Testimony of Robert McCullough

Q: Please give your name and address.

A: My name is Robert McCullough. My place of business is McCullough Research, 6123 S.E. Reed College Place, Portland, Oregon 97202. My qualifications are included as Wah Chang Exhibit 301.

Q: What is the purpose of your testimony?

A: On May 22, 2000, the power market across the Western U.S. and Canada experienced a one time shift in market economics roughly equivalent to the removal of 8,000 MW of generation. The impact of the supply shift was an enormous impact on prices throughout the region. I have studied that shift in great detail; I wish to explain its cause and effect, and tender the data I have gathered in support of my conclusions. Last, I would also like to explain the origins of the market-indexed rate and its misuse in the present business atmosphere.

Q: How is your testimony organized?

A: My testimony addresses ten major points:

1. The Western wholesale market in mid-1990s

2. Industry Expectations in 1997

3. April 1998 To May 2000

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

4. The Behavior of Market Price May 2000

5. Evidence for the Exercise of Market Power
   - A: Load Resource Balance
   - B. Disconnection from Fuel Costs
   - C. Unexplained Under-generation

6. Market Power Impacts On WSCC Prices

7. Financial and Physical Hedges

8. FERC's Finding of Unjust and Unreasonable Prices

9. Future Market Developments

10. Origins and Limits of Market-Indexed Pricing

Summary

Q: Can you summarize your conclusions?

A: Yes. The complex California experiment in centrally directed "market prices" has failed to deliver reasonable results. Instead of providing a competitive solution, the California ISO ("Independent System Operator", the transmission operator) and PX ("Power Exchange", the now defunct energy supply mechanism) have provided a "petri dish" for collusion and profiteering. The result has been prices and operations that appear to have little relationship to traditional supply and demand. Players in this collusive environment have made enormous profits – brokering gas based generation into ISO emergency "out

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

of market" purchases.[1] The mechanics of the process were facilitated, at the start, by the decision of the ISO to provide critical market data to the generators and marketers in California, and, after withdrawal of that data, by the physical withholding of generation--ostensibly (but suspiciously) attributed to forced outages-- accounting for as much as 30% of the generation within the ISO's control area.

Q: What has happened since May 22nd?

A: As I stated above, on May 22, 2000, western bulk power markets saw a shift in supply roughly equivalent to 8,000 megawatts. The impact on prices has been equivalent to the loss of eight nuclear stations, thirty two Frame 7F natural gas fired units, or the removal of a half dozen Columbia hydroelectric projects. The massively distorted market conditions could not have been, and were not, expected by market participants, and have led to a state of affairs where the none of the Western bulk power markets may be said to represent just or reasonable price levels. For that reason no pricing mechanism based on an index of any of those markets is just or reasonable.

The Western Wholesale Market in Mid-1990s

Q: Please summarize the history of bulk power markets since 1980.

A: The bulk power market on the West Coast started in 1980 with the passage of the Pacific Northwest Regional Power Act. Traditionally, the Bonneville Power Administration had allocated its hydroelectric surplus according to legal priorities and historic use patterns. As part of the implementation of the new law, BPA began an active marketing program. The early years of the market were characterized by continuing conflict between

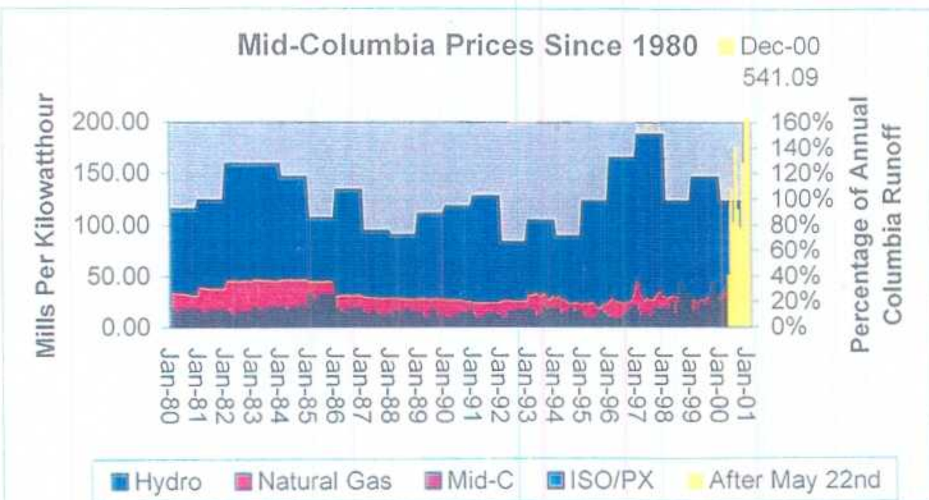
[1] "Out of market" means purchases from the real WSCC energy market. It is the opposite of purchases from the PX and ISO administered markets.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100

California and the Pacific Northwest over the appropriate regulated price for the hydroelectric surplus as prices fluctuated between the displacement value in California and the Pacific Northwest.

In 1987 this conflict was settled by the approval of the Federal Energy Regulatory Commission of the Western States Power Pool experiment. Final approval of the experiment occurred in 1991. The WSPP approval effectively recognized the status quo that had existed since 1980 – an unregulated bulk power market where prices were largely governed by the cost of the highest cost currently operating thermal unit.

The bulk power market has remained stable throughout droughts, earthquakes, and wide variations in the load/resource balance. The following chart shows hydro runoffs, natural gas prices, and Mid-Columbia prices since 1980.



Q: What prices have we seen in the market since 1980?

A: From 1980 to March 1998, the bulk power market reflected a simple rule of pricing – prices reflected the highest cost running unit on the system. Although this period saw

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

droughts, dramatic load/resource imbalances, and high gas prices, the overall level of prices was very low. On April 1st, 1998, the California system of administered markets began. Prices increased to compensate for the inefficiencies at the ISO and the PX and the elimination of the negotiating advantage traditionally enjoyed by the large California utilities. Natural gas prices and Columbia River inflows encouraged lower prices over this period, but were outweighed by the impact of the new system. Starting in May, 2000, a dramatic shift occurred. Prices increased by a factor of eight over traditional levels – by a factor of five over the ISO/PX prices of the previous two years – while natural gas prices on average increased by only fifty percent.

The following table shows average Columbia River inflows, natural gas prices in California , and the melded electric energy price at the Mid-Columbia hydro plants for on- and off-peak power:

	Mid-C	Columbia Inflows	Natural Gas
January 1980 to March 1998	15.22	99%	$ 3.38
April 1998 to April 2000	24.17	107%	$ 3.04
May 2000 to December 2000	169.41	98%	$ 7.53

Industry Expectations in 1997

Q: Can you testify concerning market perceptions in 1997?

A: Yes. I provided numerous forecasts of market prices to industrial customers and utilities over this period, and closely followed conclusions of other professional forecasters in the area.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100

Q: What did the industry forecast about future prices?

A: Overall, the industry based its forecasts on the highest-cost running-unit methodology. This approach mirrored operations in other commodity markets. In a nutshell, prices were expected to reflect the least efficient unit running within the WSCC. Eventually, use of less and less efficient units would create a signal that would cause new gas fired units to be added.

Q: Is it possible to put a number to this expectation?

A: Actually, it is. The long run expectation was for the price to be set by the cost of gas fired generation at a 7,000 heat rate, for years the assumed practical limit of thermal efficiency. The calculation is six mills for capital costs, three mills for O&M, and fourteen to seventeen mills (depending on the gas forecast) for fuel. The total was twenty three to twenty six mills. Before the period when new plant construction was implied, the cost would be lower than this.

Q: Were these naive theoretical beliefs?

A. We certainly did not think so, nor do I now in retrospect. Seventeen years of experience with bulk power markets had taught us that prices would increase until the supply of electricity equaled demand. The market mechanism that set prices equal to the high cost running unit simply reflected reality – if the price went higher, more units would be dispatched than the system could use. If the price was lower, the system would face a shortage of electricity until the price increased.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

Q: Can you point to any public forecasts and computer models that used this approach?

A: Yes. BPA built a simple model that reflected this methodology, as did the Pacific Northwest Regional Planning Council. Even Pacific commissioned such models for their forecasting needs.

Simply stated, our experience of real world markets lead us to expect that bulk power prices would be based on fundamentals – the world of Paul Samuelson (marginal cost of production), and the smooth operation of supply and demand.

April 1998 To May 2000

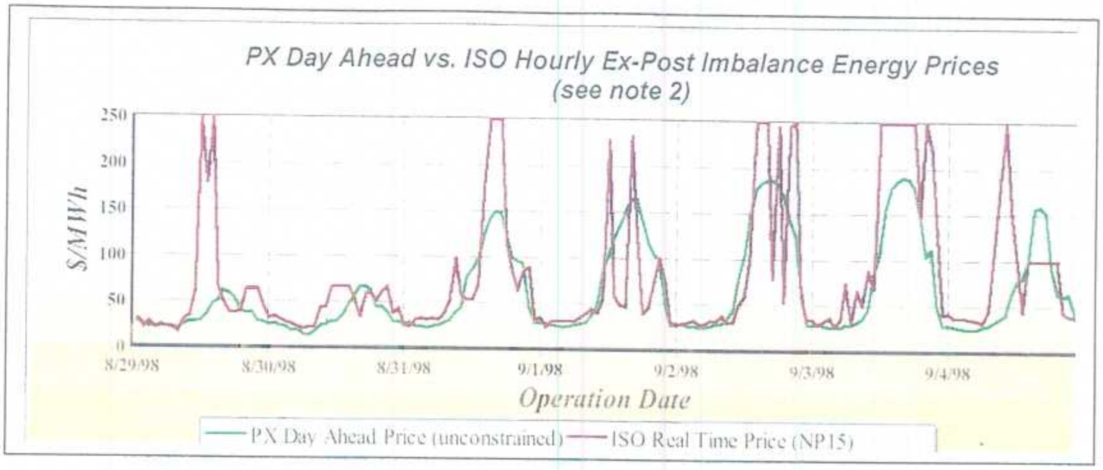
Q: What happened on April 1st, 1998?

A: This was the date that California's newly restructured electricity market system went into effect.

Q: What was the genesis of California "restructuring?"

A: On May 24, 1995, the California Public Utilities Commission issued its order on electric restructuring. After intense lobbying, the CPUC proposed a "poolco" based on the United Kingdom model – a centralized mechanism where all transactions went through a central administered marketplace. This order formed the template upon which the complex consensus known as AB-1890 was based. AB-1890, signed on September 23rd, 1996, institutionalized the complex ISO/PX mechanisms that were brought into operation on April 1st, 1998.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100



From the beginning the ISO/PX structure was complex and not without problems. As early as August 1998, the ISO contributed to high regional prices due to underscheduling from the Power Exchange.[2]

Q: Can you describe the actual operations of the California system?

A: Although the experiment was described as deregulation, the reality was almost 180 degrees from that goal.

The desire for "transparent" prices had drawn the architects of the system to a centralized structure. The Power Exchange received daily, day-ahead bids from suppliers and customer aggregators (in practice very little retail competition ever developed, so the only real aggregators were the three existing utilities.) Once the Power Exchange had determined the market clearing price, the data was handed to the Independent System

[2] The basic structure of the California system under AB-1890 required that the three large investor owned utilities purchase all of their requirements from the Power Exchange. Although theory presumed that supply would equal demand, practice has been very different. Both generators and utilities have underscheduled at the day-ahead PX auction, leaving the ISO to meet large unanticipated requirements that must be covered in the real time market. This was a recipe for disaster, as ISO requirements were purchased at emergency prices, to avoid blackouts and without cost constraints.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

Operator who checked whether the market solution was consistent with transmission and reliability constraints. The ISO then operated a computerized market of its own for capacity to provide reserves for the market. This process determines whether the ISO feels it is necessary to hold a second auction in real time to cover real load.

The system was appallingly bureaucratic. Submission of bids into the agencies was so complex that classes were required before experienced utilities could participate. The agencies, themselves, were swamped by the complexity of their own process with "settlements"-- actual economic transactions routinely lagged energy dispatch and consumption by ninety days.

Q: What price impact did the ISO and PX have?

A: Our statistical approach indicates that this added between 18.1 mills (on-peak) and 9.6 mills (off-peak) to western market prices.

Most of us were surprised when the new system raised prices in the western energy markets. With the wisdom of hindsight, it is now clear that two effects were at work. First, the new system eliminated the negotiating advantage traditionally enjoyed by PG&E and SCE. These large utilities were the primary consumers of secondary energy and could pick and choose their suppliers. They exercised their advantages ably and were often able to out negotiate Pacific Northwest utilities. Secondly, the sheer complexity of the process added a deadweight cost to the market in California. One of our utility clients has estimated that working through the California system added three mills (ten to fifteen percent, at the time) to the cost of supplying power in California.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100

The Behavior of Market Prices May 2000

Q: What happened on May 22nd?

A: On May 22nd we saw a sudden shift in prices upward from historical fundamental levels. Since May 22nd, explanation of West Coast prices based on supply and demand or fossil fuel prices has no longer been possible.

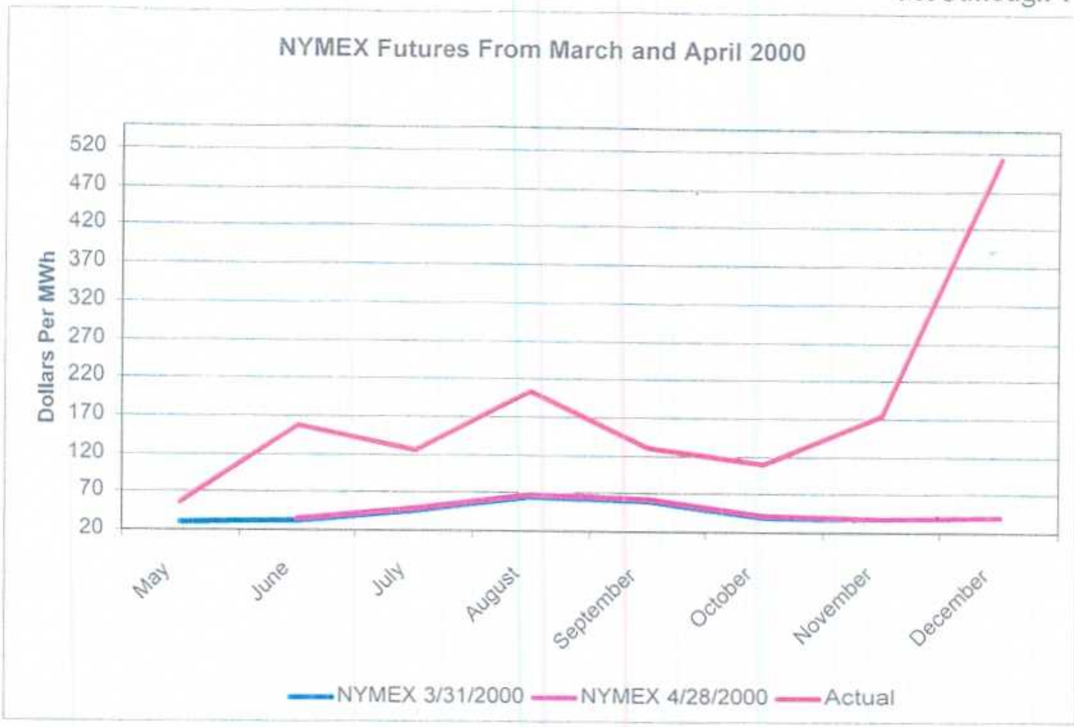
Q: Was this foreseen by the market?

A: Absolutely not. Back when we had organized futures markets for electricity, we could check future expectations by simply looking up the future prices on the NYMEX or the PX block forward market. Neither futures market predicted this shift.

Q: Show us the NYMEX at this time, please.

A: The NYMEX futures markets predicted that 2000 would closely resemble 1999. The following chart shows the March and April settlements on the NYMEX for the remainder of 2000.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158



Q: Were you active in this area at the time?

A: Yes. In the course of the May 22nd excursion I received calls from our utility and industrial clients asking if we knew what was going on. Other industry analysts also called to check the facts. Overall, I discussed the matter with a half dozen different market players on the first day of the shift from Seattle City Light to the analysts from Energy Market Report.

Q: Has the situation persisted after May 22nd?

A: Yes. The following chart shows twenty years of market prices.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100

Simply stated, against the massive price increases since May 22nd, previous market prices appear minuscule. Even the drought and capacity constraints of the mid 1980s are dwarfed against developments in California in the past few months.

Evidence for the Exercise of Market Power

Q: Before you discuss your evidence, please define what you mean by "market power."

A: I use the definition used by FERC staff : market power is "the ability of a seller to influence market outcomes, especially the market price for a sustained period."[3]

Simply stated, market power occurs when a seller is able to shift the prices in the market by its actions or through the actions of a cartel of which the seller is a member. The

---

[3] November 1, 2000 FERC Staff Report, page 5-16.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

California wholesale power structure is particularly susceptible to the exercise of market power. The complex rules, the pervasive secrecy, and the very limited number of sellers make this a fertile area for market manipulation schemes.

With market power, a seller can create the perception of scarcity by withdrawing his product from the market – artificially making consumers pay prices that should only occur during periods of actual scarcity. But without direct proof of manipulation or collusion, it is necessary to make sure any scarcity was not naturally occurring. This was my first inquiry.

Load Resource Balance

Q: Did you find such naturally occurring scarcity? Was the shift in market pricing due to a naturally occurring shift in market fundamentals--demand, supply, marginal cost of production?

A: No. As I will discuss below, the simple explanations of below average water along the Columbia or the increase in loads will not work to explain the price shift. In order to make sure that this was the case, I undertook an extensive review of the fundamental conditions using data from the WSCC, the ISO, the EPA, FERC, the Energy Information Administration, Natural Resources Canada, the Canadian National Energy Board, BPA, and the Northwest Power Pool (NWPP).

The presence of enormous hydroelectric resources along the Pacific coast has insulated the electric industry from hour to hour operating constraints. This freedom from hourly concerns also is reflected in the available data. While almost all utility and generating data is public, hourly data is not commonly collected outside of regulatory proceedings.[4]

---

[4] The Federal Energy Regulatory Commission, the Energy Information Administration, and Natural Resources Canada provide detailed information on a monthly basis. Generation figures, by plant, including costs, are available for the U.S. Weekly data is available from the through the Northwest Power Pool. Hourly generation

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100

As of the date of this testimony (April 2001) complete hourly data is only available through December from the EPA and through October from the WSCC.

Monthly data is currently available through November from FERC and Energy Information Administration and through November from Natural Resources Canada.

Almost all explanations for the price spike based on supply and demand concerns turn out to be exaggerated. Hydro conditions were average in 2000, peak loads (only ISO peak loads are currently available) were lower in 2000 than in 1999. Gas prices were higher – considerably so – but this would only explain a portion of the price changes. Overall capacity margins appeared sufficient to meet loads across the region.

Q: Please summarize the load resource balance.

A: The West Coast's reliability is the responsibility of the Western Systems Coordinating Council, a trade organization with members from the utilities, marketers, and regulators. At least twice a year, the WSCC issues reports on the load resource balance from Alberta to New Mexico.

Overall, the WSCC has found sufficient resources for the West Coast, California, and the ISO. The lowest reserve margins are for the ISO during the months of July and August. Even within these months, the margin is significantly higher than any normal standard for reliability problems. The ISO's subsequent announcement of 102 system emergencies in 2000 has directly contradicted these estimates.

---

data is available from the Army Corps of Engineers, and the Environmental Protection Agency. Of these, only hydroelectric generation at the Corps projects is available without a substantial lag. One very important source, the EHV (Electric High Voltage) data base, is available (on a website administered by the WSCC) without a lag, but substantial obstacles had to be overcome before it could be accessed. Apparently as a result of our investigation, the ISO withdrew from this database the day after our initial results were announced.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

Q: Are the WSCC resources available to the California market?

A: This is difficult to answer. Clearly, the resources are present, and theoretically available through the integrated transmission network which links the WSCC states and provinces together. The ISO's ability to maximize the advantage of the network is in some doubt.

The ISO has classified even the most trivial day to day information. A careful review of ISO operations indicates that they have little information even on the resources in their control area. And even for the resources where they have knowledge, their operations have been frequently in error. For example, even though the area requires substantial resources on-peak, the ISO often fails to refill pumped storage units under its control.

The best we can say today is that the resources are present, but the ISO may not know about or be able to dispatch these resources effectively.

Q: Have you reviewed loads in the WSCC and California since May 22nd?

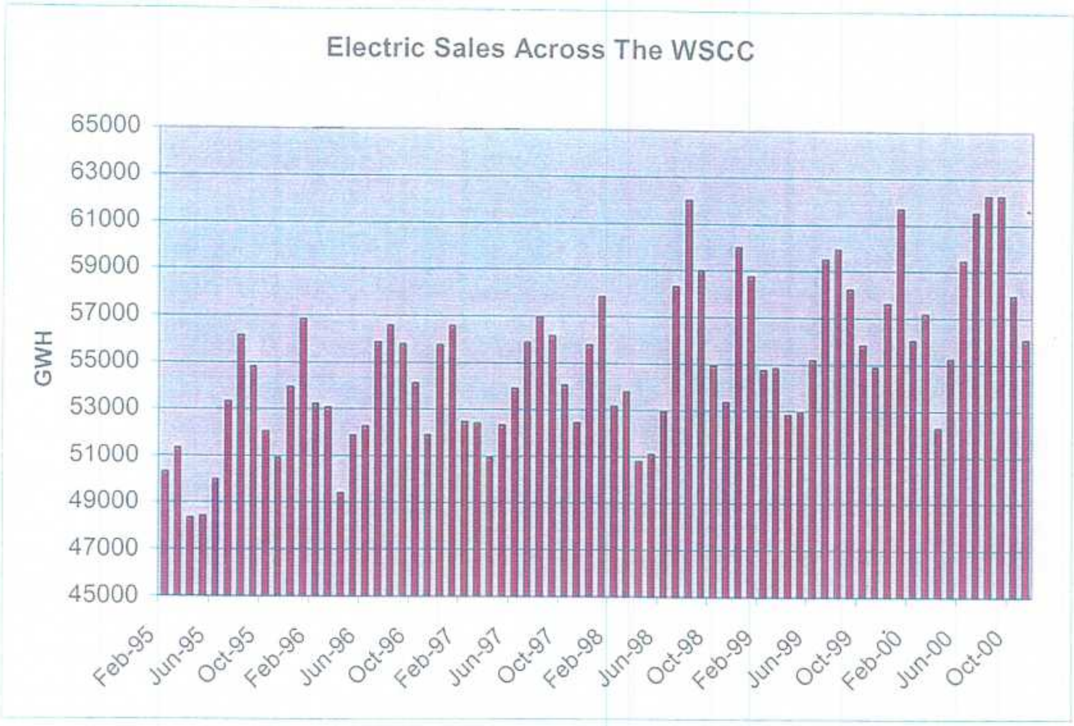
A: We will not have hourly loads for the entire WSCC until the summer of 2001. We do have hourly loads for the ISO through 2000 and monthly energy loads for the entire WSCC through November.

Retail load data is available by state for the U.S. and by province for Canada through November 2000. Definitions vary slightly between the two countries, and no attempt has been made to include the small portions of Texas and Mexico within the WSCC, but these factors are of no major moment.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100

Q: What was your finding?

A: Actual WSCC loads were higher in the summer of 1998 and the winter of 1999/2000 than the loads through July of 2000.

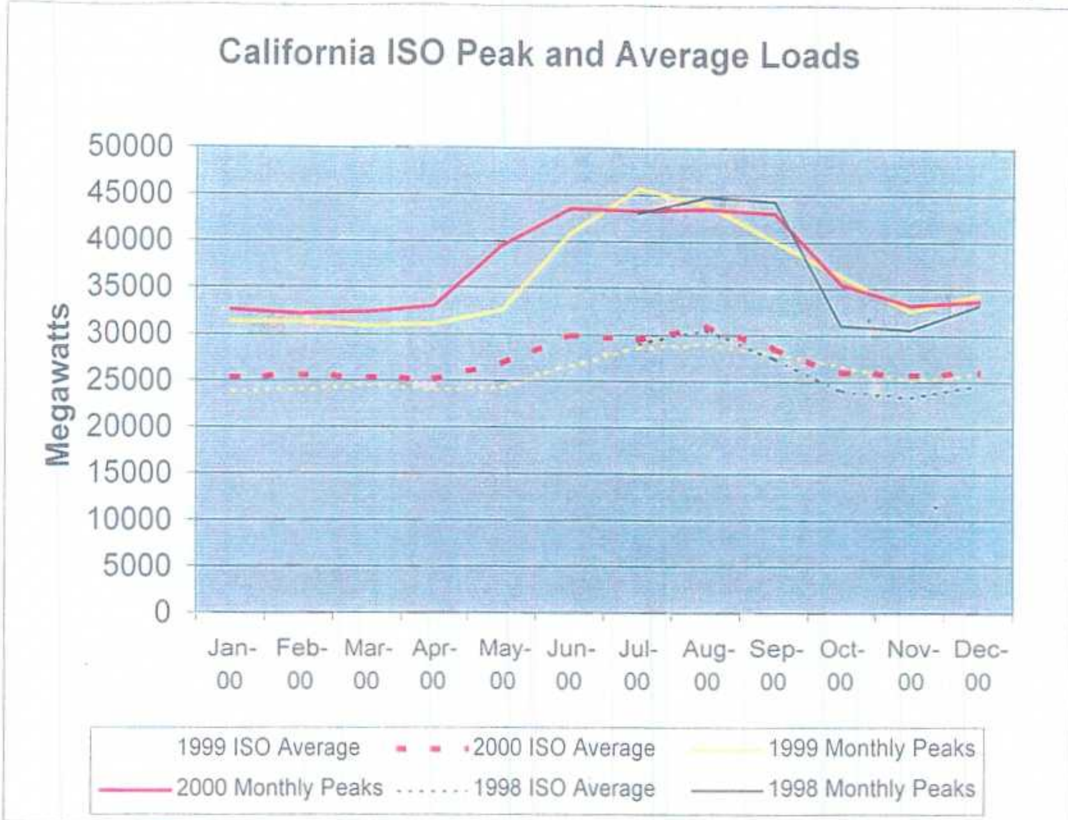


Regional loads in May were lower than loads during a number of previous months, and roughly equivalent to the loads on May 1999.

In spite of a number of reports to the contrary, California ISO peak in 2000 was significantly lower than the peak in 1999. The 1998 California ISO peak was also higher than the peak load for summer 2000.[5] In fact, the ISO's summer peak was the lowest since 1996.

[5] The hourly load data set from the University of California Energy Institute identifies the 1998 peak load as 44,759 megawatts, the 1999 peak as 45,574 megawatts, and the summer 2000 peak as 43,509 megawatts.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

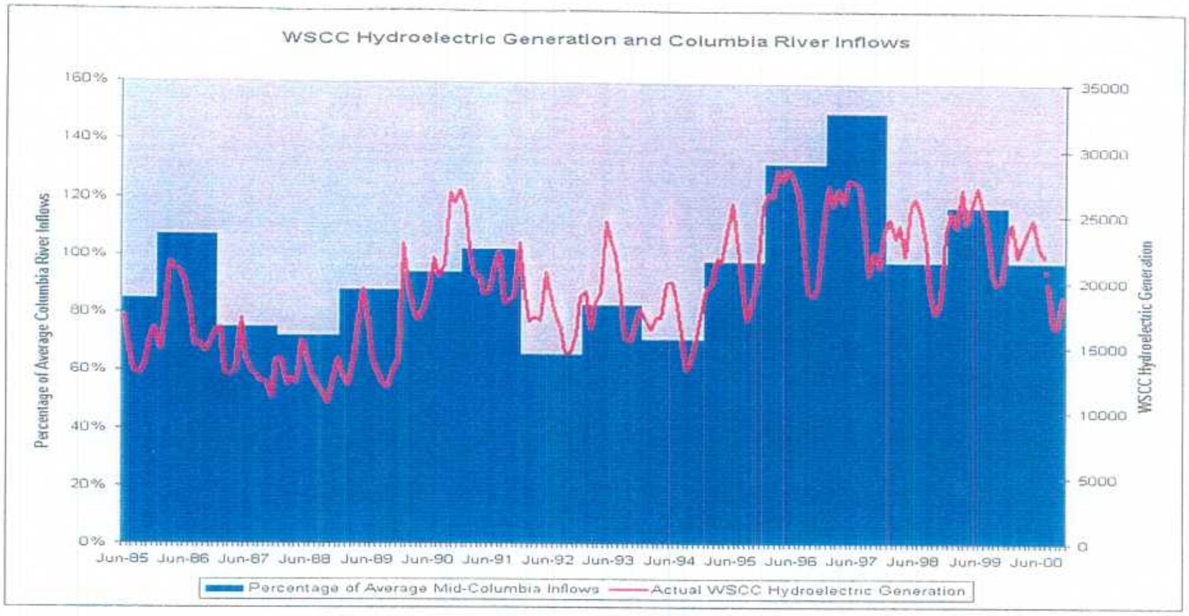


The significance of this chart is that summer peaks in 2000 were not surprisingly high. Summer peaks were lower than the previous three years. Average energy use was higher than 1999, but approximately equivalent to 1998.

Q: Please summarize the hydroelectric situation in 2000.

A: The major hydroelectric resource on the West Coast is the Columbia River. The Columbia is unusual among major hydroelectric resources, both for the uncertainty of its annual flows and the highly restricted amount of storage available. Columbia inflows were only average in 2000, although May hydroelectric generation was 120% of the May average from 1986 through 1999. In fact, all summer generation was slightly above the average for the past fourteen years.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100

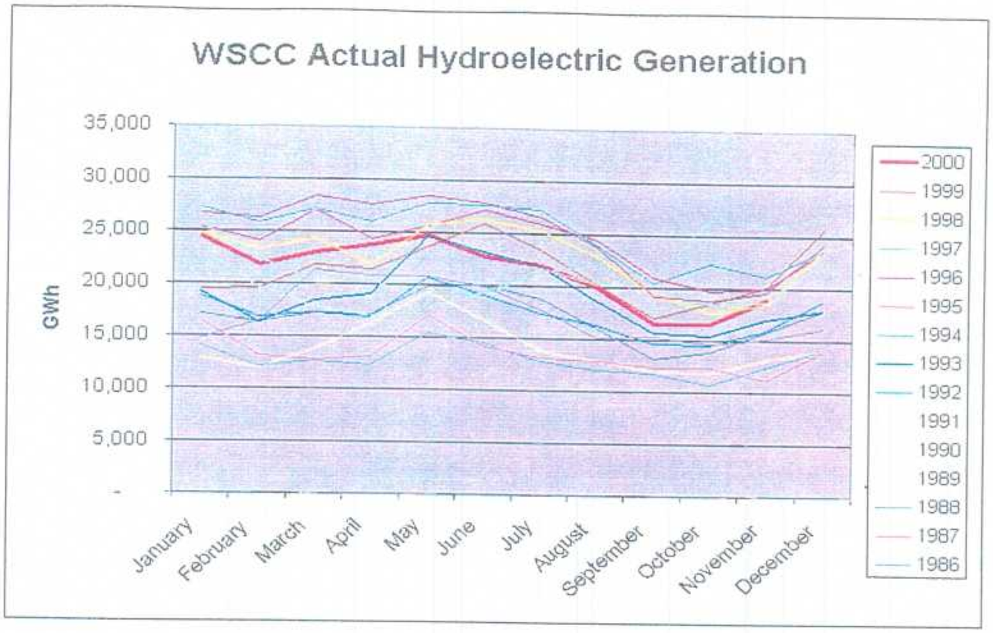


There has been substantial publicity concerning the "low" flows on the Columbia, but the actual data is very different, at least for the year 2000. [6] Columbia flows peak in the late spring as the snow melts along the Canadian Rockies. The pattern of flows in 2000 were unusual – June was lower than expected – but overall total hydroelectric generation was better than average.

Data on hydroelectric generation is currently available through November for the WSCC.

[6] It is absolutely essential, to avoid the trap of mistaking anecdote for objective evidence, that one observe the time periods being addressed. Here, for example, it will not do to impute the forecasted drought conditions of 2001 to 2000.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158



Q: What are your conclusions about WSCC load/ resource balance in 2000?

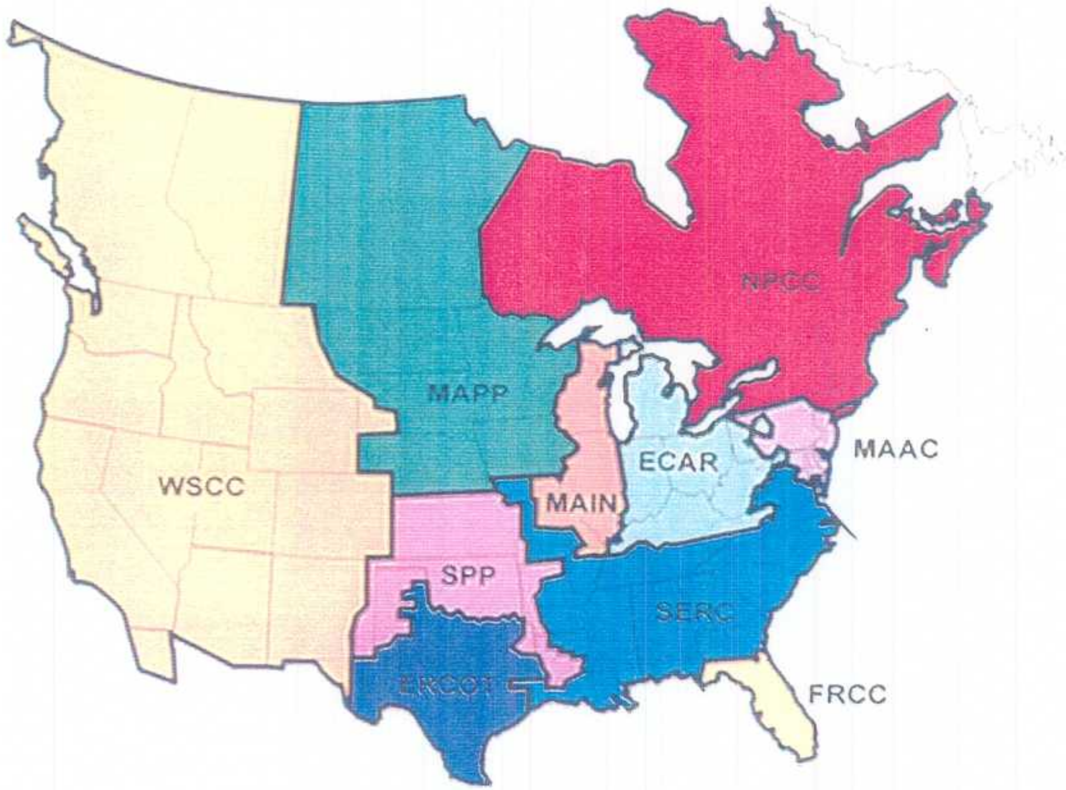
A: Overall, this year was not unusual in terms of loads, hydroelectric generation, or the load/resource balance. The WSCC's assumption of "business as usual" was very reasonable in terms of the summer's operations. ISO peak loads were lower than in the previous three years, average loads increased, and hydroelectric generation was a bit above average. There simply was no major shift in market fundamentals.

Q: Was there an actual reliability problem in California?

A: No. From the beginning of the summer severe doubt has existed concerning the accuracy of the ISO's reliability calculations. Reliability calculations in the U.S. and Canada are the province of the National Electric Reliability Council (NERC.) NERC was founded in the mid-60's in response to New England's "great blackout." NERC is an association of the U.S. and Canadian entities who trade, generate, and regulate electricity. In actual practice, reliability issues are delegated to a series of local reliability councils. The

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100

council that addresses reliability concerns in the west is the Western Systems Coordinating Council or WSCC.

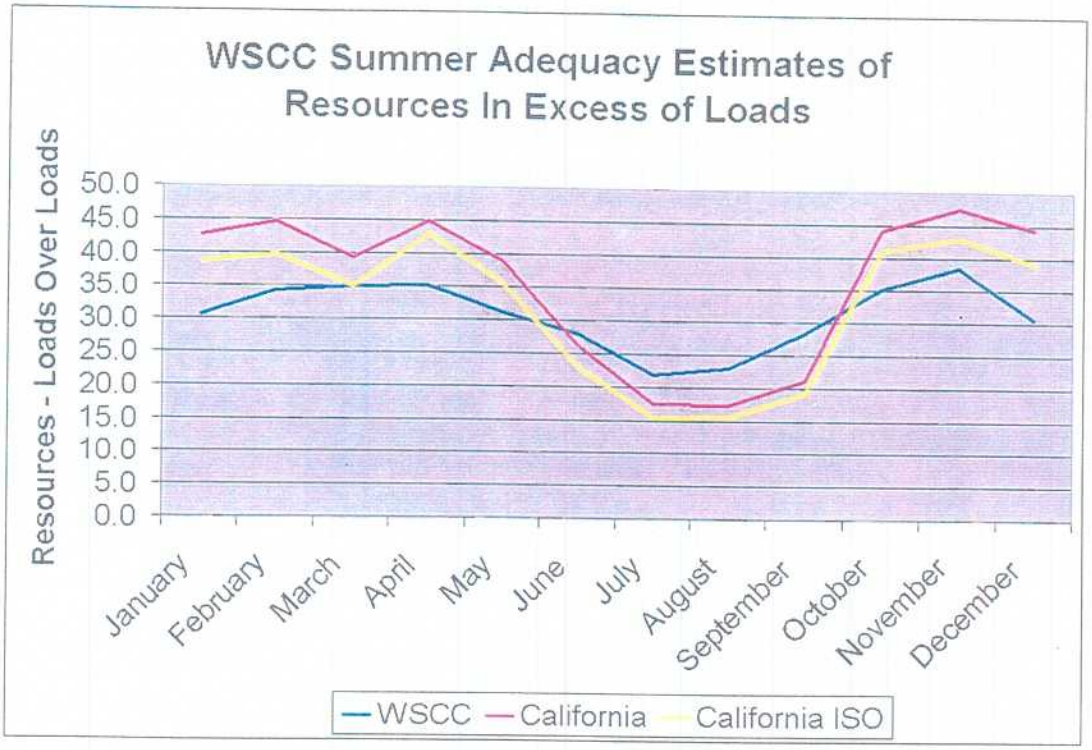


The WSCC evaluates the state of the load resource balance in our area in a number of different documents. The two most widely know documents are the Load and Resources Report and the Summer Adequacy Report. The 2000 Summer Adequacy Report was published on May 25, 2000.

The Summer Adequacy Report indicated that there were sufficient resources on both a regional level and within California. The following chart summarizes the reserve margin, by month, for the WSCC, California, and the portion (approximately 80%) served by the California ISO.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

The following chart summarizes the margin of resources over loads in 2000 for the entire WSCC, California, and the ISO's portion of California.



The WSCC estimates for California and the ISO implied a satisfactory margin of loads over resources for this summer – a margin above 15%. The WSCC estimates depended on a low level of imports – 2,000 megawatts over the summer months.[7]

Notwithstanding the foregoing, from May 23rd through the end of the summer, the ISO declared 38 separate emergencies. In each case, the ISO announced that their reserves had fallen below the appropriate trigger level. Each emergency was characterized by

---

[7] WSCC estimates are "worst case." Imports to California would be far lower if the Pacific Northwest had experienced "critical water" – the worst inflows in our historical record. As noted above, the Columbia River inflows were average so the energy available for export to California was significantly higher than the WSCC's assumptions.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100

high prices as the ISO entered the larger WSCC bulk power market for "out of market" purchases to meet its system peaks in real time.

Q: Did the rest of the region seem to share the ISO's sense of shortage?

A: Absolutely not. The contradiction between the ISO and the WSCC estimates has been difficult for the industry to resolve. As a matter of industry tradition, reliability issues are not matters that are subject to deception – declaring a false emergency is the equivalent of "crying wolf." At the same time, the ISO's frequent emergencies did not reflect the experience of the summer at any other utility in the region.

The only echo of the ISO's continuing difficulties that occurred elsewhere on the West Coast was a single day (August 22nd, 2000) when the Bonneville Power Administration advised the national Marine Fisheries Service that low flows might threaten its environmental obligations. BPA officials later noted that they were amazed at the quantity of offers they received the next day from potential suppliers.

Q: How do you explain this disparity of view over power supply?

A: The answer turns out to be relatively straightforward. Every other utility in the region makes its reliability assessments and capacity arrangements on a reasonable prospective planning horizon. As a matter of industry practice, each utility owns or has contracted for sufficient capacity to meet summer and winter peaks – even after forced outages.[8] The ISO, on the other hand, depends on day-ahead offers of capacity to meet summer peaks. Simply put, the ISO declared each emergency when the offers of capacity were insufficient to meet its reliability criteria. It is, of course, significant that, without

[8] Industry usage is that the phrase "forced outage" to describe the breakdown of equipment. "Planned outage" means that the plant is out of service for maintenance.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

exception, next day real-time sellers were available to avert the ISO's emergency, but at murderous market-clearing prices. The mystery is why the ISO allowed itself to be so repeatedly deceived. This, alone, may explain FERC's recent insistence on the elimination of seller's representatives from the ISO board.

Q: Do you see California quickly correcting the problems?

A: No. California has not implemented any significant reforms in the ISO process. FERC has eliminated the PX as a going concern, but the ISO's myopia concerning capacity supply remains unaddressed.

The confusion has been complicated by the ISO's secrecy policies. After months of effort on our part, the ISO finally released historical forced outage data for the resources within the ISO's service territory only within the past several weeks. ISO representatives stress that their own information during the summer was faulty and incomplete.

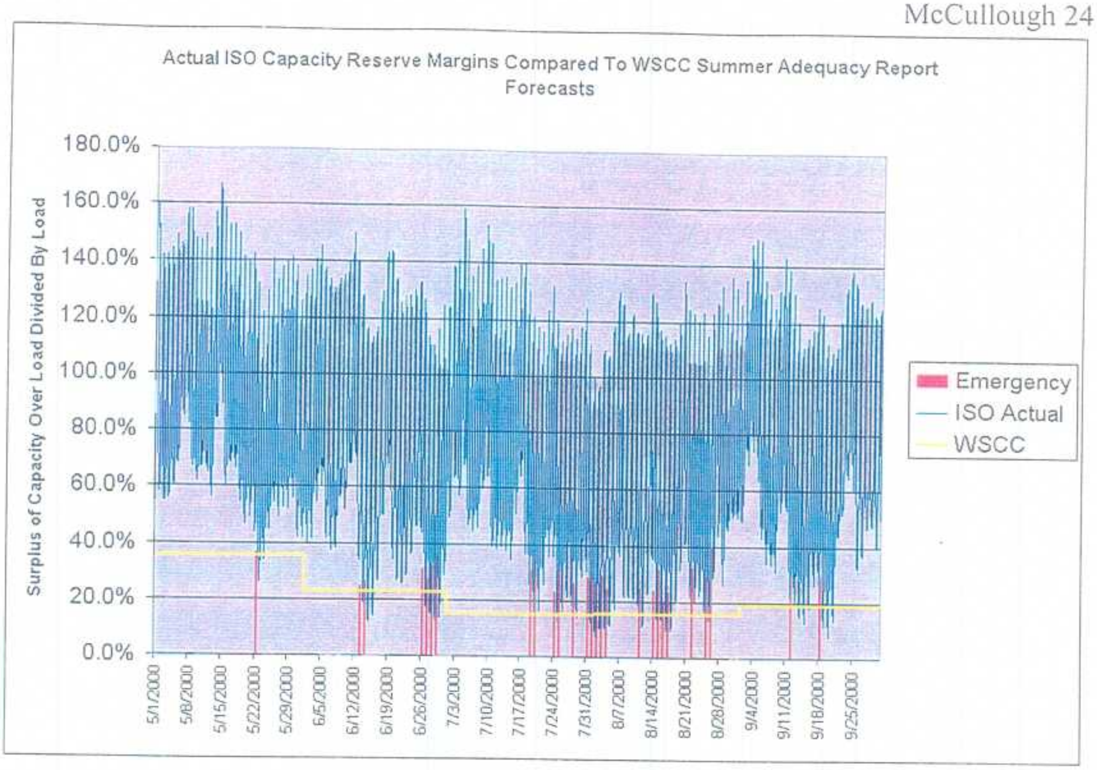
There is enough data to update the WSCC's estimate of the ISO's reserve margin for actual loads and imports.[9] We have not yet been able to update the WSCC analysis to include forced outages, but FERC's November 1st Report indicated that outages were in the 8% range.[10]

---

9 A utility's reserve margin is the percentage of resources available after loads have been met. The traditional rule of thumb for the industry is that reserves should be at least 5% of load plus the single largest resource in the utility's portfolio. In the case of the ISO, a reserve margin in the 7% to 8% range would be regarded as a logical minimum.

10 "Factoring in the actual planned and unplanned outages that occurred in the California market (see Figure 2-12), and holding the other assumptions equal, the reserve margins in the California subregion dropped from 26.3 to 17.5 percent for June, from 17.7 to 10.2 percent for July and from17.4 to 8.98 percent for August." FERC Staff Report, page 5-4.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100



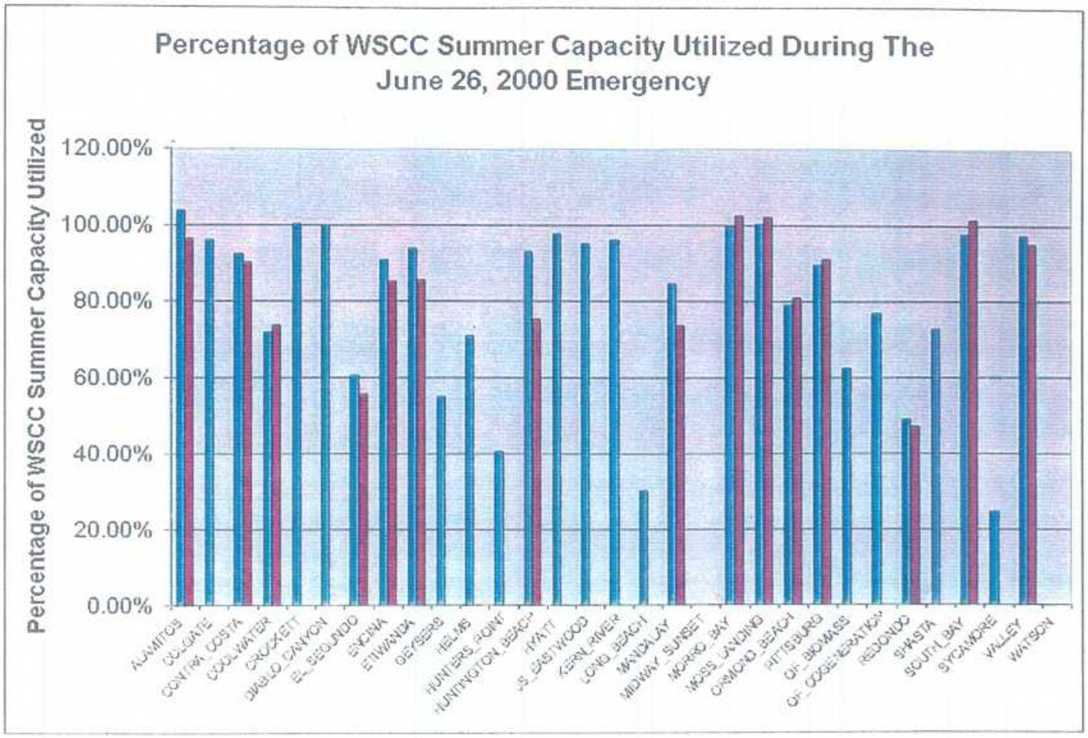
This chart shows the ISO's reserve margin, by hour, from May through September. The blue lines indicate the reserve margin by hour. The yellow horizontal lines show the reserve margin forecasted by the WSCC in the Summer Adequacy Report. The red columns show the reserve margin during the ISO emergencies. On average, before forced outages, the ISO averaged a reserve margin of over 20% during their emergencies this summer.

Plant outages were mentioned in the FERC's November 1st report – approximately 8% – leaving a margin above 10% across the summer's emergencies.

The ISO appears to have "derated" capacity in the portion of California under their control in order to maintain consistency with its computer forecasting and operations methodology. The inconsistency between fundamentals and their offer based methodology shows up throughout the data. For example, the generation of plants within the ISO's service territory during emergencies is very odd. The following chart shows

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

the generation of units during the June 26th emergency



Q: What is your conclusion?

A: Overall, the situation is that the ISO has a very poor methodology for evaluating its reliability situation. Underscheduling and market maneuvers such as scheduling power out of state can drive the ISO into declaring an emergency. The economic incentives designed into the system reward market participants for encouraging the ISO's perceptions of shortage.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100

Q: What were the mechanics of the misperception process?

A: The first stage of the process began with the filing of supply curves with the PX by each potential supplier. A supply curve described the quantities offered for sale at each price. Any party could file a supply curve, although the sheer complexity of the process posed a barrier for many less sophisticated utilities and generators. The supply curves were aggregated into a single PX supply curve.

Q: How frequently were the supply curves submitted to the PX?

A: Daily.

Q: Please continue.

A: Under AB-1890, the loads of the three utilities are automatically included as the demand curve. The intersection of the supply and demand curves sets the market clearing price for the day and identifies which resources will operate the following day.

The results of the PX comparison between the demand curve and the supply curve provided a template for operations by the ISO.

The ISO took the commodity results from the PX and adjusted the results to reflect transmission. It also purchased reserves under a number of schedules from the operators in the area. If underscheduling had been present in the filed demand curves (as was frequently the case) supply and demand would not match, and the ISO would use its reserves to bring the two into balance. If the ISO's reserves were insufficient, it would then resort to “out of market” purchases – purchases from the market to avert an operating emergency. Since May 22, "emergency" purchases by

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

the ISO operating under this process have occurred throughout each emergency, and continue today. The result has been a constant state of frenetic buying without price constraint for the past 11 months, with no end in sight.

Q: Do the ISO's continual emergencies influence the PX auction?

A: Yes, before FERC released the California investor-owned utilities from the PX (on December 15th) it certainly did.

The supply curves (i.e. the day ahead offers to the PX) were not required to be related to actual operating costs. Potential suppliers could file whatever prices and quantities they choose. In practice, the aggregated supply curves show a number of curious features. They have tended to shift upwards during high price periods – apparently reflecting the supplier's assumption that their bids will be accepted in spite of a sharp increase in price.

Q: Did the cessation of the daily PX auction repair this process sufficiently to return the market to fundamentals?

A: No. The problems in the PX market, though grave, were only a small part of the overall California market failure. The ISO continues to declare the need for emergency supply-- either from miscalculation or mischief-- and high pricing without economic causation continues.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100

Disconnection of Prices from Fuel Costs

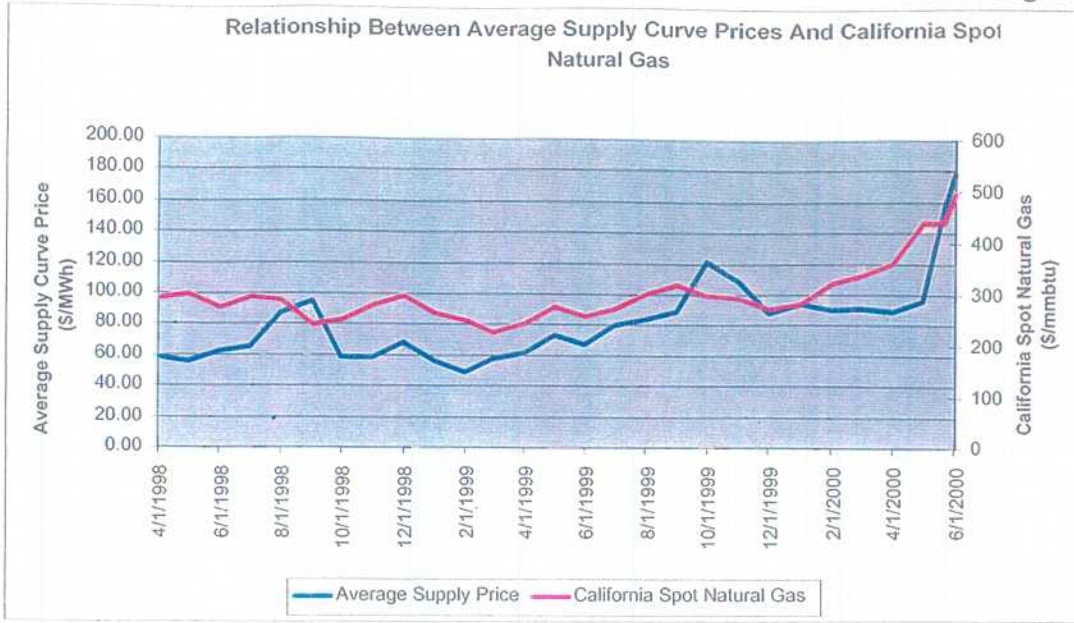
Q: Describe the correlation of the bulk power and natural gas markets, please.

A: Prior to May 22, 2000, they followed normal paths, producing relatively constant, even predictable relationship.

The following chart shows the relationship between natural gas prices and the average daily supply curve price at the ISO. In a well functioning, competitive market, we would expect the average prices from the supply curve to vary with spot natural gas prices.[11] The basic relationship between gas price and the average supply curve is consistent with economic logic, but there are severe excursions from the expected relationship during price spikes. Thus:

[11] Describing and working with this complex data is not easy, however. The following charts calculate the average weighted price from the supply curve offered for a given period – the price times the supplies offered at each price. This is an indicator of the "height" of the curve and allows us to measure how it has shifted over time.

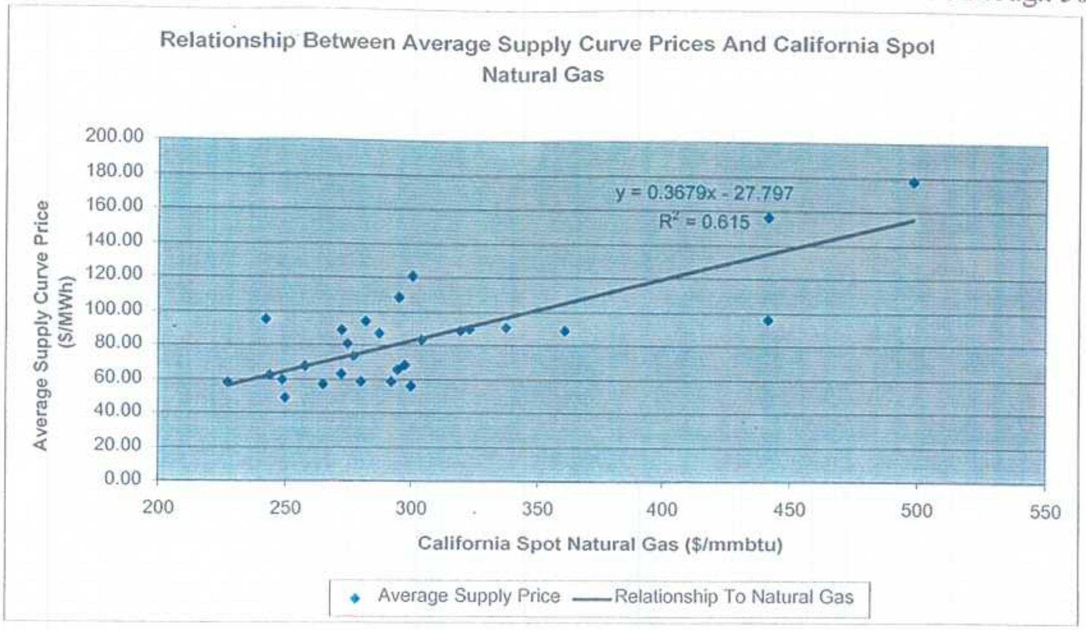
LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158



The statistical relationship between natural gas prices and the average supply curve price is Supply Curve Price = -27.8 mills + .367 x (Gas Price in Cents per mmbtu). While high, the direction of the relationship makes reasonable common sense.[12]

[12] One kilowatt-hour of electricity can be produced by 12,500 btu of natural gas. Logically, an increase of one dollar in natural gas prices should raise electric prices by 12.5 mills. The coefficient that we would "expect" to see in this statistical relationship is .125 in a perfect world.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100



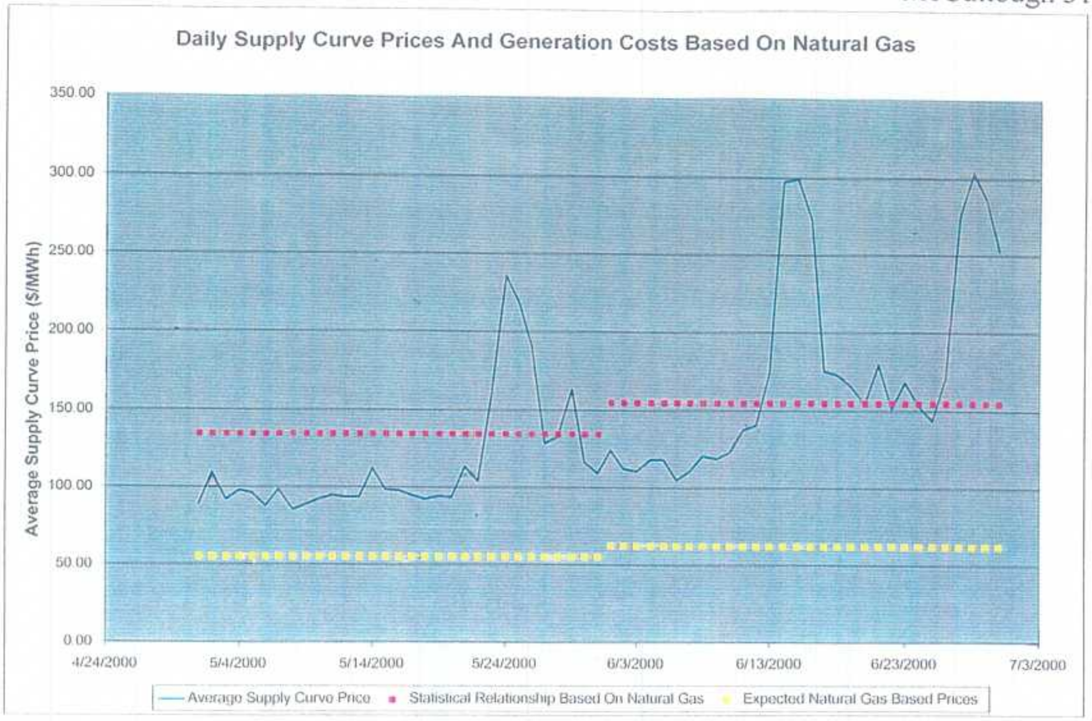
Q: What happens during price spikes at the ISO?

A: During high price periods the average supply curve price diverges dramatically from the relationship shown above. Specifically, during ISO emergencies, the supply curve shifts upward dramatically.

Q: How do you explain that?

A: Logically, this could only occur if the market participants could operate cooperatively. If they could not rely upon competitors joining them in an increase in the supply curve, they would be better off to maintain their current supply curve and take advantage of the activities of the other players.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158



Q: What does this chart show?

A: This chart is worrisome to an economist, since it indicates that the supply curve was considerably higher throughout the summer than we would expect from the underlying production relationship (the yellow line.) It is even more worrisome since there are dramatic divergences from even the high historical relationship between the California PX's average supply curve price and the historical estimate of the relationship between gas (the red line) and the PX supply curve.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100

Q: Why worrisome?

A: Because there is no clear operating reason for the supply curve to surge upwards – natural gas prices did not double during these periods, nor are there other clear reasons.[13] A competitor with excess capacity could have swept the market by simply running its unit full out. As we will see below, many California units did not operate at full capacity during these periods. It is highly unusual for a market participant to forego maximizing its profit during these periods unless some other strategy is being exercised. I mean, of course, that this pattern--holding back production in the face of high-priced demand--strongly speaks to the exercise of market power.

Unexplained Undergeneration

Q: Does your analysis of plant-by -plant operations also support the market power hypothesis?

A: Yes. Our review of some individual plant operations also tend to support the hypothesis that generation in California is characterized by the exercise of strong market power. Two sources provide detailed data on plant operations – the Acid Rain database from the Environmental Protection Agency, and the Electric High Voltage database from the WSCC.

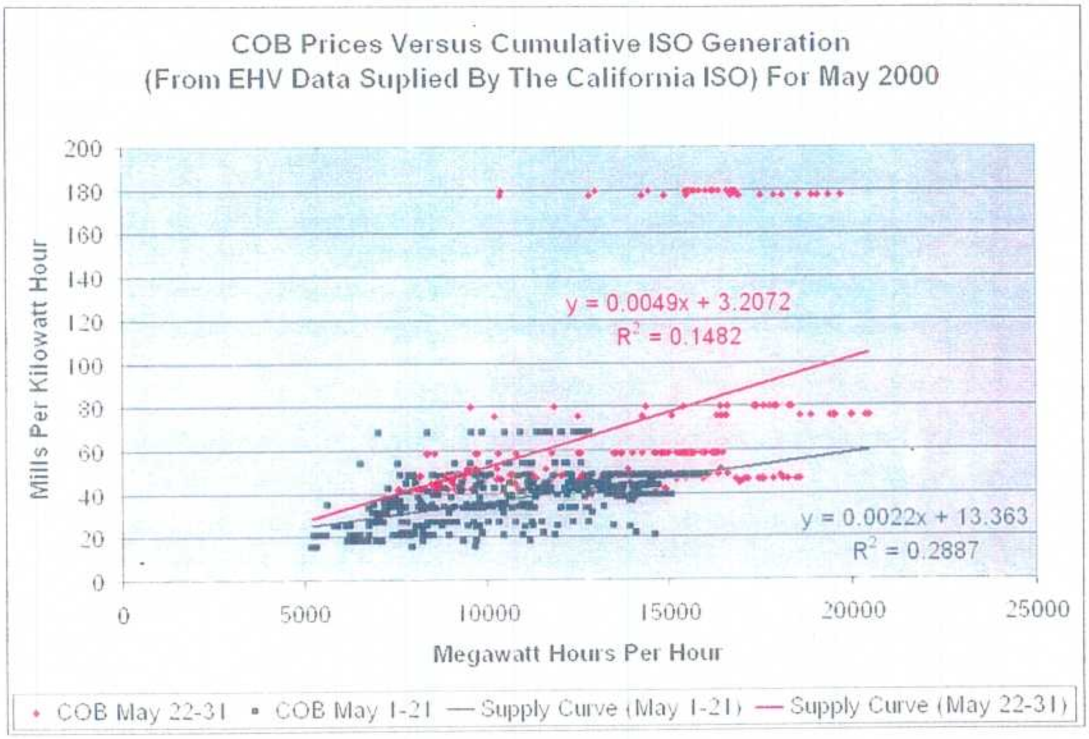
---

[13] The cost of emission credits has been cited as a possible explanation, but the market for emission credits is limited to the L.A: basin. We have extensively reviewed this market and the marginal impact of these prices was relatively small.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

Q: Please continue.

A: We know from the prices experienced this past summer that May 22nd was a major watershed. This chart derives a simple supply curve from actual generation data as supplied by the ISO. On the vertical axis are the prices at the California Oregon border actually experienced in the real market. On the horizontal axis is the actual production from the plants itemized by the ISO in the EHV database.



The black dots reflect the generation/price behavior before May 22nd. During this period 1 mill called forth a 500 MW increase in generation for the ISO dispatched plants in the ISO database. After May 21st, a 1 mill price increase brought forward a 200 MW increase in generation.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100

In the jargon of an economist, the supply curve drawn in black shifted upwards and to the left on May 22nd. Since this comparison is conducted within a single month, it effectively avoids questions of hydroelectric supply and gas price. The simple bottom line is that this massive shift has no explanation from market forces.

Q: What do you mean by "on May 22 the supply curve shifted upwards and to the left?" What effect did that mean to market prices then, and thereafter?

A: The effect on the market was if the supply curve for the entire state of California was shifted against the consumer. For each level of price, generators offered significantly less generation.

Q: How have individual plants in California reacted to the post-May 22nd prices?

A: Simply stated, they have throttled down. We have conducted a number of case studies on California (and non-California plants) during this period. The simplest analysis is often the best: did these plants run the way we would have expected given prices and costs? The answer is "No".

We have efficiency and fuel cost estimates from a number of sources. Efficiency data can be taken from the California Energy Commission, the Federal Energy Regulatory Commission, and the Environmental Protection Agency.

Q: What was your methodology?

A: First we calculated the cost of generation by taking the heat rate (the number of units of natural gas required to generate a kilowatt-hour of electricity) and added two mills for variable O&M. We conducted a variety of sensitivity studies to see

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

if the results would change markedly if we added additional charges for losses and transmission, but given the very high prices experienced this summer, these charges were not significant.

Natural gas prices are taken from Gas Daily for recent years and the Energy Information Administration's Electric Power Monthly publication. The California Energy Commission was used for heat rates for each unit. The cost of South Coast Air Quality Management District emission costs was taken from the RECLAIM data base. We used SCAQMD's own estimates of the quantity of NOx produced by megawatt hour, updated, where appropriate with our own research on the relationship using the EPA's acid rain data.

Q: What did you find?

A: We found a broad pattern of undergeneration at California thermal units. Our approach was to assume full generation when it would have been profitable for the plant to generate. During periods when the plant would not have been profitable, we have assumed zero generation. Our analysis of profitability included both fuel costs, RECLAIM credits, and O&M. Using these assumptions we dispatched the high cost natural gas units in California on an hourly basis from January 1, 1997 though September 30, 2000.

This period breaks into three distinct periods:

1. Before the California ISO and PX started operations: January 1, 1997 though March 31, 1998;

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100

2. During the first few years of operations, but before May 22, 2000; and

3. The period after May 22nd.

The following table shows the pattern of over- and undergeneration for all three periods.

	Northern California	Southern California (Outside of SCAQMD)	SCAQMD	Total
Forecasted MWh				
Jan-97	5.82	467.31	486.99	960.12
Apr-98	1,384.57	2,145.22	2167.11	5,696.90
May-Dec-00	3,985.08	4,498.21	4112.30	12,595.59
Actual				
Jan-97	941.86	1,157.25	1060.72	3,159.82
Apr-98	1,214.57	1,349.55	952.43	3,516.54
May-Dec-00	2,185.46	2,696.50	2237.99	7,119.96
Difference				
Jan-97	936.04	689.93	573.74	2,199.70
Apr-98	(170.00)	(795.67)	(1,214.68)	(2,180.36)
May-Dec-00	(1,799.62)	(1,801.71)	(1,874.30)	(5,475.63)

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

This table shows that before the arrival of the PX and the ISO, the three California utilities tended to overgenerate. This was part of a successful strategy to out negotiate Pacific Northwest exporters. Our analysis indicates that total California generation was 2,199.7 average megawatts higher than the level that would have been forecasted.

After the beginning of the ISO and the PX, generation in California began to diminish. This represented the end of the negotiating advantage of the three large utilities. It also reflected the inefficiencies inherent in the complex ISO/PX framework. Total generation averaged 2,180 average megawatts less than forecasted.

From May of 2000 through the end of September, undergeneration increased enormously – even in the SCAQMD – as generators were able to affect market conditions through their bidding and generation decisions. After May, 2000, generation fell an average of 5,476 average megawatts less than the level we would have expected if the generators had dispatched when electric prices were greater than their fuel and environmental costs.

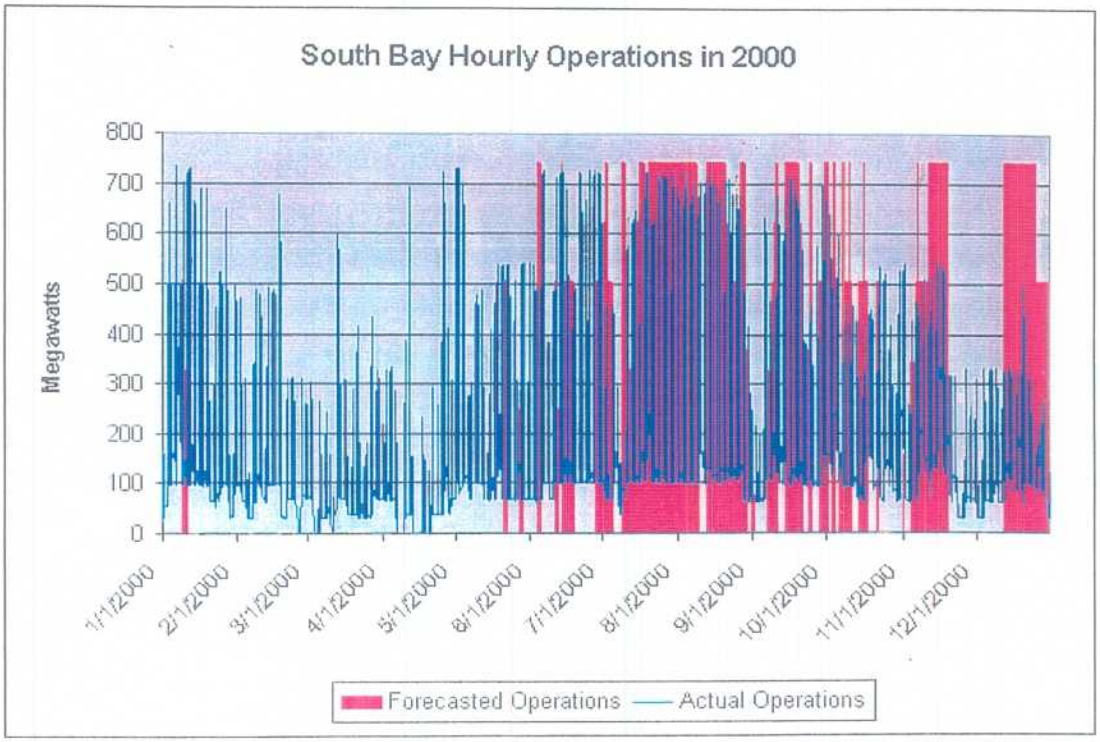
This table also addresses a frequent statement made by the generators – that the high cost of SCAQMD emission credits forced them to stop generating over the summer. While the credits did increase dramatically in price (from $1.00 or less in previous years to $40.00 to $50.00 late in the summer of 2000), the cost added by the credits was far less than the additional profit potential in the market for electricity.

Q: Did you also conduct detailed case studies of a number of the California plants?

A: Yes. As a general rule, the California plants in our case studies have been characterized by surprisingly low levels of generation given the prices this summer. The following chart shows the results for the entire South Bay plant (all four units) located in San Diego.

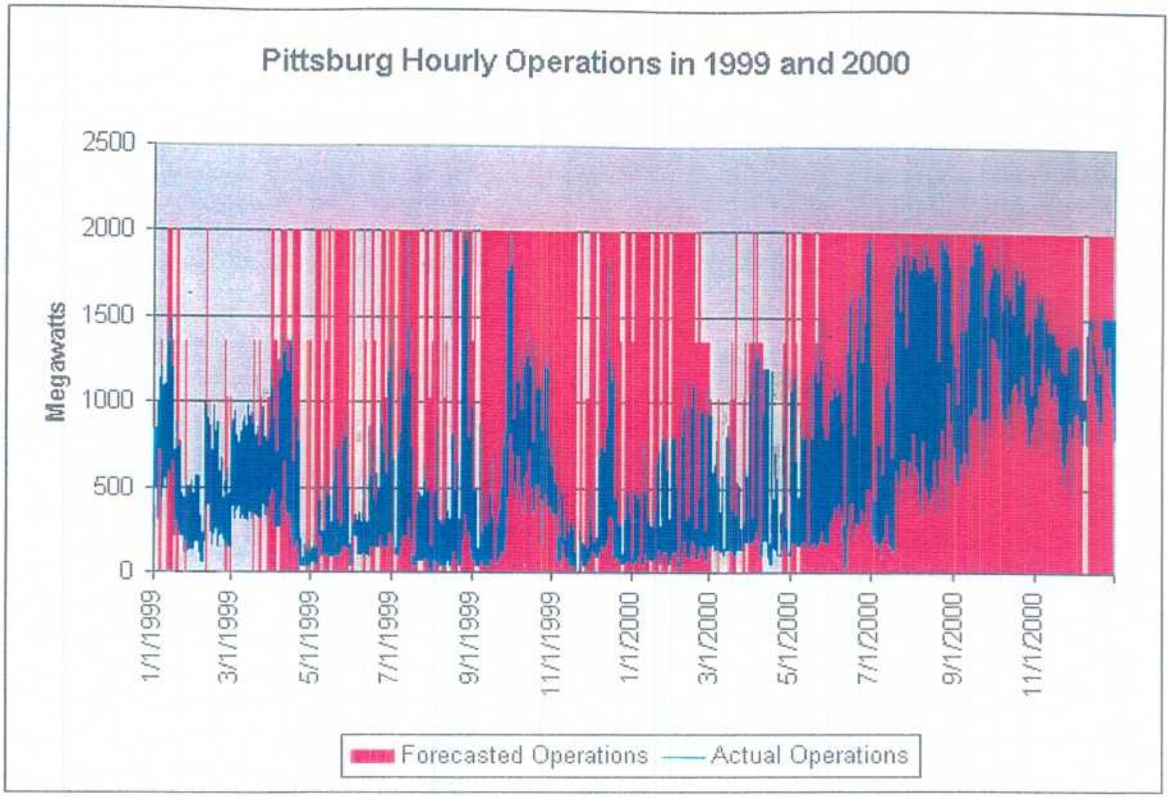
LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100

In June, South Bay generated only 65% of the energy we would have expected from market electric prices.



Another example, the Pittsburgh unit from the San Francisco area shows very similar behavior. This analysis indicates a generation level only 43.3% of the level we would expect for June 2000.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158



Q: Perhaps they were down for preventive maintenance?

A: It isn't logical to think so. The economic losses borne by these generators over prolonged periods of undergeneration are enormous – so enormous that they could have doubled their profits if they had followed traditional price signals.

Q: Perhaps they were down from forced outages or administrative order?

A: We do not have detailed information on possible forced outages or environmental constraints on most plants. However, given the significant deviations from traditional dispatch, forced outages or environmental constraints should have shown up either in the press or in the industry literature. With the exception of the Los Angeles area, this was not the case. Even within the L.A. basin recent ISO and FERC reports indicate that these explanations carry little weight.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

Q: Are South Bay or Pittsburgh in the LA basin?

A: No.

Q: Did you look at other WSCC generating units to analyze their market behavior during this period.

A: Yes. Comparable generating units outside of California do not show this behavior.

Q: What is your conclusion from your study of California plants.

A: The bottom line is straightforward – the California market was characterized by large, enduring deviations from traditional utility practice. Generators did not generate. Peakers did not peak. Emergencies appeared to lack solid justification. All of the evidence is consistent with a major, sustained exercise of market power.

Q: What was the role of the WSCC EHV's Real Time Generation Database in the generation hold back during this period, if any?

A: I think it was a significant contributing feature, but first let me provide some background. Although, as a general rule, all electric utility data is public, hourly operating data is seldom made available outside of rate proceedings. Several years ago the WSCC embarked on a project to make real time data accessible on its web site. Participation in the database is optional, so it currently functions as a fire alarm that only covers part of the house – reassuring only if you know where the fire was going to start to begin with.

Nonetheless, as a market information tool, it is very good. The ISO provided all of its plant data in its control area to the WSCC. This means that any

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

California generator dealing with the ISO and the PX had hourly, real time dispatch information on the operations of their competitors.

Q: What advantage would this have supplied among PX/ISO suppliers?

A: The problem with a collusive exercise of market power is that it is terribly easy to cheat – to raise production beyond agreed to levels. This is the continuing problem with OPEC cartel. While frequent meetings set production levels, most if not all participants make additional sales in order to capture more than their share of the profits. The ready availability of real time production data between competitors provides a way to gauge whether production discipline is being maintained.

Q: Does the ISO still distribute this generation to their generators?

A: No. On October 12th the ISO withdrew from the EHV database, citing as the reason, access to the database by outsiders. This occurred one day after our initial results (and the peculiar ISO practices on the EHV database) were released.

Q: Then the price signaling has stopped, and the market has returned to normalcy?

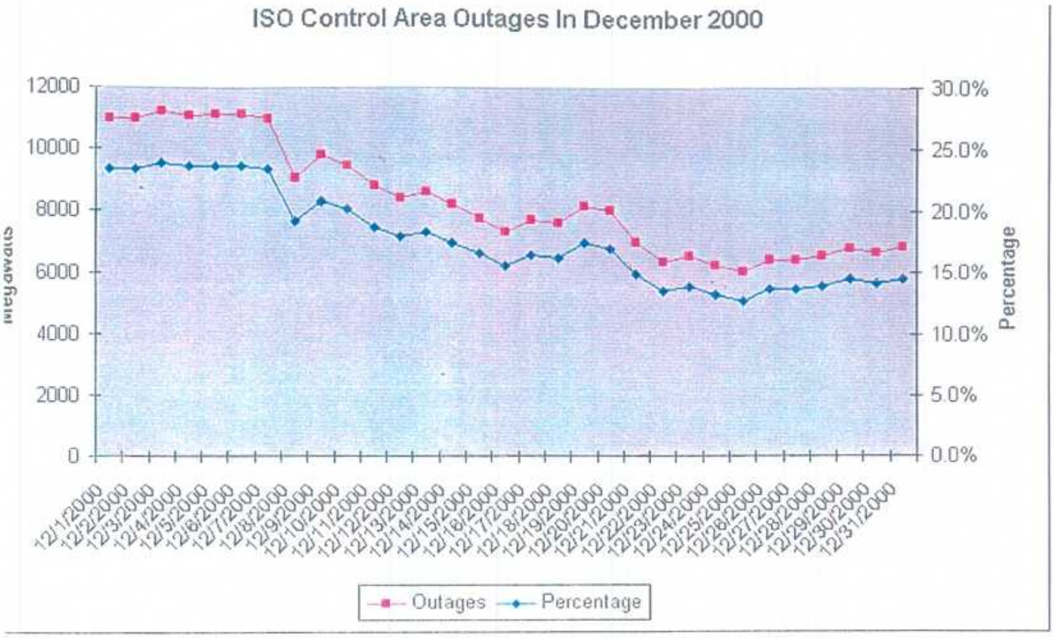
A: No.

Q: Why not?

A: From November 15th to the present, the form of undergeneration has changed to one characterized by long forced and planned outages. While this is only speculation, the withdrawal of the EHV data may have forced conspirators to a different (and possibly)

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100

more damaging form of collusion. The following chart shows the outages for December.

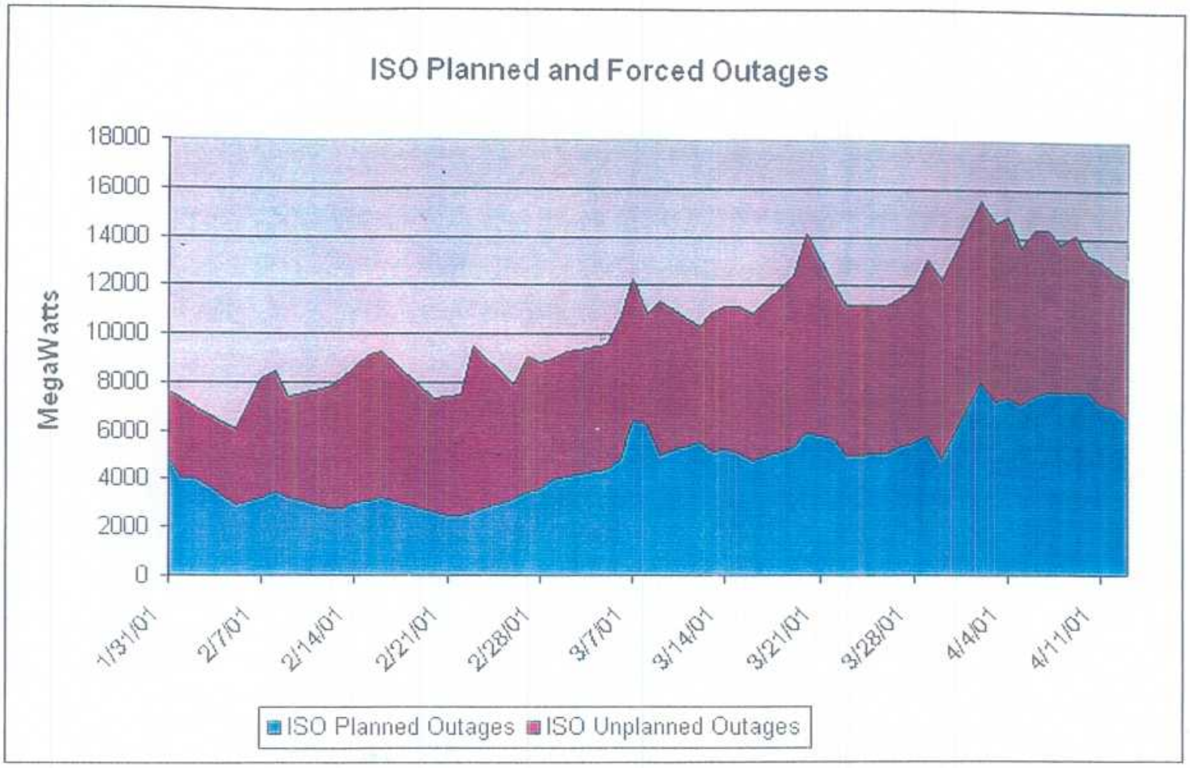


Q: Is this level of outages and limitations surprising?

A: Yes. Although the ISO has been highly secretive about the outages, they reflect extremes never before seen in the electric business in North America. The chart below shows the ISO reported planned and forced outages since the ISO was required to begin reporting outages in January 2001[14].

[14] This list is posted in accordance with California public Utilities Code Section 352.5. Section 352.5 which requires the ISO to make publicly available daily a list of all power plants located in the state that are not operational due to a Planned or Unplanned outage.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158



Q: What does the graph show?

A: Both planned and forced outages are extremely high – higher than we have seen in normal practice elsewhere in the industry.

Q: How has the ISO explained the situation?

A. The ISO explanations have ranged from poor hydro in Northern California to "tired plants" exhausted by dispatch during the summer peaks.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

Q: Do these explanations carry much weight?

A: No. The ISO has tended to view outages in a credulous fashion with little effort expended to verify or understand their causes.

Q: Did you review FERC's audits of the outages?

A: Yes. FERC staff did an honorable job of conducting the audit, but it was clear that they had neither the resources nor the expertise to truly evaluate the situation. Their conclusions were that the outages appeared to reflect actual operating conditions and necessary repairs. What they did not review was the timing of the outages and the economic losses that the generators were facing if the outages were actually occurring.

Q: How do the economic losses affect the results?

A: A number of the generators have propósed vastly extended outages over the winter – in some cases as long as three months. Given current prices, the repairs should be accomplished with the same tempo as similar repairs for similar equipment in industrial applications – a matter of days rather than months.

Q: What are you inferring from this conduct?

A: I infer that because the profits available from an emergency are so much greater than the profits available through normal markets that an incentive exists to physically withdraw from the market – to make repairs where repairs may not be required and to make them in as slow and deliberate fashion as possible.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

Market Power Impact On WSCC Prices

Q: To reiterate, by your work, you do conclude that bulk power markets in California have been captured by market power, is that correct ?

A: Yes, that is what I conclude as a student of the market.

Q: Can you estimate the costs of market power to the consumer?

A: Yes. The contribution of market power to bulk power prices should be the amount not caused by changes in natural gas prices, hydroelectric generation, and the actual load/resource balance. We have assembled a statistical model that includes these components. We have also included a "dummy" variable starting in the last week of May representing market power since the 22nd.

Q: Please describe the results of your model.

A: The results of this model indicate a very high cost associated with market power:

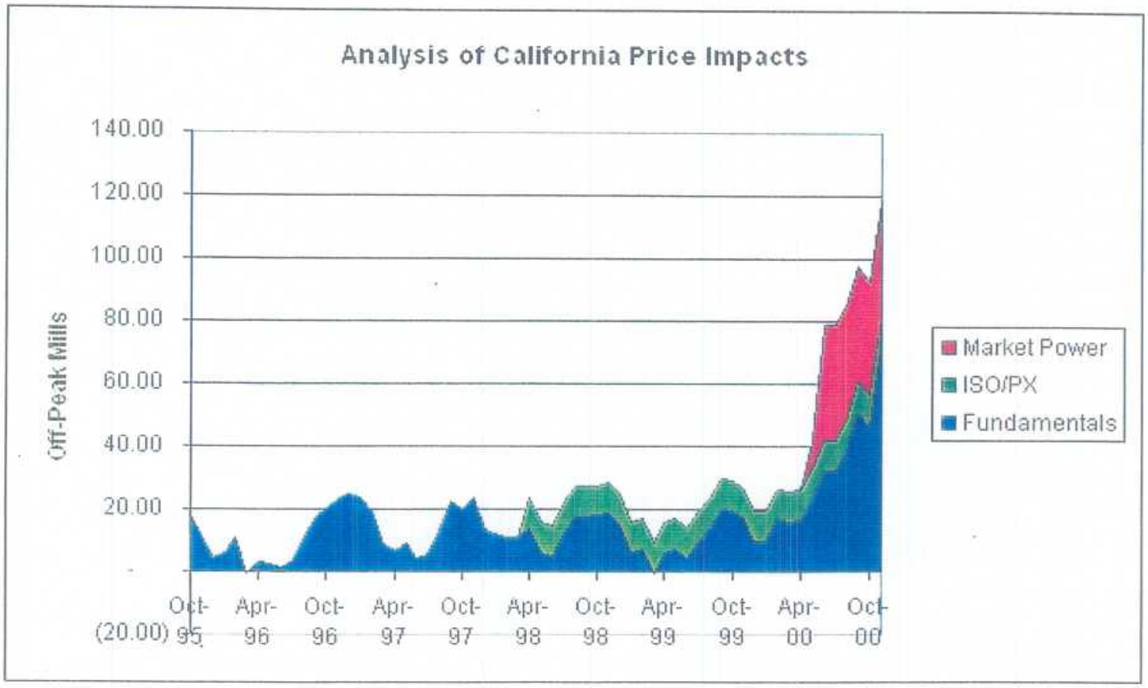
1. The on-peak market power penalty to customers is 97.7 mills +/- 23.2 mills, at a 99% confidence level. (for those of you who snoozed through this lecture in college -- this means that there is a 99% confidence that the correct "true" value is within this range.)

2. The off-peak market power penalty to customers is 36.8 mills +/- 30.3 mills.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100

3. This surcharge is on top of the existing increase in bulk power markets caused in April 1998 by the arrival of the ISO and PX, of 18.09 and 9.6 mills. This cost increase reflects the elimination of California's traditional advantages in import markets.

The following two charts show the structure of surcharges through November:



LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

The green area represents the increase in prices that occurred when the ISO and PX were established. This reflects two factors:

1. The elimination of the oligopolistic market power of the three IOUs when they were forced into the PX, and

2. The derating of California's system as part of the complex ISO process.

We expect that the elimination of the requirement that the IOUs buy from the PX will reduce the height of the "green" surcharge when the IOUs can purchase outside the system.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100

Q: Has there been a reduction yet, and if not, why not?

A: Energy prices are in a chaotic state in California. Primary energy purchasing has been usurped by the ISO and the California Department of Water Resources. Credit support for PG&E and SCE is non-existent. In addition, the structure of rates left over from AB-1890 has still not been clarified.

Q: Does the dysfunction in the California market directly cause the dysfunction of pricing at COB as reflected in the Dow Jones index?

A: Yes. These markets are directly related.

Q: Does one have to be a participant in the ISO/PX auctions to be advantaged or disadvantaged by that market?

A: No. The nexus between the prices set by ISO/PX auctions and bulk power markets throughout the WSCC is well-established. Berne Martin Howard has shown the proof of the matter, and I have done similar work, detailed in an affidavit submitted earlier. Anyone whose receipts or charges arose from any bulk power market in the WSCC since at least May 22, 2000 is as enriched or enfeebled as though he were a direct participant in the ISO and PX markets. The conclusion of my research is that the problem has been caused in California and the impacts are felt throughout the WSCC.

Q: Does one advantaged by the post- May 22 market necessarily bear the stigma of collusion?

A: Obviously not.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

Financial and Physical Hedges

Q: Can financial and physical hedges be used to correct overpricing due to the exercise of market power?

A: No. Financial hedges are simply a way of distributing volatility between buyers and sellers. Financial hedges do not change the level of electric prices – nor, in principle, do they reduce overall risk. The purpose of a hedge is simply to act as a mechanism where one party pays another to bear the risk. Physical hedges can transform the nature of the risk – shifting electric price risk to gas price risk, but this step is difficult to implement and not without cost.

Q: Please explain how a financial hedge would operate.

A: In the financial hedge of a contract obligation, the seller of the hedge offers an adjustment to the contract obligor (the buyer of the hedge) that sets the financial exposure of the obligor/buyer to a fixed price. For example, a five year hedge to a contract obligation indexed to market prices would usually be approximately 10% higher than the predicted prices over the next five years. If actual prices are less than the hedge price, the seller of the hedge receives a payment from the buyer. If the actual prices are higher than the hedge price, the seller of the hedge will pay the difference to the buyer. At the end of each month the net effect is if the buyer of the hedge had purchased power at a fixed price.

Q: Why is the hedge price higher than the predicted price of power over the next five years?

A: The seller must be reimbursed for his willingness to bear the risk of higher prices than expected. The hedge surcharge varies with the volatility of the

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100

market. The ten percent premium mentioned above simply reflects our experience with the purchase of hedges since May 22, 2000.

Q: Does the purchase of a hedge change the overall expected position for someone who buys power based on an index?

A: Yes. The expected economic position of the hedge buyer is worse – the average price of electricity becomes higher after the hedge is purchased. This is due to the risk premium the seller charges to offset the additional risk. . The problem in a dysfunctional market , of course, is that it's anybody's guess what the future market price will be, increasing the risk premium all the more, or simply eliminating the possibility of hedging your contractual obligation.

Q: Why would anyone buy such a hedge if costs so much?

A: While risk is a cost of business, too, many firms would simply not purchase a hedge if electricity was not a critical component of their production process. For a high tech firm, they would be better off without a hedge because it is unlikely that even extreme electricity price changes would affect the profitability of their plant. For firms in metals, paper, or chemicals, a hedge may be a necessity for them to assure that they can produce and make a profit at their site. Overall, this is a useful tool, but it simply cannot offset the massive increase in price levels we have seen since May 22, 2000.

Q: What is a physical hedge?

A: A physical hedge involves finding a real life alternative to the indexed supply. The easiest example is the purchase of a generating unit which can burn natural gas to produce electricity. In some cases, this is "inside the fence" and

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

simply replaces purchases under the current contract. In other cases, this might be a generating unit at another location or a part of a unit owned by another party.

In both cases, the physical hedge involves gambling on natural gas prices rather than electric prices.

Q: Can't this reduce overall prices to the customer?

A: Yes, it can in certain circumstances. It is neither easy nor is it certain that it can be implemented in less than several years. The problem is a combination of natural gas siting, natural gas supply, and the availability of generating units.

Since May 22nd, with the exception of a few days in December, the cost of natural gas used in the generation of electricity has been significantly less than the price of electricity. Switching to natural gas is quite attractive. Switching involves several difficult steps: first, a suitable site must be found. The smaller the unit usually means the easier it is for the unit to be sited. Unfortunately, the smaller the unit, the less efficiently it transforms natural gas into electricity. Secondly, the simple purchase of a generator has now become very difficult, because of the demand. Third, we expect the price of natural gas to increase as a massive shift from purchased electricity to purchased natural gas takes place.

FERC's Finding of Unjust and Unreasonable Prices

Q: Are you acquainted with recent FERC order affecting the California bulk power market?

A: Yes.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100

Q: Do they agree with your opinions and findings?

A: They corroborate some of my findings, and provide a factual framework for understanding the changing operations (in the PX and ISO functions) in the California market.

Q: What Are the Implications of FERC's November Report which affect your analysis?

A: FERC's major directives, were:

1. Elimination of the restriction against purchasing by the IOUs outside of the PX.

2. The implementation of a "soft" interim price cap of $150/MWh.

3. The imposition of a penalty for incorrectly forecasting load.

4. Direction to the ISO to reconsider its reliability approach.

Their primary conclusion was that the prices in the California market (and therefore throughout the western markets) were unjust and unreasonable.

Q: What does this mean in terms of the level of pricing in the WSCC?

A: I find it instructive that FERC, like my work, was unable to find justification for the prices according to its traditional cost based methodologies or logical market based pricing. While FERC did not come to a conclusion concerning market power, they did recommend far reaching changes in California.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

Q: Were these conclusions changed in FERC's December 15th Order?

A: No. The December 15th Order effectively dismantled the PX, removed the board of the ISO, and directed increased market monitoring activities. FERC has clearly identified the problem, but it has not yet proceeded to a final market power solution. Discussions are ongoing at FERC concerning market monitoring and the mitigation of market power.

Q: Do you believe FERC should order refunds?

A: I have not studied FERC's power to order refunds, so I cannot say, but I do expect, as a professional working many years in the industry, that the Commission will affirm their finding that wholesale power rates in the WSCC have been unjust and unreasonable since May 22, and that they will use their full powers to correct the resulting injustices, whether caused by collusion or profiteering. In either case the profit is unjust under the circumstances. As an economist, I can tell you that there is no worse evil than a corrupted market because signals to consumers will lead to inefficiency and waste. This is what we expect regulation to prevent or cure.

Future Developments

Q: Do you foresee a change in the California markets this year?

A: No. The investigation of market power has commenced in all of the Pacific coast states. While this investigation may very well find criminal activities in the California market, it is far to early to know the results of any anti-trust determination.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

In the short run, the high prices have driven PG&E into bankruptcy. This new crisis has preoccupied state leadership in California and few substantive reforms are being pursued effectively.

Q: Does this mean that the problem is insoluble?

A: No. It will be solved. Reform at the ISO and elimination of the ability to exercise market power in California is inevitable. The problem is timing. We simply cannot predict when FERC, Congress, the State of California, or the California Attorney General's Office will act.

Q: Is it appropriate to disregard the plight of an Oregon customer who has been caught in the California disaster by the use of a price index?

A: Absolutely not. The current situation is the moral equivalent of a European tourist taking the wrong directions from the Miami airport. The role of regulation is to set the tourist on the road to the beach – not to wait for the tourist to be mugged or murdered. The using of indexing in industrial contracts was pioneered twenty years in Oregon as a pricing alternative for large industrials. For nineteen and a third years this approach was logical and stable. Since May 22nd, this option has exposed Pacific Northwest utilities and industries to market conditions that are unjust and unreasonable, and may well be found to be criminal in the foreseeable future.

It would be completely inappropriate for a Pacific Northwest customer to be held hostage to such conditions.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

Origins and Limits of Indexed Pricing

Q: How did the indexed rate concept come about?

A: To the best of my knowledge it was pioneered here in Oregon in the early 1980s. Portland General, my employer at the time, explored a number of alternative concepts for industrial and wholesale pricing, including the use of commodity and market indexes.

The concepts were well received in the industry. Pacific adopted a number of the same concepts during the 1980s as well. I can remember briefing Pacific management on the concepts a number of times in the middle 1980s including several meetings with Don Frisbee, Pacific's CEO at the time.

Q: How closely did these early concepts resemble the current Wah Chang contract?

A: Not terribly closely. We did not have a third party measure of spot markets until groups like Energy Market Report and Dow Jones began publishing their indices in 1995. Early approaches at PGE included a similar concept known as "stack pricing" to emulate a market measure.

Utah Power (now PacifiCorp) emulated this approach in their industrial contracts in the 1980s.

Q: Why did the industry pursue this concept?

A: It was fundamentally an attempt to make electric pricing more efficient. Since the bulk power market started in the 1980s, we knew that our conservative reliability standards caused the utilities to underutilize our resources. Since we built the system to a 15% to 20% reserve margin, we had surplus resources throughout the vast majority of hours.

The surpluses led to market prices at the short-term marginal cost of the highest cost-operating unit. To not use this energy would be wasteful --

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158
(503) 778-2100

especially if retail and wholesale customers were available to purchase on these terms.

This opportunity contributed to work I was personally involved in throughout the U.S. and Canada in the later 1980s and early 1990s from aluminum contracts in Kentucky, Quebec, and Texas, to the establishment of Puget's indexed tariff five years ago and a number of negotiations with Pacific during the same period.

Q: Why is the index-pricing concept no longer appropriate?

A: As mentioned in my early testimony, since market prices no longer reflect underlying economics, and hence indices like Dow Jones COB don't reflect marginal cost, the solution is hardly efficient.

Clearly, as market power exercise in California has "soaked up" energy surpluses, the market prices simply reflect the scale of the market failure in California.

Q: Does this problem show up in the Wah Chang contract?

A: Yes, although to explain it I have to go to confidential data, and for that reason the following part of this testimony, pages 57 through 63, is sealed and marked confidential.

Q: Does this conclude your testimony?

A: Yes.

LANE POWELL SPEARS LUBERSKY LLP
SUITE 2100
601 SW SECOND AVENUE
PORTLAND, OREGON 97204-3158

BEFORE THE PUBLIC UTILITY COMMISSION
OF THE STATE OF OREGON

UM 1002

Wah Chang,	)
Petitioner,	)
	)
v.	)
	)
PacifiCorp,	)
	)
Respondent.	)
	)

Wah Chang Exhibit 300
Testimony of Witness Robert McCullough Pages 57-63
was submitted to the PUC
under seal pursuant to Order No. 01-149
and contains confidential information

Docket UM 1002
Wah Chang Exhibit 301
Witness: Robert McCullough

BEFORE THE PUBLIC UTILITY COMMISSION OF THE STATE OF OREGON

UM 1002

Wah Chang,	)
	)
Petitioner,	)
v.	)
	)
PacifiCorp,	)
	)
Respondent.	)
	)

Exhibit Accompanying Testimony of Robert McCullough

Resume of Robert McCullough

April 17, 2001

ROBERT McCULLOUGH
Managing Partner

McCullough Research
Economic and Financial Consulting

Office: 503-771-5090
Fax: 503-771-7695
Cellular: 503-784-3758
Email: robert@mresearch.com

Employment Experience:

July 1985 to the Present:	Managing Partner of McCullough Research. Providing strategic planning assistance, litigation support, and planning for a variety of customers in energy, regulation, and primary metals.
Sep. 1996 to the Present:	Adjunct Professor, Economics, Portland State University.
Dec. 1990 to Aug 1991:	Director of Special Projects and Assistant to the Chairman of the Board. Conducted special assignments for the Chairman in the areas of power supply, regulation, and strategic planning.
June 1988 to Dec. 1990:	Vice President in Portland General Corporation's innovative bulk power marketing utility subsidiary, Portland General Exchange. Primary negotiator on the purchase of 550 MW transmission and capacity package from BPA. Primary negotiator of PGX/M, PGC's joint venture to establish a bulk power marketing entity in the Midwest. Negotiated power contracts for both supply and sales. Coordinated research function.
June 1987 to June 1988:	Manager of Financial Analysis, Portland General Corporation. Responsible for M&A analysis, restructuring planning, and research support for the financial function. Reported directly to the CEO on the establishment of Portland General Exchange. Team member of PGC's acquisitions task force. Coordinated PGC's strategic planning process. Transferred to the officer's merit program as a critical corporate manager.
June 1981 to June 1987:	Manager of Regulatory Finance, Portland General Electric. Responsible for a broad range of regulatory and planning areas. These include preparation and presentation of PGE's financial testimony in the state rate cases in 1980, 1981, 1982, 1983, 1985, and 1987 before the Oregon Public Utilities Commission. Also responsible for preparation and presentation of PGE's wholesale rate case with BPA in 1980, 1981, 1982, 1983, 1985, and 1987. Coordinated activities at Bonneville and FERC on wholesale matters for the ICP (InterCompany Pool, the association of investor owned utilities in the Pacific Northwest) since 1983.

Created BPA's innovative aluminum tariffs, adopted by BPA in 1986. Led PGC activities, reporting directly to the CEO and CFO on a number of special activities including litigation and negotiations concerning WPPSS, the Northwest Regional Planning Council, various electoral initiatives, and the development of specific tariffs for major industrial customers. Member of the Washington Governor's Task Force on the Vancouver Smelter (1987) and the Washington Governor's Task Force on WPPSS Refinancing (1985). Member of the Oregon Governor's Work Group On Extra-Regional Sales (1983). Member of the Advisory Committee to the Northwest Regional Planning Council (1981).

Dec. 1979 to June 1980: Economist, Rates and Revenues Department, Portland General Electric. Responsible for financial and economic testimony in the 1980 general case. Coordinated testimony in support of the creation of the DRPA (Domestic and Rural Power Authority) and was a witness in opposition to the creation of the Columbia Public Utility District in state court. Member of the Scientific and Advisory Committee to the Northwest Regional Power Planning Council.

Sept. 1976 to Dec. 1979: Graduate student, Cornell University. Worked at Cornell as an economist for Institutional Research directly for the Vice-President of Planning. Co-investigator on a major grant from the Department of Labor's Bureau of International Labor Affairs. Performed statistical and demographic analysis for the New York State Consumer Protection Agency.

Sept. 1973 to Sept. 1976: Portland State University. Worked as Research Assistant in the Economics Department. Summer work for the U.S. Bureau of Land Management and the Institute On Aging.

Jan. 1974 to June 1974: Economist, Legislative Research. Researched bills before the legislature on issues from land use to economic development.

Jan. 1973 to Sept 1973: Researcher, Willamette Management Associates. Responsible for economic research and writing in various financial periodicals. Supported corporate valuation analysis.

Major Economic Consulting Experience:

Jan. 2000 to Present:	Advisor to the California Attorney General on possible market manipulations in the WSCC power markets
Jan. 2000 to Present:	Advisor to the VHA power purchasing program.
Jan. 2000 to Present:	Expert witness in WECCO/PacifiCorp litigation.
Dec. 2000 to Present:	Expert witness in Wah Chang/PacifiCorp litigation.
Sept. 2000 to Present:	Expert witness in SCE/BPA litigation.
June 2000 to Present:	Advisor to Blue Heron Paper on West Coast price spikes
June 2000 to Nov. 2000:	Expert witness for Georgia Pacific and Bellingham Cold Storage in WUTC proceeding on power costs
Nov. 1999 to May 2000:	Expert witness for the Large Customer Group in PacifiCorp's Utah general rate case
Sept 1999 to April 2000	Expert witness for Tacoma City Light regarding termination of WAPA contract.
Sept 1999 to present	Advisor to the Manitoba Cree on energy issues in Manitoba and Minnesota.
Sept. 1999 to Oct. 1999	Advisor to GTE regarding Internet Access in a competitive telecommunications market.
July 1999 to present:	Expert report to the Center Helios on Freedom of Information in Quebec.
July 1999 to present	Analysis of PacifiCorp power costs for Nucor Steel and Geneva Steel.
April 1999 to present:	Advisor to the Grand Council of the Cree on Hydro-electric Development
April 1999 to Sep. 1999:	Advisor to Logansport Municipal Utilities
January 1999 to present:	Advisor to Bayou Steel on alternative energy supplies
January 1999 to present:	Advisor to Abitibi-Consolidated on energy supply issues

November 1998 to present:	Advisor to Cominco Metals on possible sale of hydro-electric dams in British Columbia
September 1998 to present:	Advisor to the Betsiamites on the possible purchase of hydro-electric dams in Québec
June 1998 to June 1999:	Advisor to the Illinois Chamber of Commerce on its affiliate electric and gas program
June 1998 to present:	Advisor to Edmonton Power on utility plant divestiture in Alberta
January 1998 to Jan. 2000:	Energy buyer for California Steel
February 1998 to present	Retained as energy advisor for Boise Cascade
April 1998 to Aug. 1998	Intervention in Québec`s first regulatory proceeding on behalf of the Grand Council of the Cree.
August 1998 to Jan. 2000:	Energy buying and transmission negotiations for Nucor steel
January 1998:	Market forecasts for Montana Power's restructuring proceeding
Nov. 1997 to Oct. 1999:	Advisor to the Columbia River Intertribal Fish Commission on Columbia fish and wildlife issues.
April 1997 to August 1997:	Advisor to Kansai Electric on restructuring in the electric power industry Nationally, with emphasis on the California markets.
March 1997 to June 1997:	Expert witness in the Alcan/British Columbia litigation.
January 1997 to Jan. 1998:	Advisor to Port of Morrow regarding power marketing with respect to existing gas turbine plant.
January 1997 to Jan. 1998:	Expert witness in the Tenaska/BPA litigation
Nov. 1996 to April 1997:	Bulk power purchasing for the Association of Bay Area Cities
July 1996 to June 1997:	Advisor to Texas Utilities on industrial issues
April 1996 to Sept. 1997:	Expert witness in the Puget/March Point litigation

January 1995 to present:	Bulk power supplier for a variety of Pacific Northwest industrials
November 1995 to present:	Advisor to Tacoma Utilities on contract issues.
July 1995 to Jan. 1996:	Expert witness in the Tacoma/WAPA litigation
January 1995 to present:	Advisor to Seattle City Light on industrial contract issues.
January 1994 to Dec. 1995:	Advisor to Idaho Power on Southwest Intertie Project marketing.
January 1993 to present:	Northwest representative for Edmonton Power.
January 1993 to Aug. 1997:	Expert witness in the MagCorp/PacifiCorp litigation
August 1992 to Aug. 1994:	Negotiator on proposed Bonneville Power Administration aluminum contracts
March 1992 to March 1995:	Advisor to the Citizen's Energy Corporation
Jan. 1992 to July 1992:	Bulk power marketing advisor to Public Service of Indiana
August 1991 to June 2000:	Strategic advisor to the Chairman of the Board, Portland General Corporation
August 1991 to March 1992:	Financial advisor on the Trojan owners' negotiation team.
July 1991 to July 1993:	Chairman of the Investor Owned utilities' (ICP) committee on BPA financial reform
July 1991 to Nov. 1991:	Advisor to Shasta DAM PUD on COTP and related issues.
March 1991 to present:	Advisor to the Grand Council of the Cree on energy issues in Québec.
Jun. 1990 to Feb. 1991:	Advised the Chairman of the Illinois Commerce Commission on issues pertaining to the 1990 General Commonwealth Rate Proceeding. Prepared an extensive analysis of the bulk power marketing prospects for Commonwealth in ECAR and MAIN.
Jan. 1988 to Sept. 1988:	Facilitated the settlement of Commonwealth Edison's 1987 general rate case and restructuring proposal for the Illinois Commerce Commission. Reported directly to the Executive Director of the

Commission. Responsibilities included financial advice to the Commission and negotiations with Commonwealth and interveners.

Oct. 1987 to July 1988: Created the variable aluminum tariff for Big Rivers Electric Corporation. Responsibilities included testimony before the Kentucky Public Service Commission and negotiations with BREC's customers. The innovative variable tariff was adopted by the Commission in August 1987. Supported negotiations with the REA in support of BREC's bailout debt restructuring. Various minor consulting projects from 1981 through 1989 including financial advice for the Oregon AFL-CIO, statistical analysis of equal opportunity for Oregon Bank, cost of capital for the James River dioxin review, and economic analysis of qualifying facilities for Washington Hydro Associates. Taught classes in senior and graduate forecasting, micro-economics, and energy at Portland State University from 1980 to 1986.

Education:

A.B.D. Economics, Cornell University, 1979. Teaching Assistant in Micro and Macro-economics.

M.A. Economics, Portland State University, 1975. Research Assistant.

B.A. Economics, Reed College, 1972. Undergraduate thesis "Eurodollar Credit Creation"

Areas of specialization include micro-economics, statistics, and finance.

Volunteer Activities:

Chairman: Portland State Economics department advisory committee.
Member: Portland State College of Arts and Sciences advisory committee.

Professional Affiliations:

American Economic Association, American Financial Association, and the Econometric Society.

Publications and Presentations:

Numerous publications in industry journals and presentations to industry groups. The most

Professional Affiliations:

American Economic Association, American Financial Association, and the Econometric Society.

Publications and Presentations:

Numerous publications in industry journals and presentations to industry groups. The most recent presentations include: The Perfect Storm on March 22nd, 2001 and Tsunami: Prices Since May 22nd on October 11, 2000. Most recent publications are: "Power Spike Tsunami" in the January 1st, 2000 Fortnightly and "FERC's December 15th California Order" in the February 1st, 2000 Fortnightly.

Since 1994

Market Opportunities in Transmission: The Next Decade in the Pacific Northwest NELPA Presentation	March 28, 1994
Competition in the 1990s: Hard Work, Low Prices, Opportunities for Expansion Industrial Customers of Northwest Utilities Annual Meeting	January 10, 1995
Stranded Costs: Accountants Full Employment for the 1990's (Northwest Electric Light & Power)	February 16, 1995
Using the "R" Word Bonneville's Decision to Release 4000 Megawatts to the Market NELPA Annual Accounting Meeting	June 12, 1995
Bringing Ports and Utilities Together Pacific Northwest Ports Association	June 22, 1995
Restructuring in Alberta and California Change is inevitable so market needs to be competitive Governor's Energy Symposium, Springfield, Illinois	August 20, 1995
Retail Wheeling as a Quid Pro Quo for Plant Location Discussion of Competition, Regulation and innovative solutions New York Infocast Seminar	August 28, 1995
Estimating the Competitive Dividend (Competitive Utility)	October, 1995

Teaching the Hippopotamus to Dance: Negotiating with A New Utility Discussion of competition and market positioning for industry.	October 10, 1995
Teaching the Hippo To Dance: Negotiating with The "New" Utility. Bringing competition to a non-competitive world Pulp and Paper Association Annual Energy Meeting	October 12, 1995
Teaching the Hippopotamus to Dance: Bringing the Competitive Electric Market to Evanston Discussion of competition in the marketplace	October 18, 1995
Should We Be Waiting for FERC? (Or Congress, or the State Commissions)? Megawatt Markets	November 29, 1995
Predators and Prey: 1995 through 2010 in the WSCC Surplus power and plummeting natural gas prices NELPA/PSU Energy Symposium	December 4, 1995
Big Rivers Electric Cooperative: A Stranded Investment Case Study? Overview, history, market value of BREC Stranded Investment	December 12, 1995
The Alberta Power Pool 1996 Analysis of creation and implementation of Alberta Power Pool	December 18, 1995
"Predators and Prey", printed in <u>Competitive Utility</u>	January, 1996
Western States Power Supply Industrial rates are turning downward and special arrangements should be viewed with care	January 26, 1996
Primary Metals: Energy Supply Case Study Pasha Symposium on Energy Supply	February 3, 1996
Acquiring and Using a Resource Portfolio in Open Access Profile of change for large industrial user vs competition	February 3, 1996
Power Contracts: Writing the Deal	February 2, 1996

Supply Power to Industrials: Competitive Bidding, Houston, TX	February 2, 1996
Is PoolCo Just the Status Quo? Competition will allow other players to choose other suppliers	February 23, 1996
Energy Strategies for the Turn of the Century Do not commit - the market is changing daily Presentation to Weyerhauser Senior Management	March 19, 1996
Market Fundamentals West Coast Forecast 1996-2010 Presentation to Seattle City Light Senior Management Surviving the New Industrial Markets Shifts at BPA have opened new alternatives	March 21, 1996
Power Supply Option Under Central Lincoln's 1981 Power Sales Contract Competition is keen. It is a buyers market and many opportunities exist for medium term firm suppliers	May 9, 1996
Fifty Ways to Leave Your Lover Another argument for choosing interruptibility	May 10, 1996
Sliding Towards Home New markets and new prices will be determined by the customer Northwest Pulp and Paper Association	May 17, 1996
Lions, Tigers, and Bears: The New Zoology of the North American Electric Business. 1996 PowerMart Opening Presentation	June 5, 1996
Electricity/Gas Cross Market Opportunities Exploiting the synergies between gas and electricity will increase the supply of both commodities. InfoCast Electric/Gas Symposium	June 24, 1996
Timing New Industrial Power Contracts Minimize any commitments under current arrangements and avoid any new entanglements.	August 21, 1996
Power Supplies for New Municipals: Designing an Effective RFP and Evaluating Responses.	August 26, 1996

What Do Industrials Need? Need to be responsive to customer's needs in a competitive world 1996 PowerMart	September 7, 1996
West Coast Overview Summary of progress in region Retail Wheeling III, Washington, D.C.	September 14, 1996
Knowing When to Save Millions, printed in <u>Competitive Utility</u>	October, 1996
Trading on the Index: Spot Markets and Price Spreads in the Western Interconnection: <u>Public Utilities Fortnightly</u> Tying contracts to prices index. Evaluation of best index and adjustments for delivery points.	October 21, 1996
Breaking Up Is Hard to Do Discussion of Restructuring Marketplace after Competition EEI Distribution Committee	October 20, 1996
California Gas Forecasts Base forecasts, heavy use/constrained supply, fully competitive	October 28, 1996
Watching the Hippos Dance: Electricity in the 1990's Competition discussion since 1992	November 6, 1996
Stakeholders Under Restructuring Return of competition shifts interest of players dramatically NWPPA Annual Energy Meeting	November 14, 1996
Assessing Real Power Markets for Real Customers Buyers and Sellers unwilling to commit to long-term agreements.	November 18, 1996
Evanston Energy Supply Solutions Evanston, Illinois Energy Symposium	November 27, 1996
What are we Waiting for? (Megawatt Markets)	Winter/1996
Getting The Best Deal for the Customer: at Buying and Selling Electricity in the West Options for customers in the changing competitive environment. Law Seminars Annual Energy Meeting	January 16, 1997

Markets, Transmissions & Resources — January 10, 1997
Overview of US/Canadian Power Market for the Edmonton Power Authority

Clark County Utilities: A Revisionist View of the Future — January 20, 1997
Clark County Executive Retreat
Discusses the future of utilities in a competitive market

Power Supplies for New Municipals — January 28, 1997
Designing and Effective RFP and Evaluating Responses

Economic Evaluations of Municipalization: InfoCast's — April 3, 1997
Municipalization in a Changing Power Industry, Arlington VA

The Fifth Fiasco — May 15, 1997
Clark County PUD Energy Symposium

Electric Competition — April 9, 1997
Opening Presentation at the 1997 GasMart
Chicago, Illinois

A Revisionists History of the Future, Energy Buyer's Guide — June, 1997

How Regional Issues Have Shaped the Landscape for Tomorrow's Competition — June 3, 1997
Keynote Address at Electricity Choices for Consumers

Buying Cheap Power in California — June 20, 1997
InfoCast Seminar, San Francisco, California

Negotiating A Better Deal For Your Power Supply — June 23-24, 1997
InfoCast Seminar, Chicago, Illinois

Buying Cheap Power in the Northeast and Mid-Atlantic States — July 25, 1997
InfoCast Presentation, Boston, Massachusetts

Select Aggregation Partners That Offer the Greatest Cost Savings, — August 14, 1997
The Center for Business Intelligence seminar, Boston, Ma.

A Primer on Price Volatility, Energy Buyer. Analysis of spot price history — August 1997
and concludes they really haven't changed much.

Pacific Northwest: An Overview, Energy Buyer. A brief history of power issues past and present confronting the Pacific Northwest.	October 1997
Negotiating a Better Deal for your Power Supply, InfoCast presentation, Chicago, Illinois.	October 27, 1997
Is Capacity Dead? Energy Buyer. Discussion of capacity as a pricing component in a deregulated environment.	November 1997
RFP Development: A step-by-step guide. AIC Conference, Chicago, Illinois	November 17, 1997
Buying Cheap Power in California, InfoCast presentation, Santa Monica, Ca.	November 18, 1997
Getting There is Half the Cost: How Much is Transmission Service? Energy Buyer. Discussion of cost of transmission service in a deregulated market.	December 1997
Tools of the Trade: End-User Purchasing Strategies in the New Market, The Energy Institute conference, Las Vegas, Nevada	December 12, 1997
Pondering the Power Exchange, Energy Buyer	January, 1998
Coping With Interruptibility, Energy Buyer	February 1998
Selecting a Power Supplier: Fundamentals, Fundamentals, Fundamentals. LSI conference, February 19-20. Discussion of various approaches to selecting a power suppliers in a competitive environment.	February 19, 1998
Can Electricity Markets Work Without Capacity Prices? Public Utility Fortnightly. Analysis of the feasibility of future energy only power markets.	March 15, 1998
A Revisionist's History of the Future. Presentation to Tacoma City Light Board. A synopsis of energy use from the past and how markets have changed in a competitive environment.	May 5, 1998
Participation In BPA's Conscription Process: Opportunity or Extortion? Presentation to the Snohomish Public Utilities Board	May 19, 1998

Running a Competitive Bidding Program for Energy Services and Supplies. InfoCast-The Institutional Energy Users Forum, San Francisco, California. Discussion of purchasing processes, RFP structuring, pricing and insights into the prices of power past and future.	May 7, 1998
FORSCOM Utility Deregulation Panel of Experts. Armed forces panel formed to solve the problem of procuring gas and electricity energy services and manage their use under a deregulated utility industry.	May 14, 1998
Participation in BPA's Conscription Process: Opportunity or Extortion? Presentation to Snohomish Public Utilities, Snohomish, Washington. Discussion of BPA's historical background, current market forces, and choices to be made in a competitive energy environment.	May 19, 1998
Managing Electricity Price Risk: Practical Methods in the Emerging Markets. Presentation to Tacoma City Light, Tacoma, Washington. Discussion of risk management issues in a changing power market.	May 20, 1998
Succeeding In Aggregation. Presentation to the New Mexico Retail Association. Durango, Colorado. History of regulation in energy market and suggestions and methods to aggregate power in a deregulated environment.	June 13, 1998
Visions of Power Markets of the Future. Presentation to the Pacific Northwest Gas/Electric Integration group meeting. Discussion of power markets in deregulated market.	June 18, 1998
Pricing Strategies. Presentation to the June 26, 1998 session of the American Management Association on technical pricing and contract trends.	June 26, 1998
Are Customers Necessary? Analysis of the failure of the California retail market published in Public Utilities Fortnightly.	July 15, 1998
Proactive Strategies and Electricity Markets. Presentation to Abitibi Consolidated, Inc. Strategies for purchasing and selling power in competitive environments.	July 16, 1998
Marketing Priest Rapids and Wanapum Presentation to Grant County PUD #2. Discussion of issues	September 15, 1998

district relating to FERC orders and deregulation trends.

Evaluating Electric Supply Risk — October 20, 1998
Presentation to Georgia Pacific, Bellingham, WA.
Discussion of power markets, spot prices and hedging options.

Electric Markets–Challenges and Solutions — November 5 1998
Presentation to Puget Power's Industrial Customers. Discussion of issues affecting power markets in a competitive environment.

Electric Markets — December 16, 1998
Western Power Markets, Las Vegas Nevada
Analysis of responses to recent changes in western power markets

Factors Driving the Market — January 14, 1999
Buying and Selling Electricity In the West, Seattle, Washington
Discussion of markets in the restructured energy market.

Coping With Capacity Prices — January 25, 1999
Presentation at Metals Week Aluminum Meeting
Analysis of responses to recent spot price spikes

Electric Competition, One Year Later: Winners and Losers in California — March 1, 1999
Analysis of deregulation in the California energy market.

Winners & Losers in California. Public Utilities Fortnightly, — March, 1999
Discussion of electric competition in the California market.

Presentation to the ISO Market Oversight Committee Seminar sponsored by the Power Industry Computer Application group — May 17, 1999
San Jose, California.

Winners and Losers in California. An overview of the deregulated California energy market. Presentation to the Western Power Trading Forum. — June 8, 1999

How to Buy Power in the Pacific Northwest: A Buyer's Perspective. — June 22, 1999
Presentation to Megawatt Daily, Generation Week and Financial Times Energy Conference.

Northwest Reliability Issues — January 12, 2000
Presentation to the Oregon Public Utilities Commission

Northwest Power Developments Presentation to Georgia Pacific Management	May 5, 2000
Magnesium Corporation Developments Presentation to the Utah Public Utilities Commission	May 10, 2000
Northwest Market Power Presentation to Georgia Pacific Management	June 5, 2000
Northwest Market Power Presentation to the Oregon Public Utilities Commission and Oregon State Energy Office	June 10, 2000
Northwest Market Power Presentation to Governor Locke of Washington Seattle, Washington	June 30, 2000
Anatomy of a Corrupted Market Presentation to the Oregon Public Utilities Commission and Oregon State Energy Office Salem, Oregon	August 14,2000
Tsunami: Market Prices Since May 22nd Presentation to Price Spikes Symposium Portland, Oregon	October 11, 2000
Tsunami Presentation to the International Association of Refrigerated Warehouses Los Vegas, California	October 26, 2000
"Power Spike Tsunami" <u>Public Utilities Fortnightly</u>	January 1, 2001
"FERC's December 15th California Order" <u>Public Utilities Fortnightly</u>	February 1, 2001
Wholesale Pricing and Location of New Generation Buying and Selling Power In the Pacific Northwest Seattle, Washington	January 19, 2001