Index of Relevant Material Template

Submitter (Party Name)	California Parties
Index Exh. No.	CA-356
Privileged Info (Yes/No)	Yes
Document Title	Prepared Rebuttal Testimony of Arthur Lewbel, Ph.D. on Behalf of the California Parties
Document Author	Arthur Lewbel
Doc. Date (mm/dd/yyyy)	03/20/2003
Specific finding made or proposed	Market fundamentals do not explain the excessive prices charged by sellers in the ISO and PX markets during the period May 1, 2000 - June 20, 2001.
Time period at issue	a) before 10/2000; b) between 10/2000 and 6/2001; c) after 6/2001
Docket No(s). and case(s) finding pertains to *	EL00-95 and EL00-98 (including all subdockets)
Indicate if Material is New or from the Existing Record (include references to record material)	New
Explanation of what the evidence purports to show	Dr. Cicchetti's analysis cannot be relied upon and does not support the claims made in his testimony. His claim to have demonstrated that 95% or more of the price variation in the California markets is due to "benign economic and market forces" is clearly wrong, and is likely to be substantially too high. His analysis of the behavior of prices in the electricity market largely fails to distinguish between market fundamentals and market manipulation.
Party/Parties performing any alleged manipulation	N/A

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

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

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

PREPARED REBUTTAL TESTIMONY OF
ARTHUR LEWBEL, PH.D.
ON BEHALF OF THE CALIFORNIA PARTIES

1 **I.   INTRODUCTION AND SUMMARY**

2 Q.   Please state your name, business address and occupation.

3 A.   My name is Arthur Lewbel. I am a Professor of Economics at Boston

4   College in Chestnut Hill, Massachusetts.

5 Q.   Please summarize your education and professional background.

6 A.   I received my Bachelor of Science degree in Mathematics at the

7   Massachusetts Institute of Technology, and a Ph.D. in Management

8   Applied Economics from the MIT Sloan School of Management. Prior to

9   joining the Boston College faculty in 1998, I taught at Brandeis University,

10   and have been a visiting professor at Boston University and at the MIT

11   Sloan School. I have been the principal investigator on five National

12   Science Foundation grants, and provided econometric consulting services

13   on many others. My research is mainly in the areas of econometric theory,

14   consumer demand analysis, and economic aggregation issues. I am the

15   author of over fifty articles in refereed journals, and have published in most

16   of the top ten journals in economics, including eight publications in

17   *Econometrica* and three in the *American Economic Review*. I am on the

18   editorial boards of *The Journal of Econometrics* and *The Journal of Applied*

19   *Econometrics*, and was a co-editor of *Economics Letters*. I was recently

1   made a fellow of *The Journal of Econometrics*.   A more complete

2   description of my qualifications appears in Exh. No. CA-357.

3   Q.   By whom were you retained in this proceeding?

4   A.   I was retained by Southern California Edison Company.

5   Q.   What is the purpose of your testimony?

6   A.   I am responding to the testimony of Dr. Charles J. Cicchetti (Exh. No.

7   MAR-1) filed in this proceeding on March 3, 2003, on behalf of Avista

8   Energy, Inc., BP Energy Company, IDACORP Energy L.P., Puget Sound

9   Energy, Inc., TransAlta Energy Marketing (U.S.) Inc., TransAlta Energy

10   Marketing (California) Inc., and TransCanada Energy, Ltd. In particular, I

11   analyze the validity of Dr. Cicchetti's econometric analysis of the

12   California electricity market and the conclusions he draws.

13   Q.   Please summarize your conclusions.

14   A.   I find that Dr. Cicchetti's analysis cannot be relied upon and does not

15   support the claims made in his testimony. His claim to have demonstrated

16   that 95% or more of the price variation in the California markets is due to

17   "benign economic and market forces" is clearly wrong, and is likely to be

18   substantially too high.   His analysis of the behavior of prices in the

19   electricity market largely fails to distinguish between market fundamentals

1   and market manipulation.   More specifically, Dr. Cicchetti's analysis

2   suffers from (1) misattribution of explanatory and other variables to market

3   forces rather than potential market manipulation; and (2) various

4   econometric misspecification and other statistical and methodological

5   flaws. These are fundamental and pervasive flaws, so that no meaningful

6   conclusions can be drawn from Dr. Cicchetti's study.

7   Q.   Please summarize how Dr. Cicchetti's analysis misattributes explanatory

8   and other variables to market forces, and how it affects the validity and

9   reliability of Dr. Cicchetti's results and conclusions.

10 A.   Dr. Cicchetti claims that at least 95% of variation in prices is explained by

11   benign economic and market forces. This number is based on his claim that

12   at least 95% of the variation in prices is explained by the variables that are

13   included in his models. However, these included variables may themselves

14   be determined in part by market manipulation, or may have facilitated

15   market manipulation, or simply be correlated with market manipulation.

16   As a result, a portion of the price variation that is explained by these

17   included, explanatory variables may be attributed to market manipulation,

18   not benign economic and market forces. Dr. Cicchetti's analysis is invalid

19   and unreliable because his conclusions assume that all of the variation in all

20   of his explanatory variables is due to market forces and is uncorrelated with

1   any market manipulation. This assumption is made without any evidence

2   or proof, and is in violation of available evidence to the contrary.

3   In addition, at least one of the variables in Dr. Cicchetti's models appears to

4   have been constructed on the basis of price variation itself, thereby

5   erroneously inflating the 95% explanatory power of the model. Also, as a

6   result of the statistical technique Dr. Cicchetti employed, the reported 95%

7   includes a portion of price variation that is not explained by any of the

8   included explanatory variables. Finally, the reported 95% measure

9   overstates the variation in prices explained by market forces because some

10   of the correlation of prices with variables in the model is likely to be

11   spurious, that is, time series that coincidently move together without one

12   causing or explaining the other. I show that Dr. Cicchetti's own analysis

13   provides evidence of the presence of such spurious correlation.

14   I would also mention that even if variables used by Dr. Cicchetti were not

15   subject to influence by manipulation, his conclusions would remain

16   suspect. This is because market fundamentals, all else equal, would affect

17   prices even if the market were not competitive. Higher input costs or

18   increases in demand (assuming some slope in the supply curve) will lead to

19   higher prices even where market power is an issue.

1   Q.   Please summarize how Dr. Cicchetti's analysis suffers from econometric

2   misspecification and other statistical and methodological flaws, and how

3   these flaws affect the validity and reliability of Dr. Cicchetti's results and

4   conclusions.

5   A.   Examination of Dr. Cicchetti's models reveals evidence of omitted

6   variables, inappropriately constructed variables, and the use of incorrect

7   econometric techniques for assessing statistical significance.   These

8   econometric and methodological flaws are all indicators of the inadequacy

9   of his models and of the methods he used to assess the validity of his

10   models. Dr. Cicchetti's conclusions depend upon the appropriateness of his

11   econometric models and methods, so all these flaws in his methodology

12   mean that his conclusions and results are unsubstantiated.

13 Q.   Please summarize the cumulative effects of these misattribution,

14   misspecification, and methodological flaws on Dr. Cicchetti's overall

15   analyses and conclusions.

16 A.   The numerous examples of flaws documented in this testimony invalidate

17   Dr. Cicchetti's analyses and conclusions. Most of these flaws specifically

18   indicate that Dr. Cicchetti's attribution of 95% of price variation to benign

19   economic and market forces is wrong, and is likely to be substantially too

20   high. Due to the total number and seriousness of these flaws, his analysis

21   largely fails to distinguish between the effects on prices of market

1   fundamentals versus market manipulation. In short, Dr. Cicchetti's analysis

2   is unreliable, statistically invalid, and fails to support his conclusions.

3   Q.   How have you organized the remainder of your testimony?

4   A.   I will first explain how Dr. Cicchetti's analysis suffers from the above

5   listed misattribution flaws, and how these misattribution flaws invalidate

6   his conclusions. I will then explain how Dr. Cicchetti's analysis also

7   suffers from the above listed misspecification and statistical methodology

8   flaws, and describe how these additional flaws also invalidate his

9   conclusions.

10 **II.**   **DR. CICCHETTI'S MISATTRIBUTION FLAWS**

11 Q.   Please summarize the types of included explanatory variables that, in Dr.

12   Cicchetti's analysis, may be in whole or in part misattributed to benign

13   economic and market forces.

14 A.   Most of the explanatory variables in his models may be related to or

15   correlated with market manipulation, and hence misattributed to purely

16   market fundamentals or market design flaws. These include measures of

17   quantities of electricity available or supplied, input prices, and regulatory

18   and market design-related variables.

1   Q.   Why are many of the explanatory variables in Dr. Cicchetti's models likely

2   to be related to or correlated with market manipulation?

3   A.   Market manipulation relates to and is correlated with explanatory variables

4   that represent market fundamentals because market fundamentals create

5   conditions, such as scarcity and high demand, that make market

6   manipulation and the exercise of market power both possible and

7   profitable. As explained by Dr. Peter Fox-Penner (Exh. No. CA-1 at 3:19-

8   25), "[m]any of the manipulative strategies of sellers were enabled (*i.e.*,

9   made profitable) by the same market conditions that allowed sellers to

10   become pivotal and therefore profitably exercise market power.

11   Furthermore, these manipulative strategies were created to exacerbate the

12   same sort of artificial shortages created by withholding. That is, they

13   themselves represent a further exercise of market power." (*See also* Exh.

14   No. CA-1 at 57-65). In addition to this general explanation, some of the

15   specific explanatory variables used by Dr. Cicchetti have other properties

16   that relate to market manipulation. I will describe these in detail later in

17   this testimony.

18   Q.   Are there any other sources of misattribution in Dr. Cicchetti's analysis?

19   A.   Yes. There are three other sources or potential sources of misattribution.

20   (1) At least one of the variables in Dr. Cicchetti's models appears to have

21   been constructed on the basis of price variation itself, thereby erroneously

1   inflating the 95% explanatory power of the model. (2) The econometric

2   technique that Dr. Cicchetti used to deal with autocorrelation is equivalent

3   to incorporating a lagged value of the unexplained portion of price variation

4   as a variable included in the model. As a result, Dr. Cicchetti's 95%

5   specifically includes part of the price variation that is not explained by any

6   of his included variables, and so could be due to market manipulation. (3)

7   Dr. Cicchetti's reported 95% measure overstates the variation in prices

8   explained by market forces because some movements in prices may

9   coincide with movements in his explanatory variables just by random

10   chance. This is known as spurious correlation. It is very difficult or

11   impossible to identify exactly what correlations are spurious rather than

12   causal, but Dr. Cicchetti's own counterfactual analysis provides evidence of

13   the presence of such spurious correlations.

14 Q. What are the included measures of quantities of electricity available or

15   supplied that may be misattributed to benign economic and market forces?

16 A. Relevant measures of volume or quantities available or supplied include

17   **l_maxld**, the maximum system load, and **l_dcan** and **l_avail**, which in part

18   measure electricity imports from Canada. By economic theory, both

19   quantities supplied and quantities demanded are primary determinants of

20   the market clearing price. To the extent that suppliers restricted quantities

21   to manipulate markets, some of the price variation attributed to the quantity

1   measures in Dr. Cicchetti's models is due to market manipulation, not

2   market fundamentals. Examples of such manipulation include the shutting

3   down of units as documented in Mr. Philip Hanser's testimony (Exh. No.

4   CA-9), withholding of units from the market as documented by Dr. Robert

5   J. Reynolds (Exh. No. CA-5) and evidence of potential manipulation of

6   imports from Canada as described in the testimony of Dr. Peter Fox-Penner

7   (Exh. No. CA-1).

8   Q. What are the included input prices that are misattributed to benign

9   economic and market forces?

10   A. The input prices included in the model are **l_nocal** and **l_socal**, which are

11   measures of natural gas prices in Northern and Southern California. As

12   documented in the testimony of Dr. Michael J. Harris (Exh. No. CA-15),

13   some portion of the movements of these gas prices was due to

14   manipulation, not market forces. As a result, the portion of the variation in

15   electricity prices that is explained by these gas prices is itself at least in part

16   attributable to market manipulation, not market forces.

17   Q. What are the included regulatory and market design variables that are

18   misattributed to benign economic and market forces?

19   A. The variable **ev_days** that is included in Dr. Cicchetti's econometric

20   models is defined to equal one on every day that emergency conditions

1   were declared by the California ISO ("CAISO"), and zero otherwise. Mr.

2   Hanser's testimony (Exh. No. CA-9) documents specific evidence of

3   market manipulation that occurred on emergency days, such as units

4   reported to the CAISO as unavailable where sellers' internal records show

5   that the units were available. The CAISO publicly announced which days

6   were emergency days, so this information was readily available for

7   suppliers to exploit for the purposes of market manipulation. To the extent

8   that emergencies facilitated market manipulation, or to the extent that, for

9   any other reason, the periods in which emergencies occurred overlap with

10   or were caused by market manipulation, price movements that are

11   explained by the **ev_days** variable must also be attributed in part to market

12   manipulation.

13   Finally, a regulatory and market design variable that is misattributed to

14   benign economic and market forces is **com_flaw**. The **com_flaw** variable

15   is supposed to represent regulatory and market design flaws.   Dr.

16   Cicchetti's analysis incorrectly attributes price movements to regulatory

17   and design flaws to the extent that any such design flaws either facilitated

18   market manipulation, or if for any other reason, the time periods or

19   magnitudes of the **com_flaw** variable coincide with periods or magnitudes

20   of market manipulation.

1   The variable **com_flaw** also appears to have been inappropriately

2   constructed in part on the basis of price variation itself, thereby further

3   increasing misattribution by artificially inflating the explanatory power of

4   Dr. Cicchetti's models.

5 Q. Explain how **com_flaw** is inappropriately constructed, and how this

6   construction further increases misattribution by artificially inflating the

7   explanatory power of the models.

8 A. Dr. Cicchetti claims (Exh. No. MAR-1 at 40) that **com_flaw** is "the

9   combined regulatory and market designs flaws of FERC, CPUC and long

10   term contracts." However, this variable is not actually constructed by

11   objective measurement of regulatory and market design flaws. Instead, it is

12   defined as the sum of three variables, each of which is assigned a value

13   (either 1, 0, -0.1, or -0.4) in each time period that Dr. Cicchetti designates
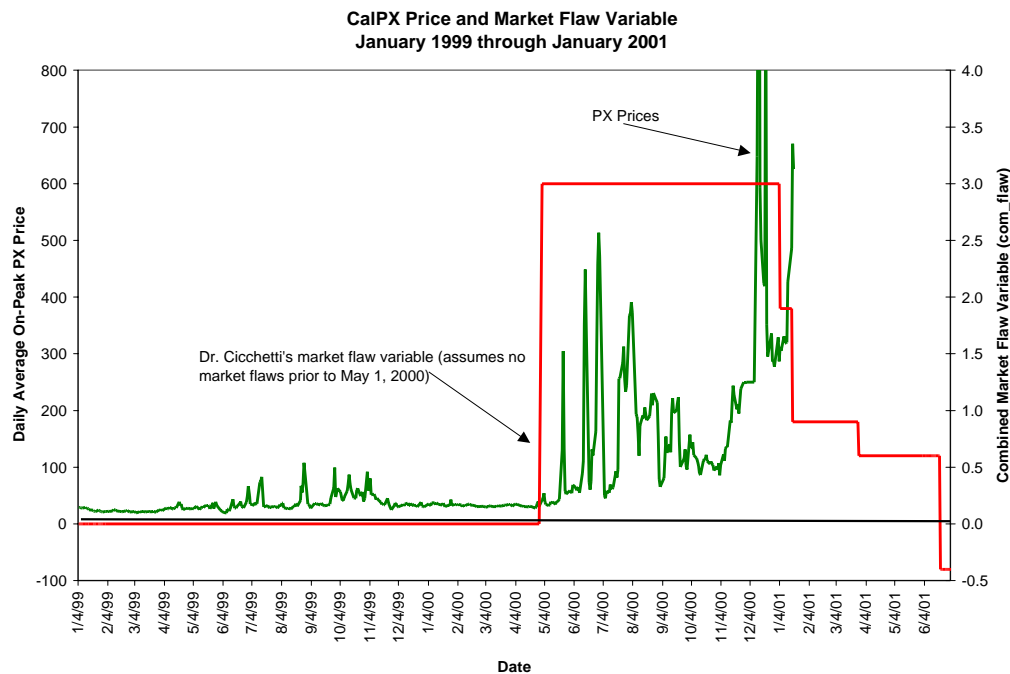
14   as either flawed or not.

15   The exact construction of this variable entailed many unsubstantiated

16   judgment calls on Dr. Cicchetti's part. The exact date at which each

17   component flaw variable is assigned a nonzero value is to a large extent

18   arbitrary. For example, the so-called **ferc_flaw** component is defined to be

19   zero before May 1, 2000, and one afterward, implying that the market was

20   flawed after May 1, 2000, but not before. However, I understand that there

1   was no fundamental change in the FERC's rules or market design that

2   occurred on or near May 1, 2000. The other two flaw variable components

3   that comprise **com_flaw** are also arbitrarily defined to jump from zero to

4   one on the exact same date.

5   Even if some regulatory or market design change did occur on that day,

6   there are presumably many other days where changes occurred that could

7   instead have been designated as the start date of each of these regulatory

8   and market design flaws. The values assigned to other components of Dr.

9   Cicchetti's flaw variables, such as -0.1 or –0.4, also appear to have been

10   determined based on Dr. Cicchetti's personal judgment rather than by any

11   objective measure of the magnitude of the flaws.

12   The main objection to Dr. Cicchetti's construction of **com_flaw** is not that

13   personal judgement was involved, but rather that the basis for the

14   construction of this variable appears to have been observed price

15   movements themselves, rather than any objective measure of regulatory or

16   market design flaws. It is not market design or regulatory flaws that started

17   during May of 2000, but rather it was price that began to dramatically

18   increase at that time. The explanatory power of the price model, and hence

19   Dr. Cicchetti's measure of 95%, is artificially increased because this

20   "market flaw" variable is artificially constructed to partially coincide with

21   the movements of prices.

1   This artificial construction can be seen in the graph below, which shows

2   **com_flaw** along with on-peak PX prices. Notice, for example, that

3   **com_flaw** is defined to equal zero before May 1, 2000, and jumps to its

4   maximum value of 3 on and after May 1, 2000. Again, if **com_flaw**

5   actually measured the combined regulatory and market designs flaws, then

6   it would need to be the case that no or very few flaws existed prior to May

7   1, 2000, and that the maximum value of every documented regulatory and

CalPX Price and Market Flaw Variable
January 1999 through January 2001

Dr. Cicchetti's market flaw variable (assumes no market flaws prior to May 1, 2000)

PX Prices

8   market design flaw was present starting the next day.

9   Given the amount of judgment that was involved in the construction of

10   **com_flaw**, it would have been prudent to implement some direct

11   econometric tests of the validity of this construction. However, few if any

1   of the econometric tests provided in Dr. Cicchetti's testimony may be

2   construed as direct tests of the validity of the construction of **com_flaw**.

3   The time periods in which **com_flaw** is constructed to be greater than zero

4   are the time periods in which market manipulation is most likely to have

5   occurred. For example, the testimony of Dr. Fox-Penner (Exh. No. CA-1)

6   documents a widespread pattern of supply withholding starting in May

7   2000, and pervasive use of manipulative trading strategies throughout the

8   period of May 1, 2000 through June 18, 2001. This is almost identical to

9   the time period that Dr. Cicchetti defines **com_flaw** to be positive. To the

10   extent that price movements in this time period are due to market

11   manipulation, Dr. Cicchetti's **com_flaw** variable measures market

12   manipulation, not market fundamentals or design flaws. In simplest terms,

13   Dr. Cicchetti's model purportedly measures the causes of price increases,

14   but use of the **com_flaw** variable, which artificially varies with the price,

15   erroneously foreordains the result that price increases will be explained by

16   causes other than market manipulation.

17 Q.   Please explain how the econometric technique that was used to deal with

18   autocorrelation results in misattribution of possible market manipulation

19   effects to benign economic and market forces.

1   A.   In the form of autocorrelation correction used by Dr. Cicchetti, the value of

2   the model's estimated prediction error (called the "residual") from the

3   previous day is included as an additional explanatory variable in the model

4   to help explain the price movements on each day. These residuals are, by

5   construction, equal to all the price movements that are NOT explained by

6   the included variables.   Dr. Cicchetti's models include these lagged

7   residuals in his calculation of his 95% figure. Therefore, to the extent that

8   any unexplained price variation (*i.e.*, prediction error) in the model is due to

9   market manipulation, Dr. Cicchetti's analysis erroneously attributes a

10   portion of that manipulation effect to benign market forces.

11   Q.   What is the evidence that some portion of the 95% figure reported by Dr.

12   Cicchetti may be due to spurious correlation or statistical coincidence?

13   A.   To test for the possible presence of statistical coincidence, Dr. Cicchetti

14   performed a "counterfactual analysis" (Exh. No. MAR-1 at 54). This

15   counterfactual analysis consisted of estimating models for electricity prices

16   in eastern states, using the explanatory variables from the western states'

17   models. Dr. Cicchetti says, "I would not expect purely western regional

18   explanatory factors to matter at all." (Exh. No. MAR-1 at 55:5-6).

19   However, Dr. Cicchetti then reports that the percent of price variation

20   explained in these counterfactual models is between 61 and 69% (Exh. No.

21   MAR-1 at 38 and Exh. No. MAR-11). Therefore, by Dr. Cicchetti's own

1   method of measuring explained price variation, more than 60% of the

2   variation in eastern states' prices is explained by western explanatory

3   variables.   At least some of this explained variation must be due to

4   statistical coincidence.   This suggests that at least some of the 95% of

5   variation explained in the western region models is also due to statistical

6   coincidence.

7   In addition to statistical coincidence, some of the over 60% explained

8   variation in the counterfactual models is attributable to the autocorrelation

9   correction as described earlier, which again illustrates the error of

10   attributing the entire explained variation to included variables.

11   It is also worth noting that not one of Dr. Cicchetti's NP15, SP15, or PX

12   price models covers the entire crisis period. For example, in his models for

13   NP15 and SP15, prices only start on December 18, 2000, and thus omit all

14   of the summer and fall 2000 time period. The percent of price variation

15   explained by market forces alone in any model will be lower on days where

16   manipulation occurs, so in a model of market forces alone, the fewer the

17   number of days in which manipulation occurs, the greater will be the total

18   amount of price variation that is explained over the time period of the

19   model.   More simply, if manipulation is present, then the measured

20   explanatory power of market forces alone will be larger than the actual

21   explanatory power if one leaves some crisis days out of each model, as Dr.

1   Cicchetti has done. More generally, the shorter the time span of a model,

2   the greater is the opportunity for spurious correlation.

3   Q.   Please summarize how all of these errors of misattribution affect the

4   validity and reliability of Dr. Cicchetti's results and conclusions.

5   A.   Each of these many errors of misattribution mean that Dr. Cicchetti's

6   analysis mistakenly attributes some price movements to market forces.

7   Taken together, all these errors of misattribution result in a significant

8   overestimate of the effects of market forces on price variation. His claim to

9   have demonstrated that 95% or more of the price variation in the California

10   markets is due to benign economic and market forces is clearly wrong. His

11   analysis of the behavior of prices in the electricity market largely fails to

12   distinguish between market fundamentals and market manipulation. Dr.

13   Cicchetti's analysis fails to support his conclusions.

14   **III.   EVIDENCE OF ECONOMETRIC MISSPECIFICATION AND**
15   **   OTHER METHODOLOGICAL FLAWS**

16   Q.   Please summarize the evidence showing that Dr. Cicchetti's analysis also

17   suffers from econometric misspecification and other statistical and

18   methodological flaws.

1   A.   This evidence includes the presence of significant autocorrelation, omitted

2   variables, inappropriately constructed variables, and the use of incorrect

3   econometric techniques for assessing statistical significance.

4   The presence of significant autocorrelation is evidence of possible omitted

5   variables. The inappropriate construction of variables, like the **com_flaw**

6   variable discussed earlier, constitutes a form of econometric

7   misspecification, and invalidates his measures of statistical significance.

8   (This is in addition to the misattribution problems discussed earlier). The

9   spurious correlation problem discussed earlier is also evidence of

10   misspecification. Finally, the method Dr. Cicchetti used to adjust for

11   endogeneity of input prices fails to account for the effects of endogeneity

12   on estimates of statistical significance, and variables other than input prices

13   may also be endogenous.

14 Q.   What is the evidence indicating that the models suffer from omitted

15   variables?

16 A.   Dr. Cicchetti reports the presence of autocorrelation (Exh. No. MAR-1 at

17   44). One measure of the magnitude of autocorrelation in econometric

18   models is called "rho," which typically takes on a value from zero to one,

19   with zero indicating no autocorrelation and one being the maximum degree

20   of autocorrelation. (It is possible for rho to be negative if negative

1   autocorrelation is present, and rho can be bigger than one in certain

2   nonstandard models that have nonstationary prediction errors).   In Dr.

3   Cicchetti's models reported in Exh. No. MAR-9, rho ranges from 0.47 to

4   0.80, indicating a moderate to high degree of autocorrelation.

5   The presence of autocorrelation indicates that the model likely suffers from

6   omitted variables.   For example, a popular graduate level textbook in

7   Econometrics (Econometric Analysis, 5th edition, by William H. Greene, p.

8   250) says: "One explanation for autocorrelation is that relevant factors

9   omitted from the time series regression … are correlated across periods."

10   Dr. Cicchetti's own counterfactual models provide an illustration of this

11   point.   These counterfactual models are purposely designed to suffer

12   severely from omitted variables, since these are models of eastern regional

13   prices in which the only explanatory variables that are used are western

14   regional factors.   Every one of his counterfactual models (*see* Exh. No.

15   MAR-11) shows a moderate to high degree of autocorrelation, with "rho"

16   equal to 0.70 to 0.79.

17   Q. Is there any other evidence of omitted variables?

18   A. Yes. Without any clear economic rationale, Dr. Cicchetti omits variables

19   from some of his price models that appear to be relevant in others.   For

20   example, crude oil price and California unemployment variables are

1   included in his NP15 and SP15 models, but not in his PX model. If

2   unemployment and oil prices are relevant for both the North (NP15) and the

3   South (SP15) separately, then they should also be relevant for PX prices

4   that combine the two regions. Another example is that Dr. Cicchetti

5   includes a climate variable in his PX off-peak price model, but omits this

6   climate variable for PX on-peak prices and in the NP15 and SP15 price

7   models. If climate is an important market fundamental (as Dr. Cicchetti

8   explains in his testimony, Exh. No. MAR-1 at 13-15), then that variable

9   should not be omitted from these price models. A third example is that Dr.

10   Cicchetti does not include any variables relating to NO_x emissions credits,

11   even though he describes these as an example of a relevant market

12   fundamental in his testimony (Exh. No. MAR-1 at 17). (Note also that Dr.

13   Richard M. McCann (Exh. No. CA-11) indicates that the market for NO_x

14   credits may have been manipulated).

15   Q.   What are the implications of Dr. Cicchetti's models suffering from omitted

16   variables flaws?

17   A.   Variables that affect electricity prices that are excluded from the model

18   (*i.e.,* omitted variables) may be due in whole or in part to market

19   manipulation activities, or may facilitate manipulation, or may be

20   coincidently correlated with manipulation activities. Also, to the extent that

21   omitted variables that correlate with market manipulation-related activities

1   are also correlated with the included variables, variation that should be

2   attributed to manipulation will be erroneously attributed to market forces.

3   Finally, the existence of omitted variables of any kind (either manipulation

4   related or not) that are correlated with the included variables causes bias in

5   the estimates of the statistical significance of the included variables.

6   Dr. Cicchetti used an estimation method called "generalized least squares"

7   to deal with autocorrelation (*see* Exh. No. MAR-1 at 44), but the above

8   problems remain.   Generalized least squares does not solve the omitted

9   variable   attribution   problems,   and   accounts   for   the   effects   of

10   autocorrelation on parameter estimates only if the omitted variables are not

11   themselves correlated with included variables.

12   It is not possible or desirable to fixed the omitted variables problem by

13   including every possibly relevant variable in a model, because doing so will

14   cause   undesirable   multicollinearity.   As   noted   by   Dr.   Cicchetti:

15   "Multicollinearity is the 'yang' to the omitted variable 'ying.'" (Exh. No.

16   MAR-1 at 43).   However, the size of the autocorrelation effect and the

17   economic relevance of the omitted variables suggest that the adverse

18   effects of the omitted variables problem is likely to be severe in his models.

19   Q.   In addition to omitted variables, is there any other evidence of econometric

20   misspecification?

1 A.   Yes. The presence of spurious correlation, as discussed earlier, is a form of

2   econometric misspecification. Also, the inappropriately constructed

3   **com_flaw** variable discussed earlier constitutes a form of econometric

4   misspecification. Not only does this variable cause misattribution as

5   described earlier, it also invalidates Dr. Cicchetti's measures of statistical

6   significance reported in his Tables 1, 2, and 3 (Exh. No. MAR-1 at 36-38).

7   This is because the calculation of statistical significance requires that the

8   true prediction errors in the models be uncorrelated with the included

9   explanatory variables. (Note that the residuals, defined earlier, equal

10   estimated, not true, prediction errors). These true prediction errors are a

11   component of prices, so when a variable like **com_flaw** is constructed in

12   part on the basis of price movements, it will by construction be correlated

13   with prediction errors. And, importantly, it is not only the statistical

14   significance of **com_flaw** that is affected: the presence of one such

15   inappropriately constructed variable corrupts the estimates of statistical

16   significance of other included variables as well.

17 Q.   Are there any other statistical flaws in Dr. Cicchetti's analysis?

18 A.   Yes. There is a technical flaw in the way he deals with the problem of

19   endogeneity (or simultaneity) in his models. As noted by Dr. Cicchetti,

20   natural gas prices may be endogenous, and an appropriate method for

21   dealing with the resulting simultaneity problem is to use predicted values

1   for endogenous variables in a regression equation instead of the actual

2   values (Exh. No. MAR-1 at 44:17-45:11). This procedure would produce

3   appropriate parameter estimates if the model had no other flaws, but it does

4   not produce correct measures of statistical significance. A mathematical

5   adjustment to these measures of statistical significance is required to take

6   account of the fact that a predicted value was used. This correction is

7   described in, e.g., Greene, *supra*, pp. 79 and 400. This flaw, while present,

8   is likely to be numerically small.

9   Finally, it should also be noted that measures of quantities in the models,

10   such as the California supply variables and the maximum load variable,

11   may also be endogenous. Standard economic theory suggests that

12   quantities would be endogenous in price equations (i.e., be determined

13   simultaneously with prices). However, Dr. Cicchetti's failure to account

14   for this potential simultaneity may only be a minor flaw, because of the

15   presence of price regulations and the general inelasticity of electricity

16   demand.

17   Q.   Please summarize how econometric misspecification and the other

18   statistical and methodological flaws you've described in this section of your

19   testimony affect the validity and reliability of Dr. Cicchetti's results and

20   conclusions.

1   A.   These flaws are all indicators of the inadequacy of Dr. Cicchetti's models

2   and of the methods he used to assess the validity of his models. Dr.

3   Cicchetti's conclusions depend upon the appropriateness and validity of his

4   econometric models and methods. The presence of these flaws in his

5   methodology invalidates his conclusions.

6   Q.   Please summarize the cumulative effects on Dr. Cicchetti's conclusions of

7   all of the misattribution, misspecification, and methodological flaws you

8   have described in your testimony.

9   A.   The numerous examples of flaws in attribution, model specification, and

10   methodology documented in my testimony show that Dr. Cicchetti's

11   analyses and conclusions are invalid. Most of these flaws specifically

12   indicate that Dr. Cicchetti's attribution of 95% of price variation to benign

13   economic and market forces is wrong, and is likely to be substantially too

14   high. As a result of the quantity and severity of these flaws, Dr. Cicchetti's

15   analysis largely fails to distinguish the effects on prices due to benign

16   economic and market fundamentals from those effects that are due to

17   market manipulation. Dr. Cicchetti's analysis is so pervasively flawed that

18   it has no value in examining the impact of market manipulation on prices

19   and it fails to support his conclusions.

1   Q.   Does this conclude your testimony?
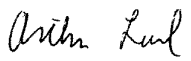
2   A.   Yes, it does.

3

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

AFFIDAVIT OF ARTHUR LEWBEL, PH.D

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

Executed on March 20, 2003.

Arthur Lewbel
_____
Arthur Lewbel, Ph.D