Index of Relevant Material

Submitter (Party Name)	California Parties
Index Exh. No.	CA-349
Privileged Info (Yes/No)	Yes
Document Title	Prepared Rebuttal Testimony of Dr. Peter Fox-Penner on Behalf of the California Parties
Document Author	Dr. Peter Fox-Penner
Doc. Date (mm/dd/yyyy)	03/20/2003
Specific finding made or proposed	Market fundamentals do not explain the excessive prices charged by sellers in the ISO and PX markets during the period May 1, 2000 - June 20, 2001. Seller generated uninstructed to bypass organized markets. Seller submitted Bids in the ISO and PX Markets in order to exercise market power. Seller participated in collusive acts. Sellers participated in false load schedules. Sellers participated in Megawatt Laundering or "Ricochet". Sellers participated in "Death Star" or other Congestion Games. Sellers participated in the "Get Shorty" strategy of selling non-existent Ancillary Services to the ISO.
Time period at issue	a) before 10/2000; b) between 10/2000 and 6/2001
Docket No(s). and case(s) finding pertains to *	EL00-95 and EL00-98 (including all subdockets)
Indicate if Material is New or from the Existing Record (include references to record material)	New
Explanation of what the evidence purports to	Market fundamentals do not fully explain the price increases during the CA power crisis. Rather, market fundamentals and scarcity enabled and made profitable the exercise of market power and manipulation. The

show	supply-demand imbalance positioned the Big Five generators and Powerex to become pivotal suppliers with both the incentive and ability to exercise market power. The Enron trading strategies were not benign, but facilitated the exercise of market power and caused reliability problems, harms that are magnified through the trading strategies' use in conjunction with sellers' other market activities. Certain market participants' claims that they did nothing wrong are refuted by the evidence presented in this case.
Party/Parties performing any alleged manipulation	Various suppliers including Avista, Enron, NCPA, Powerex, Puget Sound, and Reliant

* This entry is not limited to the California and Northwest Docket Numbers.

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

San Diego Gas & Electric Company, Complainant,	)	**Docket Nos. EL00-95-000**
	)	**EL00-95-045**
	)	**EL00-95-075**
v.	)	
	)	
Sellers of Energy and Ancillary Services into Markets Operated by the California Independent System Operator Corporation and the California Power Exchange, Respondents.	)	
	)	
Investigation of Practices of the California Independent System Operator and the California Power Exchange	)	**EL00-98-000**
	)	**EL00-98-042**
	)	**EL00-98-063**
	)	

PREPARED REBUTTAL TESTIMONY OF
DR. PETER FOX-PENNER
ON BEHALF OF THE CALIFORNIA PARTIES

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I. INTRODUCTION AND SUMMARY

Q. Please state your name and address.

A. I am Peter Fox-Penner. My business address is 1133 20th St. NW, Washington, DC, 20036.

Q. By whom are you employed, and what is your position?

A. I am a Principal and the Chairman of The Brattle Group, an economic and management consulting firm with offices in Washington, Cambridge, MA, London, and California.

Q. Have you filed testimony previously in this proceeding?

A. Yes. My direct testimony in this proceeding was filed as Exh. No. CA-1, and my academic credentials and industry experience are set out in my vita, which is appended to that earlier testimony in Exh. No. CA-2.

Q. What is the purpose of this testimony?

A. I have been asked by Southern California Edison to discuss certain arguments raised in testimony filed on behalf of various suppliers who are parties in this proceeding ("Respondents").

Q. Which suppliers' testimony is addressed in your rebuttal?

A. My testimony discusses certain claims made in the testimony of Drs. Harvey and Hogan ("Harvey/Hogan") on behalf of Mirant, of Mr. Hamal

on behalf of Reliant, of Dr. Pickel on behalf of Powerex, of Dr. Cicchetti on behalf of Avista,[1] and of Dr. Wilson on behalf of Burbank, Glendale, Imperial Irrigation District, and Turlock Irrigation District.

Q. How is your rebuttal testimony organized?

A. Section II of my rebuttal testimony refutes claims that market fundamentals, that is, economic factors beyond the control of the suppliers, explain the high prices observed in California power markets in 2000 and 2001. This section discusses why the explanation I advance in Exh. No. CA-1, that market fundamentals and scarcity enabled and made profitable the exercise of market power and manipulation, is more consistent with all of the testimony and discovery in this proceeding, and why Respondents' discussion of the fundamentals does not prove their case.

Section III rebuts the claims by Drs. Harvey and Hogan that market power exercise was not significant due to CA suppliers' small market shares. In this section I show that the arguments of Dr. Pickel endorse the view that Powerex and other suppliers became pivotal during the crisis, implying both the incentive and the ability to exercise market power, and that Harvey/Hogan themselves do not rule out market power exercise.

[1] Avista Energy, Inc., BP Energy Company, IDACORP Energy L.P., Puget Sound Energy, Inc., TransAlta Energy Marketing (U.S.) Inc., TransAlta Energy Marketing (California) Inc., and TransCanada Energy, Ltd.

Section IV examines arguments by Harvey/Hogan and Mr. Hamal that various trading or gaming strategies (often dubbed the "Enron Strategies") employed by suppliers to take advantage of the power market were, in fact, economically beneficial. This section also responds to other sellers' claims that they did not engage in inappropriate market behavior. Finally, in Section V, I present corrections to two analyses in my direct testimony.

Q. Please summarize your conclusions.

A. My rebuttal to the Respondents' testimony may be summarized as follows:

1. The evidence presented by Respondents that purports to explain why "fundamentals" fully explain the price increases during the crisis does not nearly achieve the claimed quantitative results. At most they catalogue various factors indicating that market fundamentals were consistent with elevated prices during the crisis period from May 2000 through June 2001. Even then, changes in several fundamentals *do not* shift with prices, suggesting that the fundamentals alone are not the only causal factor. As conceded by Drs. Harvey and Hogan after 150 pages cataloguing purported shortage conditions in California and more generally in Western power markets, "[t]he existence of capacity shortages in California is consistent with a competitive origin of high prices but these capacity shortages also do not rule out the existence of market power." (Exh.

No. MIR-1 at 152:10-12) After noting that withholding capacity could contribute to shortages and raise prices, they admit, that "[n]one of the data we have analyzed rules out such withholding...". (Exh. No. MIR-1 at 152:14)

This is entirely consistent with my earlier testimony, which explains that tight market conditions set the stage for the exercise of market power by suppliers, and with the scholarly literature Harvey/Hogan dismiss. Furthermore, documentation of withholding and the deliberate exercise of market power is amply provided in evidence obtained by the California Parties ("CA Parties") that Drs. Harvey and Hogan (and other Respondent witnesses) do not address, as well as in settlements and other documents from the FERC and other government agencies.[2]

2. With respect to market power, Harvey/Hogan claim that the "Big Five" California power generators (Dynegy, Duke, Reliant, Mirant, and Williams/AES) had market shares too small to influence prices. In this rebuttal I show that this market share conclusion is based on a market definition that is economically incorrect and inconsistent

[2] The claim by Dr. Cicchetti to the effect that market fundamentals "explain" 95% of the price movements observed in California power prices is based upon an econometric analysis so flawed that it is not remotely credible, as explained in the testimony of Professor Lewbel (Exh. No. CA-356).

with Commission market measurement policies and precedent. As noted, even with their flawed market share calculation Harvey/Hogan do not rule out market power. As I explain in my direct testimony (Exh. CA-1, Section IV), a poor supply-demand imbalance positioned generators owned by major sellers in the West, including the Big Five and Powerex, to become pivotal. In addition to being "not ruled out" by Harvey/Hogan, this view is supported by Dr. Pickel's testimony and by several scholarly analyses as well as by the CA Parties' discovery documents, testimony, and other evidence.

3. With respect to manipulative trading strategies, I find that Respondent witnesses have analyzed only a few of these strategies in any detail, and even then apparently did not look at any documents or discovery. They make broad assertions that these trading strategies were benign arbitrage and did not substantially raise price. The first of these assertions does not address the detailed analysis of market harm I provided in Exh. No. CA-1 for each strategy, nor does it address the ISO's own very specific statements concerning the harm that comes from these trading practices. I also find that their second assertion, that prices were not substantially affected, misrepresents the complex relationship between the strategies I and

others have been able to analyze, bidding and withholding practices, and the prices paid by all market participants resulting from these practices.

II. RESPONDENTS' EVIDENCE ON MARKET FUNDAMENTALS DOES NOT REFUTE THE EXERCISE OF MARKET POWER AND PROFITABLE MANIPULATION

Q. What is the essential difference between Harvey/Hogan's view of the role of market fundamentals in the California power crisis and your view?

A. The critical difference between my assertion and that of Harvey/Hogan is that they claim that the unprecedented increase in prices in Western markets from May 2000 through June 2001 can be fully explained by "the fundamentals" as opposed to market power. They state that "[f]undamental forces of demand and supply, exacerbated by policy decisions in California – rather than market manipulation or the exercise of market power – can account for both the increase in prices beginning in the spring of 2000 and the decline of prices in the summer of 2001." (Exh. No. MIR-1 at 6:15-18) Dr. Pickel makes a similar claim. (Exh. No. PWX-1 at 2:3)

On the other hand, I believe that while fundamentals unquestionably played a role in tightening the market, they cannot fully explain the increase in prices seen during the crisis. Instead, the high degree of imbalance between supply and demand made various suppliers in Western markets pivotal during many periods, enabling the exercise of market power and profitable manipulation strategies. Moreover, some of the manipulative trading

strategies were intended to tighten portions of the market further in order to further inflate seller revenues. In short, market fundamentals set the stage for market manipulation and the exercise of market power.

Q. As an initial matter, does the Commission's Mitigated Market Clearing Price ("MMCP") method and the CA Parties' use of this method in the testimony of Dr. Stern in this proceeding attempt to replicate prices in a competitive market that take into account the changes in actual market fundamentals that occurred during the western power crisis?

A. Yes, the MMCP calculation framework is designed to factor in the market fundamentals that existed during the crisis period, such as the actual level of demand, supply of hydro power, and nuclear plant outages, into its result. The MMCP method was explicitly designed by the Commission to estimate prices that would prevail in a competitive market. This is made clear in the Commission's April 26, 2001 and June 19, 2001 orders, when the Commission chose a method that set the MMCP at the marginal cost of the last generating unit dispatched. The Commission chose this method because this approach "best replicates prices in a competitive market."[3]

Q. How do you respond to the information Drs. Harvey and Hogan have provided on market fundamentals?

[3] 96 FERC 61,418 at 62,560.

A. In Section II of their testimony, Drs. Harvey/Hogan present a number of facts and observations concerning many of the fundamental factors affecting Western power markets during 2000 and 2001. In the remainder of this section, I examine each of the main points Harvey/Hogan make regarding these factors.

For each of these fundamentals, I ask the following question: is the evidence presented regarding this particular factor sufficient to distinguish between the "fundamentals explain everything" versus the "market power and fundamentals" assertions, or is it consistent with either explanation? In every case, it is the latter.

Q. Do other witnesses for the suppliers also argue that fundamentals rather than the exercise of market power could cause the price movements observed during the crisis?

A. Yes. As I mentioned earlier, various experts for the suppliers put forth arguments that fundamentals explain what occurred in California power markets in 2000 and 2001. Since Drs. Harvey and Hogan seem to have the most comprehensive treatment of these issues, I have patterned my discussion on theirs.

Q. What is the first fundamental Harvey/Hogan discuss?

A. The first fundamental Harvey/Hogan discuss is the level of aggregate market demand or load. All else equal, it is uncontroversial that lower demand yields lower prices. Based on this, they argue generally that "[t]he rise and decline in California electricity prices coincides with a rise in demand, followed by falling demand in [sic] beginning in the spring and falling prices in the summer of 2001 when demand returned to more normal levels." (Exh. No. MIR-1 at 8:5-8) More specifically Harvey/Hogan state:

> *Table 2 shows that in May and June of 2000, reported peak loads for the California-Mexico region of the WSCC were well above prior levels for the corresponding months in prior years with comparable data, which contributed to the capacity shortages that led to the elevated prices during those months. In the following months, peak load in this region was within the range of peak loads in these same months in prior years, until it began to decline markedly in June 2001. (Exh. No. MIR-1 at 19:5-10, footnote omitted)*

and:

> *…although peak load in the California-Mexico region…fell below prior year levels for those same months starting in July 2000, this was not the case for WSCC loads outside California, which continued to exceed the prior year peaks for those months throughout 2000… (Exh. No. MIR-1 at 22:4-7)*

Examining these statements closely we see two assertions. First, they assert that price increases coincided with peak loads rising above normal levels. This is simply not the case. Table 2 in their testimony (Exh. No. MIR-1 at 19) shows that peak load in May did not exceed levels seen in

earlier comparable years (45,947 MW in 2000 vs. 47,027 MW in 1997). Furthermore, except for June, peak loads in the remainder of 2000 "fell below prior year levels for those same months…" (Exh. No. MIR-1 at 22:5-6) Although prices in CA power markets went up in June 2000, they did not drop below prior year levels in July or August 2000 or any of the succeeding months when CA demand fell below levels seen earlier.

The second assertion is that peak loads "began to decline markedly in June 2001." (Exh. No. MIR-1 at 19:10) But their Table 2 shows that peak loads in July and August 2001 were at or above June 2001 levels (June 2001: 46,173 MW; July 2001: 47,482 MW; August 2001: 48,351 MW) and far above those for the earlier spring months when prices were high. (Exh. No. MIR-1 at 19:11-14) Thus, to the extent that CA is a distinct market from the rest of the West – a topic I return to in Section III below – this fundamental refutes their argument.

Q. Does the situation change if one looks at the WSCC as a whole?

A. No. As seen in Table 5 of the Harvey/Hogan testimony (Exh. No. MIR-1 at 23), after July 2000, peak load in the WSCC also fell below levels seen in the months and years surrounding the CA energy crisis, with the exception of November 2000 and January and February 2001 (although demand levels in January and February were not materially higher than those in

previous years). So this does not explain the sustained high prices during this period. Similarly, the periods when prices fell do not correspond to the periods with lower peak loads. In 2001, June's peak exceeded that of May, and peak loads in both July and August eclipsed that seen in June, yet prices fell. All this is illustrated in Figure II-1 of Exh. No. CA-350, which shows that CA price levels and WSCC demand levels did not change in anything like a "lockstep" before, during, or after the crisis. In short, Westside demand does not seem to explain prices by itself very well either.

I also question the emphasis Drs. Harvey and Hogan have placed upon whether or not peak load in a particular month exceeds loads seen for that specific month in earlier years. Looking at Table 2 of the Harvey/Hogan testimony (Exh. No. MIR-1 at 19) we see that summer peak loads in the California-Mexico region of the WSCC declined steadily from 1998 through 2001. From 55,441 MW in 1998 (September), summer peaks were down to 53,146 MW in 1999 (July), 51,213 MW in 2000 (August) and 48,351 MW in 2001 (August). In the WSCC as a whole, 1998 was again the peak at 131,680 MW (August), while 2000 saw a peak of 130,892 MW (July) and 2001 dropped to 125,040 MW (August). (Exh. No. MIR-1 at 23:Table 5) Thus from their own data it can not be credibly argued that peak loads in California or the West were extraordinary in the summer of 2000 or in the period of the crisis more generally.

A final point puts the impact of marketwide demand on price in some perspective. Harvey/Hogan assert that "over 2000 as a whole, electric energy consumption in this region was up over five percent from 1999, which itself saw a 3 percent increase from 1998." (Exh. No. MIR-1 at 8:2-4)

If this level of increase in demand is meant to convince observers that demand increases explain high prices, such an argument falls far short of the mark. Throughout most of this century, electricity demand has increased year after year throughout the United States, often by 5% a year or more, without triggering sustained real price increases of any kind, much less the largest and most sustained price increase in the history of the industry.

Q. Does your discussion of demand levels mean that you disagree with Harvey/Hogan's assertions that demand levels impacted prices?

A. No, the level of demand in the CA markets obviously impacted price. But the pattern and level of demand shifts does not nearly explain the pattern and level of price increases. Furthermore, as explained above, the MMCP method is based on the actual demand levels experienced by the California ISO in every hour.

Q. Please comment on the second fundamental that Harvey/Hogan discuss, hydroelectric supply in CA and the whole WSCC.

A. Hydroelectric generation is an important source of power in the West. Harvey/Hogan point out that hydroelectric generation "fell substantially below the level available in the corresponding month over the 1995-1999 period beginning in June 2000 and fell even further relative to historic levels in early 2001." (Exh. No. MIR-1 at 37:23-38:2) Drs. Pickel and Cicchetti and Mr. Hamal also all mention adverse hydro conditions, especially Dr. Pickel. (Exh. Nos. MAR-1, PWX-1 and REL-1)

Harvey/Hogan illustrate adverse hydro conditions in Figure 22 (Exh. No. MIR-1 at 38) which is reproduced exactly as Figure II-2 in Exh. No. CA-350. However, a careful examination of the data in this figure shows that these data, again, do not support the witnesses' assertion that hydro conditions explain the high Western prices. In fact, the data in this figure alone show that the shortfalls in hydro generation were just as large, or larger, in months with low prices in the West as in months with very high prices.

To show this, I calculate the U.S. and Canada hourly average hydro generation "shortfalls" in January 2000 through September 2001 using the data from Harvey/Hogan Table 21 (Exh. No. MIR-1 at 277) and compare

them with reported average CA spot prices, as shown in Figure II-3 of Exh. No. CA-350. In this chart, I define hydro shortfall as the amount by which actual average hourly hydro generation in 2000 to 2001 was below that of 1995 to 1999. It is striking in Figure II-3 that the December 2000 prices were higher than those in January 2001 through June 2001 even though the shortfalls in the latter months exceeded that of December 2000 by 2,000-7,000 MW/hour. Most of all, hydro shortfalls peaked in Summer 2001, but of course, prices had dropped by then. It should also be noted that 1995 to 1999 itself was an above average period, so the shortfalls measured in this graph are somewhat overstated.[4]

Q. Drs. Harvey and Hogan say the demand net of hydro generation provides an explanation of price movements. Is this accurate?

A. No. Figure II-4 (Exh. No. CA-350), based upon hydro data from Harvey/Hogan Table 25 (Exh. No. MIR-1 at 42), plots WSCC demand net of hydro generation along with average monthly spot electricity prices in California. Demand net of hydro remains high in the summer of 2001 even as prices are falling rapidly.

[4] I have conservatively used only the data from 1995 – 1999 for this calculation. From Dr. Pickel's testimony (Exh. No. PWX-1 at 8-9) it can be seen that the average hydro-electric generation in the 1995–1999 period was about 283,000 GWh, above the 30 year average hydro-electric generation of 250,000 GWh.

Q. Does your disagreement with the point that reduced hydroelectric generation fully explains prices mean that hydro conditions have no impact on prices?

A. No, of course not. A relative reduction in the supply of hydro impacts prices, but in this market the periods of reduced hydroelectric generation do not correspond to high price periods, notably Summer 2001. Furthermore, the effect of hydroelectric supply reductions are reflected in an MMCP calculation because it is based on actual CA hydro generation and import levels in each hour during the crisis.

Q. Please discuss the third fundamental Harvey/Hogan point to, nuclear and coal supply.

A. Harvey/Hogan examine the supply of Western power from coal and nuclear plants during the crisis period. They first conclude that coal-fired power remained relatively unchanged from prior years, so this is not an explanatory factor one way or another. With respect to nuclear power, Harvey/Hogan assert that:

> *One of the contributing factors to the imbalance in supply and demand and resulting high electricity prices during the fall of 2000 and early 2001 was that not only did hydro generation output in the WSCC fall well below historic levels, but so did nuclear generation output in CA…The output of nuclear plants in California over the period January-May 2001 was lower than in any year except 1997. (Exh. No. MIR-1 at 42:10-19)*

Harvey/Hogan go on to list a number of nuclear plant outages and their dates, all of which are shown in the table below. (Exh. No. MIR-1 at 43-45)

Nuclear Unit	**Capacity Out (MW)**	**Outage Period**
Washington Nuclear Project 2*	230	April 1, 2000 to May 31, 2000
Diablo Canyon 1	1,100	May 15, 2000 to May 29, 2000
Washington Nuclear Project 2	1,150	June 27, 2000 to July 4, 2000
Washington Nuclear Project 2*	460	August 18, 2000 to September 1, 2000
Washington Nuclear Project 2	1,150	September 2, 2000 to September 7, 2000
Diablo Canyon 2	1,100	September 5, 2000 to September 18, 2000
Palo Verde 2	1,270	October 4, 2000 to November 6, 2000
San Onofre 2 (SONGS 2)	1,127	October 8, 2000 to November 19, 2000
Diablo Canyon 1	1,100	October 8, 2000 to November 25, 2000
San Onofre 3 (SONGS 3)	1,127	January 2001 through May 2001
Palo Verde 3	1,270	February 17, 2001 to March 1, 2001
Palo Verde 1	1,270	March 31, 2001 to May 14, 2001
Diablo Canyon 2	1,100	End of April 2001 through May 2001
Palo Verde 3	1,270	May 19, 2001 to May 21, 2001
Washington Nuclear Project 2	1,150	May 20, 2001 to July 2, 2001

*denotes a partial outage

Once again this supply fundamental does not match up with explaining high prices in the CA markets. I have graphed generation by nuclear units by month and average monthly prices in Figure II-5 of Exh. No. CA-350. As Figure II-5 shows, the outages were sometimes accompanied by high prices, other times by relatively low prices. For example, a coincident SONGS and Diablo Canyon outage occurred in October and early November 2000, which was a relatively low-priced period.

Here again I do not mean to suggest that nuclear outages, which reduce overall power supply, should not and did not have any impact on price. To the extent there was an impact, this would also be reflected in the MMCP calculation, as it is based on the actual units available to the market in each hour.

Q. Please discuss gas prices, the next fundamental on Harvey/Hogan's list of explanatory factors.

A. Gas prices are not an element of the demand and supply physical balance, but rather an input cost to gas-fired generators.

Harvey/Hogan first claim that:

> *The impact of gas prices on the level of electricity prices was particularly large during the spring of 2001 because California gas-fired thermal generation was operating at unprecedented levels and was dispatched to meet load throughout the WSCC (as opposed to being constrained on to manage congestion in isolated load pockets; see Table 33, appended). During prior springs, gas-fired generation in the West was much lower, more likely to be running to manage local transmission constraints, and less likely to be on the margin setting regional electricity prices." (Exh. No. MIR-1 at 50:4-10, footnote omitted)*

They then assert that:

> *[T]he increases in spot electricity prices are largely coincident with increases in spot gas prices. (Exh. No. MIR-1 51:7-8)*

and:

> *The period of high gas and electricity prices during 2000 and 2001 matches almost perfectly with the period in which monthly gas consumption in California was 10 percent or more above the 1999 level. (Exh. No. MIR-1 at 56:14-15 and at 57:1, emphasis added)*

The only data Harvey/Hogan provide to support these assertions are shown in their Figures 34 and 38 (Exh. No. MIR-1 at 51 and 57, respectively). It should first be noted that their Figure 34 shows pricing for a hub outside CA (COB), not an internal pricing point. Nevertheless, visual inspection of these figures suggests to me that the coincidence of gas and electric prices in these figures is hardly an "almost perfect" match. In Figure 34, electricity prices spiked over $200/MWh on average during Summer 2000 while gas prices remained at about $6/MMBtu or below. Figure 38, which I reproduce as Figure II-6 in Exh. No. CA-350, compares the ratio of gas demand in the current month to gas demand in that same month in 1999 (solid line) to PG&E citygate gas prices. This graph shows an even larger divergence than their Figure 34 – yet this is the graph Harvey/Hogan refer to as an "almost perfect" match.

Q. What about the possibility that the reported prices of natural gas shown in these figures, or the actual price paid for gas at the CA border, was inaccurately reported and/or inflated via the exercise of market power?

A. This possibility is discussed directly in the testimony of Dr. Harris, in (Exh. No. CA-15). For the purpose of this discussion, the point is that the evidence does not allow one to conclude that the published gas price indices reflect a gas cost to power generators that was the result of workable competition at all times during the crisis. Hence, this particular "fundamental" cannot be taken at face value to establish the "fundamentals explain everything" hypothesis. Given the evidence concerning gas market price manipulation, the impact of this "fundamental" is more in keeping with my combination hypothesis.

Q. Please discuss the next fundamental, environmental constraints.

A. Environmental constraints present the same problem as natural gas prices – prices of NOx emission permits may reflect market manipulation and thus may not reflect a workably competitive "fundamental." California Parties' witness McCann introduced evidence in his direct testimony (Exh. No. CA-11) that NOx markets had been manipulated by the trading behavior of certain generators. Further, a very recent paper by Jonathan Kolstad and Frank Wolak also challenges the notion that NOx prices were merely a market fundamental outside the control of sellers. The results presented in this paper – while acknowledged by its authors as "far from conclusive" – "strongly suggest that NOx emission prices were used by suppliers during 2000 to enhance their ability to exercise market power in the California

electricity market." (Exh. No. CA-367 at 28) This notwithstanding, my discussion of NOx issues will be limited to the question of whether Harvey/Hogan's discussion – even if taken at face value – supports their "only fundamentals" assertion.

First, I note that Harvey/Hogan acknowledge the fact that only about sixteen plants in CA must pay NOx emissions costs that are based on emissions rates. (Exh. No. MIR-1 at 285: note 3) Harvey/Hogan then state:

> *Some gas-fired generating units in the SCAQMD apparently had NOx emission rates ranging up to 4 or 5 pounds per MWh, emission allowances costing $10 to $40/lb could translate into variable cost adders of $40 to $200/MWh for gas fired generating units in the SCAQMD. (Exh. No. MIR-1 at 76:10-13)*

Accompanying this statement, Harvey/Hogan present emission rates for SCAQMD units in Table 46 (Exh. No. MIR-1 at 77), but that table reports only units with emissions rates greater than 1 lb/MWh.[5] Even so, there are only 4 units on this chart with emission rates of 5 lbs/MWh or higher; the next closest unit drops to 3.24 lbs/MWh, and most of the units on this already-selective table have rates below 2 lbs/MWh. The units with rates of 4 or more lbs/MWh add up to only 636 MW of total nameplate capacity.

[5] These units represent nine of the sixteen plants subject to SCAQMD jurisdiction. Presumably units at the other seven plants have emission rates below 1 lb/MWh.

Continuing to rely entirely on Harvey/Hogan's data, we then must ask the following: How can it be that a handful of units with high emissions rates (and therefore emissions costs of $40 to $200/MWh, accepting their emissions prices) set the price of all power purchased in the market, when only 16 plants paid any emissions costs and the average of these 16 plants paid only about a fifth as much for emissions as the four highest-emitting units regardless of the emissions price? Harvey/Hogan provide the following answer:

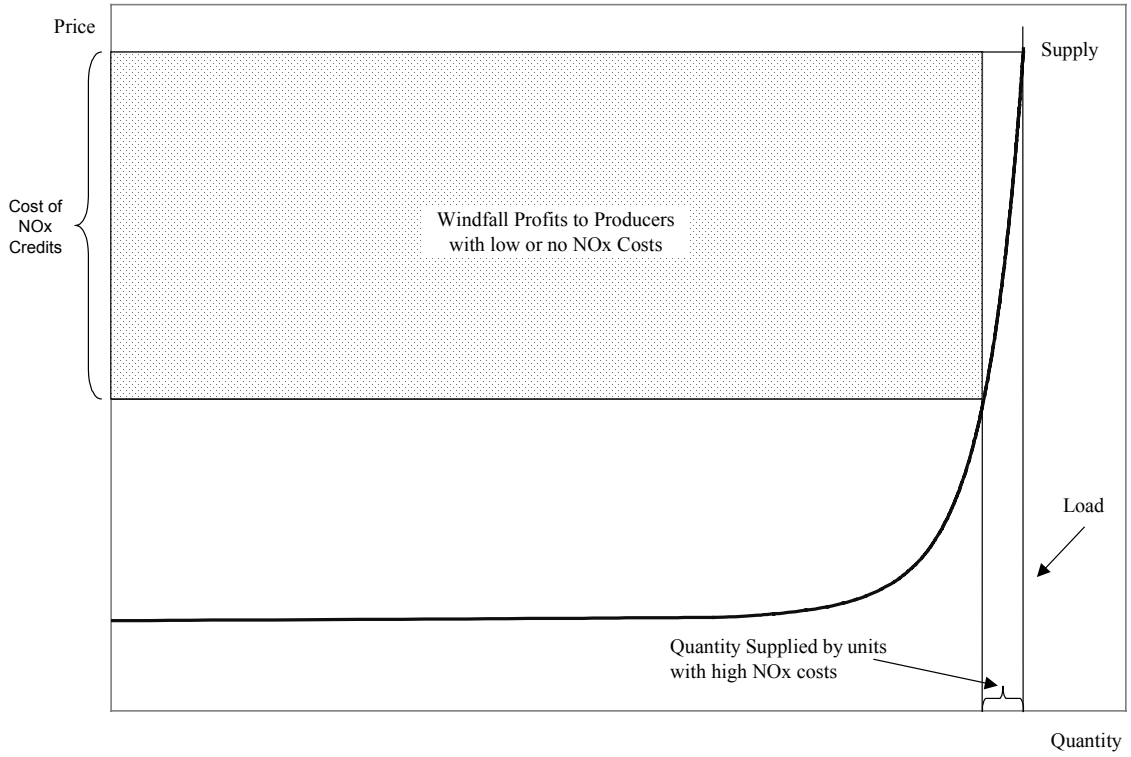
> *Q. WHY DID THE COST OF EMISSIONS ALLOWANCES IN SOUTHERN CA AFFACT ELECTRICITY PRICES MORE BROADLY IN THE WSCC?*
> *A. Because of the reduction in hydro and nuclear generation in the WSCC, gas-fired generation in Southern California tended to be within or on the margin for meeting load throughout the May 2000-summer of 2001 period. (Exh. No. MIR-1 at 82:7-12)*

The Commission should consider carefully what Harvey/Hogan assert here and how this relates to just and reasonable electric prices. Harvey/Hogan are in effect saying that generating capacity was so scarce throughout the Western U.S. that power buyers throughout this market were forced to pay (per Harvey/Hogan) more than $200/MWh above the cost of generating power from all but four units, due to the high emission costs purportedly experienced by those few generating units amounting to only 636 MW.

This is illustrated in highly simplified fashion in the figure below. If the West was one single market clearing at a single price (as Harvey/Hogan assert elsewhere, and which will be examined below in more detail), and the extremely high production costs of only four generating units in the LA basin raised the price of power by hundreds of dollars per MWh, then there was a windfall to every other generator in the WSCC, most of whom had to pay nothing for NOx emissions at all, or much smaller amounts. The profits earned by WSCC producers *in a single day* in which the four units shown in Harvey/Hogan's table increased prices earned by all WSCC units by $200/MWh would be as high as $400 million in this simplified scenario.[6]

[6] This calculation is based on the WSCC peak load from November 2000 through March 2001, shaped based on the ISO load on the peak day in the same time period. The portion of load served by retained generation of load serving entities would not have earned windfall profits, so the estimated net effect on generation-owning utilities would be smaller.

Profits Earned by All Other Generators Due to the High Emissions Costs of a Handful of Units As Suggested by the Harvey/Hogan Approach



Of course, this argument is farfetched, and that is the point. Something does not add up in Harvey/Hogan's analysis. As discussed below, one element I do not agree with is treating all of the WSCC as a single geographic market for the purpose of analyzing market power. However, illustrating the implications of Harvey/Hogan's arguments helps demonstrate another important point: the mere fact that a handful of generators may have experienced high production costs should not lead the entire West to clear at such a high price unless there is an enormous shortage, which provides further withholding incentives to all pivotal

suppliers, and results in prices and rents *far* beyond marginal costs for the vast majority of the market.

Q. Please discuss the next fundamental, Qualifying Facility ("QF") supply.

A. This fundamental is consistent with reduced supply and higher prices, and is also consistent with my alternative assertion. Harvey/Hogan note that they cannot quantify the magnitude of this impact. (Exh. No. MIR-1 at 87:10-11) Furthermore, this "fundamental" only existed for a couple of weeks in early 2001, and there is no evidence at all that QF production would have affected prices in the summer of 2000, which is when the crisis began. Finally, this fundamental is, again, reflected in the MMCP calculation because the ISO's choice of the units available to serve actual demand each hour must have reflected the absence of QF power during those hours when it was not there.

Q. Please discuss the final fundamental on Harvey/Hogan's list, new generation capacity.

A. This fundamental is also consistent with both their hypothesis and mine. There is little dispute over the fact that new power plants came on line in 2001 and 2002 around the West, and that these plants helped restore a healthier balance between supply and demand. However, there is no

quantification of the timing or magnitude of this effect, and in any case this fundamental, too, should be reflected in the MMCP calculation.

Q. Beyond this item-by-item analysis, do Harvey/Hogan provide additional evidence in their testimony that supports your "market power and fundamentals" assertion over "fundamentals only"?

A. Yes. Drs. Harvey and Hogan never attempt to quantify the individual or aggregate impact of the fundamental shifts on market prices. Instead, they do the opposite – they admit directly that they are unable to explain all of the factors that influenced price: "[w]e have been able to identify many, although probably not all, of the causes of these high prices." (Exh. No. MIR-1 at 15:5-6)

No other witness appearing on behalf of Respondents in this proceeding, other than Dr. Cicchetti, has attempted to quantitatively compare the magnitude of the price rise during the crisis with the magnitude of changes in fundamentals. The testimony of Professor Lewbel, Exh. No. CA-356, explains why Dr. Cicchetti's testimony is fundamentally flawed and why the Commission cannot rely on this quantification to reach any conclusion.

In contrast, the MMCP calculation provided by Dr. Stern (Exh. No. CA-3) is designed to take into account the major market fundamentals Respondent witnesses point to as a reason why prices rose during the crisis. Dr. Stern's

calculation shows that these changes in fundamentals do not fully explain the prices increases seen between May 2000 and June 2001.

Q. Do Drs. Harvey and Hogan address any of the evidence elicited in discovery concerning the behavior of suppliers in the California electricity market?

A. No. Drs. Harvey and Hogan do not appear to have examined any of the specific evidence of withholding or manipulation produced by sellers in this proceeding or made public by this Commission or other administrative agencies.

Q. Do Harvey/Hogan also directly admit that market power may have been exercised in these markets?

A. Yes, and more than once. First, in their discussion of whether there was a genuine shortage of capacity in the CA markets, they say:

> *The existence of capacity shortages in California is consistent with a competitive origin of the high prices but these capacity shortages also do not rule out the exercise of market power. Thus, if non-quick-start capacity were held off line, providing neither energy nor reserves, then that physical withholding could contribute to a shortage and give rise to high prices. None of the data we have analyzed rules out such withholding, but there also does not appear to be evidence that such capacity withholding was material. If essentially all of the available thermal generation in California was on-line and was used to either generate energy or provide reserves, then the source of high prices was not market power of thermal generators with California but rather shortages of capacity. (Exh. No. MIR-1 at 152:10-19)*

Later, Harvey/Hogan discuss their own simulation of market prices, they emphasize that they have not disproved the existence of market power:

> *Q. DOES YOUR SIMULATION MODEL PROVE THAT NO MARKET POWER WAS EXERCISED IN THE WSCC OVER THE PERIOD JUNE 2000 THROUGH JULY 2001?*
> *A. No. The simulation results in our July 16, 2002 paper and those presented above are based on approximate data and we have repeatedly pointed out that a single stack dispatch model that does not account for all of the factors impacting the real-time dispatch does not provide a reliable method for assessing whether market power has been exercised. Moreover, even if the general price level is consistent with competitive supply and demand forces, it is possible that market power may have been exercised by particular market participants, at particular locations, in particular hours, without noticeably impacting overall prices.*
>
> *The point of these simulations is that the actual level of prices is broadly consistent with supply and demand factors and thus that there is no basis for asserting that these prices could only have arisen from the exercise of market power. (Exh. No. MIR-1 at 190:18-23 and 191:1-8; footnotes omitted, emphasis added)*

The last sentence in this passage bears close reading. Notice that in this sentence Harvey/Hogan have abandoned and reversed their own hypothesis. In this passage they claim that the results of the market power studies they reviewed as well as their own simulation provides no basis for asserting that these prices could *only* have arisen from market power. No party I am aware of asserts that fundamentals played no role in the price increases, and the CA Parties' MMCP calculation recognizes this as well.

Q. What do you conclude from the information on market fundamentals offered by Drs. Harvey and Hogan?

A. I believe the evidence they have thus far presented in this proceeding is more consistent with a position that market fundamentals enabled market manipulation and the exercise of market power, rather than the view that market fundamentals fully explain the observed price movements. They concede that their evidence does not rule out the exercise of market power. Upon examination, much of their evidence does not support the conclusions they draw from it or it is mischaracterized in their testimony. Nowhere do they quantify the overall impact of the factors they discuss. Their lengthy testimony fails to address in any way the documentary evidence discovered in this proceeding and related in the direct testimonies of the various witnesses for the CA Parties. This evidence, gleaned directly from business records and personnel of market participants, provides the best information available concerning specific supplier activities and motives and their impacts upon the power markets.

III. RESPONDENTS' ANALYSIS OF MARKET POWER SUPPORTS, RATHER THAN REFUTES, THE LIKELIHOOD THAT MAJOR SUPPLIERS TO THE CA MARKET WERE PIVOTAL

Q. What assertion by Respondents do you rebut in this section of your testimony?

A. In this section I rebut the claims made in section IV.A. of Harvey/Hogan's testimony that CA-based generation sellers could not have possessed or exercised market power. I explain why this assertion is based on a definition of the market and estimated market shares that are unsupported by the data and by the prior actions and policies of the Commission. When this defect is corrected, the remainder of Harvey/Hogan's arguments and conclusions concerning market power becomes invalid.

Q. Before turning to Harvey/Hogan's specific claims, please summarize the basic process by which economists analyze the incentive and ability to exercise market power in electricity markets.

A. Economists traditionally use market shares and market concentration measures as the initial basis of their analysis of market power. Intuitively as well as formally, firms that have very large market shares or large shares of unsold capacity relative to unmet demand ("pivotal sellers") have the incentive and ability to profitably withhold supply and/or raise price.

To measure market share, it is first necessary to define the product one is measuring (so all sellers of this product can be counted) and the geographic limits of the market (for the same reason). This process is known as market definition. Once the market is properly defined, shares can be computed and analyzed.

Q. Which aspect of this procedure contains the fundamental flaw in Harvey/Hogan's assertion?

A. Their flaw occurs in their assertion that the geographic scope of the market is the entire Western U.S. This is vastly larger than the true scope of the market, especially during many portions of the crisis period because it does not reflect the supply alternatives available to the utilities who were constrained to purchasing from the CA PX and ISO, and therefore could obtain only the supply that could be offered and delivered in the ISO zone where it was needed.

Q. Please summarize Harvey/Hogan's overall argument concerning CA sellers' market power.

A. Harvey/Hogan's argument proceeds in four stages: (a) there were no transmission constraints into CA during this period; (b) the geographic market was therefore the entire WSCC; (c) for a market of this size, the CA suppliers had a small share; and (d) suppliers who have small shares do not

have an incentive to exercise market power by withholding. Thus, CA suppliers had neither the incentive nor the ability to exercise market power.

Q. The first two items in this line of reasoning amount to an assertion that the geographic market is equal to the WSCC. Do the data support this view?

A. No, they do not. The sole data Harvey/Hogan put forth in defense of this market definition are the following statements:

> *On the contrary, a striking feature of the high prices in the California electricity markets is that they often occurred during periods in which imports into California were not transmission constrained and the high prices were not limited to California. (Exh. No. MIR-1 at 157:12-14, footnotes omitted)*

and:

> *In addition it is our understanding that transmission constraints into California from the Pacific Northwest and Southwest were generally not binding during this period. Thus, California electricity prices were high because imports were lower than normal, not because transmission constraints prevented a rise in imports. While it is possible that there has been some withholding of transmission service that limited supplies from other regions in the WSCC even when transmission constraints were not binding, we are not familiar with any such allegations. (Exh. No. MIR-1 at 158:6-12, footnotes omitted)*

These statements effectively assert that the entire Western U.S. can be treated as one spot market because there was rarely any transmission congestion between any two parts of the West.

Q. Are these somewhat broad assertions supported by the facts?

A. No, they are not. Neither the data on transmission congestion in the West nor the data on price differences between trading hubs supports this particular conclusion for the spot market. Although prices were certainly high throughout the West during the crisis, this broad statement is not sufficient to define a market. Indeed, the facts do not support treating even the ISO's own control area as a single market for the specific purpose of analyzing market power in the CA spot markets.

Table III-1 of Exh. No. CA-350 shows the percentage of time that the CAISO reported that transmission congestion existed between either SP15 or NP15 and adjacent border trading points, or between SP15 and NP15. The numbers in this table show the percentage of time that the two market points have separated due to congestion. These data reflect the final hour-ahead ISO schedules.

Table III-1 shows that congestion between and within the CAISO area occurred during 7% to 29% of peak hours over the first few months of 2000 (prior to the crisis), except that there was no congestion between the ISO and Los Angeles ("LA") or the Imperial Irrigation District ("IID"). The table also shows that during the crisis congestion patterns changed significantly. Congestion dropped between NP15 and the northwest and

between SP15 and the southwest, increased to 20% to 30% between SP15 and the northwest, and increased greatly between SP15 and NP15, rising to over 40% of peak hours and as high as 59% of all hours.

Spot price differences between these trading points show an even stronger signature of market definition. First, note that all the data I will discuss here are for daily 16-hour peak or 8-hour off-peak periods. Through the laws of averaging, hour to hour price differences will range over a much wider area. Nonetheless, even daily average prices show strong divergence between hubs during the crisis. Figures III-1 to III-3 in Exh. No. CA-350 compare daily peak average price differences between three northern WSCC trading points, NP15, COB, and Mid-C. For example, the red line on this chart shows the daily average price difference each day between NP15 and COB. Figure III-1 shows the period before the crisis, Figure III-2 shows prices from May 2000 through June 2001, and Figure III-3 shows the remainder of 2001 and the first half of 2002.

Visual inspection shows how dramatically price differences increased during the crisis period. During the crisis, prices diverged by more than $10/MWh during 82% of all off-peak hours and about 65% of all on-peak hours between SP15 and NP15. During off-peak hours, prices differed between California and Oregon by more than $100 during 17.4% of all

hours. The numbers are similar but slightly less divergent in the south, where SP15 diverged from Palo Verde by more than $10 during about half of all peak hours.

Figures III-4 to III-6 of Exh. No. CA-350 show price differences between three southern WSCC trading points, SP15, Four Corners ("4C"), and Palo Verde ("PV") over the same three periods. Once again these figures show that price differences escalated dramatically and suddenly in June 2000, refuting the view that one can treat these trading points as within one market.[7]

Q. Does Harvey/Hogan's estimate of market share use market definition methods consistent with those used by the Commission for the analysis of market-based rates and the competitive effects of mergers?

A. No. The Commission's methods of measuring market shares for the purpose of determining whether sellers should receive market-based rates would not treat the WSCC as a single market. The Commission's Supply Margin Assessment ("SMA") test would not allow a market size larger than the generation within SP15 or NP15 (only) plus the simultaneous transmission capacity into that area. The Commission's directive for market analysis in mergers, Order 642, would define a geographic market

[7] Figures III-7 to III-12 show the comparable pictures for off-peak periods. These figures also support my conclusion.

that is in most cases significantly smaller, namely the generation within SP15 or NP15 plus that portion of transmission import capacity available to the spot market.

In addition, Harvey/Hogan do not account for the fact that a substantial amount of generation was not available to the PX or ISO because it was dedicated to load elsewhere in California or the rest of the WSCC. The relevant market supplying the PX and ISO are the set of sellers with capacity that can be economically bid into and delivered into these two markets. While Commission methods for estimating market share – and thus whether suppliers might be pivotal – require that these considerations be taken into account, Drs. Harvey and Hogan do not incorporate these essential considerations in their market share numbers.

Were these defects to be remedied, it is obvious that the actual market shares of the CA generators would be much larger than the numbers Drs. Harvey and Hogan estimate.

Q. Do other analyses refute the view that the entire WSCC can be treated as a single geographic spot market?

A. Yes, they do. In a number of instances in which electric utilities have applied to the Commission for approval of a merger or market-based rates, economic experts have treated California as a distinct geographic market

for short-term products and usually treated NP15 and SP15 as distinct markets as well. In March 2000 – two months before the crisis began – I filed an extensive analysis of spot market geographic boundaries in connection with the merger application of Portland General Electric and Sierra Pacific Power (Docket No. EC00-63-000). In this analysis, I concluded that the two parts of the ISO control area as well as smaller regions of the WSCC outside of CA should be analyzed as distinct markets.

More recently, in Docket No. EC02-35-000, the Commission accepted an analysis of the competitive effects of the sale of Westcoast Energy, Inc. to Duke Energy Corporation, the parent of one of the Big Five CA sellers. The competitive analysis in this proceeding defined distinct geographic electric markets for NP15 and SP15.

Q. You find that the proper geographic markets for the purpose of analyzing whether specific sellers became or could become pivotal are the CAISO zones. Does this mean that the market conditions in one part of the West did not influence prices in other parts, or that workable competition ceased to exist only within the CAISO?

A. No, it does not. As a matter of logic it is obviously possible for several distinct markets to experience a shortage or malfunction at the same time.

Furthermore, one routinely expects that changes in market conditions in one market will affect conditions in adjacent markets.

When economists define a geographic market this does not mean the market is isolated from its neighbors and regional market forces. It merely means that this market has a set of buyers whose supply alternatives are not so similar to the supply alternatives of other nearby buyers as to make significant price differences impossible. In other words, markets are distinct when sellers and buyers cannot reliably arbitrage away all significant price differences. Yet even if all price differences cannot be *eliminated*, shortages, market power exercise, and market manipulation can extend across and involve multiple geographic markets, and substantial problems of this nature within one geographic market could have a substantial impact on adjacent markets.

Q. What are the implications of the CA sellers having much larger shares of much smaller markets for the exercise of market power and other manipulative practices?

A. The implications of sellers having much larger shares of the relevant market in which they sell are that these sellers gain both the incentive and the ability to withhold power profitably, *i.e.* to exercise market power. As Harvey/Hogan note, sellers with small market shares do not have this

incentive or this ability. When a seller's share gets large, withholding a small amount of capacity (or threatening to withhold it) can often raise price substantially for the remaining capacity that seller leaves in the market (*i.e.* does not withhold).

Q. Is the conclusion that the relevant market shares are smaller than Harvey/Hogan suggest your only basis for refuting their assertion that there is no exercise of market power in these markets?

A. No, it is not. To reach my conclusion that market power was exercised in this market, I rely on the enormous body of documents and data produced during this proceeding; the records developed by the Commission and Commission staff concerning the AES/Williams withholding episode, the Reliant withholding episode, and the public portions of its investigation of Enron and its affiliates; scholarly literature in the public domain; economic analyses conducted by ISO and PX economists; and my experience analyzing Western power markets.

Q. Does the additional information you refer to here include specific studies as to whether the supply demand "fundamentals" caused suppliers to become pivotal, thus giving them market power?

A. Yes, it does. A number of studies have examined whether power suppliers in the West became pivotal during the crisis period. These studies include

"Measuring Unilateral Market Power in Wholesale Electricity Markets: The California Market 1998 to 2000,"[8] "Pricing and Firm Conduct in California's Deregulated Electricity Market,"[9] and "Wholesale Generator Incentives to Exercise Market Power in the California Electricity Market,"[10] in addition to papers discussed by Harvey/Hogan in Section IV of their testimony. Without exception, these papers find that suppliers frequently became pivotal in the CA power markets during the crisis.

Q. What about the Harvey/Hogan critique of several of these studies?

A. A detailed response to their methodological criticisms would be quite lengthy. However, the important thing to note is that their critique focuses on whether various models measure the marginal cost of suppliers accurately. This is important because differences between observed prices and estimated marginal costs are the main symptom of market power exercise.

Nevertheless, the Commission should understand that this is a debate among diagnosticians about whether symptoms have been properly

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[8] Wolak, Frank A. (2003) "Measuring Unilateral Market Power in Wholesale Electricity Markets: The California Market 1998 to 2000" *American Economic Review*, May, forthcoming, available from http://www.stanford.edu/~wolak.

[9] Puller, Steven L., "Pricing and Firm Conduct in California's Deregulated Electricity Market, Steven L. Puller." POWER Working Paper PWP-080, University of California Energy Institute. August 2002 (Original Version November 2000).

[10] Silsbee, Carl H. and John L. Jurewitz. "Wholesale Generator Incentive to Exercise Market Power in the California Electricity Market", *The Electricity Journal*, August/September 2001.

measured – not a debate over whether the patient had the disease. On the latter point, Harvey/Hogan themselves simply do not address the ramifications of the fact that suppliers became pivotal, and therefore had every reason to exercise market power, as suggested by their own analysis of the fundamentals.

Q. In addition to the Big Five CA sellers, is there evidence that importers may have been pivotal sellers in the CA markets during the crisis?

A. Yes, at least for Powerex. As I noted previously (Exh. No. CA-1 at 116:28-36), Powerex's own assessment of its sales to the ISO found that its share of the ISO's RT market was 44% in September and 79% in November of 2000. (Exh. No. CA-189 at 1 and 2) In a July 17, 2000 phone conversation between what appears to be two Powerex employees, the traders noted that they "want to push the price up and keep the price up" and discussed the implementation of bidding strategies that would signal to other market participants not to sell power. (Exh. No. CA-366) In a May 31, 2001 email, a Powerex employee stressed that it is "not untrue but…confidential" that Powerex was charging the CDWR "double the market at times." (Exh. No. CA-44 at 1)

In conjunction with its large energy supply, there is some evidence that Powerex may have sought to control key transmission interfaces into and

out of California. An April 29, 2001 Powerex email apparently expresses displeasure with Mirant for cutting schedules into NOB, noting that "[s]omebody should give [Mirant] another call and set them straight again, or we should stop buying this stuff from them. *Don't they know that we own NOB*?" (Exh. No. CA-364 at 2, emphasis added) Examples of evidence documenting Powerex (primary- and secondary-market) transmission purchases from LADWP, Turlock, NCPA, SVL, and Calpine is shown in Exh. Nos. CA-83 at 1 and 3; CA-364 at 5; CA-364 at 4; CA-364 at 1; and CA-364 at 3.

Q. Is there additional evidence that suppliers acted as if they were pivotal in this market?

A. Yes, there is. Exh. No. CA-374 contains the transcript of a discussion between an Avista and a Puget Energy trader dated June 12, 2000. The relevant part of the conversation proceeds as follows:

ANNA: *Puget, Anna.*
TONY: *Okay. You want to sell me some reasonable priced stuff now that the ISO's quit playing with ya'?*

* * *

TONY: *Nope. Yeah, I've been trying to get every preschedulers and real-time person to boycott California, on August 1st and 2nd.*
ANNA: *Oh, really?*
TONY: *So oh, --*
ANNA: *To do?*
TONY: *Just have zero sales, no preschedule, no real-time, no sales to marketers --*

ANNA: *For the purpose of?*
TONY: *Getting California to play nice with us.*
ANNA: *Oh, instead of all this crap?*
TONY: *(Inaudible) west.*
ANNA: *Yeah.*
TONY: *We need to let them know what side their megawatt is buttered on.*
ANNA: *Well, Friday would be a good day (laughter).*
TONY: *(Laughter.)*
ANNA: *Why wait (laughter)?*
TONY: *It's gotta get good and hot --*
ANNA: *Yeah.*
TONY: *-- so there's a real shortage of water.*
ANNA: *Yeah.*
TONY: *So they can sit in the dark.*

* * *

ANNA: *Yeah. God, you are just wicked.*
TONY: *I shouldn't be saying this on the recorded line.*

In this conversation, the Avista trader openly talks about waiting for periods in which hot weather and low hydro conditions combine to allow sellers outside CA to name their price. Of even greater concern, the Avista trader talks about organizing a group of sellers to act together to coordinate withholding and prices on August 1st and 2nd of 2000. In response to a suggestion that he might try this as early as the coming Friday, which would have been June 14, 2000, he responds that the later dates would offer ideal conditions in terms of high loads and reduced hydro availability.

It has not yet been possible to determine whether any coordinated efforts to withhold resulted from the efforts of these traders. As a purely circumstantial matter, however, I note that June 14, 2000 was, in fact, a day

when there were physical shortages and rolling blackouts in San Francisco. Similarly, Dr. Berry's direct testimony, Exh. No. CA-7, at 24, Figure 7, shows that on August 1st and 2nd seven significant suppliers[11] to California submitted bid price spikes on all or a large number of their units, the equivalent of economically withholding these units from the market. On those days the ISO was also forced to declare stage 2 emergencies.

Q. Drs. Harvey and Hogan also argue that withholding did not occur because power generators within CA produced much more output during the crisis than these generators produced during comparable earlier periods (Exh. No. MIR-1 at 10:4-8). Does producing greater-than-historic levels of output prove that there was no withholding or market power exercise?

A. No, historical output comparisons alone cannot prove an absence of strategic behavior. There are at least two reasons for this. First, as Harvey/Hogan themselves argue, the reason why gas-fired generators produced high levels of output was that demand was up and hydro generation was down. But this says little about whether power was withheld strategically during certain periods when a small amount of withholding could create very high prices, as was the case in the Reliant June 21-22 withholding episode. As I explain in Section IV of my direct

[11] Williams, Dynegy, Reliant, Powerex, LADWP, Idaho Power, and Mirant

testimony and Section I above, tightness in the markets goes hand in hand with market power exercise. It is not an either-or proposition. If the fundamentals made it such that gas-fired producers had to generate more and were "constantly on the margin," this makes it *more* likely that they had the incentive and ability to manipulate markets and raise prices.

The second error in this reasoning is that physical withholding is not necessary to raise price in a market with a vertical demand curve (*i.e.,* zero price elasticity of demand). In markets with normal non-vertical demand curves, withholding is the way that sellers force buyers to bid up the price in response to withheld supplies. However, when the demand curve is essentially vertical this is the equivalent of buyers saying to sellers: "I must buy a set quantity no matter how much you charge. I will pay whatever it takes to get this quantity."

When buyers say this, sellers do not have to physically withhold to raise price. As long as there is not enough supply to create competition between sellers, sellers need not physically withhold – they simply name their price. (One example is the Mirant e-mail dated July 24, 2000: "J-Man, load is avg 40,000 during peak. So, submit revised supp bids and stick-it to 'em!!!" (Exh. No. CA-141)). Having the ability to raise price profitably without

physically removing supply from the market is sometimes called economic withholding, but whatever it is called it is the exercise of market power.

IV. TRADING STRATEGIES AND OTHER SELLER BEHAVIOR HARMED THE MARKET

Q. Respondent witnesses Harvey/Hogan (Exh. No. MIR-1 at 249-58), Cicchetti (Exh. No. MAR-1 at 33), and Hamal (Exh. No. REL-1 at 19-20) provide testimony on the topic of manipulation, the Enron Strategies, and "gaming." What are the main themes of this testimony?

A. Broadly speaking, these witnesses make two points. First, they assert that these strategies were acceptable competitive behavior or even beneficial to the marketplace. Second, they assert that these strategies did not have a major impact on price.

Q. Do you agree that the misrepresentation aspects of these strategies were generally acceptable competitive behavior?

A. No. Several of the manipulative strategies I examined in my direct testimony involve the intentional submission of false information to the ISO. I find it extremely difficult to see how submitting false statements can be acceptable behavior. Importantly, Harvey/Hogan acknowledge this

implicitly when they begin their discussion of trading strategies by "setting aside all the legal or policy issues regarding misrepresentations to the ISO." (Exh. No. MIR-1 at 249:6-7) Harvey/Hogan acknowledge that there are "legal and policy" implications associated with intentional false statements to the ISO, yet they simply "set aside" these implications and conclude that the Enron Strategies are somehow acceptable and beneficial.

Q. Do these witnesses demonstrate that the manipulative strategies discussed in your testimony were beneficial or simply efficient arbitrage?

A. No, they do not. First, most Respondent witnesses do not take the time to examine each of the manipulation strategies I examine in my testimony in any detail. Mr. Hamal and Dr. Cicchetti do not analyze *any* strategies in detail. As to Harvey/Hogan, despite their claim that they assessed "the effect of the so-called 'Enron Strategies' on Western electricity prices" (Exh. No. MIR-1 at 13:18-19), their testimony appears to reach conclusions on only four of the strategies: "Fat Boy," "Ricochet," and the congestion games "Death Star" and "Scheduling Energy to Collect Congestion Charge II." On three of the Enron Strategies ("Load Shift," "Relieving Congestion," and "Wheel-out"), Drs. Harvey and Hogan appear to reach no conclusion. Finally, on "Get Shorty" and "Non-Firm Export," Drs. Harvey and Hogan are silent.

Neither Drs. Harvey and Hogan nor other Respondent witnesses conducted detailed analyses of the Enron Strategies they discuss. The documents Harvey/Hogan reviewed included only the Enron memos, reports by Robert McCullough, and two ISO documents. Respondent witnesses do not appear to reference any documents obtained in discovery nor do they assess the prevalence of these strategies. Further, they ignore clear statements about the harm from the Enron Strategies that were set forth by the ISO, such as:

- Non-Firm Export. "Adds to probability of real-time congestion, and may impose detrimental impact [sic] system cost and reliability if real time congestion occurs." (Exh. No. REL-22 at 39-40)
- Death Star. "If import/export schedules on AC transmission lines are "circular" and are not backed by physical supply resource and physical load in two different control areas outside of the ISO system, these can impose detrimental impact to system reliability if real time congestion occurs." (Exh. No. REL-22 at 42)
- Get Shorty. "[S]elling of A/S capacity that is not actually available imposes potential risk to system reliability." (Exh. No. REL-22 at 47)
- Ricochet. "Exacerbates the impact of overall market power on system reliability and costs to consumers." (Exh. No. REL-22 at 51)

Finally, Drs. Harvey and Hogan do not appear to consider the potential that, even if arbitrage can be efficiency-enhancing, the Enron strategies may

facilitate the exercise of market power or cause reliability problems. For example, the ISO states that "Ricochet scheduling allowed sellers to exercise market power and take advantage of tight supply/demand conditions by effectively withhold [sic] power from the Day Ahead market and demanding high prices in real time." (Exh. No. REL-22 at 51) The additional potential for the Enron Strategies to facilitate market power exercise when used in conjunction with other activities is discussed in Sections II.D and III of my direct testimony. (Exh. No. CA-1)

Q. Reliant claims in its Submission of Evidence (at 24) that the upper bounds of the harm from the Enron Strategies could only be in the "tens of millions of dollars." Drs. Harvey and Hogan similarly conclude that there is "no reason to believe that these strategies had a material adverse impact on Western markets." (Exh. No. MIR-1 at 13:19-20) Do you agree?

A. No, I do not. In my direct testimony in this proceeding I carefully document the widespread occurrence of these trading strategies by seller and time period. However, to the extent that Respondents cite any data whatsoever supporting their view of immaterial impacts, they tend to reference the ISO's October 2002 Enron Strategies Report. (Exh. No. CA-109) This report found that the impact of these strategies was "only" in the

tens of millions of dollars. However, using this as the sole analytical basis for arguing small impacts ignores three important factors:

- The October 2002 ISO Enron Strategies Report (Exh. No. CA-109) does *not* measure the impact of the use of all of the Enron Strategies on the entire market. Rather, the study measures only the financial impact on Enron and some other sellers from some of the Enron Strategies. A clear example of this distinction can be seen with Load Shift, in which Enron created and profited from congestion through its FTRs. In this case, the ISO would collect from users of the congested transmission path enough congestion revenues to make payments to all FTR-holders, not just Enron. So the total amount collected from customers would exceed the financial gain to Enron. Additionally, false congestion impacted energy prices and not just FTR owner revenues, but this impact on zonal energy prices is not quantified in the ISO study. Finally, the ISO study has not analyzed the market impact of some of the Enron Strategies, such as Ricochet, which I determine was used very frequently. (Exh. No. CA-1 at 110-12)
- The use of manipulative trading strategies extends beyond those enumerated in the ISO report. As the Enron memos themselves state, they only analyze "certain trading strategies that Enron's traders are using in the California energy markets." (Exh. No. CA-78 at 1) Enron

was using other potentially manipulative trading strategies such as "Black Widow" and "Round the West." (Exh. No. CA-145 at 1210) In addition, other traders were using their own strategies that are not described in the Enron Memos. For example, during the December 18-20, 2000 timeframe, Duke engaged in a congestion game that earned the company $7 million dollars and likely imposed a cost on customers that was a multiple of Duke's earnings from that game. (Exh. No. CA-1 at 149) Additional manipulative strategies not described in the Enron Memos include the "double-selling" of ancillary services and energy (Exh. No. CA-1 at 161-3) and "uninstructed generation" games. (Exh. No. CA-1 at 175-85)

- Perhaps most importantly, the trading strategies were used to facilitate the exercise of market power or to enhance the impact of other strategies. As I explain in my direct testimony (Exh. No. CA-1), the identification of the impacts of the joint use of trading strategies and other behaviors would be extremely complex. Further, trying to quantify and then decompose the total harm imposed by several market participants simultaneously using manipulation strategies or an incident that combines the use of several manipulative trading strategies at once, or that mixes uses of strategies such as Fat Boy and Ricochet with other

behaviors such as hockey-stick bidding or congestion games would be, in most cases, difficult or impossible.

Q. Are there examples of the use of manipulative trading strategies in conjunction with other trading actions?

A. Yes. Powerex, for example, appears to have used a strategy that was a combination of a bidding strategy and Fat Boy as a means of ensuring that the generation sold through its Fat Boy strategy received a good price. Under the Fat Boy part of this strategy, Powerex would submit false load information so that it could provide a "balanced schedule" to the ISO. In RT, when the generation appears but the load does not, Powerex is paid as a price-taker. Powerex combined this Fat Boy game with what is known as a "target price" game. This target price game was effectuated by Powerex "putting in high priced buy bids in the sup market to protect [its] price taker sales." These "high priced buy bids" were, in effect, an upward manipulation of the DEC price, which is the price that Powerex received under the Fat Boy game as a price-taker.

In essence, Powerex was submitting price-taker bids, but at the same time engaging in bidding practices that would manipulate the payment that a price-taker would receive. (Exh. No. CA-176 at 296) There are also various combinations of congestion games with strategies such as Fat Boy. (For example, see Exh. No. CA-1 at 150:19-25 or at 170:11-18, Exh. No.

CA-41 at 52, and Exh. No. CA-174 at 455) In addition, I have now been able to review discovery materials that provide additional evidence of how Enron Strategies were implemented through explicit coordination between market participants. Such coordination makes the assessment of individual actor impacts more difficult. For example, Exh. No. CA-365 provides further documentation of NCPA's coordination of market activities with Enron, including the apparent facilitation of the "load shift" strategy discussed in the Enron memos. A July 19, 2000 email from Enron (Exh. No. CA-365 at 1-6) contains a spreadsheet that appears to show how Enron and NCPA split congestion-related profits. An October 31, 2000 email (Exh. No. CA-365 at 7) shows that NCPA received "schedules" from EPMI (Enron) and SETC (Sempra) almost every day. In a November 15, 2000 email, Enron thanked NCPA for doing business, hoping that "it was worth it" (Exh. No. CA-365 at 8-17), and attached calculations showing that (1) NCPA got paid for transmission and earned 50% of achieved revenues (Exh. No. CA-365 at 9); and (2) that the source of these revenues included "load shift" (Exh. No. CA-365 at 10-13), which presumably refers to Enron's congestion game by that same name. That NCPA was aware of its active involvement in Enron's congestion games is evident in a January 29, 2001 email, in which an NCPA employee attempts to clarify whether certain "congestion reports" are still necessary "since we are not playing the

congestion game anymore." (Exh. No. CA-365 at 18) It appears that NCPA only took a brief pause from these congestion games, and resumed engaging in similar transactions with Enron in April 2001, as discussed in my previous testimony. (Exh. No. CA-1 at 134)

Q. Is there any other evidence that the implementation of Enron-type trading strategies may have involved the explicit coordination between suppliers?

A. Yes. Exh. No. CA-368 is a transcript of a Williams trader tape produced in the discovery process. This transcript provides a good example of a proposed megawatt laundering trade that appears to have been jointly conceived. Furthermore, the strategy appears to have been crafted for periods of Stage 2 emergencies, when the ISO's concerns over reserves were likely to cause them to purchase OOM power at uncapped prices. (Exh. No. CA-368)

As the transcript documents, an unidentified counterparty induces Williams to conduct Ricochet transactions through the use of parking service provided by the counterparty. The two traders specifically discussed the idea of exports and re-import during Stage 2 emergencies. The parking service provider then suggests Ricochet deals under which Williams would export power at Four Corners for a price of $250/MWh and buy it back at the same location for $253/MWh. The traders specifically note that the

ISO is paying above the price cap for power from outside the ISO, agreeing that the ISO has been paying as much as $450/MWh for imports into the ISO. The conversation ends with the party who offered parking to Williams noting that he could have offered the deal to "other counterparties over there," presumably referring to other ISO-internal generators.

Q. Does Reliant assert that one harmful trading practice you identify, intentional uninstructed generation, was actually beneficial to the market?

A. Yes. In its Submission of Evidence (at 24-26), Reliant claims that there is no merit to any allegations that it failed to follow CAISO dispatch instructions. It also specifically argues that "price chasing" (i.e., generating more power in real-time than CAISO ordered Reliant to provide) is not market manipulation, but rather is merely efficient arbitrage.

Q. Do you agree?

A. No. Documents discovered by the CA Parties provide specific examples showing that Reliant refused ISO dispatch instructions and intentionally did not follow ISO rules. Additional documents show that intentional uninstructed generation by Reliant caused reliability problems.

The following transcript of two May 22, 2000 (9:59:28) telephone conversations is instructive (Person 1 is identified as Kevin of Reliant; Person 2 is Walter at another Reliant plant or at another company):

Person 2: Does the ISO call you and say, "What's going on with your plant over there?"
Person 1: Sometimes.
Person 2: Oh, what do you say?
Person 1: We tell them whatever is appropriate at the time.
Person 2: "Let me check it out."
Person 1: No. No. We do a lot of uninstructed deviations. We're not in to following the ISO's instructions, routine. So there are times when they'll call and say, "Hey, where are you going?" "Well, prices are zero dollars. So I'm backing them up," or "Prices are at $400. I'm picking them up." Duh. You can figure that out without calling me....
Person 2: Hey, guys, you know when we might follow rules? If there's some sort of penalty.
Person 1: That's right…
Person 2: …Kevin, I got a quick question.
Person 1: Okay.
Person 2: ISO just called me out of sequence. Deck in Ormand Beach 20 megawatts for interzonal congestion. Now, that 20 megawatts is from schedule; right?… I mean, my schedule is 606, and I was running 765. So I told Ormand Beach to drop the 585. 20 off of the 606.
Person 1: Don't do that. You don't need to do that.
Person 2: I don't need to do that.
Person 1: No. Um, yeah. Your as-bid price is going to be, what? If he drops you 20 megawatts, you need to look at the bid, and they're going to charge you – you know, you're going to lose just thousands of dollars. I would ignore that call.
Person 2: Oh, I can do that?
Person 1: Yeah.
Person 2: On the out-of-sequence, just ignore it?
Person 1: Yeah.
Person 2: Okay.
(Exh. No. CA-34 at 13-16)

The ISO noted during the Summer of 2000 that serious reliability concerns are associated with uninstructed generation. (Exh. No. CA-1 at 178-79) In fact, as the following conversation illustrates, Reliant's overgeneration in one instance caused such reliability problems:

Chase: Reliant, this is Chase.
Ryan: Chase, hey, it's Ron.
Chase: What's going on?
(Laughter)
Ryan: Not much, man. How are you doing what? Do tell?
Chase: 750's.
Ryan: For a long time?
Chase: For four hours? Yeah, I mean look what time it is?
Ryan: So are we making a ton of money?
Chase: We're making a killing.
Ryan: Great. Do you know how much money we've made in three days this week?
Chase: Like close to 20,000,000, more than 20,000,000.
Ryan: More than 20. I mean, in ancillaries alone it's 16 and a half.
Chase: We're ... in trouble, man. We're going to make 50 million this month.
Ryan: That in balance has got to be huge. Last night at one time like when the schedules dropped I was 1500 long. Okay? And plus and prices were above 700 and the frequency was a 60.1. (Laughing) The ISO called me and he was like you need to take all of your plants to schedule right now. It's an emergency.
Chase: You went to 60.1? Oh my God. (Laughing)
Ryan: Yeah, I caused it. (Laughing)
Chase: Oh, my God. Yeah, they've had frequency problems all day today. They can't follow it, man. It's done.
(Exh. No. CA-369 at 2-4)

Reliant's apparent philosophy on uninstructed generation and its recognition that these activities violated market rules and caused reliability problems refute its own claims that there is no merit to allegations that it

failed to follow CAISO dispatch instructions or that these generation games were always benign.

Q. Sellers who submitted testimony on March 3, 2003 contend that they themselves did nothing wrong. Can you provide examples of evidence refuting particular sellers who claim they did nothing wrong?

A. Yes. For example, in its "Initial Proposed Findings" filed on March 3, 2003, Powerex stressed that it "did not engage in inappropriate market behavior" (at 3) and claims that it "did not engage in market manipulation" (at 26).

Q. Do you agree?

A. No, I do not. The totality of the evidence does not warrant exonerating Powerex. As I have discussed in my direct testimony (Exh. No. CA-1), I find substantial evidence that Powerex became a pivotal supplier during the crisis period and used a number of Enron-type trading strategies, such as Ricochet (Exh. No. CA-1 at 110:11-22, 111:1-25, and 116-118); forced bundling of OOM purchases (Exh. No. CA-1 at 30, footnote 9); withholding from the RT market to force the ISO into OOM purchases (Exh. No. CA-1 at 31:1-7 and footnote 10); inappropriately-coordinated market activities with LADWP (Exh. No. CA-1 at 46:8; see also CA-81); excessively high bidding (Exh. No. CA-1 at 74:16-18); potential congestion

games (Exh. No. CA-1 at 144:28-35, 145:25-29, and 150:19-25); potentially questionable ancillary service buyback strategies (Exh. No. CA-1 at 158:5-8); and Fat Boy-type scheduling of false load (Exh. No. CA-1 at 167:20-37 and 170:29-36). Moreover, as I discussed in my direct testimony, (Exh. No. CA-1 at 118:13-32, and as clarified further in errata) there is evidence that Powerex may have violated its export permit by exporting power from California markets into Canada during ISO emergency conditions. As I noted, Powerex certified that most of its purchases from the Cal PX in the DA market were "transmitted to the BC Hydro system and not sold to third parties" – which includes 1,205 MWh of exports to Canada under Stage 3 emergency conditions on January 26, 2001 (Exh. Nos. CA-41 at 23 and CA-2 at 72) and 366 MWh of exports under Stage 1 and Stage 2 emergency conditions on December 13, 2000. (Exh. Nos. CA-41 at 22, CA-38 at 2, and CA-2 at 68)

Ricochet activity is further documented in the January 26, 2001 email from Mr. Peterson:

> *after reaching credit limits with the ISO and PX we continued to make purchases from the PX day ahead market and make equivalent value sales into the real time market they administer. Both sets of transactions are with the PX and billing and invoicing is with the PX. However, in the real time market the PX is acting as a scheduling coordinator for the ISO and ... these transactions are settled with the ISO. (Exh. No. CA-364 at 8)*

All this evidence raises serious questions concerning Powerex's claim that it did not engage in any inappropriate market behavior whatsoever.

V. CORRECTIONS TO ANALYSES PRESENTED IN CA-1

Q. You noted that you had two corrections to your analyses presented in your direct testimony, Exh. No. CA-1. What are these corrections?

A. First, it has come to my attention that metered load data obtained from the ISO in discovery did not reflect some market participants' actual load during certain periods. Specifically, the ISO data had missing load values for certain market participants which I erroneously interpreted as having zero load. As a result, my screening test for scheduling of false load as summarized in Table I-1 of Appendix I in Exhibit CA-2 at 167 and 168 inappropriately identifies some entities as having scheduled false load when, in fact, no conclusion can be drawn due to the missing data. To be conservative, my screening test no longer identifies scheduling of false load for the following market participants shown in Table I-1 for three out of the four time periods: (1) the Cities of Anaheim and Pasadena in the May 1 through October 1, 2000 period (id., at 167); (2) the Cities of Anaheim, Riverside, and Pasadena, as well as Duke Energy and Puget Sound in the October 2, 2000 through January 17, 2001 period (id., at 168); and (3) the Cities of Anaheim and Pasadena, and El Paso Power Services in the

January 18 through June 19, 2001 period (id., at 168). Table I-1 (Amended) in Exh. No. CA-350 contains an update of Table I-1 from Exh. No. CA-2 at 167-68. This eliminates all identified Fat Boy activity during the period from January 18, 2001 to June 19, 2001.

My second correction relates to inaccurate ISO data for generating unit ownership, which requires an adjustment to the June 2000 results in Table H-1 in Appendix H of Exh. No. CA-1. The ISO data erroneously misassigned a Reliant generating unit to Southern California Edision. As a result, the 369 MW of double selling identified for Edison, should be assigned to Reliant. As a consequence, Edison should no longer appear in the table.

Q. Does this conclude your rebuttal testimony?

A. Yes it does.

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

San Diego Gas & Electric Company, Complainant	)	
v.	)	Docket Nos. EL00-95-069
Sellers of Energy and Ancillary Services Into Markets Operated by the California Independent System Operator Corporation and the California Power Exchange, Respondents.	)	
Investigation of Practices of the California Independent System Operator and the California Power Exchange.	)	Docket Nos. EL00-98-058

AFFIDAVIT OF DR. PETER FOX-PENNER

I declare under penalty of perjury that the foregoing is true and correct.

Executed on March 20, 2003.

[Name]

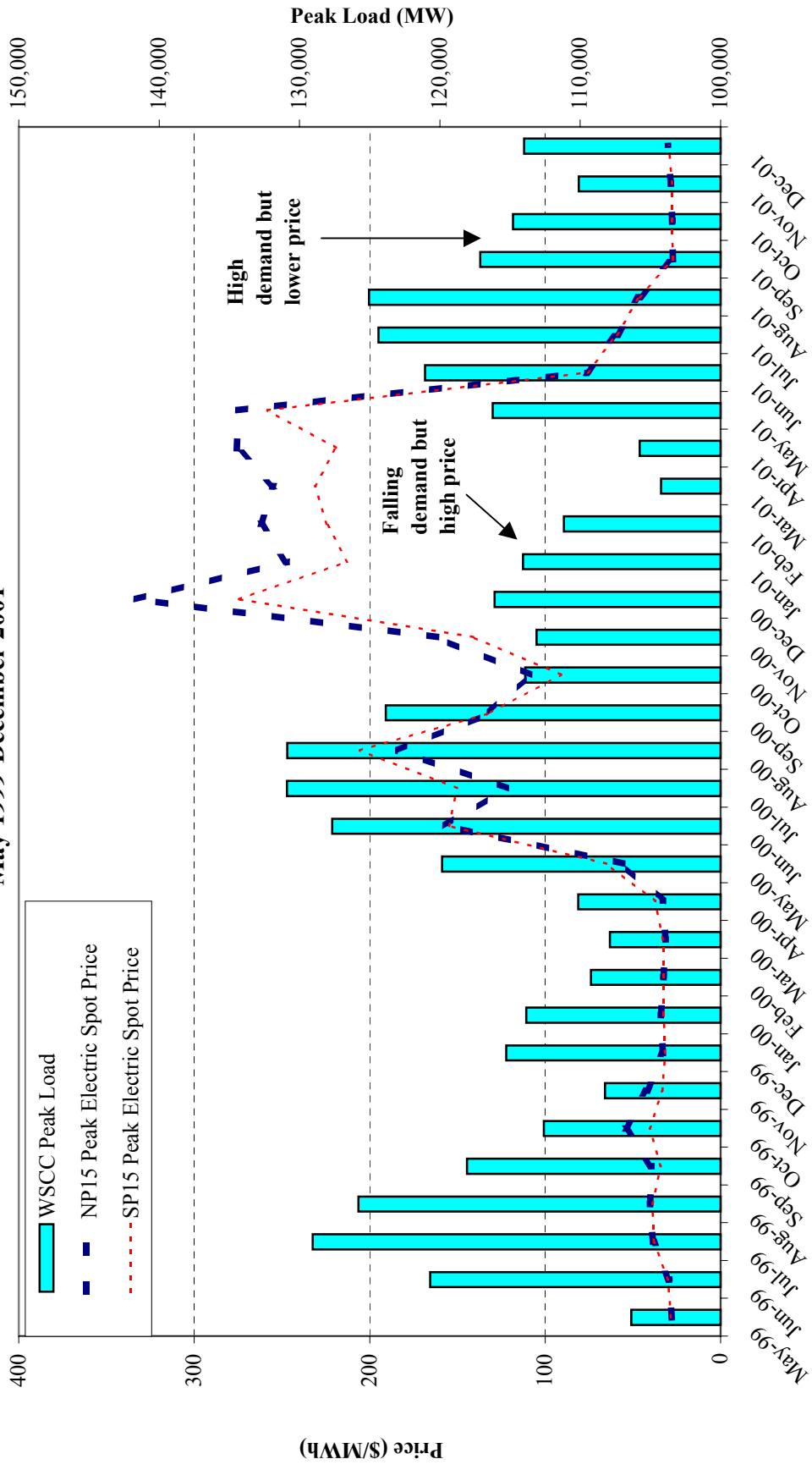
Index of Relevant Material

Submitter (Party Name)	California Parties
Index Exh. No.	CA-350
Privileged Info (Yes/No)	Yes
Document Title	Attachments to Prepared Rebuttal Testimony of Dr. Peter Fox-Penner on Behalf of the California Parties
Document Author	Dr. Peter Fox-Penner
Doc. Date (mm/dd/yyyy)	03/20/2003
Specific finding made or proposed	Market fundamentals do not explain the excessive prices charged by sellers in the ISO and PX markets during the period May 1, 2000 - June 20, 2001. Seller generated uninstructed to bypass organized markets. Seller submitted Bids in the ISO and PX Markets in order to exercise market power. Seller participated in collusive acts. Sellers participated in false load schedules. Sellers participated in Megawatt Laundering or "Ricochet". Sellers participated in "Death Star" or other Congestion Games. Sellers participated in the "Get Shorty" strategy of selling non-existent Ancillary Services to the ISO.
Time period at issue	a) before 10/2000; b) between 10/2000 and 6/2001
Docket No(s). and case(s) finding pertains to *	EL00-95-000, EL00-98-000 (including all subdockets)
Indicate if Material is New or from the Existing Record (include references to record material)	New
Explanation of what the evidence	Market fundamentals do not fully explain the price increases during the CA power crisis. Rather, market fundamentals and scarcity enabled and

purports to show	made profitable the exercise of market power and manipulation. Defining the entire WECC as a geographic market for the purpose of calculating market shares is flawed because it far exceeds the appropriate size of the market.
Party/Parties performing any alleged manipulation	Various suppliers including Avista, Enron, NCPA, Powerex, Puget Sound, and Reliant

* This entry is not limited to the California and Northwest Docket Numbers.

Figure II-1
Comparison of WSCC Actual Peak Load vs Peak California Electricity Spot Prices
May 1999-December 2001



Sources and Notes:
[1]: Source for WSCC Hourly Average Energy Demand Net Supply is Exhibit MIR-1, Table 5. Source for California Spot Electric Prices is Power Market's Week.

Figure II-2
Exhibit MIR-1, Figure 22 Reproduced
US and Canadian Hydro Generation Hourly Average Output (MW/hour)

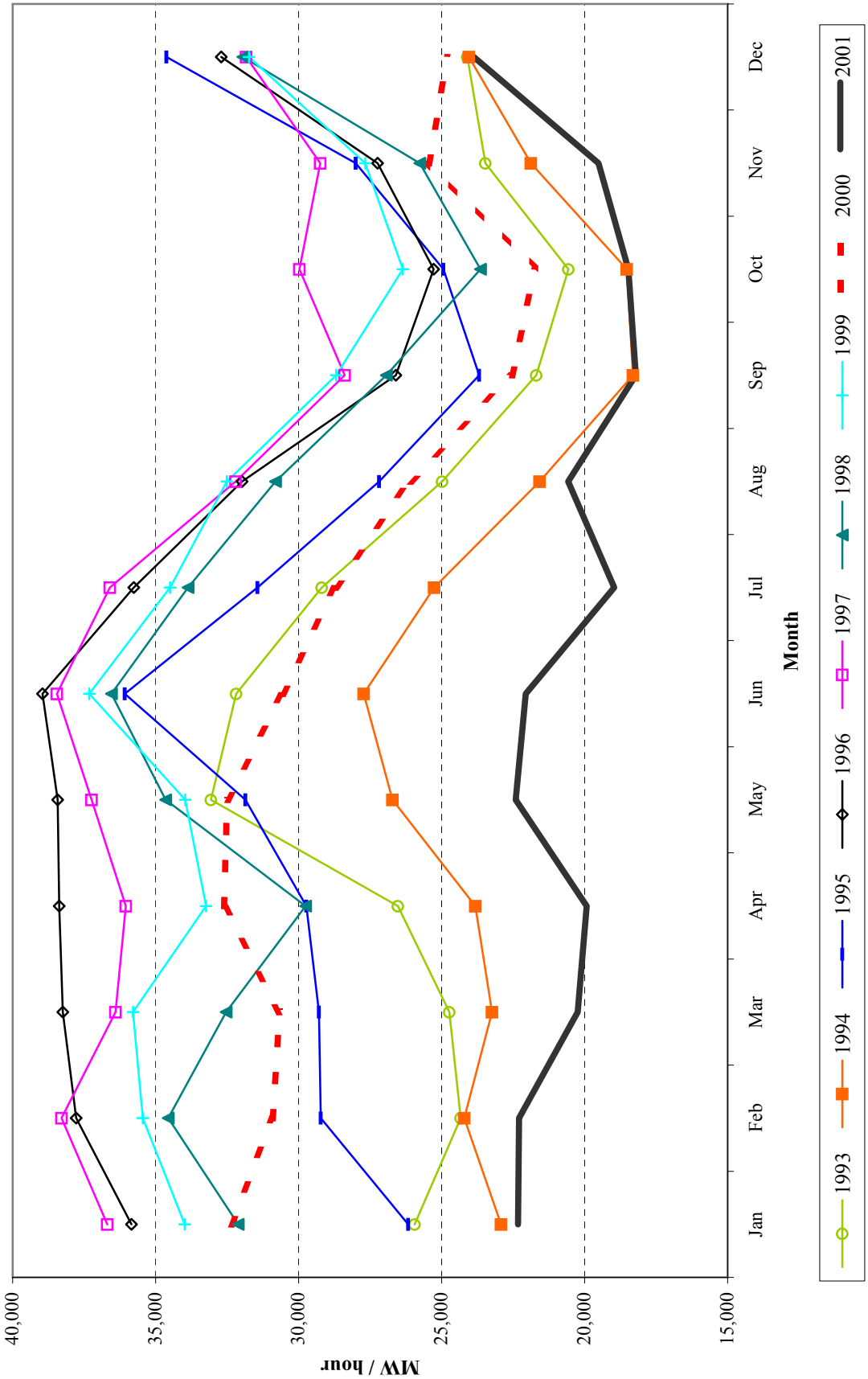
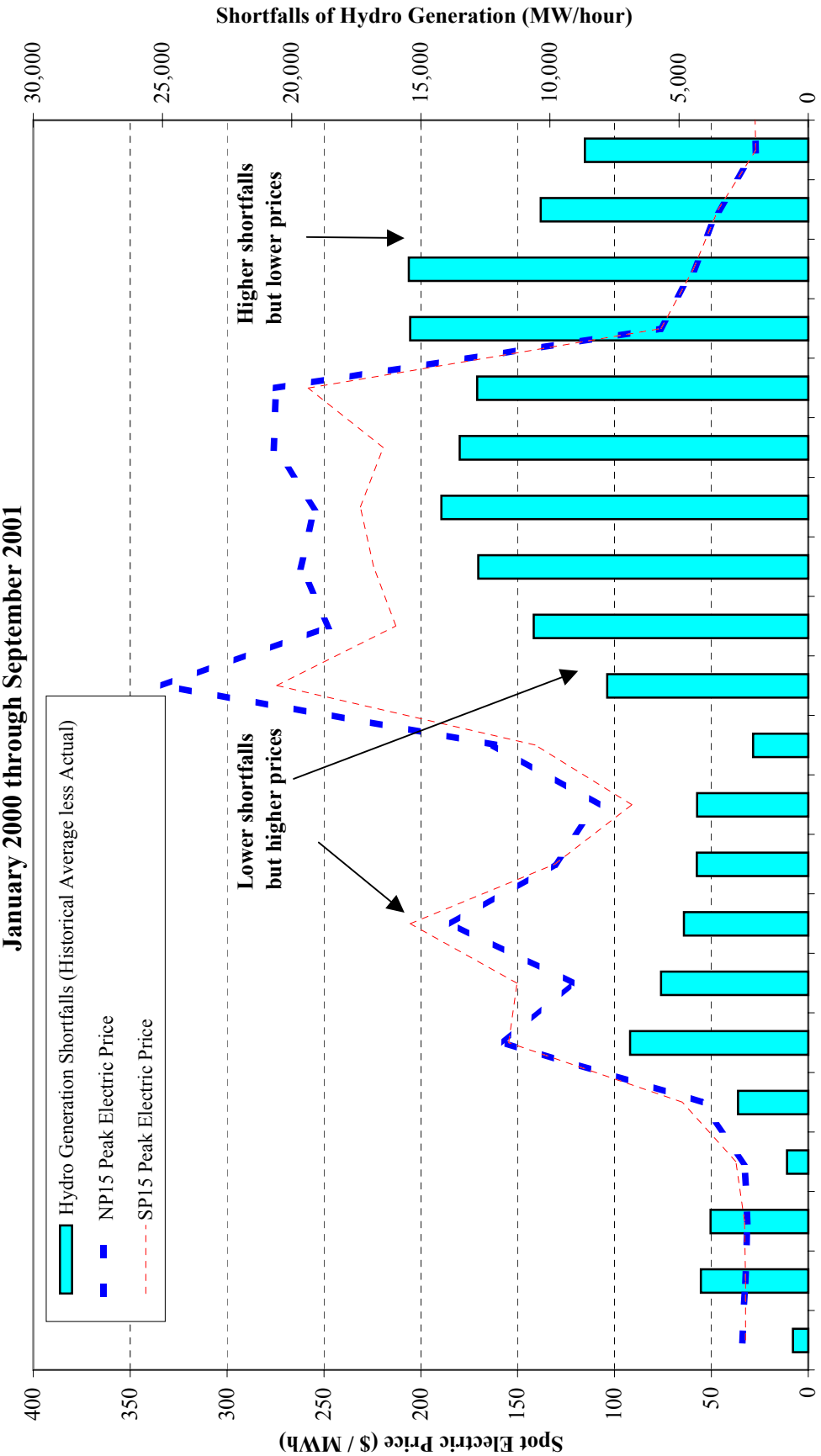
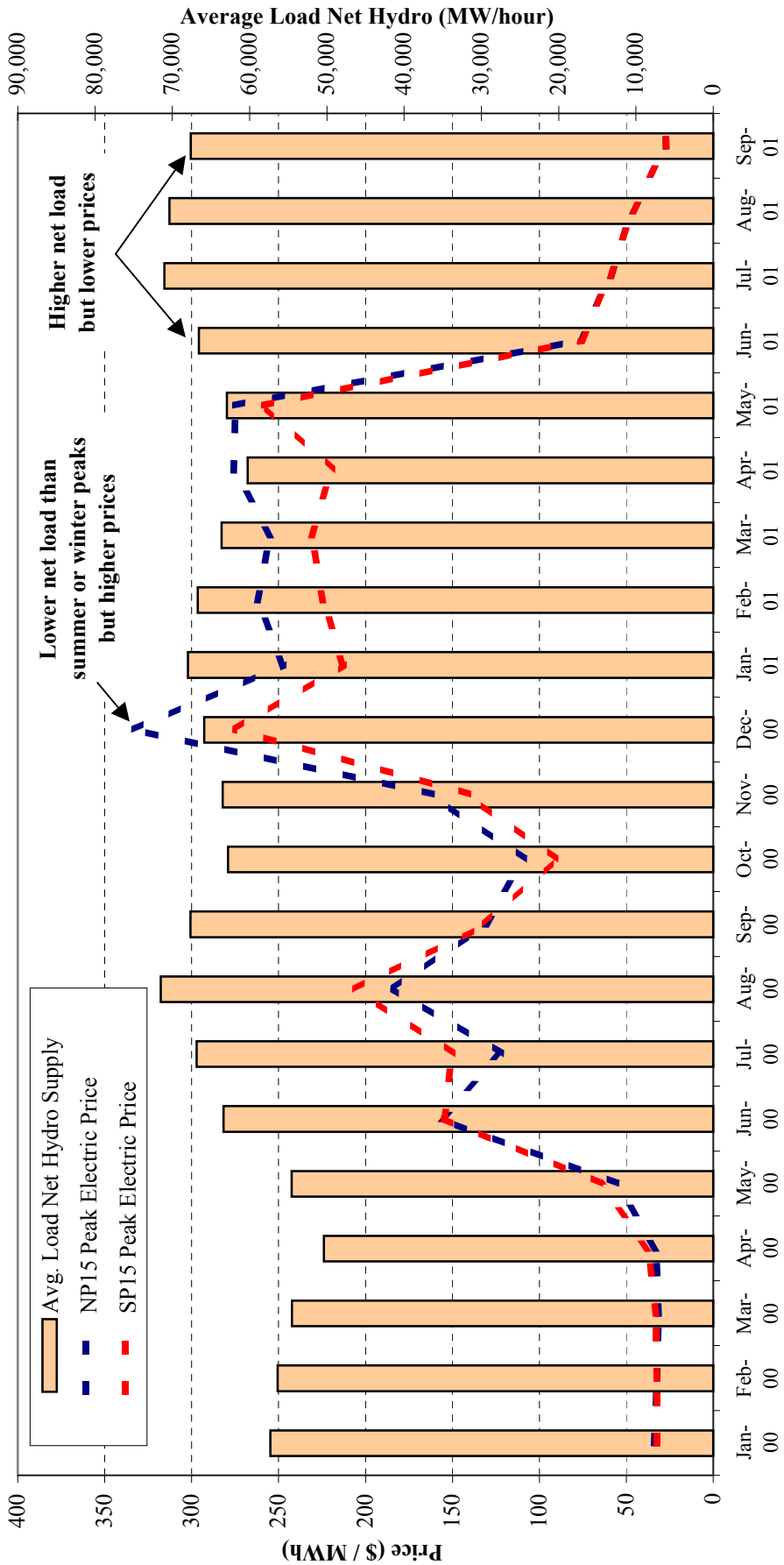


Figure II-3
Comparison of US and Canadian Hourly Average Hydro Generation Output Shortfalls and California Monthly Average Electricity Spot Prices
January 2000 through September 2001



Sources and Notes:
[1]: Average monthly hydro generation shortfalls are calculated as the 1995-1999 historical average generation minus the actual generation.
[2]: Source for US and Canadian Hydro Generation Output is Exhibit MIR-1, Table 21. Source for NP15 and SP15 Peak Electric Price is Power Markets Week.

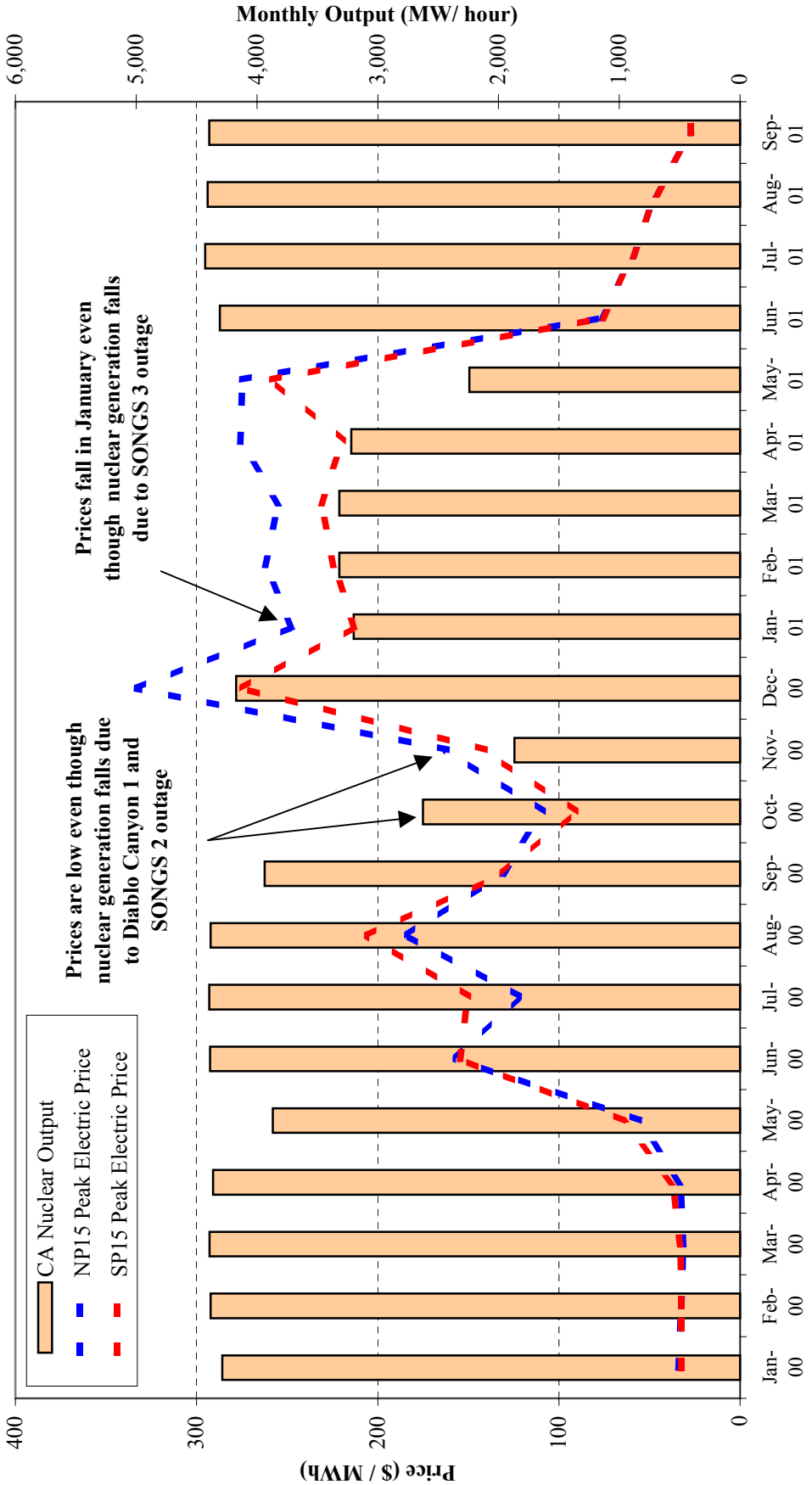
Figure II-4
Comparison of WSCC Hourly Average Energy Demand Net of Hydro Supply (MW / hour)
with California Spot Electric Prices ($ / MWh)
January 2000 through September 2001



Sources and Notes:

[1]: Source for WSCC Hourly Average Energy Demand Net of Hydro Supply is Exhibit MIR-1, Table 25. Source for Peak NP15 and SP15 Spot Electric Prices is Power Markets Week.

Figure II-5
Comparison of Hourly Average Output (MW/ hour) of California Nuclear Units and California Monthly Average Electricity Spot Prices ($/MWh)
January 2000 through September 2001

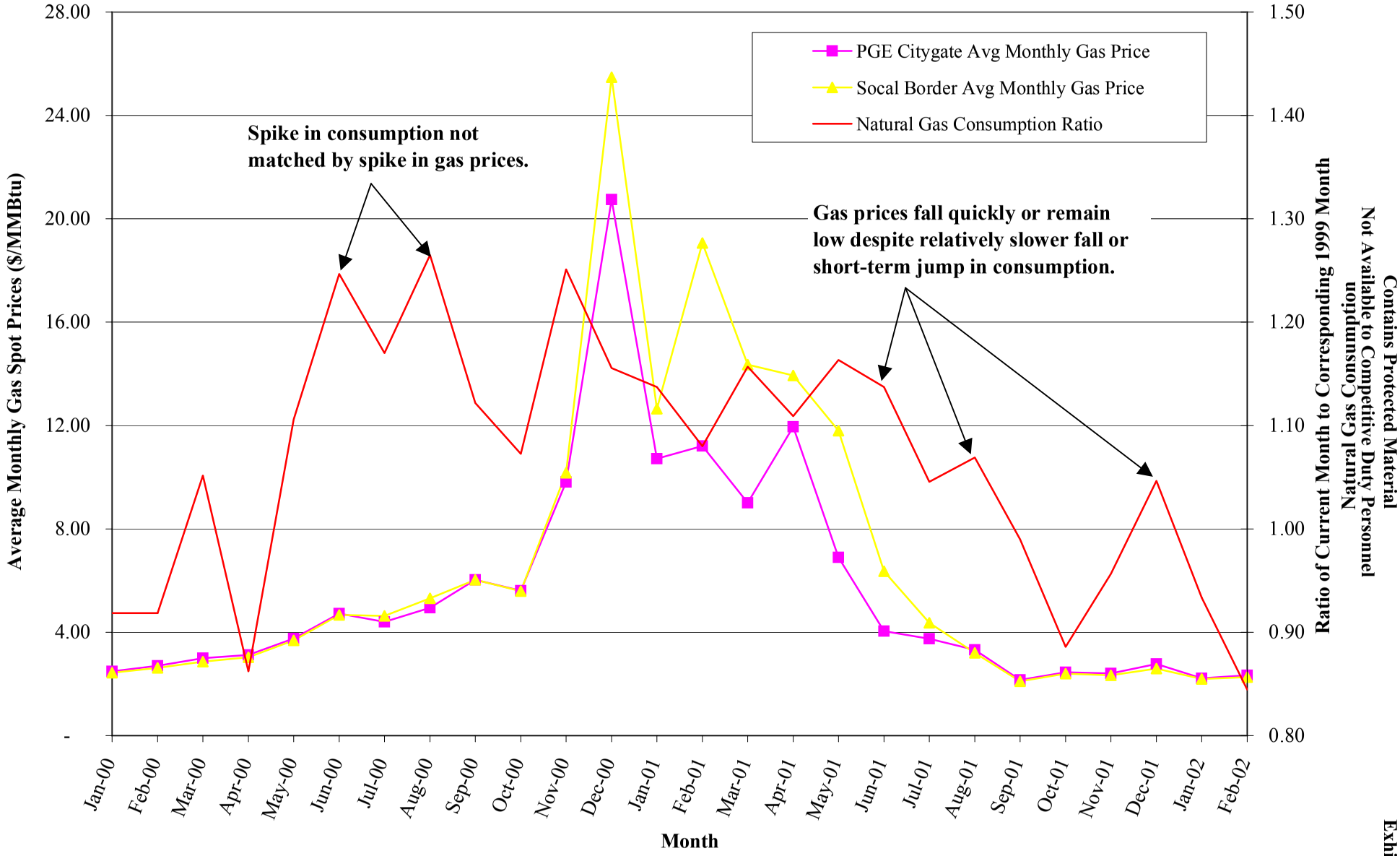


Sources and Notes:

[1]: Source for Output of California Nuclear Units is Table 26, Exhibit MIR-1. Source for NP15 and SP15 Peak Spot Price is Power Markets Week.

[2]: Diablo Canyon 1 outage from 5/15/00 to 5/2900, Diablo Canyon 2 outage 9/5/00 to 9/18/00, SONGS 2 outage 10/8/00 to 11/19/00, Diablo Canyon 1 outage 10/8/00 to 11/25/00, SONGS 3 outage from 1/01 to 5/01, Diablo Canyon 2 outage from end of 4/01 through 5/01.

Figure II-6
Exhibit MIR-1, Figure 38 Reproduced



Sources: Ratio: http://www.eia.doe.gov/oil_gas/natural_gas/data_publications/natural_gas_monthly/ngm.html, Data from Table 37; Gas Prices: Gas Daily data

Contains Protected Material
Not Available to Competitive Duty Personnel
Natural Gas Consumption

Table III-1
Hourly Occurrences of Congestion on ISO Paths in Hour-Ahead Markets
Peak and All Hours
January 1, 2000 through June 19, 2001

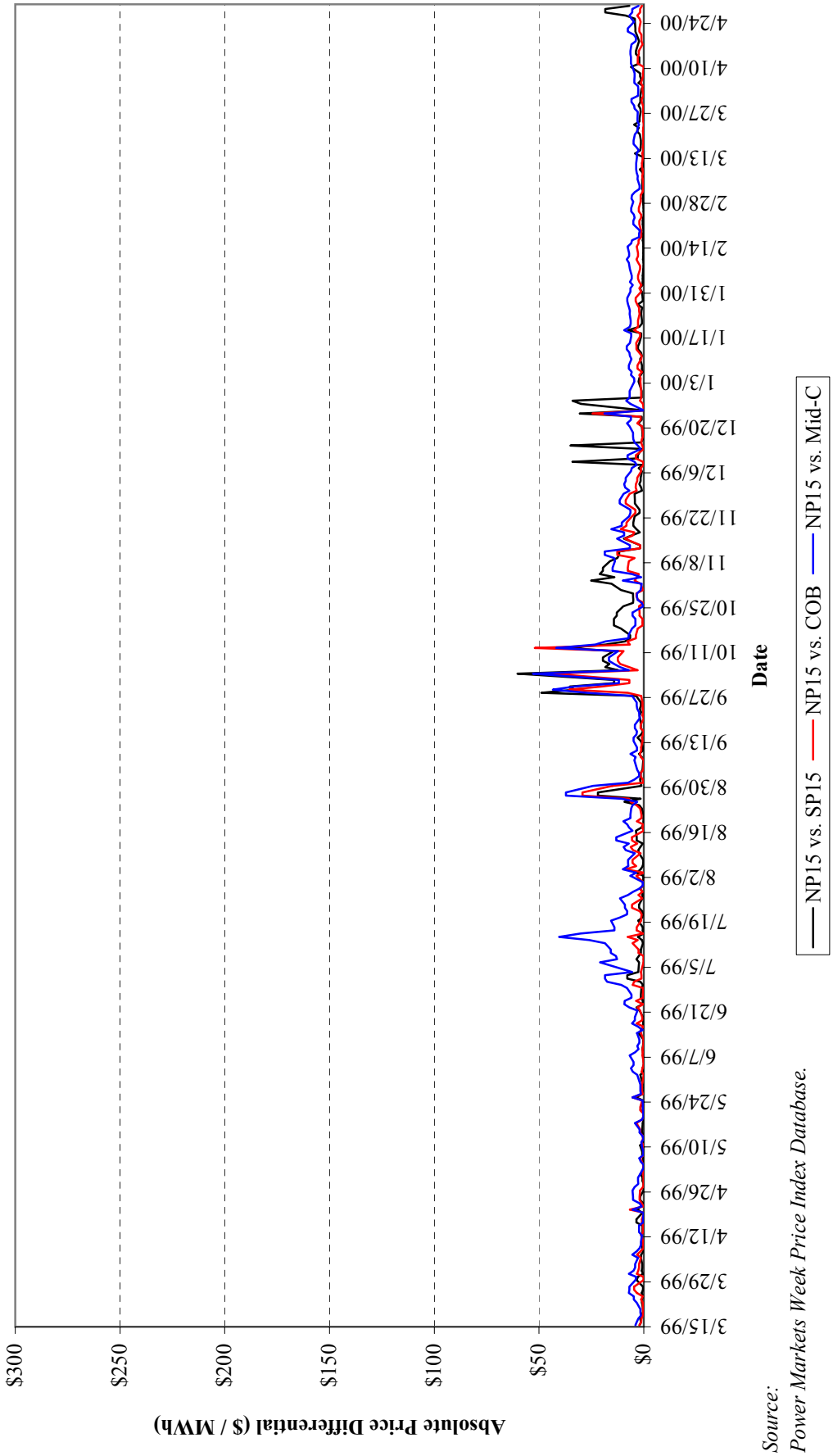
	Jan 1, 2000 - Apr 30, 2000				May 1, 2000 - Oct 1, 2000			
	All Hours		Peak Hours		All Hours		Peak Hours	
Congestion Between Points	*Hours*	*% of Hours*	*Hours*	*% of Hours*	*Hours*	*% of Hours*	*Hours*	*% of Hours*
NP15 NW	532	18%	468	29%	96	3%	88	4%
NP15 SP15	241	8%	122	7%	1,125	30%	403	20%
SP15 LA/IID	6	0%	4	0%	31	1%	13	1%
SP15 NW3	287	10%	267	16%	793	21%	500	24%
SP15 SW	673	23%	457	28%	253	7%	67	3%

	Oct 2, 2000 - Jan 18, 2001				Jan 19, 2001 - Jun 19, 2001			
	All Hours		Peak Hours		All Hours		Peak Hours	
Congestion Between Points	*Hours*	*% of Hours*	*Hours*	*% of Hours*	*Hours*	*% of Hours*	*Hours*	*% of Hours*
NP15 NW	217	8%	132	9%	173	5%	70	3%
NP15 SP15	1,525	59%	629	44%	1,601	44%	865	42%
SP15 LA/IID	56	2%	33	2%	102	3%	92	4%
SP15 NW3	890	34%	302	21%	1,346	37%	619	30%
SP15 SW	611	24%	308	21%	135	4%	48	2%

Sources and Notes:

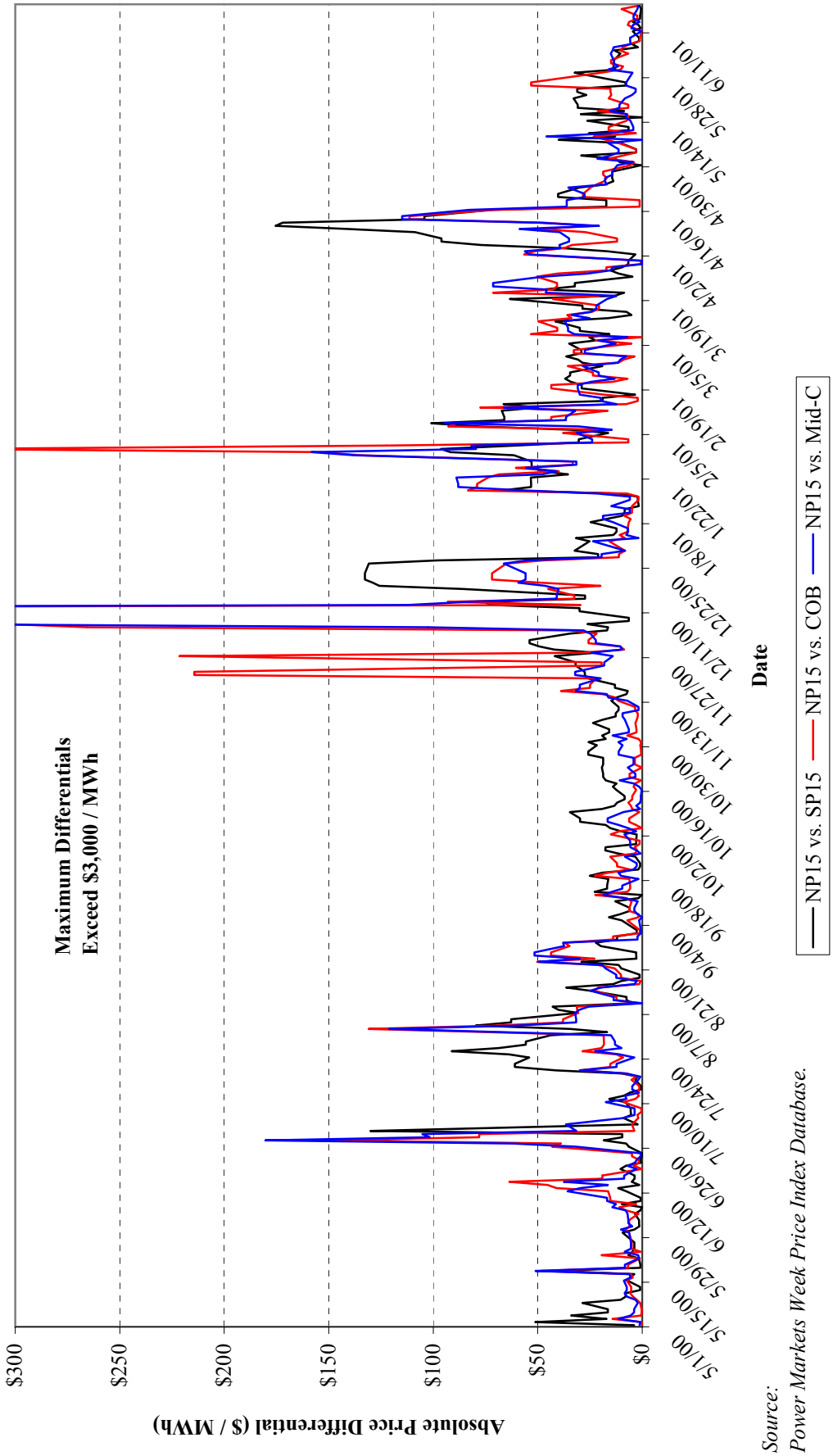
[1]: Source is response to Data Request CA-ISO-14.
[2]: The Area / Zone combination NP15 / SP15 represents congestion of Path 15.
[3]: The Area / Zone combination SP15 / NW3 represents congestion on NOB.
[4]: Congestion Between NP15 and NW represents congestion between NP15 and ISO Control Zones NW1, NW2, and SR2.

Figure III-1
NP-15 Absolute Price Differentials (Peak Strips)
Period A: 3/15/99 - 4/30/00



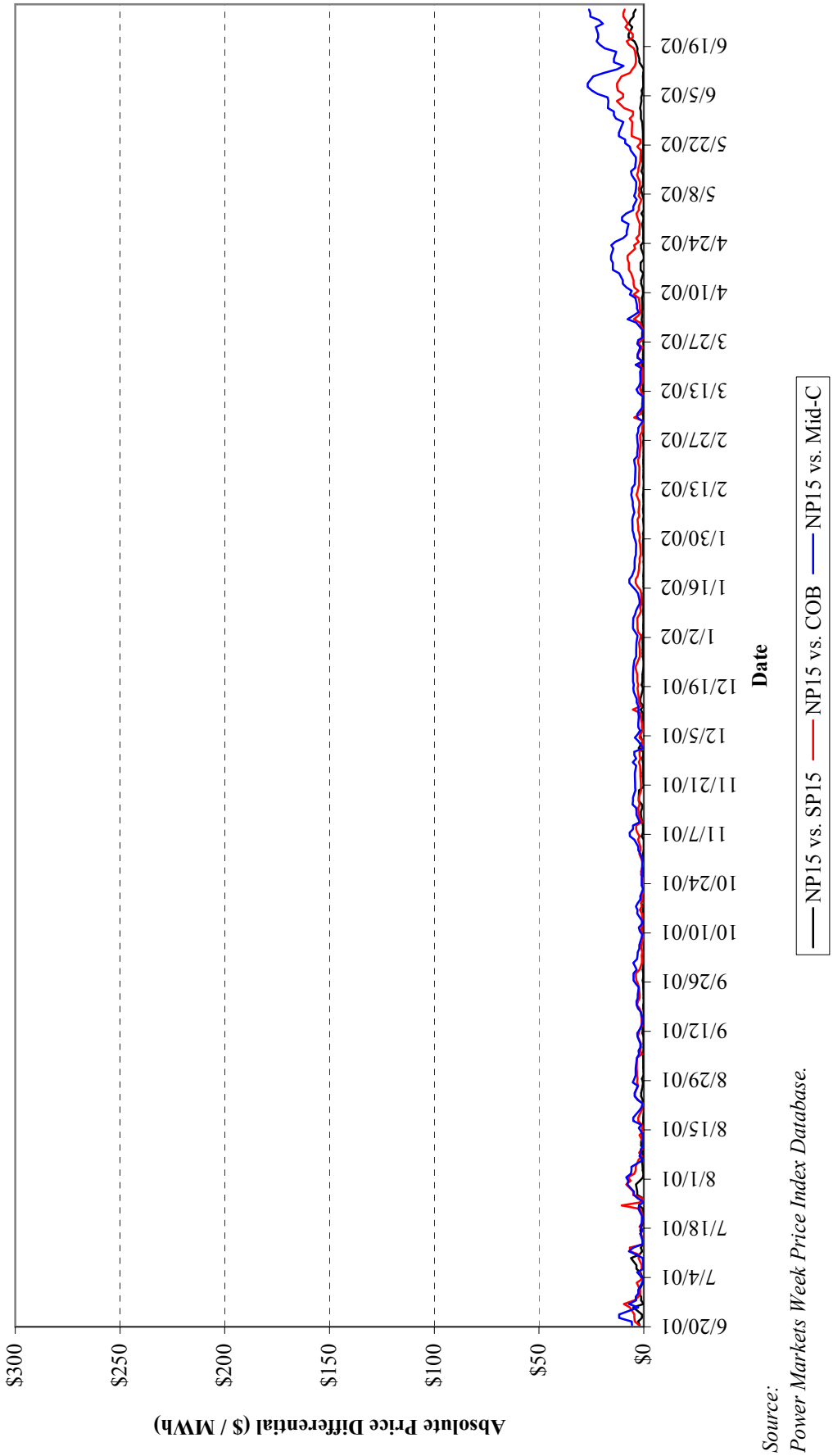
Source:
Power Markets Week Price Index Database.

Figure III-2
NP-15 Absolute Price Differentials (Peak Strips)
Period B: 5/1/00 - 6/19/01



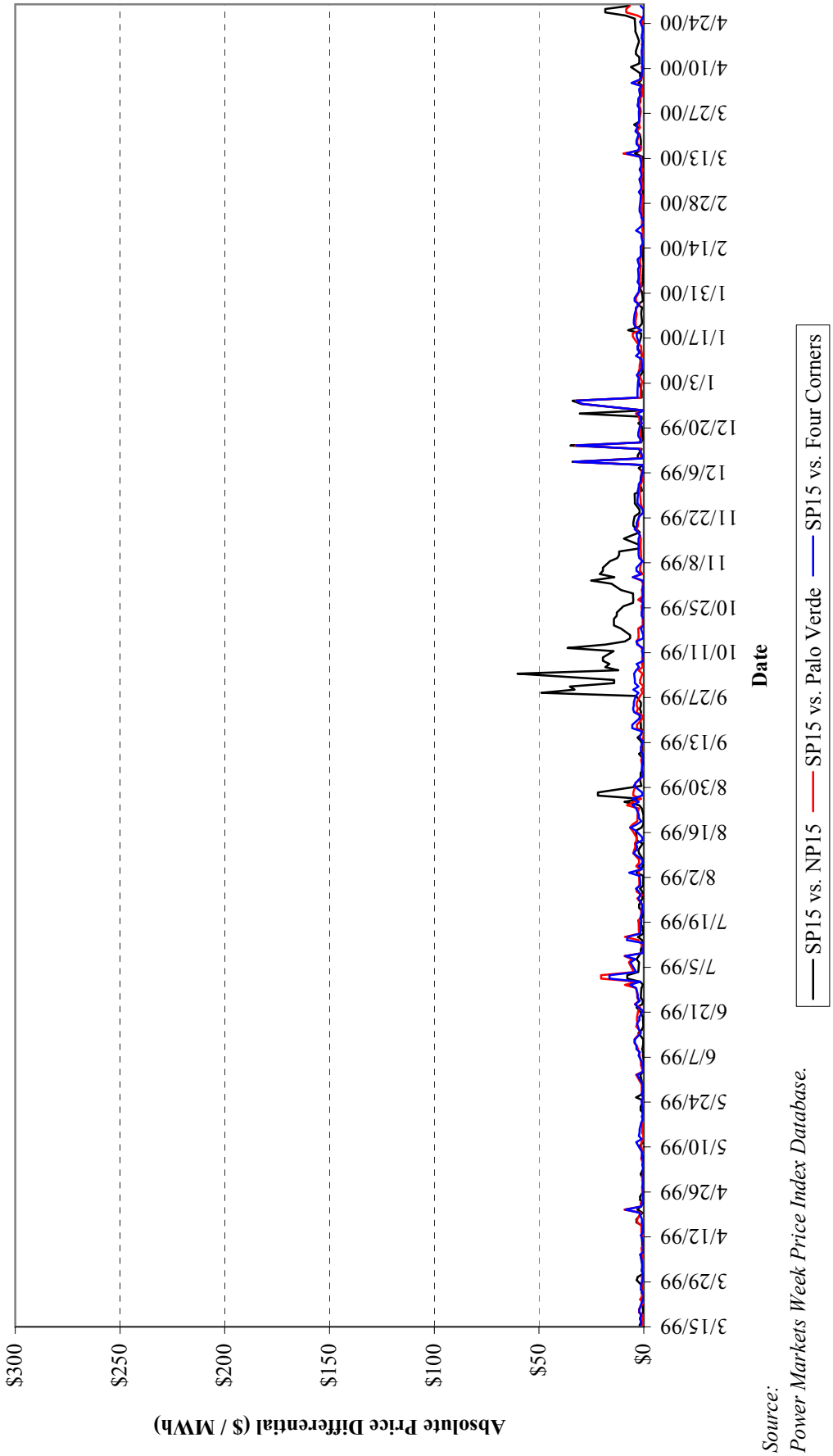
Source:
Power Markets Week Price Index Database.

Figure III-3
NP-15 Absolute Price Differentials (Peak Strips)
Period C: 6/20/01 - 6/30/02



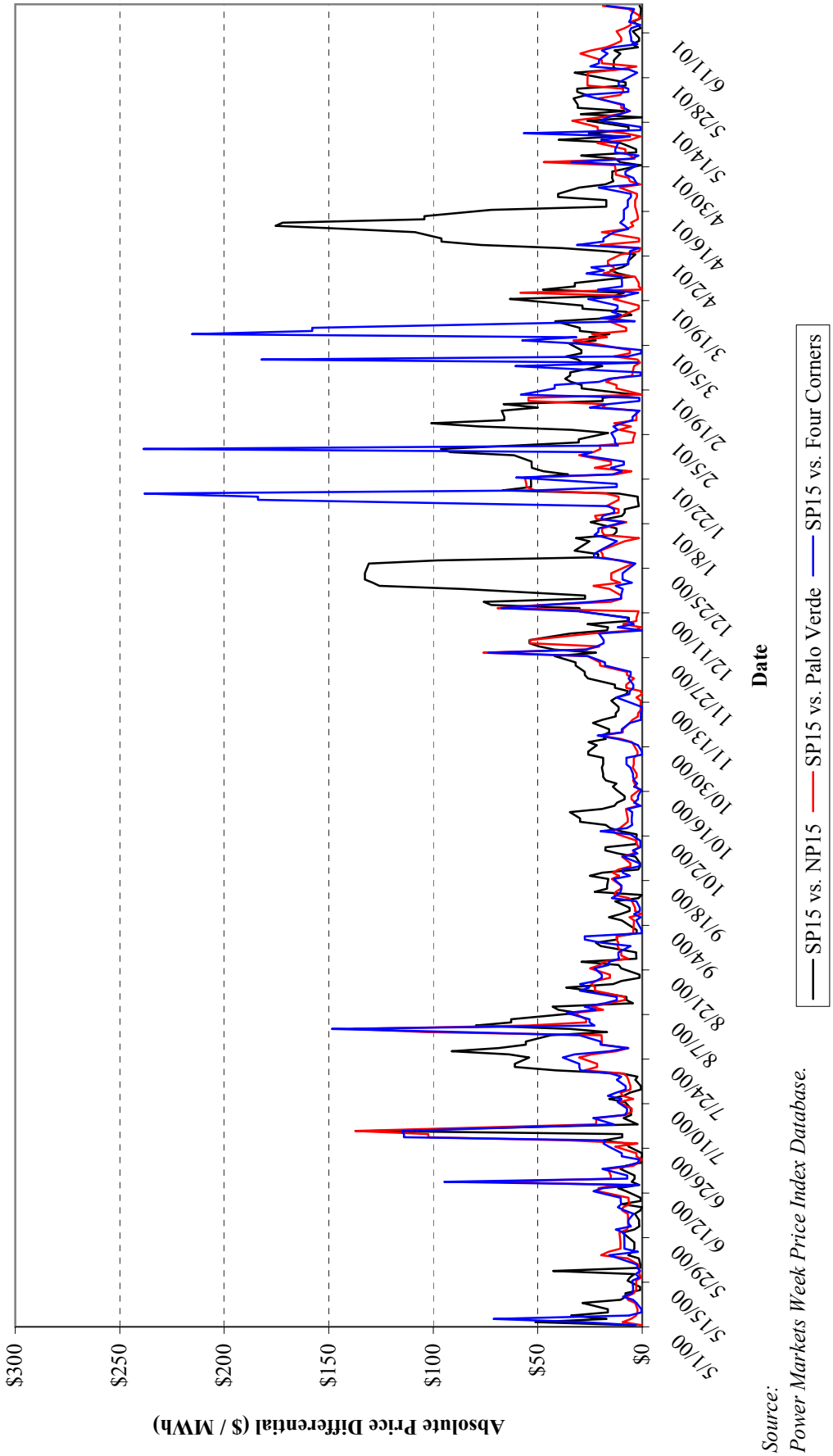
Source:
Power Markets Week Price Index Database.

Figure III-4
SP-15 Absolute Price Differentials (Peak Strips)
Period A: 3/15/99 - 4/30/00



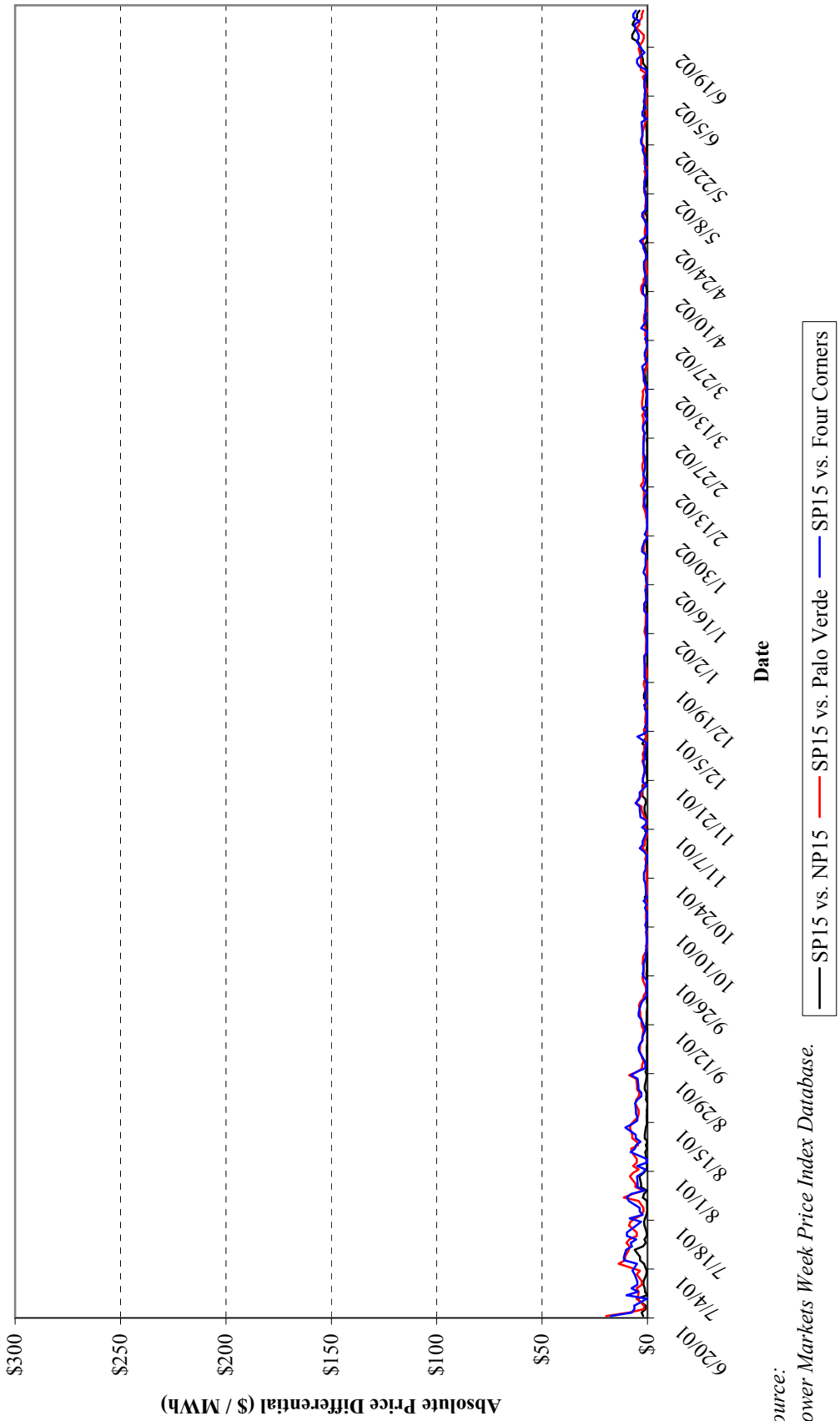
Source:
Power Markets Week Price Index Database.

Figure III-5
SP-15 Absolute Price Differentials (Peak Strips)
Period B: 5/1/00 - 6/19/01



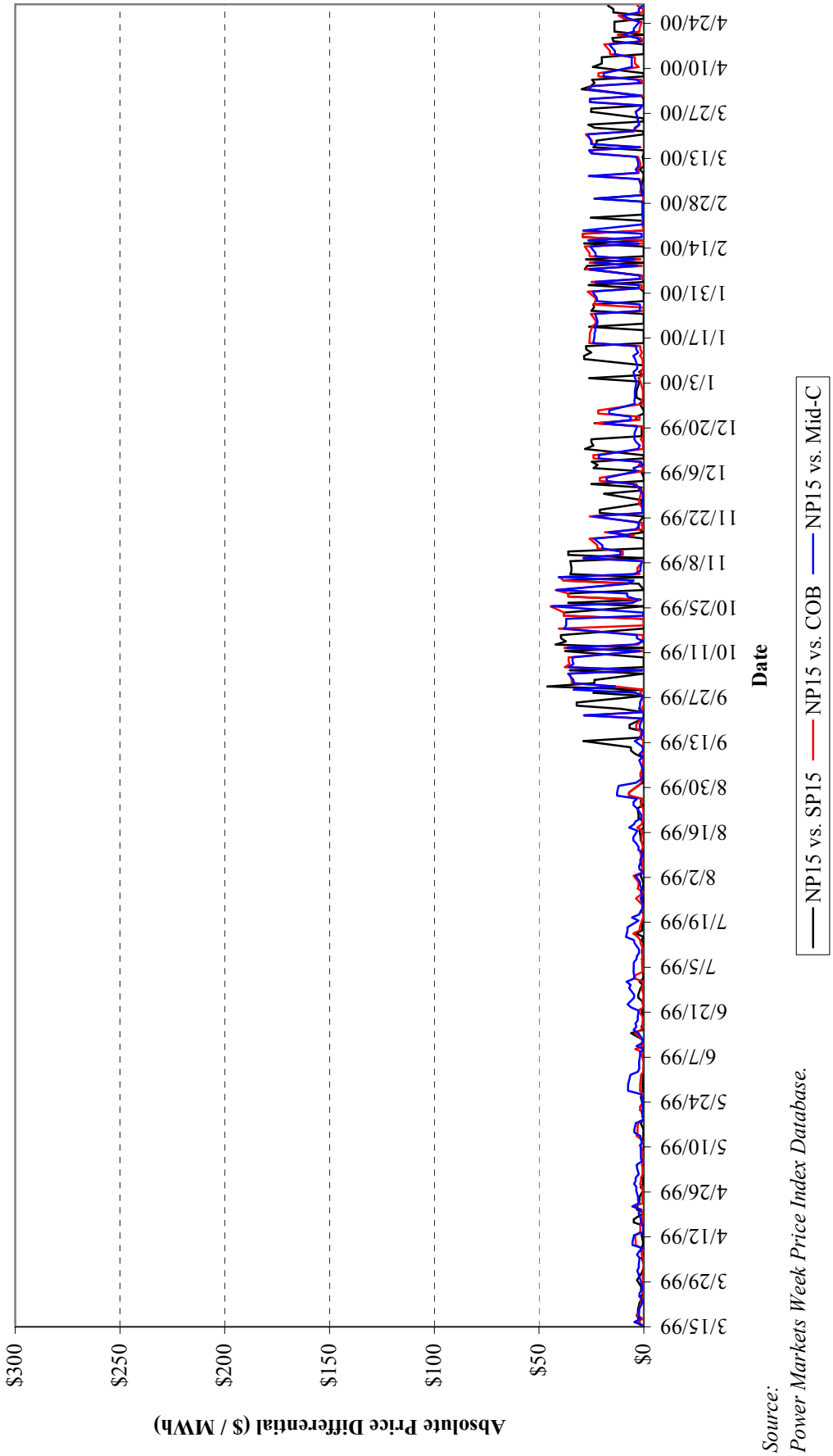
Source:
Power Markets Week Price Index Database.

Figure III-6
SP-15 Absolute Price Differentials (Peak Strips)
Period C: 6/20/01 - 6/30/02



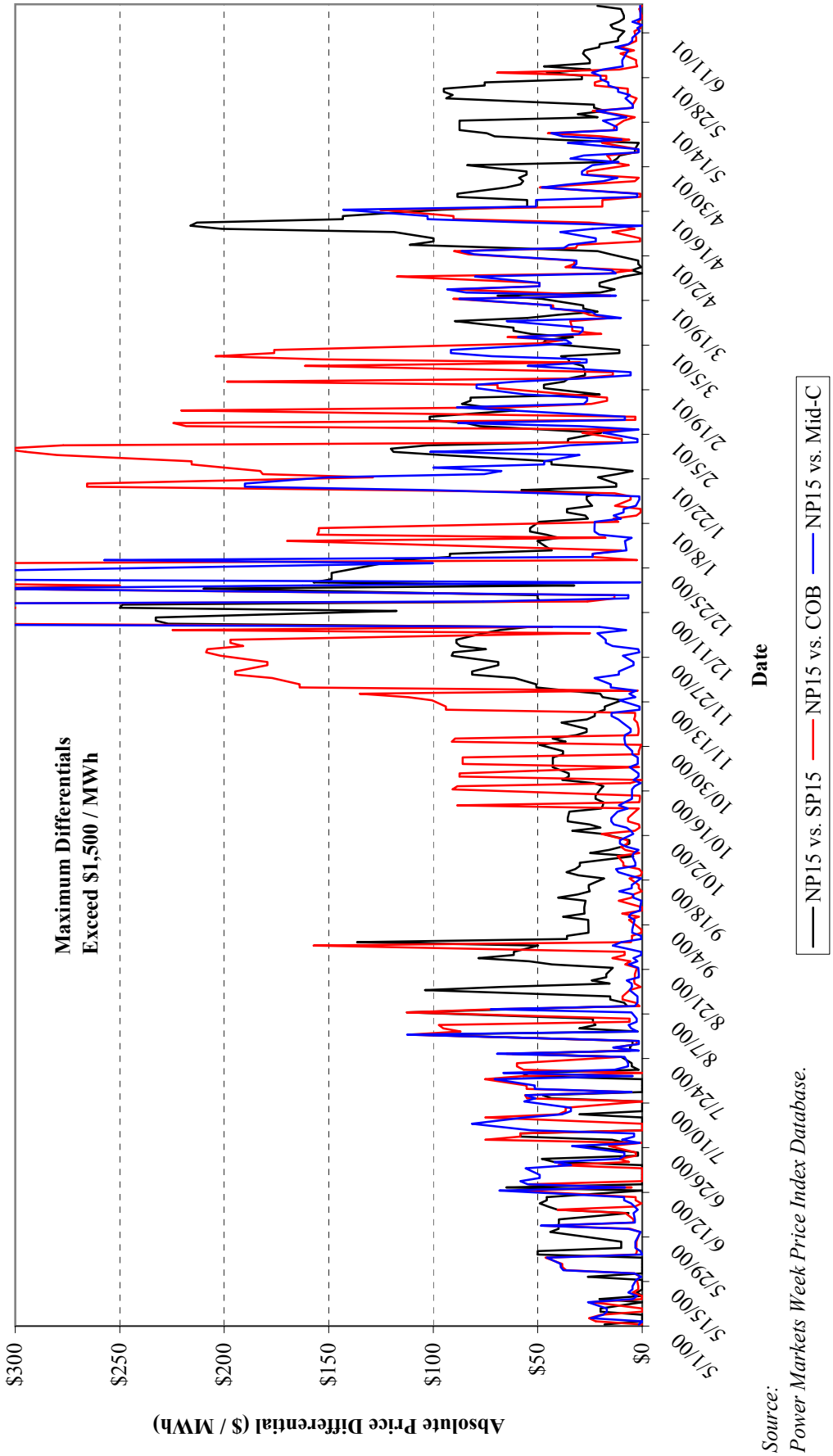
Source:
Power Markets Week Price Index Database.

Figure III-7
NP-15 Absolute Price Differentials (Off-Peak Strips)
Period A: 3/15/99 - 4/30/00



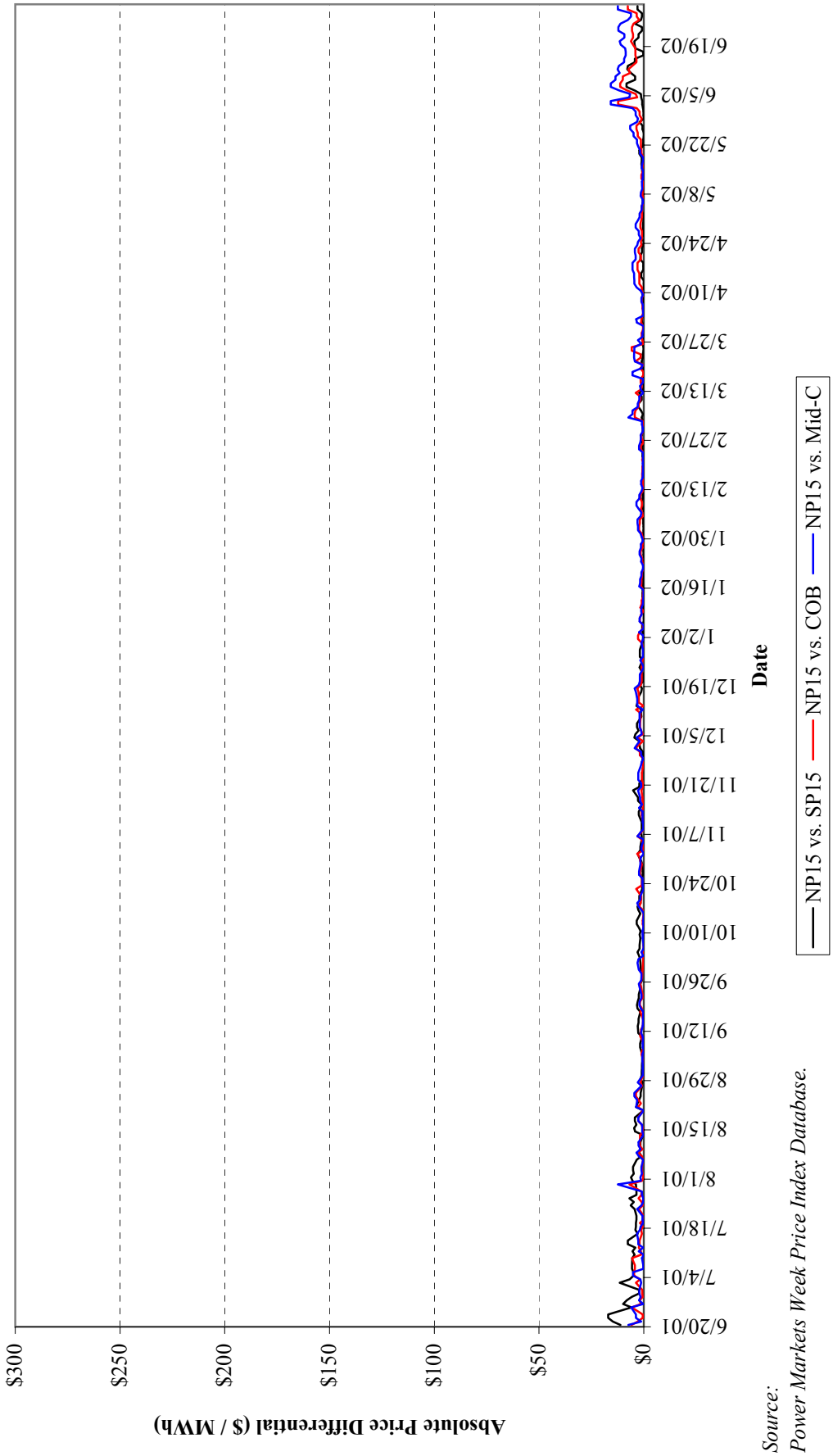
Source:
Power Markets Week Price Index Database.

Figure III-8
NP-15 Absolute Price Differentials (Off-Peak Strips)
Period B: 5/1/00 - 6/19/01



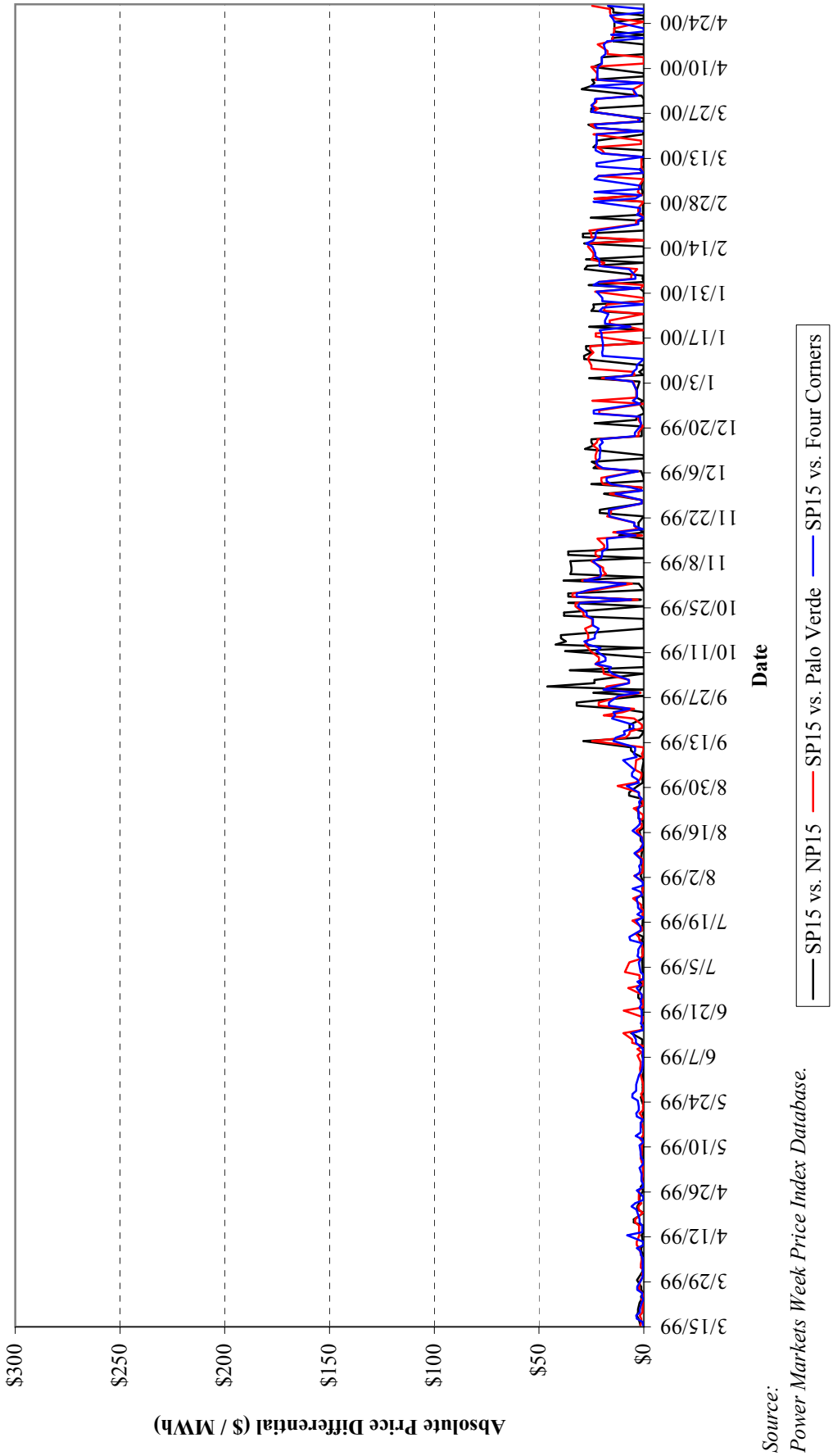
Source:
Power Markets Week Price Index Database.

Figure III-9
NP-15 Absolute Price Differentials (Off-Peak Strips)
Period C: 6/20/01 - 6/30/02



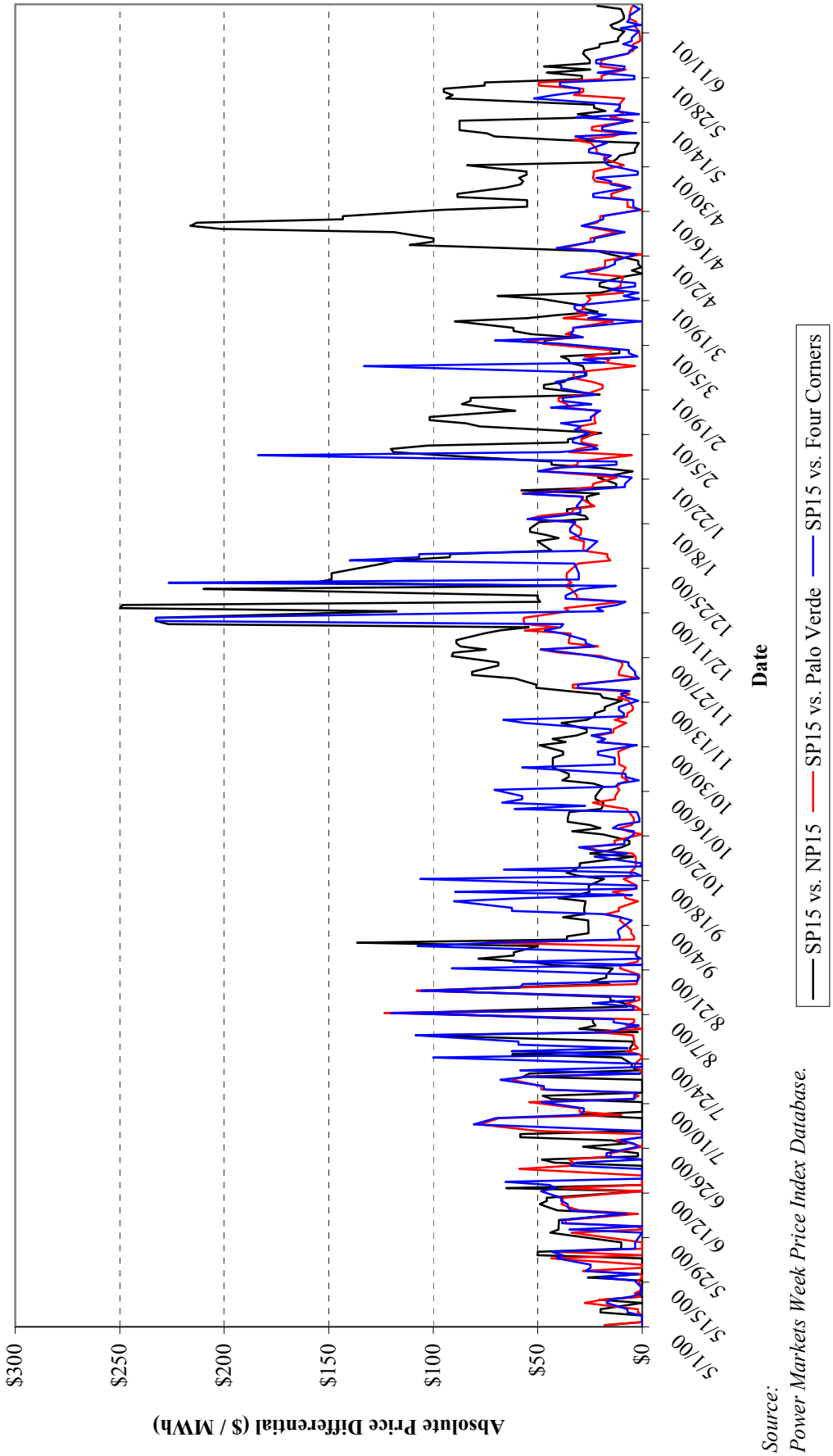
Source:
Power Markets Week Price Index Database.

Figure III-10
SP-15 Absolute Price Differentials (Off-Peak Strips)
Period A: 3/15/99 - 4/30/00



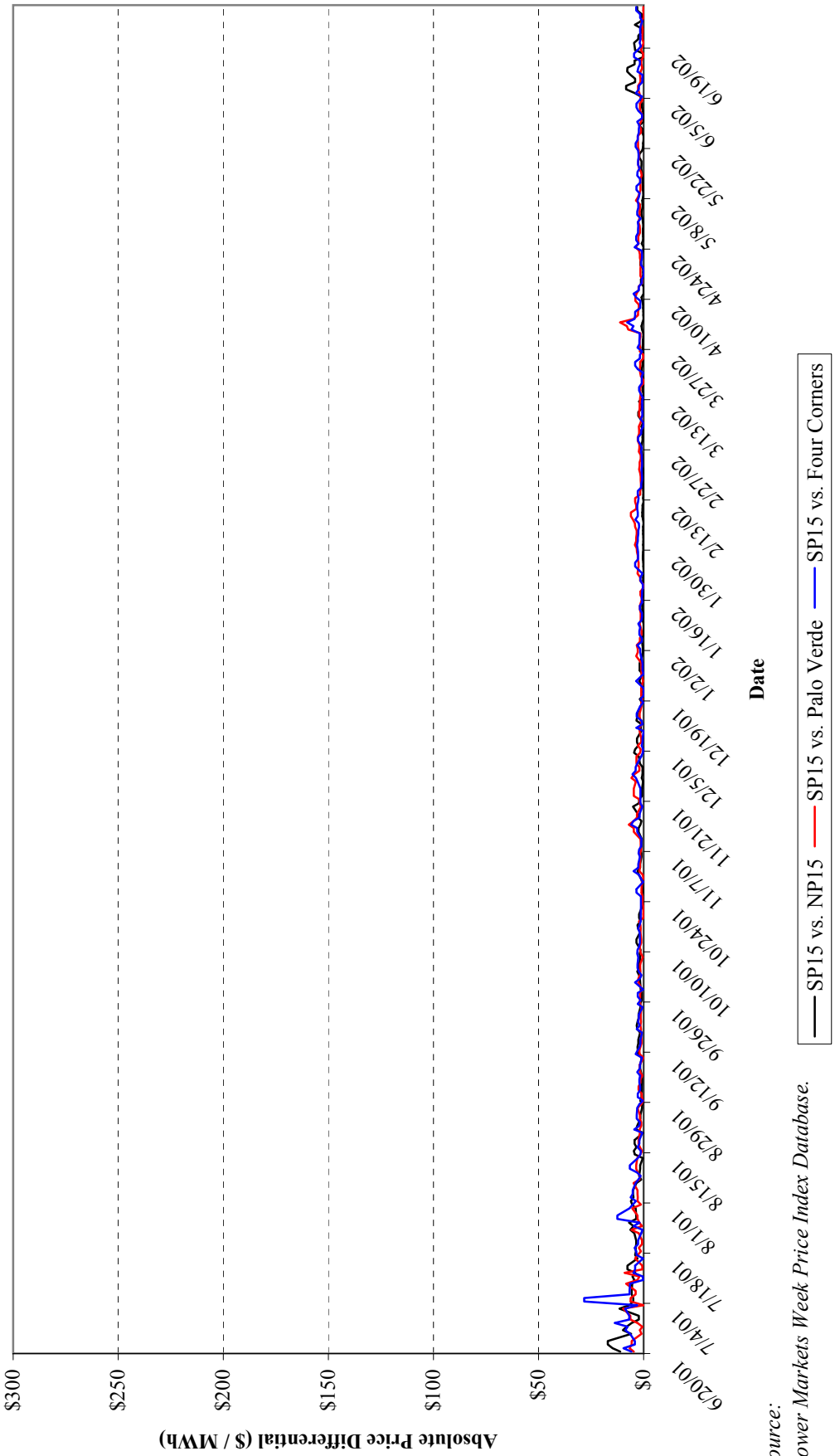
Source:
Power Markets Week Price Index Database.

Figure III-11
SP-15 Absolute Price Differentials (Off-Peak Strips)
Period B: 5/1/00 - 6/19/01



Source:
Power Markets Week Price Index Database.

Figure III-12
SP-15 Absolute Price Differentials (Off-Peak Strips)
Period C: 6/20/01 - 6/30/02



Source:
Power Markets Week Price Index Database.

Table I-1 (Amended)
(Replacing Table I-1 in Exh. No. CA-2 at 167-168)
Scheduling of False Load
Average Metered and Scheduled Load (MW) during On-Peak Hours
by Period for the Most Active Schedule Coordinators

	January 1, 2000 - April 30, 2000				
Schedule Coordinator	*Average Metered Load* [1]	*Average Scheduled Load* [2]	*Difference* [3]	*Number of Hours with False Load* [4]	*Percent of Hours with False Load* [5]
Southern Company Energy Marketing, L.P.	0	94	94	549	53.72%
ENRON Power Marketing, Inc.	538	724	187	874	53.55%
PG&E Energy Services Corporation	465	616	150	786	48.16%
California Polar Power Brokers, L.L.C.	1	124	124	1134	77.88%
NewEnergy Inc.	700	803	103	443	37.93%
Sempra Energy Trading Corporation	35	136	101	1052	64.46%
Idaho Power Company	11	26	15	564	34.90%
Salt River Project	461	535	75	546	33.46%

	May 1, 2000 - October 1, 2000				
Schedule Coordinator	*Average Metered Load* [1]	*Average Scheduled Load* [2]	*Difference* [3]	*Number of Hours with False Load* [4]	*Percent of Hours with False Load* [5]
Southern Company Energy Marketing, L.P.	0	217	217	1216	63.17%
City of Riverside	272	347	74	585	28.34%
ENRON Power Marketing, Inc.	919	1,330	411	1898	91.96%
British Columbia Power Exchange Corporation	255	613	358	1255	60.80%
Hafslund Energy Trading L.L.C.	0	223	223	674	48.98%
Sempra Energy Trading Corporation	46	231	184	1473	71.57%
California Polar Power Brokers, L.L.C.	0	162	162	426	21.65%
PG&E Energy Trading Power, L.P.	0	155	155	1131	77.68%
Coral Power, L.L.C.	33	124	91	647	39.02%

	October 2, 2000 - January 17, 2001				
Schedule Coordinator	*Average Metered Load* [1]	*Average Scheduled Load* [2]	*Difference* [3]	*Number of Hours with False Load* [4]	*Percent of Hours with False Load* [5]
Southern Company Energy Marketing, L.P.	0	242	242	716	61.56%
Dynegy/Electric Clearinghouse	48	141	93	472	32.78%
British Columbia Power Exchange Corporation	212	720	508	736	51.11%
ENRON Power Marketing, Inc.	948	1,368	420	1077	74.79%
Sempra Energy Trading Corporation	0	262	262	746	75.35%
Hafslund Energy Trading L.L.C.	0	232	232	418	56.79%
PG&E Energy Trading Power, L.P.	0	230	230	710	75.53%
Coral Power, L.L.C.	16	71	55	658	45.69%
Salt River Project	539	613	75	379	26.32%
Northern California Power Agency	36	103	68	356	24.72%

Notes:
[1] Average hourly MW of metered load during hours in which SC scheduled false load. Source: Response to CAL-ISO-28.
[2] Average hourly MW of scheduled load during hours in which SC scheduled false load. Source: Response to CAL-ISO-4.
[3] [2] - [1]
[4] Number of hours false load was scheduled.
[5] [4] as a proportion of hours in which either scheduled or metered load were greater than zero.

A scheduling coordinator was considered to have scheduled false load in an hour if scheduled load exceeded metered load by at least 50 MW or if scheduled load was at least twice metered load and scheduled load was greater than 10 MW.

Scheduling coordinators listed above scheduled false load in at least 20% of the on-peak hours during which they had either postive scheduled or metered load.