

BEFORE THE PUBLIC UTILITY COMMISSION OF OREGON

UM 1002

WAH CHANG,

Petitioner,

v.

PACIFICORP,

Respondent.

CERTIFICATE OF SERVICE OF
PACIFICORP'S SUPPLEMENTAL
REPLY TESTIMONY AND EXHIBITS

I certify that I have this day served the documents listed in the Attachment, consisting of 1 page, to this certificate, constituting PacifiCorp's Supplemental Reply Testimony and Exhibits, upon all parties of record in this proceeding by delivering a copy in person or by mailing a copy properly addressed with first class postage prepaid, or by electronic mail pursuant to OAR 860-013-0070, to the following parties or attorneys of parties:

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DATED: July 30, 2007.

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By 

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BEFORE THE PUBLIC UTILITY COMMISSION
OF THE STATE OF OREGON

UM1002

Wah Chang, Petitioner
v.
PacifiCorp, Respondent

PACIFICORP'S SUPPLEMENTAL REPLY TESTIMONY AND EXHIBITS

Description	Exhibit No.	Pages
Supplemental Testimony of Charles J. Cicchetti, Ph.D. and Jeffrey A. Dubin, Ph.D.	PacifiCorp/33	1-24 (pages 2, 3, 4, 5, 10, 11 and 14 filed under seal)
Professional Experience, Publications and Previous Testimony of Jeffrey A. Dubin, Ph.D.	PacifiCorp/34	1-24

CONFIDENTIAL VERSION

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OF OREGON**

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Supplemental Reply Testimony

Of Charles J. Cicchetti, Ph.D. and Jeffrey A. Dubin, Ph.D.

Pacific Economics Group L.L.C.

on behalf of

PacifiCorp



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Supplemental Reply Testimony

Of Charles J. Cicchetti, Ph.D. and Jeffrey A. Dubin, Ph.D.

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1 SUPPLEMENTAL TESTIMONY

2 *Introduction*

3 **Q. Please state your name, business and address.**

4 A. My name is Charles J. Cicchetti. My address is Pacific Economics Group, 301 South
5 Lake Street, Suite 330, Pasadena, California 91101.

6 **Q. Did you previously offer testimony in this proceeding?**

7 A. Yes, my reply testimony on behalf of PacifiCorp is identified as Exhibit PacifiCorp/23.

8 **Q. Please state your name, business and address.**

9 A. My name is Jeffrey A. Dubin. My address is Pacific Economics Group, 301 South Lake
10 Street, Suite 330, Pasadena, California 91101.

11 **Q. Mr. Dubin, please describe your educational background, professional experience,
12 publications and previous experience as a witness.**

13 A. My current curriculum vita, which is provided as Exhibit PacifiCorp/34, includes this
14 information.

15 **Q. What is the purpose of this supplemental testimony?**

16 A. Our supplemental testimony addresses a statistical study of PacifiCorp's transaction
17 reports to Dow Jones conducted by Wah Chang witness Howard, as presented on pages
18 13-16 of Mr. Howard's rebuttal testimony and his Exhibit WC/1203.

19 **Q. Please describe your understanding of the study presented in Mr. Howard's rebuttal
20 testimony.**

21 A. During its final two years, the MESA between PacifiCorp and Wah Chang was based on
22 the Dow Jones COB Index prices. Mr. McCullough has alleged that PacifiCorp engaged
23 in various non-transmission buy/resell transactions. Assuming that Mr. McCullough's
24 assertions are accurate, Mr. Howard purports to show that on the days PacifiCorp
25 allegedly engaged in non-transmission buy/resells at COB, "PacifiCorp's reports to Dow
26 Jones of sales transactions caused the Dow COB firm on-peak and firm off-peak indexes

1 to be higher than they would have been absent PacifiCorp's reports." *WC/1200, Howard*
2 *Rebuttal/13*. Mr. Howard claims that PacifiCorp's reports on such days "inflated the
3 index used to calculate Wah Chang's prices" by \$0.62/MWh. *Id. at 16*. Mr. Howard
4 further claims that even on days when PacifiCorp was not engaging in buy/resell
5 transactions, PacifiCorp nonetheless caused the index to be \$0.12/MWh higher than it
6 would have been absent reports from PacifiCorp on those days. *Id.*

7 **Q. Please summarize your position regarding Mr. Howard's study.**

8 A. Mr. Howard's study is fundamentally flawed for the following reasons:

- 9 • The underlying premise of Mr. Howard's analysis is lacking. Neither he nor Mr.
10 McCullough *offer any evidence* that PacifiCorp actually reported any of these alleged
11 buy/resell transactions to Dow Jones because these transactions did not satisfy the
12 Dow Jones criteria for firm energy sales. The "firm" Dow Jones price indices are the
13 prices used in the Wah Chang MESA. From our investigation, it does not appear that
14 these transactions were included in the reports to Dow Jones. If PacifiCorp did not
15 report any of the alleged buy/resell transactions to Dow Jones, none of these
16 transactions would have been used by Dow Jones to calculate its Index Price at COB.
17 Therefore, none of PacifiCorp's alleged buy/resell transactions would have had any
18 effect on the Dow Jones COB Index price.
- 19 • Mr. Howard's study relates not to whether these particular transactions had any effect;
20 rather, the study simply looks at the difference in the Dow Jones Index Price with and
21 without *all* of PacifiCorp's trades on (1) the 84 days that PacifiCorp allegedly
22 engaged in non-transmission buy/resell transactions, as well as (2) 266 other days in
23 which PacifiCorp did *not* engage in non-transmission buy/resell transactions.
- 24 • Mr. Howard does not simply remove the price effects of the alleged PacifiCorp
25 buy/resell transactions. Instead, he removes all PacifiCorp's reported transactions,
26 which likely were mostly sales at COB. Mr. Howard's approach does *not* measure or
27 represent any PacifiCorp buy/resell trading price effect at COB. He simply deletes

1 reported transactions on days that he and Mr. McCullough assert PacifiCorp hosted a
2 buy/resell trade. As we explain, there were 69 days when they claim there was a
3 PacifiCorp buy/resell and no other reported PacifiCorp transactions at COB and five
4 matched price days where the buy/resell price in Mr. Howard's data equaled the COB
5 index price. There was also one day with no transactions reported at COB. These 74
6 buy/resell days that Mr. Howard deleted were almost equal to the number of such
7 days Mr. Howard analyzed (84 days). In addition, PacifiCorp purchased many
8 MWhs, about 30 percent of its needs, to supply its native utility load. Accordingly,
9 PacifiCorp would have a strong preference, as a major net purchaser, to prefer lower
10 not higher regional market prices.

- 11 • The manner in which Mr. Howard combined Peak and Off-Peak effects on a single
12 day in which PacifiCorp had buy/resells during at least one hour in both Peak and
13 Off-Peak time periods was faulty and produced biased results. Specifically,
14 Mr. Howard calculates the difference between the average daily Dow Jones COB
15 index with and without all of PacifiCorp transactions, including non-buy/resells,
16 separately for peak hours and off-peak hours. If the hypothetical change in the Dow
17 Jones price index differs in both time periods, Mr. Howard assigns the more extreme
18 of the two effects as the value of the difference in average prices at COB as the *all*
19 day price difference. This approach biases upward the relatively small per MWh
20 amount of dollars (about \$0.50 per MWh) that Mr. Howard falsely estimates was the
21 effect of PacifiCorp's alleged buy/resell trading at COB. Coupled with the fact that
22 Mr. Howard included all of the MWhs that PacifiCorp traded on these same days, this
23 nominal \$0.50 per MWh difference he estimates for the Dow Jones COB average
24 prices all but disappears.
- 25 • Even as structured in this peculiar way, we show that straightforward statistical
26 modifications alter his misleading statistical results. Mr. Howard's study fails to
27 prove that PacifiCorp's alleged buy/resell transactions had a statistically significant

1 effect on the differences in the Firm Dow Jones COB Peak and/or Off-Peak Index or
2 the weighted average prior month's price Wah Chang paid during the last two years
3 under the MESA. When Mr. Howard's methodological flaws are corrected, there is
4 no statistically significant difference in the Dow Jones COB Index price when
5 PacifiCorp's transactions are removed from the Dow Jones COB Index.

6 ***Overview of Mr. Howard's Approach***

7 **Q. Please describe how Mr. Howard conducted his study.**

8 A. Mr. Howard uses arithmetic to determine the differences in average Peak and Off-Peak
9 index prices on 345 days that PacifiCorp traded at COB during 2000 and 2001. The
10 majority of days that Mr. Howard excluded were days when PacifiCorp did not sell
11 "Firm" energy at COB of the quality that the COB index would include. He also
12 excludes 15 other days that PacifiCorp traded at COB. On 11 of these excluded days,
13 Mr. Howard's data showed no difference in the COB average price with and without
14 PacifiCorp's trading revenue and volume because 7 had no Dow Jones prices and 4 had
15 average prices at Dow Jones equal to the average PacifiCorp prices. Mr. Howard also
16 excluded 4 additional days because he claimed these average price differences were
17 outliers. Mr. Howard separated these remaining 345 days as follows.

18 (1) The 84 days on which Mr. McCullough claims that PacifiCorp made non-
19 transmission buy/resell transactions at COB; and

20 (2) The remaining 261 (345 minus 84) days on which PacifiCorp traded at COB in
21 which a buy/resell transaction was not present.

22 Mr. Howard finds that the average price differences in average Peak and Off-Peak index
23 prices in the first category (buy/resell days) was about 61 cents per MWh, and that the
24 average price difference was about 13 cents per MWh in the second category (non-
25 buy/resell days). Mr. Howard seems to think that this "result" proves PacifiCorp's
26 buy/reselling activity may have caused COB index prices to be higher. Mr. Howard

1 states in his Rebuttal Testimony at page 16 that he found a \$0.62/MWh effect on
2 PacifiCorp buy/resell days and a \$0.12/MWh on non-buy/resell days. However, Mr.
3 Howard's revised model, which he provided in response to PacifiCorp Data Request
4 No. 167, showed slightly different results. In that model, which Mr. Howard states is the
5 one he used to calculate the effects he reports in his Rebuttal Testimony, the effect on
6 buy/resell days is actually \$0.6117/MWh and the effect on non-buy/resell days is actually
7 \$0.1266. These would typically be rounded to \$0.61 and \$0.13, respectively, which are
8 the numbers we use here, for a difference of \$0.48.

9 **Q. Do you agree with his interpretation of this "result"?**

10 A. No. There is no obvious meaning in his claimed difference in average index price
11 differences. Mr. Howard seems to think that this "result" proves PacifiCorp's
12 buy/reselling activity may have caused COB prices to be higher. Such a conclusion does
13 *not* follow from his flawed analysis even if this type of result remained after fixing his
14 experimental design and methods. Other reasons (*i.e.* omitted variables) could account
15 for the difference. Moreover, Wah Chang's contract prices were based on the COB Index
16 prices *every day*, not just on the days on which PacifiCorp traded at COB, let alone just
17 on the 84 days on which PacifiCorp allegedly had buy/resell transactions. Mr. Howard
18 also combined Peak and Off-Peak index price differences in a rather questionable manner
19 when this was neither necessary nor consistent with the terms of the MESA.

20 **Q. Are there other problems with Mr. Howard's interpretation of the "result"?**

21 A. Yes, there are two other conceptual matters. First, the rules of Dow Jones COB Index
22 specify that participants who are "sellers" report their sales at COB. However
23 participants who are "buyers" report only their COB purchases from a non-participating
24 counterparty. Second, Mr. McCullough alleges that PacifiCorp facilitated Enron's
25 so-called ricochet trades by participating in buy/resell transactions with Enron. In doing
26 so, Mr. McCullough utilizes a broad description of ricochet (taken from the infamous

1 Yoder-Hall memos).¹ In addition, Mr. McCullough seems to imply that every alleged
2 buy/resell is a "ricochet" trade, which he finds to be a nefarious example of FERC tariff
3 violation and/or price manipulation.

4 Mr. McCullough's broad definition is similar to one that the California Parties
5 advanced through Dr. Fox-Penner in the Gaming Order to Show Cause.² In that Order,
6 FERC utilized a narrower definition of ricochet, and said that "[a] market participant
7 made arrangements to export power purchased in the California day-ahead or day-of
8 markets to an entity outside the state and to repurchase the power from the out-of-state
9 entity, for which the out-of-state entity received a fee. The 'imported' power was then
10 sold in the California real-time market at a price above the cap." Thus, the differences
11 between FERC's definition of ricochets as a form of buy/resell transactions and the
12 definition that Mr. McCullough used is that the power had to have been purchased from
13 the CPX and then resold to the CAISO at a price above the prevailing price cap.

14 Utilizing this definition, the FERC Trial Staff reached a settlement of the Gaming
15 Show Cause Order with PacifiCorp where FERC Trial Staff found no settlement was
16 required from PacifiCorp because none of the ricochet transactions pertaining to
17 PacifiCorp occurred during the relevant time period and none exceeded the applicable
18 price cap. Therefore, the transactions at issue did not meet FERC's definition of
19 ricochet.³ FERC approved the settlement over the objections of the California Parties and
20 Wah Chang.⁴ FERC approved the settlement with FERC Staff that found that none of the
21 1,098 hours of alleged ricochet or the 1,116 hours of ricochets identified by Dr. Fox-
22 Penner met FERC's definition of ricochet.

¹ See Mr. McCullough's Direct Testimony, Exhibit WC/800, McCullough/127.

² *Order to Show Cause Concerning Gaming and/or Anomalous Market Behavior*, 103 FERC ¶61,345 (June 25, 2003).

³ See *Certification of Contested Settlement*, 105 FERC ¶63,043 (December 15, 2003).

⁴ See *Order Approving Contested Settlement Agreement*, 106 FERC ¶61,235 (March 8, 2004).

1 Subsequently, FERC denied the California Parties' Request for Rehearing of the
2 Gaming Show Cause Order.⁵ FERC stated that it had purposefully not adopted Dr. Fox-
3 Penner's proposed market screen for ricochet because it was "overly broad and would
4 include legitimate activity."

5 **Q. What "results" can be reached from Mr. Howard's study?**

6 A. When Mr. Howard's methodological flaws are corrected, there is no statistically
7 significant difference in the Dow Jones COB Index price when PacifiCorp's transactions
8 are removed from the Dow Jones COB Index. Thus, Mr. Howard's analysis fails to
9 demonstrate that PacifiCorp's buy/resell transactions had any effect on the Dow Jones
10 COB Index and the prices Wah Chang paid for the final two years under the MESA.

11 **Q. Please list the errors in Mr. Howard's approach.**

12 A. Mr. Howard's study suffers from the following flaws:

- 13 • Faulty premise.
- 14 • Fundamental design flaws.
- 15 • Inexplicable exclusion of data from his analysis.
- 16 • Disregard of relevant facts from his analysis.
- 17 • Use of false and biased logic to combine peak and off-peak effects.
- 18 • Failure to perform statistical analyses that would reveal the flaws in his "combined"
19 effect method.

20 ***Faulty Premise***

21 **Q. Why do you say that Mr. Howard's study suffers from a faulty premise?**

22 A. There is a disconnect in Mr. Howard's analysis because neither he nor Mr. McCullough
23 offer any evidence that PacifiCorp reported any of these alleged buy/resell transactions to
24 Dow Jones. Indeed, such buy/resell trades would typically not meet Dow Jones'
25 definition of Firm Price transactions. Further, there is no evidence that these particular

⁵ *Order Denying Rehearing*, 106 FERC ¶61,020 (January 22, 2004).

1 PacifiCorp trades in real time world affect the Firm Peak and Off-Peak price indices that
2 determine the price that Wah Chang paid PacifiCorp under the MESA.

3 **Q. What types of transactions were reported to Dow Jones?**

4 A. In fact, there is very little reason to think that any buy/resell transactions would be
5 included in the transactions that PacifiCorp or any other participant reported to the Firm
6 Dow Jones COB Index. In Dr. Cicchetti's Reply Testimony at pages 10-11, he discussed
7 the Dow Jones requirements for transactions to be included in calculating the Firm COB
8 Price Index. It is worth restating how Dow Jones describes the process.

9 The firm indexes average together blocks of power sold on a one-
10 day forward pre scheduled basis. No real-time power is included
11 in these indexes. Transactions are limited to power traded in 16-
12 hour blocks during on-peak hours and 8-hour blocks for off-peak.
13 Transactions which call for delivery for more than one day are not
14 included in calculations for these indexes except for the standard
15 multi-day trading that occurs as a result of schedulers' conferences
16 of month end trading is also included. Trading must follow the
17 standard WSPP schedule. Volume is reported as total megawatts
18 (MW) transacted per hour.

19 Dow Jones defines Firm as financially firm backed with liquidating damages or
20 physically firm. Buy/resell transactions typically do not fit the various specific
21 parameters of the requirements for a Firm Dow Jones COB transaction. Buy/resells tend
22 not to be for standard 16-hour blocks of Peak power or 8-hour blocks of Off-Peak power
23 and the MWs traded are often "odd" sized amounts and likely are real time, not day
24 ahead.

25 **Q. Did you investigate to determine whether the buy/resell transactions identified by
26 Mr. McCullough were reported to Dow Jones?**

27 A. Yes. We reviewed the Buy/Sell Transactions found in Mr. McCullough's spreadsheet
28 entitled "PacifiCorp's buy/resells with Enron at Malin" that were produced in response to
29 PacifiCorp Data Request No. 83. These are the transactions that Mr. Howard used to
30 determine if PacifiCorp's buy/resell transactions affected daily COB prices on days with
31 buy/resells. We compared these buy/resell transactions to the transactions that

1 PacifiCorp reported to Dow Jones, which Mr. Howard used in his analysis. None of the
2 buy/resell transactions Mr. Howard used, which are contained in Mr. McCullough's
3 spreadsheet of alleged buy/resell transactions, appear in Mr. Howard's database of
4 reported PacifiCorp's transactions to Dow Jones. This confirms our expectation that
5 buy/resell transactions are not the types of trades reported in the Dow Jones firm price
6 indices, which are the prices used in the Wah Chang contract. This means that Mr.
7 Howard's analyses can offer only minimal insight as to what else may have been
8 correlated on various days. No one can use his analyses to claim any particular or
9 meaningful causality.

10 Since PacifiCorp did not report any of the alleged buy/resell Transactions to Dow
11 Jones, none of these transactions would have been used by Dow Jones to calculate its
12 Firm Daily Index Price at COB. Therefore, none of PacifiCorp's alleged buy/resell
13 transactions would have had any effect on the Dow Jones Daily Firm COB Index prices.
14 Consequently, Mr. Howard could do no more than calculate the difference in the Dow
15 Jones Index Price with and without all PacifiCorp's trades on the 84 days that PacifiCorp,
16 according to Mr. McCullough, also engaged in non-transmission buy/resell transactions.
17 Moreover, despite this fatal flaw, after closer scrutiny, Mr. Howard's analysis fails to
18 prove that PacifiCorp's alleged buy/resell transactions had a statistically reliable effect
19 on the differences in the Daily Firm Dow Jones COB Index prices or the price Wah
20 Chang paid during the last two years of its contract.

21 ***Fundamental Design Flaws***

22 **Q. Why do you say that Mr. Howard's study has fundamental design flaws?**

23 A. A fundamental flaw in Mr. Howard's statistical analysis is what he does with the
24 PacifiCorp data, particularly on these so-called 84 buy/resell days. Specifically, he
25 removes the effect on the Dow Jones price indices of ***all*** the PacifiCorp trades on
26 these 84 days. Most of these PacifiCorp reported trades at COB likely have nothing

1 to do with alleged buy/resells, which are typically for a small fraction of the hours in
2 a day, a small percent of the MWs traded in such hours, and at prices that often are
3 below the prevailing market prices.

4 **Q. What is the problem with Mr. Howard's approach?**

5 A. If someone wanted to determine the effect of buy/resells on a day with such trades,
6 only the price effect of this very limited number of buy/resell MWs should be used.
7 Mr. Howard does not do this. Instead, he removes *all* PacifiCorp's MWs on those
8 days and calculates the effect on the COB index price "with" and "without" all
9 PacifiCorp's trades on these 84 days (ignoring his deletion of outliers). Since
10 PacifiCorp had 84 out of 345 days (or about 24 percent) with alleged buy/resells,
11 this is like saying 24 percent of all PacifiCorp's trades at COB were buy/resells.
12 This is grossly untrue.

13 Mr. Howard attempts to off-set this logical analytical flaw by doing the same
14 "with" and "without" PacifiCorp's trading at COB for the other 265 (349 minus 84), or
15 when his four outliers are removed, 261 days where he found that PacifiCorp had an
16 "effect" on the COB index prices. Again, interpretation is crucial. The most Mr. Howard
17 can claim is as follows:

- 18 • After removing all "no effect" days at COB, he analyzes the average prices at
19 COB on the remaining days.
- 20 • Mr. Howard finds that the average COB price would be slightly higher (about 61
21 cents per MWH, or \$0.061 cents per KWh) on 84 days if PacifiCorp had instead
22 made no trades at COB on these 84 days.
- 23 • Mr. Howard also finds that on the other "no effect" days, the average COB price
24 would be about 13 cents per MWH higher, or \$0.013 per KWh, if PacifiCorp had
25 no trades at COB.
- 26 • Mr. Howard did not explicitly discuss the full set of relevant facts for the Wah
27 Chang contract. Specifically, on 382 days, PacifiCorp did not report trades to

1 COB; and therefore had no price effect at COB. This is important because it is
2 not correct to conclude that PacifiCorp's buy/resell "days" caused COB prices to
3 be \$0.48 per MWH more and, therefore, Wah Chang paid too much to PacifiCorp.

4 The most relevant insight is that Mr. Howard did *not* measure or test for any price effects
5 specifically tied to any alleged specific buy/resell PacifiCorp transactions. He also failed
6 to consider other important factors, known as "omitted variables," which could explain
7 the average price differences he allegedly found in this sub-sample of 84 days. His
8 analysis is incomplete and his implied interpretation offered is misleading and biased.

9 *Exclusion of Data from the Study*

10 **Q. In what way did Mr. Howard exclude data from his study?**

11 A. Mr. Howard executes his analyses by eliminating all the 382 "no effect" and his 4 outlier
12 days. He deleted 371 such days because PacifiCorp did not trade on these days. He
13 deleted 7 days because PacifiCorp reported trades, but Dow Jones did not report trades on
14 the same day. And, he deleted 4 days because he found that the PacifiCorp average price
15 on those days equaled the Dow Jones price at COB. Mr. Howard seeks to determine the
16 effect on Dow Jones' COB price indices due to PacifiCorp's buy/resell activity at COB.
17 The strangest and most questionable decision he makes is that when he eliminates these
18 382 days, he eliminates 74 days that PacifiCorp made buy/resells at COB with zero effect
19 on the COB index prices using his definition of an effect.

20 **Q. What is the problem with Mr. Howard's exclusion of data?**

21 A. The first questionable issue is whether Mr. Howard should have eliminated 52.26 percent
22 of the days (382/731) in his analysis because PacifiCorp had "no effect" on the Peak and
23 Off-Peak Dow Jones COB price indices on those days. If his subsequent analysis is
24 limited to simply a test of the potential effect of PacifiCorp's trades on "just" the days
25 PacifiCorp traded, this sub-sample could potentially be used. However, this proceeding
26 is about prices under the MESA and, consequently, every trading day in the Dow Jones

1 COB markets in the prior month would be averaged to determine the price Wah Chang
2 paid PacifiCorp.

3 Mr. Howard does not stop deleting days. He also, as stated previously, eliminates
4 4 days that he "eye-balls" as outliers. Thus, he reduces the number of observations to 345
5 "effect days" out of 731 days. His deletion of the 4 outliers is unusual. He provides no
6 details as to why objective reviewers would do this. He does not explain the effect of this
7 deletion and/or when these days may fall. Eliminating 4 days in his sub-sample,
8 particularly when he draws inferences related to events (*i.e.* buy/resells) on a small
9 number (84) of buy/resell days (about 11 percent of the 731 days during the two years),
10 can affect both his t-statistics and price differences.

11 He also analyzes Sundays and holidays, which are included in the definition as
12 Sundays, somewhat uniquely. Four "no price effect" data anomalies occur on Sunday.
13 This suggests some need to interpret any Sunday results with suspicion because there are
14 relatively few Sundays in the PacifiCorp trading day sub-sample. Another COB data
15 anomaly was a day that PacifiCorp reported trades at COB during peak hours and Dow
16 Jones reported no trades.

17 **Q. Please illustrate with an example.**

18 A. Suppose Company A traded at COB and, on one day, Company A purchased electricity
19 for \$200 per MWh and all the other MWhs sold at COB that day traded at \$100 per
20 MWh. Also assume that on every other day over a two-year period Company A either
21 did not purchase any MWhs or purchased MWhs at a price equal to the COB index prices
22 for that day. An objective observer interested in the effect on COB index prices "with"
23 and "without" Company A's trades might say the following:

- 24 • On .14% of the days (1 out of 731), Company A raised the COB index price.
- 25 • On all other (99.86%) days, Company A's trades and non-trades did *not* affect the
26 COB price.

1 This analysis does *not* answer the question about Company A if someone is instead
2 interested in learning how Company A caused prices to vary at COB over a two-year
3 period. Quite obviously, there is *no* effect, and all 731 days matter. Mr. Howard
4 eliminates both the PacifiCorp non-trading "no effect" days (371 days) and the 11 "no
5 effect" days that PacifiCorp reported trades at COB. In effect, he considers only 345
6 days during the two years, or 47.2% of the trades (345/731). This is like discussing
7 Company A's one-day price effect. Mr. Howard's evidence depends upon two things: (1)
8 The reader and analysts need to be fully aware of what is being said about the sub-sample
9 of included days versus all the days; and (2) the question framed needs to be useful for
10 the regulatory matter under review. Here, it is not because *every day* matters in
11 determining the prices that Wah Chang paid under the MESA with PacifiCorp.

12 *Disregard of Relevant Facts*

13 **Q. In what way does Mr. Howard disregard relevant facts from his study?**

14 A. Two particular points are worth mention: (1) the circumstances surrounding buy/resell
15 transactions, and (2) the pricing structure under the MESA.

16 **Q. What relevant facts does Mr. Howard disregard with respect to buy/resell
17 transactions?**

18 A. Mr. Howard relies on Mr. McCullough's spreadsheets to identify 84 days that PacifiCorp
19 allegedly engaged in non-transmission buy/resells at COB. Both Mr. Howard and Mr.
20 McCullough seem to know that there are reasonable and legitimate reasons for buy/resell
21 trading. Regardless, there is no attempt to review any possible justification for the
22 buy/resell activity on these 84 days. We can only surmise that Mr. Howard's intention is
23 to imply that all such days have nefarious trading activity. This is an unsupported
24 assumption. Geography, for example, provides an explanation for legitimate buy/resell
25 transactions. A particular electricity supplier may have MWs in one location and load or
26 contract requirements in another. Mr. Howard names his buy/resells as "non-

1 transmission." In addition, buy/resells can also work around transmission constraints and
2 help the energy trading firms to satisfy independent or unrelated export/import or other
3 unrelated obligations.

4 Mr. Howard also uses some faulty and *biased* logic to combine "peak" (6 X 16)
5 and "off-peak" (8 X 16) effects on a single day in which PacifiCorp had buy/resells
6 during at least one hour in both Peak and Off-Peak time periods. Specifically, Mr.
7 Howard calculates the difference between the average daily Dow Jones COB index with
8 and without all of PacifiCorp transactions, including non-buy/resells, separately for peak
9 hours and off-peak hours. If the hypothetical change in the Dow Jones price index differs
10 in both time periods, Mr. Howard assigns the more extreme of the two effects as the
11 value of the difference in average prices at COB as the *all* day price difference. This
12 approach biases upward the relatively small per MWh amount of dollars (about \$0.48 per
13 MWh) that Mr. Howard falsely estimates was the effect of PacifiCorp's alleged buy/resell
14 trading at COB. When combined with the fact that Mr. Howard included all of the
15 MWhs that PacifiCorp traded on these same days, this nominal \$0.48 per MWh
16 difference he estimates for the Dow Jones COB average prices all but disappears. In
17 addition, the Wah Chang contract is based upon all the days in the month, not just days
18 that PacifiCorp traded at COB and the even smaller 11.5 percent of the days (84 out of
19 731 days) that PacifiCorp made buy/resells according to Mr. McCullough's spread sheet.

20 **Q. What other circumstances does Mr. Howard disregard with respect to buy/resell**
21 **transactions?**

22 A. Buys and resells in Real Time take place after Balance-of-Month and Day-Ahead price
23 decisions are executed in bilateral energy transactions. Mr. Howard's "cause and effect"
24 logic is "off" because the potential price signaling effect of buy/resells likely came in
25 Real Time after the prices were determined and reported to Dow Jones for the vast
26 majority of the volumes traded at COB and reported in Day-Ahead Dow Jones Indexes.



1 Mr. McCullough's spreadsheet entitled "PacifiCorp's Buy/Resells with Enron at
2 Malin" and the trading transcripts⁶ that Mr. McCullough attaches to his evidence, which
3 are summarized in the workpapers, show that agreements to buy/resell have several
4 important characteristics:

- 5 • Most buy/resells traded at *below* the prevailing spot market prices;
- 6 • Most buy/resells were for very *small* volumes and short durations;
- 7 • Such trades would not represent "blocks" of power and, as stated above, would not be
8 reported to Dow Jones by PacifiCorp.

9 **Q. What additional relevant fact does Mr. Howard disregard with respect to the**
10 **pricing structure under the MESA?**

11 A. A second relevant fact that is ignored is the pricing required under the MESA. The
12 MESA between Wah Chang and PacifiCorp had three years of fixed prices or MWh
13 charges and two years of variable monthly prices. These variable monthly prices were
14 based upon the monthly spot market index determined by the daily average of the Dow
15 Jones COB prices during the Billing Period (plus \$11/MWh), weighted by the firm index
16 for Peak hours and by the non-firm index for Non-Peak hours. The contract specifies that
17 the weighted average firm Peak price should be estimated for the non-Sunday 16 Peak
18 daily hours. Similarly, the weighted average of Off-Peak firm prices should be
19 determined for the remaining Off-Peak 8 hours each day, and all day Sunday. These two
20 weighted average monthly prices are combined into a single monthly weighted average
21 price using the percent of Peak and Off-Peak hours in a give month as weights. Mr.
22 Howard analyzed 24 months of daily data in the calendar years 2000 and 2001, which are
23 generally thought to contain the months of the California Energy crisis period. The last
24 16 months of his data are days when Wah Chang would pay a price per MWh based upon

⁶ Exhibit WC/903.

1 the previous month's average daily Peak and Off-Peak Dow Jones COB price indices as
2 described above

3 *Statistical Analysis*

4 **Q. How does Mr. Howard's statistical analysis introduce bias?**

5 A. Mr. Howard combines his data for Peak, Off-Peak, and Sundays into a single two-year
6 effect. This approach introduces an upward bias and ignores the fact that Dow Jones
7 reports separate Peak and Off-Peak firm price indices, and both are individually
8 recognized as such in the Wah Chang contract. Table 1 shows the percent of days in the
9 two years (731 days) on which removing all of PacifiCorp's trades on a given day would
10 affect the daily average price indices for Peak, Off-Peak (non-Sundays), and Sundays.
11 Using the combined effect suggests that PacifiCorp's trading affect COB prices on almost
12 half the days (47.74 percent). In fact, the "effects" are much less frequent when reviewed
13 during the specific time periods in the Wah Chang contract (Peak and Off-Peak non
14 Sundays and all the Sunday and holiday trades Off-Peak). Mr. Howard's method adds
15 more effect days and falsely uses all transactions on any given day to determine a price
16 effect.

TABLE 1
Percent Days that PacifiCorp's Trades Affected
Dow Jones COB Indices

	Average Price Effects Percent	No Price Effect Percent
Peak Index	34.88%	65.12%
Off-Peak Index	20.93%	79.07%
Sundays	2.74%	97.26%
Mr. Howard's Max Effect Logic	47.74%	52.26%

17

1 **Q. Why is it appropriate to break down the "combined effect" used in Mr. Howard's**
2 **study?**

3 A. One important reason to break down Mr. Howard's combined effect is that Dow Jones
4 reports separate daily Peak and Off-Peak indices. In addition, the Wah Chang contract
5 separately considers Peak and Off-Peak monthly COB price indices.

6 **Q. What happens when the data are analyzed separately for Peak, Off-Peak, and**
7 **Sundays?**

8 A. Mr. Howard's experimental design and methodology are not neutral. His subjective
9 decisions and choices matter. Table 2(A) shows what happens to Mr. Howard's reported
10 "combined" t-statistic of 2.754, which is based upon 345 observations (omitting his 4
11 outliers) and 84 buy/resell days, when the data is analyzed separately for Peak, Off-Peak,
12 and Sundays.

	Effect/Total	t-statistic	At 95% or More	Price Effect Difference in \$/MWH
Combined	84/345	2.754	Significant	\$0.485
Peak	53/252	1.894	Not Significant	\$0.303
Off-Peak	34/153	1.129	Not Significant	\$0.236
Sundays	7/19	1.985	Significant	\$2.481

13
14 The only individual price category that passes Mr. Howard's preferred statistical
15 significance test is Sunday. These are just 19 observations in his data and the frequency
16 of Sunday anomalies is proportionally greater than the other two categories.

17 **Q. What further analysis did you do?**

18 A. We replicated Mr. Howard's analysis and the category break-out in Table 2(B) using all
19 the 614 non-Sundays and the 117 Sundays (holidays are coded Sundays) in 2000 and

1 2001. Using every day is consistent with the contract terms. All the price differences
 2 between the between the buy/resell days without PacifiCorp and the non-buy/resells days
 3 without PacifiCorp decline sharply. In his response to PacifiCorp's Data Requests, he
 4 includes his 4 outliers in this analysis. We also converted the "combined" effect to be
 5 consistent with Mr. Howard. Therefore, we used his method, which is based upon the
 6 absolute value of the maximum effect.

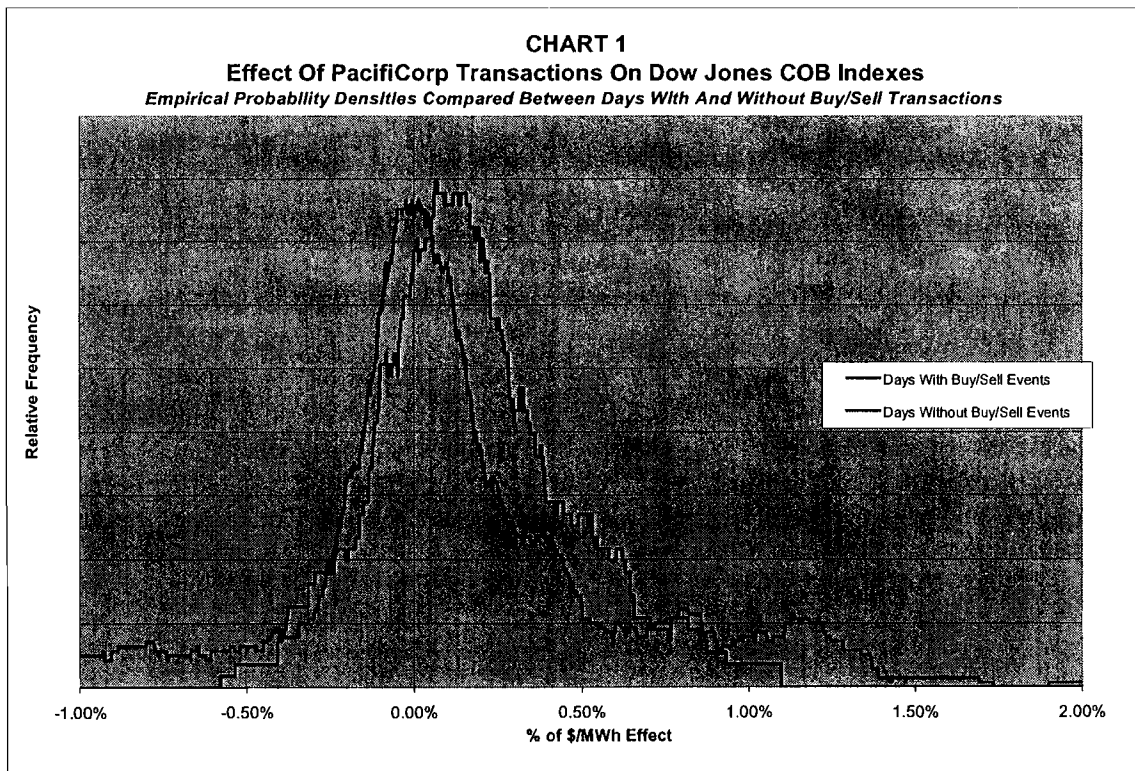
7 **Q. What conclusions do you reach from this analysis?**

8 A. The Peak, Off-Peak, and Sunday price effect differences are not statistically significantly
 9 different than zero. The Dow Jones distinguishes between the Firm Peak and Off-Peak
 10 categories. The inference to draw is that there is no statistically significant difference in
 11 the Peak and Off-Peak categories when they are analyzed individually. The Dow Jones
 12 distinguishes between Peak and Off-Peak indices in their reporting. The MESA between
 13 Wah Chang and PacifiCorp required individual monthly estimates of Peak and Off-Peak
 14 average prices. These are calculated separately and then weighted by their respective
 15 percentage of high (Peak) and low (Off-Peak) demand hours in a given month.

TABLE 2(B)				
Unequal Variance t-tests for Different Price Categories				
	Effect/Total	t-statistic	At 95% or More	Price Effect Difference in \$/MWH
Combined	158/731	2.265	Significant	\$0.240
Peak	138/614	1.820	Not Significant	\$0.126
Off-Peak	138/614	1.113	Not Significant	\$0.059
Sundays	20/117	1.156	Not Significant	\$0.639

1 **Q. Did you perform any analysis with respect to the graph shown on page 15 of Mr.**
2 **Howard's testimony?**

3 A. Yes. On page 15 of his Rebuttal Testimony, Mr. Howard included a graph that,
4 according to Mr. Howard, shows that the effects on buy/resell days "are greater and tend
5 to be positive." Mr. Howard responded to Data Request Number 175 with a frequency
6 distribution of the percentage price difference effects related to removing PacifiCorp's
7 trades at COB relative to the prevailing COB prices. He did this per PacifiCorp's request
8 for both the 84 buy/resell days and 261 non-buy/resell days in his 345 day sub-sample.
9 This is shown in Chart 1, which we reproduce from Mr. Howard's response after
10 correcting his mislabeling of the horizontal axis.



11

1 **Q. What does Chart 1 show?**

2 A. Chart 1 shows the price differential effect on the COB index using Mr. Howard's
3 questionable combined method and removing PacifiCorp's trades. We do not accept Mr.
4 Howard's combined effect methodology. Nevertheless, we show this chart because it
5 demonstrates that his alleged effects would be very small arithmetically. This is true for
6 both per unit and percentage terms. These differentials fall mostly well with plus or
7 minus one half of one percent (+0.5% to -0.5%) of the prevailing COB prices on any
8 given day. This means that for a \$100 per MWh average daily price, the price differential
9 effect of removing PacifiCorp on the COB index and using Mr. Howard's questionable
10 combined method would be scarcely noticeable. At the extremes, the effect would be on
11 the order of plus or minus fifty cents (or a range of \$99.50 to \$100.50 per MWh on a
12 \$100 per MWh transaction), and probably much less. If the daily COB price was \$30 per
13 MWh, the corresponding extreme range would be \$29.85 to \$30.15 per MWh.

14 **Q. What other analyses did you perform?**

15 A. Mr. Howard also combines both the negative and positive effects into a single
16 "Combined" effect. We performed a logit regression analysis to expand his analysis to
17 test separately for any positive or negative effect days, as well as to distinguish between
18 Peak, Off-Peak, and Combined effects. During the 731 days, the PacifiCorp daily
19 "effects" at COB were as follows:

Price Effects	Days	Percentages
No Effect	382	52.26%
Negative	123	16.83%
Positive	226	30.92%
Total	731	100.0%

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We also used the logit regression approach to include some omitted variables that this case and knowledge of the crises would suggest are reasonable to include. We did not do this to be picayune. Omitting relevant variables will cause statistical bias in the results.

Q. What did your analyses of possible omitted variables show?

A. Table 4 summarizes the various logit models that we consider. These reflect the addition of two omitted variables: (1) California Stage 3 Emergency Declarations, because Mr. McCullough observes in his Testimony that such days would trigger the CAISO to make Out-of-Market (OOM) purchases that could trigger buy/resell activity; and (2) California temperature-related data to reflect peak demand conditions in the west. We included Mr. Howard's outlier days. Therefore, there are 731 days in this analysis. The California variables reduced the number of observations, however.

Experiment	Negative	Positive	Binary Either
	(t-statistics/Results)		
1. Just PacifiCorp Buy/Resell Variable	-1.59/Reject	3.00/Accept	-1.54/Reject
2. Add State 3 Emergency Days	-1.67/Reject	1.58/Reject	-0.45/Reject
3. Add L.A. High Daily Temperature	-1.53/Reject	1.64/Reject	-0.56/Reject

14

1 The column labeled "negative" examines the days when removing PacifiCorp's
2 transactions, typically firm sales at COB, would cause the Firm COB index prices to
3 decline. The dependent variable in the logit shown in Table 4 reflects Mr. Howard's
4 combined Peak, Off-Peak, and Sunday concept.

5 The t-statistics shown are for the independent variable that designates an alleged
6 buy/resell day. Experiments 2 and 3 show the effect on the reported t-statistic for
7 buy/resell days when the respective omitted variable is included in the logit analyses.

8 The "positive" column shows a similar t-test on the buy/resell days for the
9 likelihood that PacifiCorp's reported Dow Jones trades would cause the "combined" COB
10 index price to increase. The "Binary" column shows the same information for the
11 likelihood of PacifiCorp's reported Dow Jones COB trades to change the index (plus or
12 minus).

13 Table 4 shows the only experiment with a statistically significant effect is the
14 "positive" price difference when the only included explanatory variable is a variable
15 designating days on which Mr. McCullough's spread sheet shows that a PacifiCorp
16 buy/resell trade occurred. Adding California emergency days (when Mr. McCullough
17 expects buy/resells could trigger OOM transactions) or California temperature causes this
18 alleged positive effect to become statistically insignificant. Therefore, no statistical
19 significance should attach to Mr. Howard's conclusions.

20 Table 5 shows the same logit experiments for just the days when the effect of
21 removing PacifiCorp trades would cause the Dow Jones Firm COB Peak Index to change.
22 None of the "positive" or "either" price effects are statistically significant than zero across
23 all four experiments. All the negative day effects are significant. This means that

1 removing PacifiCorp's reported trades reduces the likelihood of negative" price declines
2 when PacifiCorp has buy/resells.

TABLE 5 Logit Analyses to Determine if Positive, Negative, and Either (Binary) Peak Days Are Different Than No Effect (Zero) Days "Peak Effect"			
Experiment	Negative	Positive (t-statistics/Results)	Binary Either
1. Just PacifiCorp Buy/Resell Variable	-2.89/Accept	0.72/Reject	0.83/Reject
2. Add State 3 Emergency Days	-2.86/Accept	0.34/Reject	1.12/Reject
3. Add L.A. High Daily Temperature	-2.60/Accept	0.59/Reject	0.73/Reject

3
4 Table 6 shows that none of the likelihood of changes in the Off-Peak effects at
5 COB are statistically different than zero when PacifiCorp's trades are removed. This
6 result does not change across the three experiments shown in Table 6. We did not do a
7 separate analysis of Sundays given the small number of days with buy/resell transactions
8 and the anomalies we discussed previously.

TABLE 6 Logit Analyses to Determine if Positive, Negative, and Either (Binary) Off-Peak Days Are Different Than No Effect (Zero) Days "Off-Peak Effect"			
Experiment	Negative	Positive (t-statistics/Results)	Binary Either
1. Just PacifiCorp Buy/Resell Variable	-1.41/Reject	1.07/Reject	0.09/Reject
2. Add State 3 Emergency Days	-1.15/Reject	1.39/Reject	-0.31/Reject
3. Add L.A. High Daily Temperature	-1.50/Reject	1.33Reject	-0.04/Reject

9
10 **Conclusion**

11 **Q. Please summarize your conclusions.**

12 A. The relative price effects related to removing PacifiCorp's trades at COB using Mr.
13 Howard's sub-sample are small. These small effects shrink further when *all* the days in

1 the two-year period are included because the contract used every day to establish Wah
2 Chang's monthly contract price.

3 We also abandoned Mr. Howard's questionable composite daily price effect and
4 replaced his approach with the Peak and Off-Peak price indices. Using his sub-sample of
5 just "effect" days, both the Peak and Off-Peak price differentials are not statistically
6 significantly different from zero. We also considered all 731 days because the contract
7 would use every day and because, with virtually no justification, Mr. Howard eliminated
8 74 "no-effect" buy/resell days when he formed his sub-sample. We found that the
9 resulting very small price differentials using Peak hours and Off-Peak hours were not
10 significantly statistically different from zero.

11 There are logical flaws and methodological flaws that make Mr. Howard's results
12 biased and meaningless. There is no proof that PacifiCorp, a net buyer that purchased
13 30 percent of its native load requirements, either intentionally or accidentally caused
14 COB Peak and Off-Peak price indices to increase due to its trading activity: (1) on
15 buy/resell days; (2) as a result of only buy/resell transactions; or (3) in any meaningful
16 manner.

17 **Q. Does this conclude your supplemental testimony?**

18 **A. Yes.**

**BEFORE THE PUBLIC UTILITY COMMISSION
OF OREGON
UM 1002**

WAH CHANG,)
)
 Petitioner,)
)
 v.)
)
 PACIFICORP,)
)
 Respondent.)

**Exhibit 34 Accompanying Supplemental Reply Testimony
Professional Experience of Jeffrey A. Dubin, Ph.D.**

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Pasadena, CA 91101
Tel: 626-683-9395
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Jeffrey A. Dubin is Co-Founder and Partner in Pacific Economics Group. He is also a tenured Professor of Economics at the California Institute of Technology. His research focuses on microeconomic modeling with particular emphasis on discrete-choice econometrics. Current research topics include: discrete-choice econometrics, energy economics, tax compliance, sampling and survey methods, valuation of intangible assets, and studies of ballot proposition voting. Some examples of his work include:

INTELLECTUAL PROPERTY

- For a defendant law firm, Dr. Dubin developed a damage estimate for patent infringement litigation involving a computer upgrade chip patent.
- For a photographic equipment manufacturing company involved in patent infringement litigation, Dr. Dubin developed an econometric model to measure the relevant market, the product demand in that market and the damages resulting from the infringement.
- For a major computer company involved in patent litigation, Dr. Dubin reanalyzed a survey of computer purchase decisions offered by plaintiffs as evidence of historical damages. Dr. Dubin also designed and implemented a survey of computer users to measure potential damages.
- For a large U.S. food and beverage company, Dr. Dubin has developed econometric theory and models to assign values to several intangible assets. His approach is based on the comparison of the demand for branded and private label products.

- For a Japanese manufacturer of fractional horsepower micro-motors used in automobile power door locks and power mirrors allegedly infringed by a Hong Kong manufacturer, Dr. Dubin developed an econometric model of the world demand for micro-motors. This model was used in conjunction with an international pricing model to calculate lost profits from foregone sales and price erosion.
- For a large manufacturer of a top-50 chemical, Dr. Dubin developed a model of the world supply and demand for this chemical in order to calculate the damage resulting from a process patent infringement.
- In federal court litigation brought in New Orleans, Dr. Dubin assisted in developing a celebrity goodwill value assessment for appropriating a nationally known chef's likeness.
- For a developer of software, which provides credit card scoring, Dr. Dubin assisted counsel in developing alternative damage theories.
- For a manufacturer of a branded car wax, Dr. Dubin assisted counsel in damage calculations under alleged tradedress and trademark issues.
- For a manufacturer of artificial joint implants, Dr. Dubin developed an econometric model of product selection by orthopedic surgeons in order to quantify potential lost profits.

ANTITRUST

- For generic manufacturers of several leading pharmaceuticals, Dr. Dubin analyzed higher prices paid by consumers that resulted from delaying the time when manufacturers branded patented drugs go off patent.
- For the generic manufacturers of a leading anti-cancer chemotherapy drug, Dr. Dubin considered the anti-competitive effects of patent extensions by these patent holders. He also analyzed the demand for chemotherapy agents and the extent of the market.

- For the Oakland Raiders, Dr. Dubin analyzed the demand for NFL football. He designed an econometric model to test audience effects on individual demand, as well as how aspects of team performance affect demand. This model established that opening season box office performance could have lingering effects for a football team in terms of demand for tickets.
- For the Department of Justice, Dr. Dubin was the lead economist and expert in a multinational merger analysis of major cardio ultrasound equipment manufacturers. Dr. Dubin utilized nested logit techniques to determine the patterns of substitution for purchasing ultrasound equipment. He then used these models to determine the price consequences for cardio ultrasound equipment that would likely occur as a result of the merger.
- For a manufacturer of agricultural silage bags, Dr. Dubin assessed geographic market definition and considered the joint market power of distribution of agricultural silage bags as evidenced by their boycott of specific manufacturers.
- For a group of corn-syrup manufacturers accused of price-fixing, Dr. Dubin provided econometric rebuttal testimony to demonstrate that the opposing expert did not demonstrate price-fixing.
- For a group of merging railroads, Dr. Dubin developed rebuttal testimony to demonstrate that the opposing expert had overstated the likely diversion from rail to truck.
- For architectural hinge manufacturers accused of price collusion, Dr. Dubin developed a model of hinge pricing based on hundreds of thousands of individual transactions.
- For the U.S. Department of Justice, using scanner data, Dr. Dubin developed econometric models of the demand for white bread. These models were used to demonstrate a proposed merger's likely price consequence.
- For a telecommunications company, Dr. Dubin developed an econometric model of the choice by individuals of market versus self-insurance and showed that the damages resulting from alleged unfair marketing were substantially mitigated.

- In an antitrust action filed in New York, Dr. Dubin assisted in preparing a report assessing the divisional capital asset pricing model (CAPM) betas for an international copier and printer company.

STRATEGIC AND MANAGEMENT CONSULTING

- For a large refining company, Dr. Dubin developed an econometric model of gasoline demand.
- For Canada Post, Dr. Dubin developed an econometric model of the demand for various mail products and evaluated the simulation of a previously estimated econometric model.
- For a company doing credit card scoring analysis, Dr. Dubin evaluated the financial consequences that losing a sole-supply contract would have on market capitalization.
- For a major bank, Dr. Dubin analyzed the effects of automatic teller machines on the market for travelers checks.
- For the State of California, Dr. Dubin examined the effects of state income tax enforcement.
- For a gas pipeline restructuring under FERC Order 636a, Dr. Dubin developed a model analyzing the competitiveness of various market segments.
- For a gas pipeline, Dr. Dubin analyzed the competitive nature of the market for gas storage.
- For a top-five mail order company, Dr. Dubin analyzed historical purchase and promotion data at the individual level to model retail mail order demand, promotion effectiveness, and purchase behavior over time.

- For a large-scale manufacturer of architectural windows, Dr. Dubin has analyzed a new manufacturing process using structural econometric techniques and has designed an optimal production process.
- For the American Gaming Association, Dr. Dubin assisted in the development of economywide multiplier benefits from the gaming industry.
- For the Canadian Postal Service and Canadian Direct Marketing Association, Dr. Dubin prepared an econometric model of the demand for addressed admail and related complimentary products. This model was used to access the consequences of a proposed price increase in addressed admail.
- For a major oil-producer in Alaska, Dr. Dubin assisted in developing a model of crude oil pricing and determined the effects of natural gas liquids on crude prices.
- For a major energy company operating in Bolivia, Dr. Dubin analyzed the appropriate capital asset pricing model beta and quantified country risk and project risk.
- For a gas pipeline seeking market-based rates, Dr. Dubin conducted a discounting and elasticity of demand study to demonstrate the workable competitive nature of the market.

NATURAL RESOURCE DAMAGE ASSESSMENT

- For a major mining corporation operating in the State of Montana, Dr. Dubin developed a discrete-choice model of river choice for recreational fishing and calculated the level of damages sustained from the diminished quality of a specific river.
- For the owner of a mining operation in Colorado, Dr. Dubin analyzed a residential pricing model offered as evidence by the plaintiffs in a class-action suit alleging loss of property values due to pollution of a river.

- For several potentially responsible parties in California, Dr. Dubin developed an econometric model of commercial fishing and determined the magnitude of potential damages from the effects of alleged ocean pollution.
- For a major oil company operating in the State of Texas, Dr. Dubin analyzed the level of damages sustained to property holders due to proximity to a toxic waste site.
- For several chemical companies operating in the state of Massachusetts, Dr. Dubin reanalyzed a property value-pricing model offered as evidence by the U.S. government in a superfund suit alleging damages from the pollution of a harbor near Boston.
- In litigation involving a superfund site in Los Angeles, Dr. Dubin assisted defense counsel in deposing plaintiff's expert economic witnesses regarding the design and findings of a CVM survey utilized to compute non-use damages. Dr. Dubin assisted in critiquing the CVM survey design methodology and in proposing and redesigning the survey.
- For a major electronic manufacturer operating in Phoenix, Arizona, Dr. Dubin assisted in the development of hedonic pricing regression models to measure the affect of ground water contamination on residential housing prices.

SURVEY RESEARCH

- For the City of Los Angeles, Dr. Dubin analyzed the LAPD's use of force reports. He accomplished this using stratified sampling methods across the various reporting districts in Los Angeles.
- Dr. Dubin assisted lawyers for merging railroads in determining whether a proposed merger would affect hazardous materials shipments. Dr. Dubin used sampling methods to determine the traffic volume that would have to be sampled in order to produce reliable hazardous material shipment estimates.
- For a major psychiatric hospital in the U.S., Dr. Dubin designed a survey of hospitals in the U.S. to measure patient overcharges.

- For a major food products manufacturer, Dr. Dubin designed a sample for the valuation of inventory and fixed assets.
- Dr. Dubin has analyzed survey results from several national surveys of individuals (NIECS, SIPP, BPA).
- For a major computer hardware company involved in litigation, Dr. Dubin designed a survey of computer software users regarding their purchase decisions.
- For counsel representing two merging railroads, Dr. Dubin critiqued a well known engineering model of railroad traffic.
- For counsel representing an intervening railroad, Dr. Dubin assisted in preparing discovery and deposition questions of an opposing statistical expert.
- For counsel representing two merging railroads, Dr. Dubin has performed a statistical sampling of traffic movements in order to measure potential divertible traffic.
- For the Los Angeles Police Department, Dr. Dubin developed statistical random samples of specific police activity in connection with the consent degree between LAPD and the Department of Justice.

UTILITY MERGERS

- In several proposed mergers of electric and gas utilities, Dr. Dubin explored and analyzed the projected synergies associated with the merger of two utilities. Dr. Dubin projected energy requirements for both stand-alone utilities and the combined utility over a period of ten years. Future capital requirements and savings resulting from the merger were calculated and projected over a ten-year period for both the merged and stand-alone scenarios.
- Dr. Dubin developed the BEARS and BULLS Merger model to analyze potential synergy savings and pro-forma balance sheets for proposed utility mergers. Dr. Dubin has applied this model in several utility merger cases.

CIVIL LITIGATION

- For the Internal Revenue Service, Dr. Dubin implemented measures of shareholder common control from voluminous monthly shareholder data covering a five-year period.
- Dr. Dubin assisted in determining the appropriate refund level due to the California Independent System Operator (CAISO) from their electricity purchases in the California wholesale energy market. Dr. Dubin developed models to calculate the natural gas spot price from published ranges and average prices.
- For several tobacco companies, Dr. Dubin addressed the issue of whether cigarette smoking and asbestos exposure were synergistic in causing lung cancer. Dr. Dubin has analyzed several aspects of the tobacco-asbestos synergy issue to determine whether a combined exposure to smoking and asbestos raise the likelihood, above the individual risks, that an individual will contract lung cancer. Dr. Dubin reanalyzed the American Cancer Society database, and also conducted meta-analyses of early studies.
- For the City of San Francisco, Dr. Dubin developed a model that measured damages resulting from a major bank's failure to escheat municipal bond interest.
- For a major energy supplier in the Northwest, Dr. Dubin developed a model that measured damages resulting from a major bank's failure to escheat bond interest.
- For the City of San Francisco and the State of California, Dr. Dubin developed a model of fee overcharge and hidden interest collected by a large California title company.
- For the state of Alaska, Dr. Dubin developed a model that measured damages resulting from a major bank's failure to escheat bond interest.

- For a defendant bus company, Dr. Dubin calculated the present discounted value of future medical costs under various life scenarios.
- For the IRS, Dr. Dubin helped develop a shareholder value model that demonstrated that a packaging company's reorganization was a tax sham.
- For a grocery store chain, Dr. Dubin developed models of the demand for hamburgers to demonstrate the stigmatic effect on sales from bad publicity.
- For a gas company operating in the west, Dr. Dubin helped develop an econometric pricing model for carbon dioxide gas.

TESTIMONY

Before the Eighth Judicial District Court, Clark County, Nevada Trial Testimony on behalf of Advanced Medical Products, Inc. Case No. A449091 January 17, 2006.

Before the Eighth Judicial District Court, Clark County, Nevada Deposition Testimony on behalf of Advanced Medical Products, Inc. Case No. A449091 January 15, 2006. [pdf \(254kb\)](#)

Before the United States District Court, Central District of California, Deposition Testimony on behalf of Castaic Lake Water Agency; Newhall County Water District, et al., Case No. CV00-12613 AHM RZx, December 12, 2006. [pdf \(4 mb\)](#)

Deposition testimony on behalf of Advanced Medical Products, Inc. NRCP Rule 16.1(a)(2)(B) in Case No. A449091 Consolidated with Case Nos. A452332, A482194 & A49259, November 15, 2006. [pdf \(362 kb\)](#)

Before the Washington Utilities and Transportation Commission, Trial Testimony on behalf of Puget Sound Energy Inc., Docket No. UE-060266, Docket No. UG-060267, September 20, 2006. [pdf \(51.8kb\)](#)

Before the Washington Utilities and Transportation Commission, Prefiled Rebuttal Testimony on behalf of Puget Sound Energy Inc., Docket No. UE-060266, Docket No. UG-060267, August 26, 2006. [pdf \(95.1kb\)](#)

Before the United States District Court, District of Maryland Southern Division, Deposition Testimony on behalf of Marriott International, Inc., a Delaware corporation, et al., Case No. 8:05-CV-00787-PJM, February 24, 2006. [pdf \(1.11 mb\)](#)

Before the Superior Court of the State of California, County of Orange County - Central Justice Center, Deposition Testimony on behalf of Marilyn Miglin, an Individual, and Duke Miglin, an Individual, January 9, 2006. [pdf \(816kb\)](#)

Before the Washington Utilities and Transportation Commission, Trial Testimony on behalf of Puget Sound Energy, Inc., Docket No. UG-040640, Docket No. UE-040641, December 15, 2004. [pdf \(373kb\)](#)

Before the Washington Utilities and Transportation Commission, Trial Testimony on behalf of Puget Sound Energy, Inc., Docket No. UG-040640, Docket No. UE-040641, December 14, 2004. [pdf \(164kb\)](#)

Before the Washington Utilities and Transportation Commission, Prefiled Rebuttal Testimony on behalf of Puget Sound Energy, Inc., Docket No. UG-040640, Docket No. UE-040641, November 3, 2004. [pdf \(243kb\)](#)

Before the United States Bankruptcy Court, Southern District of New York, Trial Testimony on behalf of At Home General Unsecured Creditors Trust, Case No. 04-10156 (BRL), July 19, 2004. [pdf \(606 kb\)](#)

Before the United States Bankruptcy Court, Southern District of New York, Deposition Testimony on behalf of At Home General Unsecured Creditors Trust Case No. 04-10156 (BRL), June 15, 2004. [pdf \(1.14mb\)](#)

Before the Washington Utilities and Transportation Commission, Prefiled Direct Testimony on behalf of Puget Sound Energy, Inc., Docket No. UG-040640, Docket No. UE-040641, April 5, 2004. [pdf \(232 kb\)](#)

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"Criminal Investigation Enforcement Activities and Taxpayer Noncompliance," submitted to Internal Revenue Service Criminal Investigation, February 10, 2004. [pdf \(1.13mb\)](#)

"Stratified Random Sample for Non-Categorical Use of Force Reports," with C. Cicchetti and E. Cotton, prepared for the Los Angeles Police Department, September 10, 2001. [pdf \(633kb\)](#)

"Update of the Financial Analysis of Addressed Admail," December 1997. [pdf \(1,009kb\)](#)

Statistical Analysis of Errors and Lost Charges for TENET Home Care Facilities, January 12, 1996. [pdf \(337kb\)](#)

"Financial Analysis of Addressed Admail," May 1996. [pdf \(2.08mb\)](#)

"Bears and Bulls Synergy Model Source Code," Dubin/Rivers Research, March 7, 1996. [pdf \(954kb\)](#)

"The Economic Consequence of Independent Film Making," with Cicchetti, Peale, Boedeker, Truitt, prepared for the American Film Marketing Association, January 1995. [pdf \(622kb\)](#)

"Statistical Analysis of Errors and Lost Charges for TENET Home Care Facilities," June 7, 1995. [pdf \(481kb\)](#)

“Competition and Regulation in the Natural Gas Transportation Industry,” with C. Cicchetti and C. Long, circa 1995. [pdf \(885kb\)](#)

“National Medical Enterprises, Inc., Psychiatric Division Review,” September 14, 1994. [pdf \(370kb\)](#)

“An Introduction to Discrete Choice Modeling and its Applications to Load Forecasting,” prepared for Canadian Electrical Association Conference, Nova Scotia, Canada, May 18, 1993. [pdf \(4.7mb\)](#)

“Preliminary Analysis of the Potential Natural Resource Damage to Commercial Fishing,” prepared for the Los Angeles Harbor Counsel, July 12, 1991. [pdf \(1.15mb\)](#)

“Analysis of Market Expansion and Business Diversion in Instant Photography Attributable to the Entry of Eastman Kodak from 1976-1985,” with T. Bresnahan, April 20, 1989. [pdf \(885kb\)](#)

“Detecting Cartel Behavior from Price Data,” Architectural Hinges, with R. Preston McAfee, circa 1988. [pdf \(642kb\)](#)

“A Report on Freshmen Admissions at Caltech: Who's Admitted, Who Comes, and Why,” with R. Noll, circa 1983. [pdf \(450kb\)](#)

PROFESSIONAL ACTIVITIES

1996–present	Co-Founding Partner, Pacific Economics Group
1993–1996	Director of Statistics and Econometric Analysis, Arthur Andersen Economic Consulting
1992–1993	Senior Economist, Arthur Andersen Economic Consulting
1989–1992	Senior Advisor, Putnam, Hayes & Bartlett, Inc.

ACADEMIC APPOINTMENTS

2005- present	Visiting Professor of Economics, University of California, Santa Barbara
2005–present	Professor of Economics, California Institute of Technology
2005	Visiting Professor of Economics, Occidental College
1988–2005	Associate Professor of Economics, California Institute of Technology

1982–1988 Assistant Professor of Economics, California Institute of
Technology

EDITORIAL BOARDS

1986–1991 *The Energy Journal*

ADVISORY POSITIONS

2004 Technical Advisor under Rule 706 of the Federal Rule of Civil
Procedure to advise a Los Angeles Federal District Court in
matters of statistics.

2001 Member, California State Auditors, Bureau of State Audits

1991 Advisory Panel on Biotechnology Opportunities, National
Science Foundation, Member

1990 Lawrence Berkeley Laboratory Manufacturer Input Model for
Department of Energy

1988–1995 University of California, University-Wide Energy Research
Group

1987 California Energy Commission

1985 National Research Council, Committee on Behavior and Social
Aspects of Energy Consumption and Production

1985 Lawrence Berkeley Laboratory, Energy Analysis Program

1984 Oakridge National Laboratory, Energy Policy Division

1984 Southern California Air Quality Management Board

PUBLICATIONS

Books

The California Electricity Crisis: What, Why, and What's Next , with Charles J.
Cicchetti and Colin M. Long, Massachusetts: Kluwer Academic Publishers, 2004.
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Consumer Durable Choice and the Demand for Electricity. New York-Amsterdam: North-Holland Publishing Company, 1985. [pdf \(6,043 kb\)](#). Reviewed in: *Journal of Political Economy* 94 (1986) [pdf \(281 kb\)](#); *Journal of Economic Literature* 25 (1987) [pdf \(131 kb\)](#); and *Journal of the American Statistical Association* 82 (1987). [pdf \(66 kb\)](#)

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Appendix A
Appendix B

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SST—Statistical Software Tools Version 3.0, ©1985–2007 with R. Douglas Rivers, “Statistical Software Tools Reference Manual and User’s Guide,” with R. Douglas Rivers, (1990). [pdf\(7,051 kb\)](#). Online at: <http://www.hss.caltech.edu/~jad/sst/html/main.help.sst.html>.

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"Internal Revenue Service Tax Compliance Enforcement: 'Six-Foot Under' or just 'Lost,'" *Speaking of Economics*, Department of Economics Newsletter, Occidental College, October 28, 2005. [pdf \(51 kb\)](#)

"Market Barriers to Conservation: Are Implicit Discount Rates Too High?" *Proceedings of a POWER Conference: The Economics of Energy Conservation, University of California Energy Institute* (1993): 21-33. [pdf \(593 kb\)](#)

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"The *Real* California Lottery: Your Income Tax," *Engineering & Science* 54 (1990): 3-11. [pdf \(479 kb\)](#)

"Subsidy to Nuclear Power Through Price-Anderson Liability Limit," with Geoffrey S. Rothwell, *Contemporary Policy Issues* 8 (1990): 73-79. [pdf \(210 kb\)](#)

"Safety at Nuclear Power Plants: Economic Incentives under the Price-Anderson Act and State Regulatory Commissions," with Geoffrey S. Rothwell, *The Social Science Journal* 26 (1989): 303-11. [pdf \(340 kb\)](#)

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"Penny-Wise and Pound-Foolish: New Estimates of the Impact of Audits on Revenue," with Michael J. Graetz and Louis L. Wilde, *Tax Notes* 35 (1987): 787-91. [pdf \(316 kb\)](#)

Review of *Markets for Power: Analysis of Electric Utility Deregulation*, by P. Joskow and R. Schmalensee, *Journal of Economic Literature* 22 (1984): 1667-68. [pdf \(88 kb\)](#)

“The Effect of Rate Suppression on Utilities’ Cost of Capital,” with Peter Navarro, *Public Utilities Fortnightly* 111 (1983): 18–22. [pdf \(247 kb\)](#)

GRANTS

Racial Profiling Within Los Angeles County - Phase II, Haynes Foundation Faculty Fellowship, 2006.

IRS Criminal Investigation Research—Empirical Analysis of the Impact of CI Activities on Taxpayer Compliance, IRS Grant TIRNO-00-D-0039, 2003.

An Economic Analysis of Racial Profiling in Southern California, Haynes Foundation Faculty Fellowship, 2002.

An Economic Analysis of the San Fernando Valley Secession, Haynes Foundation Faculty Fellowship, 2000.

Comparing and Contrasting Absentee and Precinct Voters, Haynes Foundation Faculty Fellowship, 1995.

An Economic Analysis of Welfare Administration, with Louis L. Wilde, National Science Foundation #SES-9113209, 1991–92.

An Economic Analysis of the Rise (and Fall?) of State Lotteries, Haynes Foundation Faculty Fellowship, 1991.

An Empirical Analysis of Income Tax Auditing and Compliance, with Louis L. Wilde, National Science Foundation Grant #SES-8701027, 1987–89.

The Seasonal Demand for Electricity in the Pacific Northwest, with Steven E. Henson, Bonneville Power Administration, DE-AI79-83BP13579, 1985.

The Role of Capital in Public Utility Industries: An Integration of Economic and Financial Effects, with Daniel L. McFadden (P.I.) and Tom C. Cowing, National Science Foundation Grant #SES-8205713, 1983.

EDUCATION

1982	Ph.D., Economics, Massachusetts Institute of Technology
1978	A.B., Economics, University of California, Berkeley, with Highest Honors and Great Distinction in General Scholarship

HONORS AND AWARDS

Econometric Society Frisch Medal, 1986.

Departmental Citation, U.C. Berkeley, Department of Economics, awarded to the author of the best undergraduate honors thesis in Economics, 1978.

CURRENT RESEARCH

Discrete-choice econometrics, energy economics, ballot proposition voting, tax compliance.

