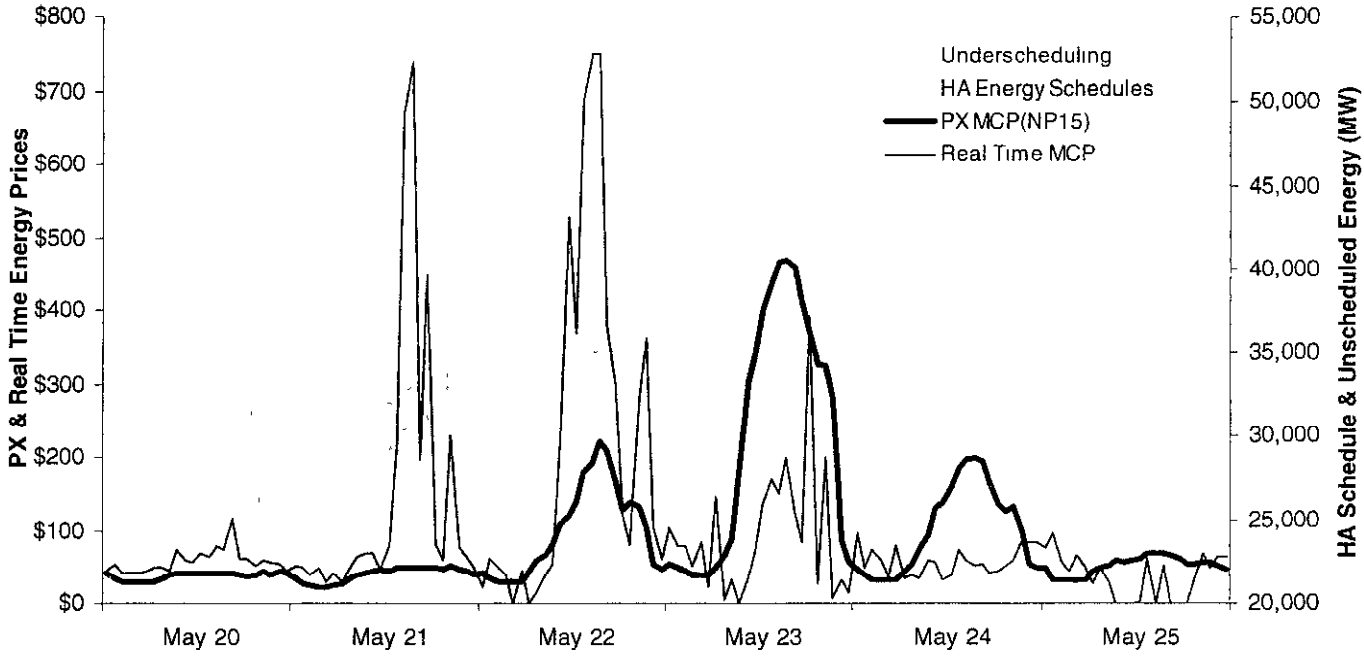
decrease the actual amount of generation that the ISO procured to meet real time demand.

Figure 4. Loads and Schedules During May 2000 Price Spikes



One of the contributing factors underlying the price spikes of May 2000 was unexpectedly high loads on May 20-21, when system loads exceeded the Day Ahead forecast by several thousand MWs,

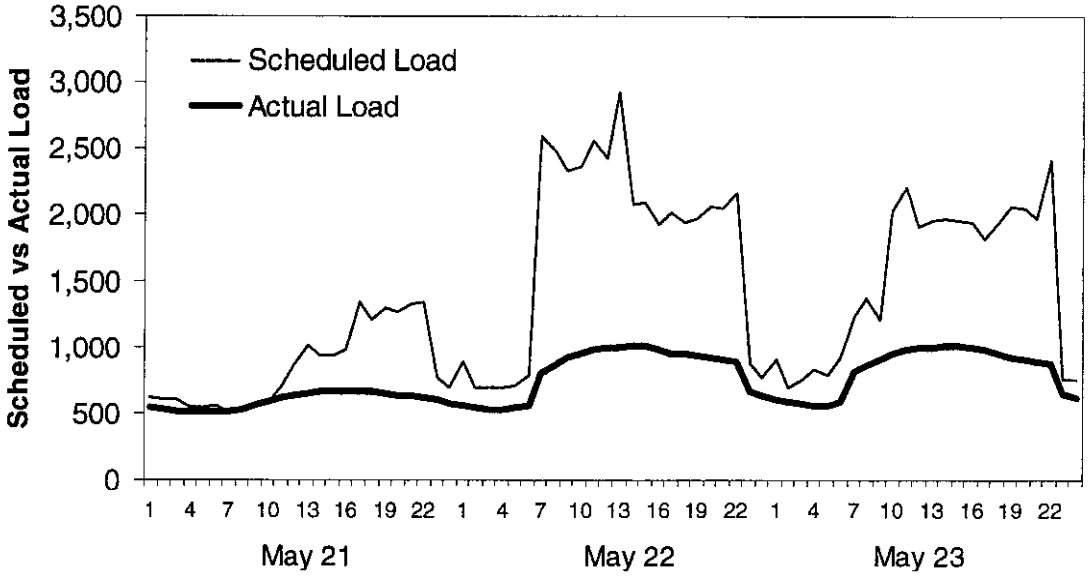
Figure 5. PX Day Ahead and Real Time Imbalance Prices (May 20-25)



As unexpectedly high loads occurred on May 20-21, prices spiked in the ISO's real time market on May 21, reaching the $750 price cap for several hours, while prices in the PX Day Ahead market remained in the $40 to $50 range. Reacting to these prices, Enron and another SC overscheduled between 1,000 and 2,000 MW of generation as "price takers" in the ISO's real time market on May 22, as shown in Figure 6.

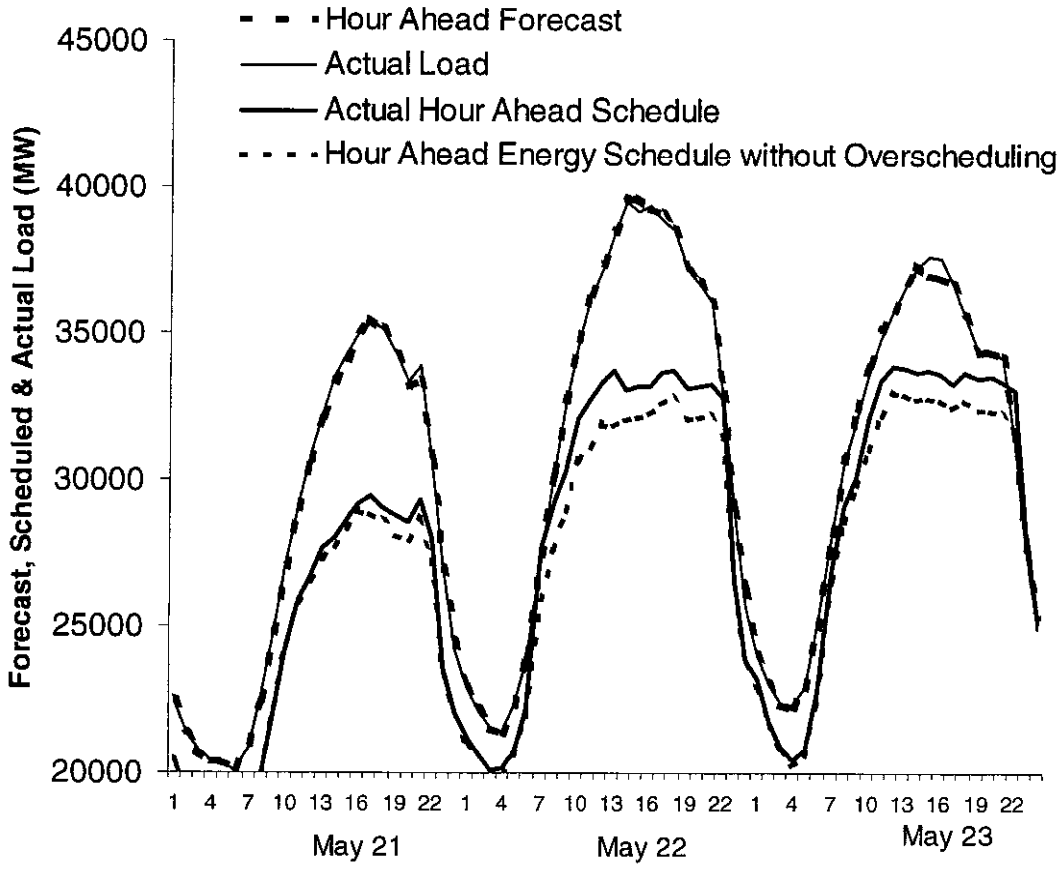
On May 22, prices in the ISO's real time market continued to exceed prices in the PX Day Ahead market by a significant margin, making this overscheduling strategy highly profitable relative to a strategy of selling in the PX on this day. However, on May 23, Enron and another SC continued to overschedule over 1,000 MW of generation as "price takers" in the ISO's real time market (Figure 6) . By May 23, however, prices in the ISO's market dropped to the $200 range, while prices in the PX rose to the $300 to $500 ranges (see Figure 5). Thus, by May 23, this overscheduling strategy had ceased to be profitable relative to a strategy of selling in the PX.

Figure 6. Overscheduling of Load by Enron and other Schedule Co-ordinator on May 21-23



As unexpectedly high loads occurred on May 20-21, prices spiked in the ISO's real time market on May 21, reaching the $750 price cap for several hours, while prices in the PX Day Ahead market remained in the $40 to $50 range. Reacting to these prices, Enron and another SC overscheduled between 1,000 and 2,000 MW of generation as "price takers" in the ISO's real time market on May 22, as shown in the Figure above. On May 22, prices in the ISO's real time market continued to exceed prices in the PX Day Ahead market by a significant margin, making this overscheduling strategy highly profitable relative to a strategy of selling in the PX on this day. However, on May 23, Enron and another SC continued to overschedule over 1,000 MW of generation as "price takers" in the ISO's real time market (Figure 6) . By May 23, however, prices in the ISO's market dropped to the $200 range, while prices in the PX rose to the $300 to $500 ranges (see Figure 5). Thus, by May 23, this overscheduling strategy had ceased to be profitable relative to a strategy of selling in the PX.

Figure 7. Impact of Overscheduling of Load on Overall ISO System Schedules



The net impact of overscheduling of generation by Enron and another large SC during this period was to reduce the difference between the amount of generation scheduled to meet ISO load and the ISO's projection of total system loads by about 1,000 to 2,000 MW. However, even with the additional scheduled generation by Enron and another SC, the ISO faced significant demand for real time energy, so that the net effect of this overscheduling of generation was to first reduce the ISO's projected shortfall of energy needed to meet real time demand, and, to then decrease the actual amount of generation that the ISO procured to meet real time demand.