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October 6, 2006

OREGON PUBLIC UTILITY COMMISSION
ATTENTION: FILING CENTER
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RE: **Docket No. UE 180/ UE 181/ UE 184** - In the Matter of PORTLAND GENERAL ELECTRIC COMPANY Request for a General Rate Revision (UE 180), 2007 Resource Valuation Mechanism (UE 181) and Request for a General Revision relating to the Port Westward Plant (UE 184).

Enclosed for electronic filing in the above-captioned docket is the Public Utility Commission Staff's Surrebuttal Testimony.

/s/ Kay Barnes
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c: UE 180/UE 181/ UE 184 Service List - parties

CASE: UE 180/UE 181/UE 184
WITNESS: Bryan Conway

PUBLIC UTILITY COMMISSION
OF
OREGON

STAFF EXHIBIT 1300

Surrebuttal Testimony

October 6, 2006

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS AND OCCUPATION.

A. My name is Bryan Conway. My business address is 550 Capitol Street NE, Suite 215, Salem, Oregon 97301-2551. I am employed by the Public Utility Commission of Oregon (OPUC) as the Program Manager of the Economic and Policy Analysis Section in the Economic Research and Financial Analysis Division.

Q. ARE YOU THE SAME BRYAN CONWAY WHO SPONSORED STAFF/1100 AND STAFF/1200?

A. Yes. My Witness Qualifications Statement is found on Exhibit Staff/1101, Conway/1.

Q. HAVE YOU PREPARED AN EXHIBIT?

A. Yes, I have prepared Staff Exhibit 1301 consisting of 90 pages.

Q. WHAT IS THE PURPOSE OF THIS TESTIMONY?

A. The purpose of my testimony is to review Portland General Electric's (PGE or Company) rebuttal testimony regarding its risk positioning model (RPM).

Summary Recommendation

Q. WHAT IS YOUR SUMMARY RECOMMENDATION?

A. I recommend the Commission reject PGE's risk positioning model because it is rife with infirmities. PGE testifies its data set has no logical grouping and does not lend itself to statistical testing. PGE testifies that its RPM omits relevant factors and therefore likely suffers from omitted variable bias. PGE admits that bias is a serious concern. PGE admits that it provided no evidence that Treasury rates are the most important factor in determining the cost of equity. PGE performs no tests of the predictive power of its RPM. And, finally, PGE confirms that the R^2, adjusted R^2, and t-statistics contained in its regression output are fallacious.

<u>PGE's Risk Positioning Model</u>

Q. PLEASE DESCRIBE PGE'S RISK POSITIONING MODEL (RPM).

A. PGE uses regression analysis as one of its methods of estimating its required return on equity. Specifically, PGE regresses differences between historic cost of equity decisions from regulatory agencies across the United States, and a lagged treasury or corporate bond rate against the same lagged treasury or corporate bond rate.

Q. WHAT CONCERNS DID YOU IDENTIFY IN STAFF/100 REGARDING PGE'S APPLICATION OF ITS RPM?

A. In Staff/1100, I identified two major concerns with PGE's RPM. First, PGE's RPM appears to be misspecified. By misspecified, I mean PGE's model appears to lack some relevant variables. Second, the RPM's statistically significant results are likely fallacious due to the circular logic used by PGE when it set up its regression analysis. I also identified three additional concerns of lesser magnitude. First, PGE did not perform basic statistical tests to check for problems present in either cross-sectional or time series analysis. Second, the analysis PGE relied upon to determine the lag it would assume for Treasury rates was not reproducible and likely not correctly done. Third, the data relied upon by PGE contains errors and is not consistent with PGE's testimony.

Q. OF THE CONCERNS YOU IDENTIFIED, WHICH CONCERNS DID PGE ADDRESS BY MODIFYING ITS RPM?

A. PGE testifies that it modified its RPM in response to my second and third concerns of lesser magnitude. These concerns were that there were obvious data errors in the RPM and PGE was unable to provide justification for its assumed lag.

Q. PLEASE DISCUSS PGE'S MODIFICATION TO ITS RPM BASED ON THE DATA ERRORS YOU IDENTIFIED.

A. PGE claims that it reviewed all of the return on equity decisions in its data set and found that the only errors were in Oregon decisions. (*See* UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/63, lines 10-12.) Assuming PGE's review was thorough; I no longer consider this a concern. I now conclude that PGE's RPM is not valid irrespective of the accuracy of PGE's data set.

Q. PLEASE DISCUSS PGE'S NEW ANALYSIS REGARDING THE OPTIMAL LAG FOR ITS RPM.

A. PGE confirmed its choice of optimal lag using more acceptable techniques than simply attempting to maximize R^2. However, PGE's discussion leads me to believe that PGE may be confused about the purpose of the specification criteria tests it conducted.

Q. PLEASE EXPLAIN.

A. PGE seems to imply that the use of the Akaike Information Criteria (AIC) and Schwarz/Bayesian Information Criteria (BIC) will identify the best predictive model (or perhaps chooses the model that is best at explaining and predicting). PGE states that the AIC and BIC tests balance the needs of a predictive model and a model that explains to "maximize a model's usefulness." (*See* UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/62, lines 12-13.)

Q. DID PGE CONDUCT ANY TESTS OF ITS RPM'S PREDICTIVE POWER?

A. No. The AIC and BIC criteria are tests for goodness of fit, not predictive power. PGE appears to agree when it testifies that the AIC and BIC criteria are "analogous to fitting using R^2 or an adjusted R^2." (*See* UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/62, lines 16-17.)

Q. DID YOU RAISE A CONCERN REGARDING THE LACK OF ANY TESTS OF THE PREDICTIVE POWER OF PGE'S RPM IN YOUR DIRECT TESTIMONY?

A. Yes. At Staff/1100, Conway/11, line 19, through Conway/12 line 7, I stated,

> **Q. DO YOU HAVE CONCERNS ABOUT PGE'S USE OF R-SQUARED FOR DETERMINING THE APPROPRIATE LAG?**

A. Yes, while it may be intuitively compelling to use the R-squared to assist in model selection, it is not generally the best tool. The R-squared is backward looking and helps one to understand how much of the "history" or variation of the dependent variable the model can explain. A more pertinent question for this model is how well the model can predict a future authorized return on equity given current interest rates.

Q. DID PGE CONDUCT ANY TESTS OF THE RPM'S PREDICTIVE POWER?

A. No. See PGE's response to Staff Data Requests Nos. 209 and 210 attached as Staff/1102, Conway/21-22.

Q. DO YOU HAVE ANYTHING ELSE YOU WOULD LIKE TO ADD?

A. PGE seems undecided regarding the purpose of its RPM. Is it intended to predict an appropriate commission decision regarding ROE? Or, is it intended to explain past commission decisions regarding ROE? There is a fundamental difference in these questions, a point with which PGE seems to agree (*See* UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/62 lines 10-12.) Nonetheless, PGE is ambiguous about which of these functions the model is intended to perform.

For example, PGE clarifies the use of its RPM at UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/57, line 17, when PGE, with respect to its RPM states, "[t]he real question is how well does the model explain." However, at UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/53, lines 18-19, PGE states that its RPM estimates "what investors might expect from a commission for an authorized ROE." At UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/59, lines 10-11, PGE states that the purpose of the RPM is to "uncover the long-term or "steady-state" risk premium" that "investors would expect in a Commission decision regarding authorized ROE." Both of these latter statements seem to imply that PGE intends for its RPM to predict outcomes rather than explain historic information.

This intention is also implicit in PGE's testimony supporting its conclusion that a single lagged Treasury rate is optimal. In this testimony, PGE implies its model is for predicting rather than explaining when it discusses the differences between models that have "easy forecasting ability but low accuracy" with models with "many variables" that "fit the data extremely well, [but] it has little forecasting use." (*See* UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/62, lines 10-14.) PGE further explains that it opted for its single-lag RPM model because, "the downside of models which rely on multiple lags is that for forecasting purposes one must either project all changes (likely by trending) or assume constancy. For our purposes, we adopted the model using lags between one and twelve months which minimized AIC and BIC. We then assumed constant rates on future corporate and treasury bonds in order to estimate ROE." (*See* UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/63, lines 1-5.)

Finally, notwithstanding testimony in which PGE implies the model is intended to predict or forecast the risk premium that investors would expect in a Commission decision regarding authorized ROE, PGE concludes that its "model is intended to provide only guidance to the Commission, and does not attempt to tell the Commissions what authorized ROE must be granted." (*See* UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/56, lines 7-8.) Further, in response to Staff Data Request No. 632 attached as Staff/1301, Conway/1, PGE states, "[t]he model does not attempt to forecast or predict future cost of equity decisions." However, at UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/54, lines 13-14 PGE seems to imply that the RPM should be relied upon by the Commission for setting the cost of equity when it states, "[f]irst, the Risk Positioning model does not tell any commission what authorized ROE to grant any more than the DCF or CAPM or any other model tells the commissions."

Q. HOW DID PGE RESPOND TO YOUR OTHER CONCERN REGARDING THE LACK OF ANY BASIC STATISTICAL TESTS?

A. PGE responds that they do not have a "full cross-sectional time series data set." With respect to the cross-sectional data, PGE states that they have "some cross-sectional data, but not for all the jurisdictions in any month." With respect to the time-series data, PGE states that they have "some time series data, but not consistently for any jurisdiction." With respect to whether they should have performed cross-sectional statistical tests, PGE responds, "[n]o. There is no logical grouping to the data." With respect to whether they should have performed time-series statistical tests, PGE responds "[n]o. There is no logical grouping to the data." (*See* UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/61, lines 11-20.)

Q. DOES THIS ALLEVIATE YOUR CONCERNS REGARDING THE LACK

OF BASIC STATISTICAL TESTS?

A. No. PGE seems to imply that its data set is so limited that statistical testing would be meaningless. What is surprising is that while PGE claims its data set does not lend itself to statistical testing, PGE claims that the statistical results from the applying its RPM to the data are “quite good for a pooled-cross sectional regression[,]” and that its “model has the expected signs on our coefficients and significant t-statistics.” (*See* UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/56, line 21 through Hager-Valach/57, line 2.) In response to Staff Data Request 563 attached as Staff/1301, Conway/2, PGE further states that it also relied upon R^2 to support its assertion that the RPM’s statistical results were “quite good.” However the R^2 is the same statistic PGE testifies is erroneously calculated in its RPM model. (*See* UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/A-4.) Further, PGE’s point estimate and 95% confidence interval for PGE’s 1-month lag RPM found at UE 180 – UE 181 – UE 184/PGE Exhibit 2003, Hager-Valach/1, is 11.35 +/- 0.44. I find it a bit incredible that PGE can obtain such precise estimates from a data set that PGE states does not lend itself to basic statistical testing and has “no logical grouping” either across time or across jurisdictions. Finally, I question what use PGE is suggesting the Commission make of this result based on PGE’s belief that the RPM does not forecast or predict future cost of equity decisions.

Q. WHAT TYPES OF PROBLEMS WOULD BASIC STATISTICAL TESTS

CHECK FOR?

A. In its simplest terms, the tests would determine if the relationship between authorized ROEs and Treasury rates are stable over time and across jurisdictions (are the parameters stable). Additionally, the tests would determine if the variations of the estimates vary across either time or jurisdiction (e.g., does the model suffer from either heteroskedasticity or autocorrelation?). These basic statistical tests are generally performed to see if it is reasonable to assume that the model reflects the assumptions embedded in standard regression analysis.

Q. I THOUGHT PGE ARGUES THAT WE ARE NEVER IN A WORLD WHERE ALL OF THE STANDARD ECONOMETRIC ASSUMPTIONS HOLD. DOES THIS ALLEVIATE THE NEED FOR THE STATISTICAL TESTS YOU MENTION?

A. No. PGE states that its RPM "follows standard regression theory and practice." (*See* UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/54, line 3.) PGE has not created something new that is no longer bound by basic econometric fundamentals. It does not seem reasonable for PGE "following standard regression theory and practice" to claim that it does not need to abide by standard regression practice by checking its data for basic problems that may cause violations of standard regression theory.

Q. HOW DID PGE RESPOND TO YOUR FIRST MAJOR CONCERN THAT ITS RPM IS LIKELY MISSPECIFIED AND SUFFERS FROM OMITTED VARIABLE BIAS?

A. PGE admits that its model lacks relevant factors considered by commissions in authorizing ROEs. (*See* UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/57, lines 18-19.) PGE further admits that bias is a concern. (*See* UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/58, line 4.) However, PGE testifies that “Staff is under the mistaken belief that any model should contain all possible explanatory factors.” (*See* UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/57, line 14-15.) PGE also testifies that it is more concerned about “over specifying” its RPM and testifies that “we must show prudence before adding variables to the model at random without a strong theoretical background for such an addition.” (*See* UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/58, line 4-8.) In support of PGE’s concern regarding over specification of its RPM, PGE cites a paper from Dr. Kevin Clarke from the Conflict Management and Peace Science Journal.

Q. DO THESE ARGUMENTS ALLEVIATE YOUR CONCERNS REGARDING OMITTED VARIABLES IN THE RPM?

A. No. I never recommended “adding variables to the model at random” as PGE suggests I did. Nor, as PGE is aware, did I testify that that any model should contain all possible explanatory factors. (*See* PGE’s response to Staff Data Request No. 566 attached as Staff/1301, Conway/53.) I did testify that PGE’s model should be developed from a sound, defensible theory that describes a causal relationship between ROE decisions and other relevant variable(s). (*See* Staff/1100, Conway/11, lines 16-18.)

Q. WHAT DOES DR. CLARKE CONCLUDE IN HIS PAPER THE PHANTOM MENACE: OMITTED VARIABLE BIAS IN ECONOMETRIC RESEARCH?

A. Dr. Clarke concludes that, under certain circumstances, adding a relevant variable may increase the bias present in a model. Dr. Clarke concludes, that omitted variable bias is a "serious problem" but, since we likely never find ourselves in a situation where we have a perfectly specified model; the problem has been overblown by quantitative political scientists.

Q. DOES DR. CLARKE PROVIDE ANY SOLUTIONS?

A. Yes, in Dr. Clarke's paper titled, Return of the Phantom Menace: Omitted Variable Bias in Econometric Research concludes that formal sensitivity analysis may be one potential solution. Dr. Clarke writes,

> "The goal of formal sensitivity analysis is to provide a sense of how large an effect an omitted variable or variables would have to have in order to invalidate a finding. That is, sensitivity analysis provides a quantitative statement that in order to explain away a particular association, one would need a hidden bias of a certain size."

Q. DO YOU HAVE ANYTHING ELSE YOU WOULD LIKE TO ADD REGARDING DR. CLARKE'S PAPERS?

A. Yes. After reviewing both of Dr. Clarke's papers mentioned in this testimony, I conclude that Dr. Clarke is concerned with quantitative political scientists throwing in too many variables without taking into account the ramifications. I do not conclude that Dr. Clarke advocates for simply choosing a single variable model over a carefully designed model specification guided by theory.

Q. DO YOU HAVE ANYTHING ELSE YOU WOULD LIKE TO ADD REGARDING HOW POLITICAL SCIENTISTS VIEW OMITTED VARIABLE BIAS?

A. Yes. Dr. Clarke presented his paper Phantom Menace: Omitted Variable Bias in Econometric Research at Peace Science Society Meeting 2004 Panel on Control Variables, Specification, and Knowledge Accumulation. At this meeting another paper was presented by Christopher H. Achen where Dr. Achen states that construction of a formal theory is a key component of proper model specification. The following excerpt sheds light on Dr. Achen's recommendations:

> What should the supporting argument for a statistical specification consist of? As I argued above, giving credibility to statistical specification, linear or otherwise, requires at least one of these two supports—either a formal model or detailed data analysis. In the first case, researchers can support their specifications by showing that they follow as a matter of rigorous mathematical inference from their formal model. This is always the most impressive support that a statistical model can receive. Though one has to guard against the risk of compounding any limitations in the formal model, nonetheless, integrating formal theory and statistical model puts to rest a host of uncertainties about the specification.
>
> When no formal theory is available, as is often the case, then the analyst needs to justify statistical specifications by showing that they fit the data. That means more than just "running things." It means careful graphical and crosstabular analysis. Is the effect really there in all parts of the data? Does it actually work the same way for all the observations? Are there parts of the data in which the competing hypotheses imply opposite results, so that we can carry out the critical test? And if we intend to apply a linear model with constant coefficients, are the effects really linear and the same size in all the parts of the data. Show us! If we have not discussed and answered these questions in our articles, no one should believe our work. In

> other words, we have to think a little more like an experienced chef adjusting the broth as he cooks, and less like a beginner blindly following the recipe whether it suits the ingredients at hand or not.

Q. HAVE POLITICAL SCIENTISTS DISCOVERED A FLAW IN ECONOMISTS' APPLIED WORK?

A. No. Concerns regarding model specification are well known in the econometric text books. For example, Peter Kennedy in his Guide to Econometrics (2nd edition) states,

> To avoid these problems a researcher usually trys to determine the correct set of explanatory variables. The first and most important ingredient in such a search is economic theory. If economic theory cannot defend the use of a variable as an explanatory variable, it should not be included in the set of potential independent variables. Such theorizing should take place before any empirical testing of the appropriateness of potential independent variables; this guards against the adoption of an independent variable just because it happens to 'explain' a significant portion of the variation in the dependent variable in the particular sample at hand. p. 69

Further, Peter Kennedy states,

> A specification search is best undertaken by beginning with a general unrestricted model then systematically simplifying it in the light of the sample evidence. This approach (deliberate 'overfitting') is preferred to/has more power than a search beginning with a very simple model and expanding as the data permit. p. 68

Q. DID PGE CONSIDER ADDING ANY ADDITIONAL VARIABLES BESIDES TREASURY RATES TO ITS RPM?

A. No. See PGE's response to Staff Data Request 631, attached as Staff/1301, Conway/54.

Q. DOES PGE OFFER ANY OTHER SUPPORT FOR ITS RPM?

A. Yes. PGE states that its RPM has been "used by several witnesses in several jurisdictions." (*See* PGE's Response to Staff Data Request No. 559 attached as Staff/1301, Conway/55.)

Q. HOW DO YOU RESPOND?

A. PGE identified only one witness who has not testified in support of an RPM in Oregon. That witness was Mr. Slade Cutter from Texas. I contacted Mr. Cutter and was told that he abandoned the RPM approach in 1994.

Q. HOW DID PGE RESPOND TO YOUR SECOND MAJOR CONCERN THAT THE STATISTICAL RESULTS OF PGE'S RPM ARE FALLACIOUS?

A. My demonstration of how PGE's RPM design results in fallacious statistical results consisted of running two regressions based on random numbers. First, I ran a regression of one random variable on the other and found no relationship. Second, I ran a regression of the difference between the two random variables regressed on one of the random variables to simulate the RPM's model design. I will refer to the latter regression as the pseudo RPM. PGE makes a slight modification to my analysis and reports the adjusted R^2 from my model runs, rather than the R^2 for both the regression of random variables and the pseudo RPM. However, this does not change the conclusions from my model runs. PGE next reports the adjusted R^2 from my regression of one random variable on the other and shows, as Staff found, that there is no relationship.

However, PGE asserts that this is evidence that its RPM is correctly specified. (*See* UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/60, lines 12-21.)

Additionally, PGE testifies that its model is identical to another "variant" of the RPM.

Q. PLEASE DISCUSS PGE'S LAST POINT THAT ITS RPM IS EQUIVALENT TO ANOTHER VARIANT OF THE RPM?

A. PGE demonstrates that its RPM equation is mathematically equivalent to the equation (1): $ROE = \alpha + \beta * T + \varepsilon$ where ROE is the authorized return on equity and T is a lagged treasury rate. PGE then demonstrates that the results of this model have reasonably high R^2 and significant t-statistics. (*See* UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/59, lines 4-9.)

Q. DO YOU AGREE?

A. Yes. This more straightforward equation contains all of the information that PGE's RPM contains. Further, the "predicted values" or estimates of ROE based on various Treasury rates are identical between this more straight forward regression equation and PGE's RPM.

Q. ARE THERE DIFFERENCES BETWEEN THE RESULTS OF THESE TWO MODELS?

A. Yes. While the estimates of ROE, given different Treasury rates, from the two models are identical, the reported values for R^2, adjusted R^2, and the t-statistic for the coefficient on the Treasury rate are not. This is what I referred to in Staff/1100, when I stated that PGE's statistical results are fallacious.

Q. DOES PGE RELY UPON THESE FALLCIOUS STATISTICAL RESULTS IN ITS DEFENSE OF ITS RPM?

A. Yes. PGE explicitly uses these flawed statistics to support its claims that the statistical results from applying its RPM to the data are "quite good for a pooled-cross sectional regression. Our model has the expected signs on our coefficients and significant t-statistics." (*See* UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/56, line 21 through Hager-Valach/57, line 2.) Further, when PGE recommends the Commission utilize its RPM results, it is implicitly drawing on the confidence interval surrounding its forecast of the ROE, which is based on these same statistical tests.

Q. PGE DEMONSTRATES THAT THE MORE STRAIGHT FORWARD MODEL HAS A HIGH R^2 AND SIGNIFICANT T-STATISTICS, DOES THAT VALIDATE THE RPM?

A. No. While equation 1 would not suffer from fallacious statistical results due to circular reasoning (as I demonstrated using randomly generated data), it would still likely suffer from omitted variable bias (i.e., there are factors considered by this Commission and commissions around the country that could rightfully be included in the regression analysis).

Q. PGE CLAIMS ITS TECHNICAL APPENDIX DEMONSTRATES ITS RPM HAS EQUIVALENT STATISTICAL RESULTS LIKE THE MORE STRAIGHT FORWARD EQUATION 1, HOWEVER YOU REACH THE

OPPOSITE CONCLUSION, PLEASE EXPLAIN.

A. PGE's technical appendix concludes that the R^2 do not match when you convert the straight forward equation 1 into PGE's RPM model. (*See* UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/A-4, lines 3-16.) Further, PGE demonstrates that the reported t-statistics on the Treasury rate across all five RPM estimates found at UE 180 – UE 181 – UE 184/PGE Exhibit 2003, Hager-Valach/1-3, and all 34 RPM estimates found at UE 180 – UE 181 – UE 184/PGE Exhibit 2019, Hager-Valach/1-21 are inappropriate. (*See* UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/A-4, lines 6-17.) What is troubling is that while PGE readily admits these statistical results are not accurate; these are the exact statistics that they report in testimony to the Commission in support of its RPM.

Q. PGE CLAIMS THAT USING ITS AIC TEST AS A PROXY FOR R^2 PROVES THAT "THE TWO VARIANTS OF THE RISK POSITIONING MODEL ARE EQUIVALENT FROM THE AIC STANDPOINT" AND LENDS SUPPORT FOR ITS RPM. DO YOU AGREE?

A. No. The equivalency of the AICs is due to the way PGE has set up its equation and does not support its assertion that the RPM specification is justified based on the underlying more straight forward model. As an example, I have run 10 regressions relying on 500 newly generated variables. The result of this exercise is that in every instance, the AICs were equivalent. (*See* Staff/1301, Conway/56-76.) PGE cannot escape the fact that its RPM specification results in statistics that cannot be relied upon. PGE could alleviate this problem by working with the straight forward model it claims underlies its RPM rather than only relying on the straight forward model solely for statistical support.

Q. IF PGE HAD UTILIZED EQUATION 1 (THE MORE STRAIGHT FORWARD MODEL) FOR THE BASIS OF ITS RPM, THEN WOULD STAFF BE ARGUING THAT ITS RPM STATISTICAL RESULTS ARE FALLACIOUS DUE TO CIRCULAR LOGIC?

A. No.

Q. IF THE ESTIMATES OF THE EXPECTED ROE, GIVEN VARIOUS TREASURY RATES, ARE IDENTICAL BETWEEN THE TWO MODELS SHOULD THE COMMISSION ADOPT THE RESULTS OF PGE'S RPM BASED ON THE MORE STRAIGHT FORWARD EQUATION 1?

A. No. Adopting equation 1 as the basis for the RPM would eliminate only one of my two listed "major concerns."

Q. WHAT DID PGE STATE AS ITS REASON TO CHOOSE ITS VERSION OF THE RPM OVER THE MORE STRAIGHT FORWARD VERSION?

A. PGE testifies, "[i]n theory either form could be used. We chose the form in equation (3) [RPM] because it explicitly models the risk premium."

Q. WHAT THEORY IS PGE REFERRING TO?

A. PGE is referring to basic mathematics. PGE simply means that the two models produce the same ROE estimates.

Q. DO YOU AGREE WITH PGE?

A. Yes, I agree that the two models mathematically produce the same ROE estimates. However, PGE's choice for its form of its RPM causes basic statistical results to be incorrectly stated, which adds to the contentiousness of this approach. Since the estimates of ROE are identical using both approaches and there is no new information garnered by manipulating equation 1, it seems like an unnecessary complication. Adopting the more straight forward model that produces equivalent estimates of ROE would have allowed parties to focus on the merits of such an approach rather than spend time debating transformations of t-statistics, alternative measures of goodness of fit, etc.

Q. DOES ONE MODEL ATTEMPT TO ANALYZE RISK PREMIUMS WHILE THE OTHER MODEL ANALYZES ROE DECISIONS?

A. No. Both models attempt to analyze ROE decisions. In the case of PGE's RPM, it estimates the expected ROE by applying the following two equations:

$$RPM = a + b * Treasury$$

$$ROE = a + B * Treasury$$

Combining the two equations, you see that PGE is actually calculating the following:

$$ROE - Treasury = a + b * Treasury$$

or

$$ROE = Treasury + a + b * Treasury$$

Since b = 1-B, PGE's RPM is simply

$$ROE = Treasury + a + (B-1) * Treasury$$

or

$$ROE = Treasury + \left(a + B * Treasury - Treasury\right)$$

Which is:

$$ROE = a + B * Treasury$$

This makes it clear that PGE has not observed a risk premium; they have simply manipulated a more straight forward model in a manner that only serves to render some of PGE's reported statistical results invalid.

Q. WOULD YOU SUPPORT A RPM BASED ON EQUATION 1?

A. No. While it would have reduced one area of contention, PGE has not addressed my primary concern of a lack of a valid economic or financial theory to support the model.

Q. PLEASE EXPLAIN.

A. Both regression equations are missing the single most important element a model such as this should contain; a formal, or at least defensible, theory that describes a causal relationship between the independent variables and the dependent variable of interest. It would be preferable if the theory were thoroughly vetted as is the theory underlying the CAPM or DCF methodologies.

Q. PGE STATES THAT ITS RPM IS BASED ON A SIMPLE THEORY THAT COST OF EQUITY DECISIONS ARE CORRELATED WITH INTEREST RATES, DO YOU DISAGREE?

A. No. I agree that interest rates play a role in determining the required return on equity for a utility such as PGE. However, I believe the analysis undertaken, and therefore the factors (or variables) considered by Commission in determining the appropriate cost of equity for its utilities, is a bit more complex. This Commission has heard arguments that SB 408, hydro risks, multi-state jurisdictions, single-state jurisdictions, etc., should be factored into the Commission's ultimate cost of equity decision. A typical Oregon record contains hundreds if not thousands of pages of testimony on the subject of cost of equity. I imagine that other jurisdictions are asked to consider different factors than those just listed. It does not seem plausible to conclude one need only to consider Treasury rates to obtain an accurate explanation or prediction of upcoming authorized ROEs across the nation, or in Oregon.

Q. HAS PGE PROVIDED ANY SUPPORT FOR ITS ASSERTION THAT INTEREST RATES ARE THE MOST IMPORTANT FACTOR IN DETERMINING ITS COST OF EQUITY?

A. No. In response to Staff Data Request Number 562, PGE clarifies that it did not testify that it had any evidence that the most important factor in determining the cost of equity was interest rates. (*See* Staff Exhibit 1301, pages 77-90.)

Q. HAS PGE PROVIDED ANY ADDITIONAL SUPPORT FOR ITS ASSERTION THAT ITS RPM WAS "QUITE GOOD FOR A POOLED-CROSS SECTIONAL REGRESSION"?

A. No. In response to Staff Data Request No. 563 attached as Staff/1301, Conway/3-52, PGE provides a copy of Daniel Rubinfeld's <u>Reference</u>

Guide on Multiple Regression from the Reference Manual on Scientific Evidence, 2nd Edition, which states,

> "typically, R^2 is low in cross-section studies in which differences in individual behavior are explained."

However, Dr. Rubinfeld goes on to explain,

> "In time-series studies, in contrast, the expert is explaining the movement of aggregates over time. Since most aggregate time series have substantial growth, or trend, in common, it will not be difficult to "explain" one time series using another time series, simply because both are moving together. It follows as a corollary that a high R^2 does not by itself mean that the variables included in the model are the appropriate ones."

Since PGE testifies that its data set is both cross sectional and time series, this excerpt provides no support for PGE's claim. Further, PGE testifies that the R^2 is not accurate for its RPM model, so it is puzzling that PGE relies on that statistic in this instance.

Q. HAS THE COMMISSION PREVIOUSLY GIVEN GUIDANCE TO WITNESSES REGARDING THE RPM?

A. Yes. In UE 115, the Commission adopted guidelines for cost of equity witnesses. The first guideline states,

> All witnesses should clearly and fully explain the methodologies used and the theoretical support for using the methodologies. When advocating a new approach, or one previously rejected by the Commission, a witness should explain why the Commission should adopt the proposed methodology in the present docket.

Q. DID THE COMMISSION PREVIOUSLY REJECT THE RPM IN UE 115?

A. Yes. In Order 01-777 at 35, the Commission stated,

> **Commission Resolution**
>
> We begin with the range of rates of return on common equity offered by each of the parties. For the reasons stated above, we reject the parties' single-stage DCF estimates, Staff's CAPM and risk premium calculations, PGE's Risk Positioning and Comparison to Authorized methods, and Staff's Qualitative Analysis.

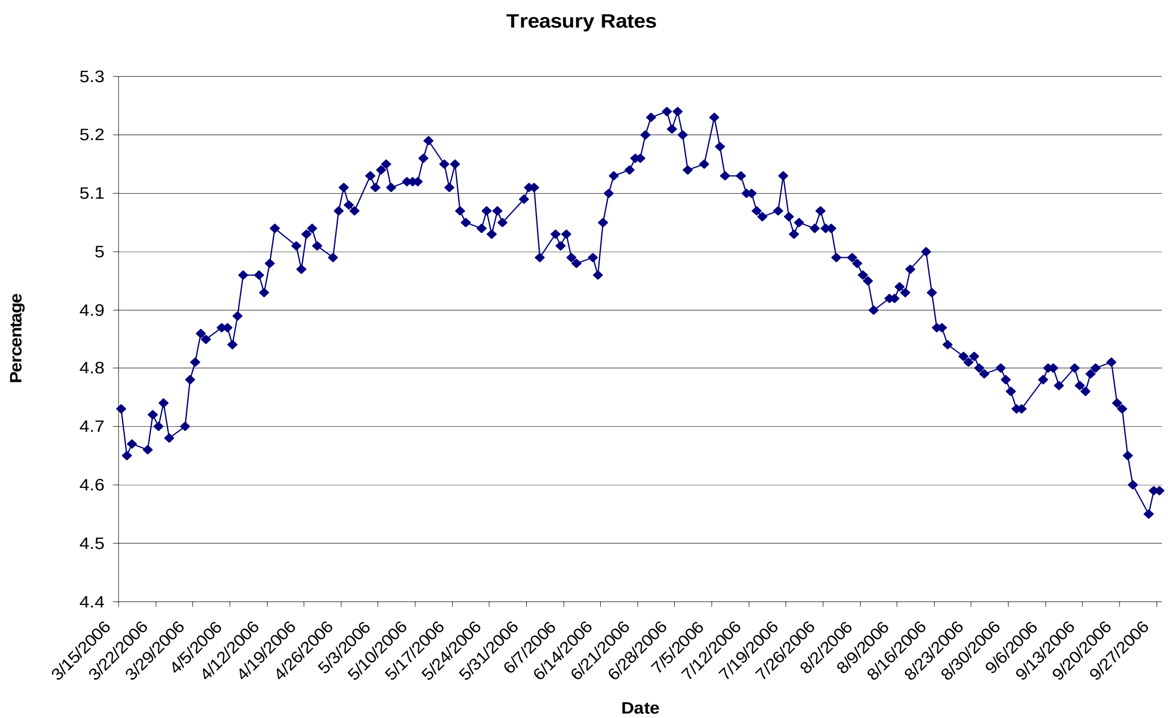
Q. HAS PGE FULLY EXPLAINED ITS RPM METHODOLOGY, THE THEORETICAL SUPPORT FOR ITS RPM, AND WHY THE COMMISSION SHOULD ADOPT THE PROPOSAL IN THIS DOCKET GIVEN IT WAS PREVIOUSLY REJECTED?

A. No.

Q. WHAT HAS HAPPENED TO INTEREST RATES SINCE PGE FILED ITS GENERAL RATE CASE?

A. Interest rates have fallen. Figure 1 shows how interest rates (as measured by the 10-year treasury) have fallen since PGE filed its rate case on March 15, 2006. On March 15, 2006, the yield on the 10-year Treasury was 4.73 percent. When Staff filed its direct testimony on August 14, 2006, the yield on the 10-year Treasury was 5.00 percent. When PGE filed its rebuttal on September 13, 2006, the yield on the 10-year Treasury was 4.76 percent. As of September 27, 2006, the yield on the 10-year Treasury was 4.59 percent.

FIGURE 1:



Q. **DOES THIS CONCLUDE YOUR TESTIMONY?**

A. Yes.

CASE: UE 180/UE 181/UE 184
WITNESS: Bryan Conway

PUBLIC UTILITY COMMISSION
OF
OREGON

STAFF EXHIBIT 1301

Exhibits in Support
Of Surrebuttal Testimony

October 6, 2006

October 2, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 25, 2006
Question No. 632

Request:

Regarding UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/57, line 17, does PGE believe it is more important to determine how well its regression explains past cost of equity decisions or how well its regression predicts future cost of equity decisions? Please explain. Would PGE's answer change if the commission decision regarding cost of equity was expected within 1 month? Please explain.

Response:

Staff misinterprets the purpose of the Risk Positioning model. As we discuss in PGE Exhibit 2000, page 53, the model postulates that authorized ROE decisions by regulatory commissions are influenced by interest rates. The model does not attempt to forecast or predict future cost of equity decisions. Rather, the model provides an estimate as what investors might expect from a commission for an authorized ROE.

No, PGE's answer would not change based on our response above.

September 26, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 19, 2006
Question No. 563

Request:

Referring to UE 180 – UE 181 – UE 184 / PGE /2000, Hager-Valach/56, line 21 through Hager-Valach/57 line 1,

a. please provide all evidence that PGE relied upon to conclude that its model was "quite good for a pooled-cross sectional regression."
b. please provide the list of all of the criteria PGE relied upon to conclude that its model was "quite good for a pooled-cross sectional regression."

Response:

a) Generally speaking, a model with a single explanatory variable that explains over half of the relationship between two variables is considered to perform well. Attachment 563-A is a copy of Daniel Rubinfeld's "Reference Guide on Multiple Regression" from the *Reference Manual on Scientific Evidence*, 2nd Edition. As Dr. Rubinfeld notes in Section IVB, typically "R^2 is low in cross-section studies in which differences in individual behavior are explained."
b) Please refer to a) the Technical Appendix and b) Hager/Valach 2000 for a fuller discussion of the criteria considered.

UE 180
Attachment 563-A

"Reference Guide on Multiple Regression"

Reference Guide on Multiple Regression

DANIEL L. RUBINFELD

Daniel L. Rubinfeld, Ph.D., is Robert L. Bridges Professor of Law and Professor of Economics at the University of California, Berkeley, California.

CONTENTS

I. Introduction

Multiple regression analysis is a statistical tool for understanding the relationship between two or more variables.[1] Multiple regression involves a variable to be explained—called the dependent variable—and additional explanatory variables that are thought to produce or be associated with changes in the dependent variable.[2] For example, a multiple regression analysis might estimate the effect of the number of years of work on salary. Salary would be the dependent variable to be explained; years of experience would be the explanatory variable.

Multiple regression analysis is sometimes well suited to the analysis of data about competing theories in which there are several possible explanations for the relationship among a number of explanatory variables.[3] Multiple regression typically uses a single dependent variable and several explanatory variables to assess the statistical data pertinent to these theories. In a case alleging sex discrimination in salaries, for example, a multiple regression analysis would examine not only sex, but also other explanatory variables of interest, such as education and experience.[4] The employer–defendant might use multiple regression to argue that salary is a function of the employee's education and experience, and the employee–plaintiff might argue that salary is also a function of the individual's sex.

Multiple regression also may be useful (1) in determining whether a particular effect is present; (2) in measuring the magnitude of a particular effect; and (3) in forecasting what a particular effect would be, but for an intervening event. In a patent infringement case, for example, a multiple regression analysis could be

1. A variable is anything that can take on two or more values (for example, the daily temperature in Chicago or the salaries of workers at a factory).

2. Explanatory variables in the context of a statistical study are also called independent variables. *See* David H. Kaye & David A. Freedman, Reference Guide on Statistics, § II.A.1, in this manual. That guide also offers a brief discussion of multiple regression analysis. *Id.* § V.

3. Multiple regression is one type of statistical analysis involving several variables. Other types include matching analysis, stratification, analysis of variance, probit analysis, logit analysis, discriminant analysis, and factor analysis.

4. Thus, in *Ottaviani v. State University of New York*, 875 F.2d 365, 367 (2d Cir. 1989) (citations omitted), *cert. denied*, 493 U.S. 1021 (1990), the court stated:

> In disparate treatment cases involving claims of gender discrimination, plaintiffs typically use multiple regression analysis to isolate the influence of gender on employment decisions relating to a particular job or job benefit, such as salary.
>
> The first step in such a regression analysis is to specify all of the possible "legitimate" (i.e., nondiscriminatory) factors that are likely to significantly affect the dependent variable and which could account for disparities in the treatment of male and female employees. By identifying those legitimate criteria that affect the decision-making process, individual plaintiffs can make predictions about what job or job benefits similarly situated employees should ideally receive, and then can measure the difference between the predicted treatment and the actual treatment of those employees. If there is a disparity between the predicted and actual outcomes for female employees, plaintiffs in a disparate treatment case can argue that the net "residual" difference represents the unlawful effect of discriminatory animus on the allocation of jobs or job benefits.

used to determine (1) whether the behavior of the alleged infringer affected the price of the patented product; (2) the size of the effect; and (3) what the price of the product would have been had the alleged infringement not occurred.

Over the past several decades the use of multiple regression analysis in court has grown widely. Although regression analysis has been used most frequently in cases of sex and race discrimination[5] and antitrust violation,[6] other applications include census undercounts,[7] voting rights,[8] the study of the deterrent

5. Discrimination cases using multiple regression analysis are legion. *See, e.g.*, Bazemore v. Friday, 478 U.S. 385 (1986), *on remand*, 848 F.2d 476 (4th Cir. 1988); King v. General Elec. Co., 960 F.2d 617 (7th Cir. 1992); Diehl v. Xerox Corp., 933 F. Supp. 1157 (W.D.N.Y. 1996) (age and sex discrimination); Csicseri v. Bowsher, 862 F. Supp. 547 (D.D.C. 1994) (age discrimination), *aff'd*, 67 F.3d 972 (D.C. Cir. 1995); Tennes v. Massachusetts Dep't of Revenue, No. 88-C3304, 1989 WL 157477 (N.D. Ill. Dec. 20, 1989) (age discrimination); EEOC v. General Tel. Co. of N.W., 885 F.2d 575 (9th Cir. 1989), *cert. denied*, 498 U.S. 950 (1990); Churchill v. IBM, Inc., 759 F. Supp. 1089 (D.N.J. 1991); Denny v. Westfield State College, 880 F.2d 1465 (1st Cir. 1989) (sex discrimination); Black Law Enforcement Officers Ass'n v. City of Akron, 920 F.2d 932 (6th Cir. 1990); Bridgeport Guardians, Inc. v. City of Bridgeport, 735 F. Supp. 1126 (D. Conn. 1990), *aff'd*, 933 F.2d 1140 (2d Cir.), *cert. denied*, 502 U.S. 924 (1991); Dicker v. Allstate Life Ins. Co., No. 89-C-4982, 1993 WL 62385 (N.D. Ill. Mar. 5, 1993) (race discrimination). *See also* Keith N. Hylton & Vincent D. Rougeau, *Lending Discrimination: Economic Theory, Econometric Evidence, and the Community Reinvestment Act*, 85 Geo. L.J. 237, 238 (1996) ("regression analysis is probably the best empirical tool for uncovering discrimination").

6. *E.g.*, United States v. Brown Univ., 805 F. Supp. 288 (E.D. Pa. 1992) (price-fixing of college scholarships), *rev'd*, 5 F.3d 658 (3d Cir. 1993); Petruzzi IGA Supermarkets, Inc. v. Darling-Delaware Co., 998 F.2d 1224 (3d Cir.), *cert. denied*, 510 U.S. 994 (1993); Ohio v. Louis Trauth Dairy, Inc., 925 F. Supp. 1247 (S.D. Ohio 1996); *In re* Chicken Antitrust Litig., 560 F. Supp. 963, 993 (N.D. Ga. 1980); New York v. Kraft Gen. Foods, Inc., 926 F. Supp. 321 (S.D.N.Y. 1995). *See also* Jerry Hausman et al., *Competitive Analysis with Differenciated Products*, 34 Annales D'Economie et de Statistique 159 (1994); Gregory J. Werden, *Simulating the Effects of Differentiated Products Mergers: A Practical Alternative to Structural Merger Policy*, 5 Geo. Mason L. Rev. 363 (1997).

7. *See, e.g.*, City of New York v. United States Dep't of Commerce, 822 F. Supp. 906 (E.D.N.Y. 1993) (decision of Secretary of Commerce not to adjust the 1990 census was not arbitrary and capricious), *vacated*, 34 F.3d 1114 (2d Cir. 1994) (applying heightened scrutiny), *rev'd sub nom.* Wisconsin v. City of New York, 517 U.S. 565 (1996); Cuomo v. Baldrige, 674 F. Supp. 1089 (S.D.N.Y. 1987); Carey v. Klutznick, 508 F. Supp. 420, 432–33 (S.D.N.Y. 1980) (use of reasonable and scientifically valid statistical survey or sampling procedures to adjust census figures for the differential undercount is constitutionally permissible), *stay granted*, 449 U.S. 1068 (1980), *rev'd on other grounds*, 653 F.2d 732 (2d Cir. 1981), *cert. denied*, 455 U.S. 999 (1982); Young v. Klutznick, 497 F. Supp. 1318, 1331 (E.D. Mich. 1980), *rev'd on other grounds*, 652 F.2d 617 (6th Cir. 1981), *cert. denied*, 455 U.S. 939 (1982).

8. Multiple regression analysis was used in suits charging that at-large area-wide voting was instituted to neutralize black voting strength, in violation of section 2 of the Voting Rights Act, 42 U.S.C. § 1973 (1988). Multiple regression demonstrated that the race of the candidates and that of the electorate were determinants of voting. *See, e.g.*, Williams v. Brown, 446 U.S. 236 (1980); Bolden v. City of Mobile, 423 F. Supp. 384, 388 (S.D. Ala. 1976), *aff'd*, 571 F.2d 238 (5th Cir. 1978), *stay denied*, 436 U.S. 902 (1978), *rev'd*, 446 U.S. 55 (1980); Jeffers v. Clinton, 730 F. Supp. 196, 208–09 (E.D. Ark. 1989), *aff'd*, 498 U.S. 1019 (1991); League of United Latin Am. Citizens, Council No. 4434 v. Clements, 986 F.2d 728, 774–87 (5th Cir.), *reh'g en banc*, 999 F.2d 831 (5th Cir. 1993), *cert. denied*, 498 U.S. 1060 (1994). For commentary on statistical issues in voting rights cases, see, e.g., Symposium, *Statistical and Demographic Issues Underlying Voting Rights Cases*, 15 Evaluation Rev. 659 (1991); Stephen P. Klein et al., *Ecological Regression versus the Secret Ballot*, 31 Jurimetrics J. 393 (1991); James W. Loewen & Bernard

effect of the death penalty,[9] rate regulation,[10] and intellectual property.[11]

Multiple regression analysis can be a source of valuable scientific testimony in litigation. However, when inappropriately used, regression analysis can confuse important issues while having little, if any, probative value. In *EEOC v. Sears, Roebuck & Co.*,[12] in which Sears was charged with discrimination against women in hiring practices, the Seventh Circuit acknowledged that "[m]ultiple regression analyses, designed to determine the effect of several independent variables on a dependent variable, which in this case is hiring, are an accepted and common method of proving disparate treatment claims."[13] However, the court affirmed the district court's findings that the "E.E.O.C's regression analyses did not 'accurately reflect Sears' complex, nondiscriminatory decision-making processes'" and that the "'E.E.O.C.'s statistical analyses [were] so flawed that they lack[ed] any persuasive value.'"[14] Serious questions also have been raised about the use of multiple regression analysis in census undercount cases and in death penalty cases.[15]

Moreover, in interpreting the results of a multiple regression analysis, it is important to distinguish between correlation and causality. Two variables are correlated when the events associated with the variables occur more frequently

Grofman, *Recent Developments in Methods Used in Vote Dilution Litigation*, 21 Urb. Law. 589 (1989); Arthur Lupia & Kenneth McCue, *Why the 1980s Measures of Racially Polarized Voting Are Inadequate for the 1990s*, 12 Law & Pol'y 353 (1990).

9. *See, e.g.*, Gregg v. Georgia, 428 U.S. 153, 184–86 (1976). For critiques of the validity of the deterrence analysis, see National Research Council, Deterrence and Incapacitation: Estimating the Effects of Criminal Sanctions on Crime Rates (Alfred Blumstein et al. eds., 1978); Edward Leamer, *Let's Take the Con Out of Econometrics*, 73 Am. Econ. Rev. 31 (1983); Richard O. Lempert, *Desert and Deterrence: An Assessment of the Moral Bases of the Case for Capital Punishment*, 79 Mich. L. Rev. 1177 (1981); Hans Zeisel, *The Deterrent Effect of the Death Penalty: Facts v. Faith*, 1976 Sup. Ct. Rev. 317.

10. *See, e.g.*, Time Warner Entertainment Co. v. FCC, 56 F.3d 151 (D.C. Cir. 1995) (challenge to FCC's application of multiple regression analysis to set cable rates), *cert. denied*, 516 U.S. 1112 (1996).

11. *See* Polaroid Corp. v. Eastman Kodak Co., No. 76-1634-MA, 1990 WL 324105, at *29, *62–*63 (D. Mass. Oct. 12, 1990) (damages awarded because of patent infringement), *amended by* No. 76-1634-MA, 1991 WL 4087 (D. Mass. Jan. 11, 1991); Estate of Vane v. The Fair, Inc., 849 F.2d 186, 188 (5th Cir. 1988) (lost profits were due to copyright infringement), *cert. denied*, 488 U.S. 1008 (1989). The use of multiple regression analysis to estimate damages has been contemplated in a wide variety of contexts. *See, e.g.*, David Baldus et al., *Improving Judicial Oversight of Jury Damages Assessments: A Proposal for the Comparative Additur/Remittitur Review of Awards for Nonpecuniary Harms and Punitive Damages*, 80 Iowa L. Rev. 1109 (1995); Talcott J. Franklin, *Calculating Damages for Loss of Parental Nurture Through Multiple Regression Analysis*, 52 Wash. & Lee L. Rev. 271 (1997); Roger D. Blair & Amanda Kay Esquibel, *Yardstick Damages in Lost Profit Cases: An Econometric Approach*, 72 Denv. U. L. Rev. 113 (1994).

12. 839 F.2d 302 (7th Cir. 1988).

13. *Id.* at 324 n.22.

14. *Id.* at 348, 351 (quoting EEOC v. Sears, Roebuck & Co., 628 F. Supp. 1264, 1342, 1352 (N.D. Ill. 1986)). The district court commented specifically on the "severe limits of regression analysis in evaluating complex decision-making processes." 628 F. Supp. at 1350.

15. *See* David H. Kaye & David A. Freedman, Reference Guide on Statistics, § II.A.e, B.1, in this manual.

together than one would expect by chance. For example, if higher salaries are associated with a greater number of years of work experience, and lower salaries are associated with fewer years of experience, there is a positive correlation between salary and number of years of work experience. However, if higher salaries are associated with less experience, and lower salaries are associated with more experience, there is a negative correlation between the two variables.

A correlation between two variables does not imply that one event causes the second. Therefore, in making causal inferences, it is important to avoid spurious correlation.[16] Spurious correlation arises when two variables are closely related but bear no causal relationship because they are both caused by a third, unexamined variable. For example, there might be a negative correlation between the age of certain skilled employees of a computer company and their salaries. One should not conclude from this correlation that the employer has necessarily discriminated against the employees on the basis of their age. A third, unexamined variable, such as the level of the employees' technological skills, could explain differences in productivity and, consequently, differences in salary.[17] Or, consider a patent infringement case in which increased sales of an allegedly infringing product are associated with a lower price of the patented product. This correlation would be spurious if the two products have their own noncompetitive market niches and the lower price is due to a decline in the production costs of the patented product.

Pointing to the possibility of a spurious correlation should not be enough to dispose of a statistical argument, however. It may be appropriate to give little weight to such an argument absent a showing that the alleged spurious correlation is either qualitatively or quantitatively substantial. For example, a statistical showing of a relationship between technological skills and worker productivity might be required in the age discrimination example above.[18]

Causality cannot be inferred by data analysis alone; rather, one must infer that a causal relationship exists on the basis of an underlying causal theory that explains the relationship between the two variables. Even when an appropriate

16. *See* David H. Kaye & David A. Freedman, Reference Guide on Statistics, § V.B.3, in this manual.

17. *See, e.g.*, Sheehan v. Daily Racing Form Inc., 104 F.3d 940, 942 (7th Cir.) (rejecting plaintiff's age discrimination claim because statistical study showing correlation between age and retention ignored the "more than remote possibility that age was correlated with a legitimate job-related qualification"), *cert. denied*, 521 U.S. 1104 (1997).

18. *See, e.g.*, Allen v. Seidman, 881 F.2d 375 (7th Cir. 1989) (Judicial skepticism was raised when the defendant did not submit a logistic regression incorporating an omitted variable—the possession of a higher degree or special education; defendant's attack on statistical comparisons must also include an analysis that demonstrates that comparisons are flawed.). The appropriate requirements for the defendant's showing of spurious correlation could, in general, depend on the discovery process. *See, e.g.*, Boykin v. Georgia Pac. Co., 706 F.2d 1384 (1983) (criticism of a plaintiff's analysis for not including omitted factors, when plaintiff considered all information on an application form, was inadequate).

theory has been identified, causality can never be inferred directly. One must also look for empirical evidence that there is a causal relationship. Conversely, the fact that two variables are correlated does not guarantee the existence of a relationship; it could be that the model—a characterization of the underlying causal theory—does not reflect the correct interplay among the explanatory variables. In fact, the absence of correlation does not guarantee that a causal relationship does not exist. Lack of correlation could occur if (1) there are insufficient data; (2) the data are measured inaccurately; (3) the data do not allow multiple causal relationships to be sorted out; or (4) the model is specified wrongly because of the omission of a variable or variables that are related to the variable of interest.

There is a tension between any attempt to reach conclusions with near certainty and the inherently probabilistic nature of multiple regression analysis. In general, statistical analysis involves the formal expression of uncertainty in terms of probabilities. The reality that statistical analysis generates probabilities that there are relationships should not be seen in itself as an argument against the use of statistical evidence. The only alternative might be to use less reliable anecdotal evidence.

This reference guide addresses a number of procedural and methodological issues that are relevant in considering the admissibility of, and weight to be accorded to, the findings of multiple regression analyses. It also suggests some standards of reporting and analysis that an expert presenting multiple regression analyses might be expected to meet. Section II discusses research design—how the multiple regression framework can be used to sort out alternative theories about a case. Section III concentrates on the interpretation of the multiple regression results, from both a statistical and practical point of view. Section IV briefly discusses the qualifications of experts. Section V emphasizes procedural aspects associated with use of the data underlying regression analyses. Finally, the Appendix delves into the multiple regression framework in further detail; it also contains a number of specific examples that illustrate the application of the technique.

II. Research Design: Model Specification

Multiple regression allows the testifying economist or other expert to choose among alternative theories or hypotheses and assists the expert in distinguishing correlations between variables that are plainly spurious from those that may reflect valid relationships.

A. *What Is the Specific Question That Is Under Investigation by the Expert?*

Research begins with a clear formulation of a research question. The data to be collected and analyzed must relate directly to this question; otherwise, appropriate inferences cannot be drawn from the statistical analysis. For example, if the question at issue in a patent infringement case is what price the plaintiff's product would have been but for the sale of the defendant's infringing product, sufficient data must be available to allow the expert to account statistically for the important factors that determine the price of the product.

B. *What Model Should Be Used to Evaluate the Question at Issue?*

Model specification involves several steps, each of which is fundamental to the success of the research effort. Ideally, a multiple regression analysis builds on a theory that describes the variables to be included in the study. For example, the theory of labor markets might lead one to expect salaries in an industry to be related to workers' experience and the productivity of workers' jobs. A belief that there is job discrimination would lead one to add a variable or variables reflecting discrimination.

Models are often characterized in terms of parameters—numerical characteristics of the model. In the labor market example, one parameter might reflect the increase in salary associated with each additional year of job experience. Multiple regression uses a sample, or a selection of data, from the population (all the units of interest) to obtain estimates of the values of the parameters of the model. An estimate associated with a particular explanatory variable is an estimated regression coefficient.

Failure to develop the proper theory, failure to choose the appropriate variables, or failure to choose the correct form of the model can bias substantially the statistical results, that is, create a systematic tendency for an estimate of a model parameter to be too high or too low.

1. *Choosing the Dependent Variable*

The variable to be explained, the dependent variable, should be the appropriate variable for analyzing the question at issue.[19] Suppose, for example, that pay

19. In multiple regression analysis, the dependent variable is usually a continuous variable that takes on a range of numerical values. When the dependent variable is categorical, taking on only two or three values, modified forms of multiple regression, such as probit analysis or logit analysis, are appropriate. For an example of the use of the latter, see *EEOC v. Sears, Roebuck & Co.*, 839 F.2d 302, 325 (7th Cir. 1988) (EEOC used logit analysis to measure the impact of variables, such as age, education, job-type experience, and product-line experience, on the female percentage of commission hires). *See also* David H. Kaye & David A. Freedman, Reference Guide on Statistics § V, in this manual.

discrimination among hourly workers is a concern. One choice for the dependent variable is the hourly wage rate of the employees; another choice is the annual salary. The distinction is important, because annual salary differences may be due in part to differences in hours worked. If the number of hours worked is the product of worker preferences and not discrimination, the hourly wage is a good choice. If the number of hours is related to the alleged discrimination, annual salary is the more appropriate dependent variable to choose.[20]

2. Choosing the Explanatory Variable That Is Relevant to the Question at Issue

The explanatory variable that allows the evaluation of alternative hypotheses must be chosen appropriately. Thus, in a discrimination case, the variable of interest may be the race or sex of the individual. In an antitrust case, it may be a variable that takes on the value 1 to reflect the presence of the alleged anticompetitive behavior and the value 0 otherwise.[21]

3. Choosing the Additional Explanatory Variables

An attempt should be made to identify additional known or hypothesized explanatory variables, some of which are measurable and may support alternative substantive hypotheses that can be accounted for by the regression analysis. Thus, in a discrimination case, a measure of the skills of the workers may provide an alternative explanation—lower salaries may have been the result of inadequate skills.[22]

20. In job systems in which annual salaries are tied to grade or step levels, the annual salary corresponding to the job position could be more appropriate.

21. Explanatory variables may vary by type, which will affect the interpretation of the regression results. Thus, some variables may be continuous and others may be categorical.

22. In *Ottaviani v. State University of New York*, 679 F. Supp. 288, 306–08 (S.D.N.Y. 1988), *aff'd*, 875 F.2d 365 (2d Cir. 1989), *cert. denied*, 493 U.S. 1021 (1990), the court ruled (in the liability phase of the trial) that the university showed there was no discrimination in either placement into initial rank or promotions between ranks, so rank was a proper variable in multiple regression analysis to determine whether women faculty members were treated differently from men.

However, in *Trout v. Garrett*, 780 F. Supp. 1396, 1414 (D.D.C. 1991), the court ruled (in the damage phase of the trial) that the extent of civilian employees' prehire work experience was not an appropriate variable in a regression analysis to compute back pay in employment discrimination. According to the court, including the prehire level would have resulted in a finding of no sex discrimination, despite a contrary conclusion in the liability phase of the action. *Id. See also* Stuart v. Roache, 951 F.2d 446 (1st Cir. 1991) (allowing only three years of seniority to be considered as the result of prior discrimination), *cert. denied*, 504 U.S. 913 (1992). Whether a particular variable reflects "legitimate" considerations or itself reflects or incorporates illegitimate biases is a recurring theme in discrimination cases. *See, e.g.,* Smith v. Virginia Commonwealth Univ., 84 F.3d 672, 677 (4th Cir. 1996) (en banc) (suggesting that whether "performance factors" should have been included in a regression analysis was a question of material fact); *id.* at 681–82 (Luttig, J., concurring in part) (suggesting that the regression analysis' failure to include "performance factors" rendered it so incomplete as to be inadmissible); *id.* at 690–91 (Michael, J., dissenting) (suggesting that the regression analysis properly excluded "performance factors"); *see also* Diehl v. Xerox Corp., 933 F. Supp. 1157, 1168 (W.D.N.Y. 1996).

Not all possible variables that might influence the dependent variable can be included if the analysis is to be successful; some cannot be measured, and others may make little difference.[23] If a preliminary analysis shows the unexplained portion of the multiple regression to be unacceptably high, the expert may seek to discover whether some previously undetected variable is missing from the analysis.[24]

Failure to include a major explanatory variable that is correlated with the variable of interest in a regression model may cause an included variable to be credited with an effect that actually is caused by the excluded variable.[25] In general, omitted variables that are correlated with the dependent variable reduce the probative value of the regression analysis.[26] This may lead to inferences made from regression analyses that do not assist the trier of fact.[27]

Omitting variables that are not correlated with the variable of interest is, in general, less of a concern, since the parameter that measures the effect of the variable of interest on the dependent variable is estimated without bias. Sup-

23. The summary effect of the excluded variables shows up as a random error term in the regression model, as does any modeling error. *See infra* the Appendix for details. *But see* David W. Peterson, *Reference Guide on Multiple Regression*, 36 Jurimetrics J. 213, 214 n.2 (1996) (review essay) (asserting that "the presumption that the combined effect of the explanatory variables omitted from the model are uncorrelated with the included explanatory variables" is "a knife-edge condition . . . not likely to occur").

24. A very low *R*-square (R^2) is one indication of an unexplained portion of the multiple regression model that is unacceptably high. However, the inference that one makes from a particular value of R^2 will depend, of necessity, on the context of the particular issues under study and the particular data set that is being analyzed. For reasons discussed in the Appendix, a low R^2 does not necessarily imply a poor model (and vice versa).

25. Technically, the omission of explanatory variables that are correlated with the variable of interest can cause biased estimates of regression parameters.

26. The importance of the effect depends on the strength of the relationship between the omitted variable and the dependent variable, and the strength of the correlation between the omitted variable and the explanatory variables of interest.

27. *See* Bazemore v. Friday, 751 F.2d 662, 671–72 (4th Cir. 1984) (upholding the district court's refusal to accept a multiple regression analysis as proof of discrimination by a preponderance of the evidence, the court of appeals stated that, although the regression used four variable factors (race, education, tenure, and job title), the failure to use other factors, including pay increases which varied by county, precluded their introduction into evidence), *aff'd in part, vacated in part*, 478 U.S. 385 (1986).

Note, however, that in *Sobel v. Yeshiva University*, 839 F.2d 18, 33, 34 (2d Cir. 1988), *cert. denied*, 490 U.S. 1105 (1989), the court made clear that "a [Title VII] defendant challenging the validity of a multiple regression analysis [has] to make a showing that the factors it contends ought to have been included would weaken the showing of salary disparity made by the analysis," by making a specific attack and "a showing of relevance for each particular variable it contends . . . ought to [be] includ[ed]" in the analysis, rather than by simply attacking the results of the plaintiffs' proof as inadequate for lack of a given variable. *See also* Smith v. Virginia Commonwealth Univ., 84 F.3d 672 (4th Cir. 1996) (en banc) (finding that whether certain variables should have been included in a regression analysis is a question of fact that precludes summary judgment).

Also, in *Bazemore v. Friday*, the Court, declaring that the Fourth Circuit's view of the evidentiary value of the regression analyses was plainly incorrect, stated that "[n]ormally, failure to include variables pose, for example, that the effect of a policy introduced by the courts to encourage husbands' payments of child support has been tested by randomly choosing some cases to be handled according to current court policies and other cases to be handled according to a new, more stringent policy. The effect of the new policy might be measured by a multiple regression using payment success as the dependent variable and a 0 or 1 explanatory variable (1 if the new program was applied; 0 if it was not). Failure to include an explanatory variable that reflected the age of the husbands involved in the program would not affect the court's evaluation of the new policy, since men of any given age are as likely to be affected by the old policy as they are the new policy. Randomly choosing the court's policy to be applied to each case has ensured that the omitted age variable is not correlated with the policy variable.

Bias caused by the omission of an important variable that is related to the included variables of interest can be a serious problem.[28] Nevertheless, it is possible for the expert to account for bias qualitatively if the expert has knowledge (even if not quantifiable) about the relationship between the omitted variable and the explanatory variable. Suppose, for example, that the plaintiff's expert in a sex discrimination pay case is unable to obtain quantifiable data that reflect the skills necessary for a job, and that, on average, women are more skillful than men. Suppose also that a regression analysis of the wage rate of employees (the dependent variable) on years of experience and a variable reflecting the sex of each employee (the explanatory variable) suggests that men are paid substantially more than women with the same experience. Because differences in skill levels have not been taken into account, the expert may conclude reasonably that the wage difference measured by the regression is a conservative estimate of the true discriminatory wage difference.

The precision of the measure of the effect of a variable of interest on the dependent variable is also important.[29] In general, the more complete the explained relationship between the included explanatory variables and the dependent variable, the more precise the results. Note, however, that the inclusion of explanatory variables that are irrelevant (i.e., not correlated with the dependent variable) reduces the precision of the regression results. This can be a source of concern when the sample size is small, but it is not likely to be of great consequence when the sample size is large.

will affect the analysis' probativeness, not its admissibility. Importantly, it is clear that a regression analysis that includes less than 'all measurable variables' may serve to prove a plaintiff's case." 478 U.S. 385, 400 (1986) (footnote omitted).

28. *See also* David H. Kaye & David A. Freedman, Reference Guide on Statistics § V.B.3, in this manual.

29. A more precise estimate of a parameter is an estimate with a smaller standard error. See *infra* the Appendix for details.

4. Choosing the Functional Form of the Multiple Regression Model

Choosing the proper set of variables to be included in the multiple regression model does not complete the modeling exercise. The expert must also choose the proper form of the regression model. The most frequently selected form is the linear regression model (described in the Appendix). In this model, the magnitude of the change in the dependent variable associated with the change in any of the explanatory variables is the same no matter what the level of the explanatory variables. For example, one additional year of experience might add $5,000 to salary, irrespective of the previous experience of the employee.

In some instances, however, there may be reason to believe that changes in explanatory variables will have differential effects on the dependent variable as the values of the explanatory variables change. In these instances, the expert should consider the use of a nonlinear model. Failure to account for nonlinearities can lead to either overstatement or understatement of the effect of a change in the value of an explanatory variable on the dependent variable.

One particular type of nonlinearity involves the interaction among several variables. An interaction variable is the product of two other variables that are included in the multiple regression model. The interaction variable allows the expert to take into account the possibility that the effect of a change in one variable on the dependent variable may change as the level of another explanatory variable changes. For example, in a salary discrimination case, the inclusion of a term that interacts a variable measuring experience with a variable representing the sex of the employee (1 if a female employee, 0 if a male employee) allows the expert to test whether the sex differential varies with the level of experience. A significant negative estimate of the parameter associated with the sex variable suggests that inexperienced women are discriminated against, whereas a significant negative estimate of the interaction parameter suggests that the extent of discrimination increases with experience.[30]

Note that insignificant coefficients in a model with interactions may suggest a lack of discrimination, whereas a model without interactions may suggest the contrary. It is especially important to account for the interactive nature of the discrimination; failure to do so may lead to false conclusions concerning discrimination.

30. For further details concerning interactions, see *infra* the Appendix. Note that in *Ottaviani v. State University of New York*, 875 F.2d 365, 367 (2d Cir. 1989), *cert. denied*, 493 U.S. 1021 (1990), the defendant relied on a regression model in which a dummy variable reflecting gender appeared as an explanatory variable. The female plaintiff, however, used an alternative approach in which a regression model was developed for men only (the alleged protected group). The salaries of women predicted by this equation were then compared with the actual salaries; a positive difference would, according to the plaintiff, provide evidence of discrimination. For an evaluation of the methodological advantages and disadvantages of this approach, see Joseph L. Gastwirth, *A Clarification of Some Statistical Issues in* Watson v. Fort Worth Bank and Trust, 29 Jurimetrics J. 267 (1989).

5. Choosing Multiple Regression as a Method of Analysis

There are many multivariate statistical techniques other than multiple regression that are useful in legal proceedings. Some statistical methods are appropriate when nonlinearities are important.[31] Others apply to models in which the dependent variable is discrete, rather than continuous.[32] Still others have been applied predominantly to respond to methodological concerns arising in the context of discrimination litigation.[33]

It is essential that a valid statistical method be applied to assist with the analysis in each legal proceeding. Therefore, the expert should be prepared to explain why any chosen method, including multiple regression, was more suitable than the alternatives.

III. Interpreting Multiple Regression Results

Multiple regression results can be interpreted in purely statistical terms, through the use of significance tests, or they can be interpreted in a more practical, nonstatistical manner. Although an evaluation of the practical significance of regression results is almost always relevant in the courtroom, tests of statistical significance are appropriate only in particular circumstances.

A. What Is the Practical, as Opposed to the Statistical, Significance of Regression Results?

Practical significance means that the magnitude of the effect being studied is not de minimis—it is sufficiently important substantively for the court to be concerned. For example, if the average wage rate is $10.00 per hour, a wage differential between men and women of $0.10 per hour is likely to be deemed practically insignificant because the differential represents only 1% ($0.10/$10.00) of

31. These techniques include, but are not limited to, piecewise linear regression, polynomial regression, maximum likelihood estimation of models with nonlinear functional relationships, and autoregressive and moving average time-series models. *See, e.g.*, Robert S. Pindyck & Daniel L. Rubinfeld, Econometric Models and Economic Forecasts 117–21, 136–37, 273–84, 463–601 (4th ed. 1998).

32. For a discussion of probit analysis and logit analysis, techniques that are useful in the analysis of qualitative choice, see *id.* at 248–81.

33. The correct model for use in salary discrimination suits is a subject of debate among labor economists. As a result, some have begun to evaluate alternative approaches, including urn models (Bruce Levin & Herbert Robbins, *Urn Models for Regression Analysis, with Applications to Employment Discrimination Studies*, Law & Contemp. Probs., Autumn 1983, at 247) and, as a means of correcting for measurement errors, reverse regression (Delores A. Conway & Harry V. Roberts, *Reverse Regression, Fairness, and Employment Discrimination*, 1 J. Bus. & Econ. Stat. 75 (1983)). *But see* Arthur S. Goldberger, *Redirecting Reverse Regressions*, 2 J. Bus. & Econ. Stat. 114 (1984); Arlene S. Ash, *The Perverse Logic of Reverse Regression*, *in* Statistical Methods in Discrimination Litigation 85 (D.H. Kaye & Mikel Aickin eds., 1986).

the average wage rate.[34] That same difference could be statistically significant, however, if a sufficiently large sample of men and women was studied.[35] The reason is that statistical significance is determined, in part, by the number of observations in the data set.

Other things being equal, the statistical significance of a regression coefficient increases as the sample size increases. Thus, a $1 per hour wage differential between men and women that was determined to be insignificantly different from zero with a sample of 20 men and women could be highly significant if the sample were increased to 200.

Often, results that are practically significant are also statistically significant.[36] However, it is possible with a large data set to find statistically significant coefficients that are practically insignificant. Similarly, it is also possible (especially when the sample size is small) to obtain results that are practically significant but statistically insignificant. Suppose, for example, that an expert undertakes a damages study in a patent infringement case and predicts "but-for sales"—what sales would have been had the infringement not occurred—using data that predate the period of alleged infringement. If data limitations are such that only three or four years of preinfringement sales are known, the difference between but-for sales and actual sales during the period of alleged infringement could be practically significant but statistically insignificant.

1. *When Should Statistical Tests Be Used?*

A test of a specific contention, a hypothesis test, often assists the court in determining whether a violation of the law has occurred in areas in which direct evidence is inaccessible or inconclusive. For example, an expert might use hypothesis tests in race and sex discrimination cases to determine the presence of a discriminatory effect.

34. There is no specific percentage threshold above which a result is practically significant. Practical significance must be evaluated in the context of a particular legal issue. *See also* David H. Kaye & David A. Freedman, Reference Guide on Statistics § IV.B.2, in this manual.

35. Practical significance also can apply to the overall credibility of the regression results. Thus, in *McCleskey v. Kemp*, 481 U.S. 279 (1987), coefficients on race variables were statistically significant, but the Court declined to find them legally or constitutionally significant.

36. In *Melani v. Board of Higher Education*, 561 F. Supp. 769, 774 (S.D.N.Y. 1983), a Title VII suit was brought against the City University of New York (CUNY) for allegedly discriminating against female instructional staff in the payment of salaries. One approach of the plaintiff's expert was to use multiple regression analysis. The coefficient on the variable that reflected the sex of the employee was approximately $1,800 when all years of data were included. Practically (in terms of average wages at the time) and statistically (in terms of a 5% significance test), this result was significant. Thus, the court stated that "[p]laintiffs have produced statistically *significant* evidence that women hired as CUNY instructional staff since 1972 received *substantially* lower salaries than similarly qualified men." *Id.* at 781 (emphasis added). For a related analysis involving multiple comparison, see *Csicseri v. Bowsher*, 862 F. Supp. 547, 572 (D.D.C. 1994) (noting that plaintiff's expert found "statistically significant instances of

Statistical evidence alone never can prove with absolute certainty the worth of any substantive theory. However, by providing evidence contrary to the view that a particular form of discrimination has not occurred, for example, the multiple regression approach can aid the trier of fact in assessing the likelihood that discrimination has occurred.[37]

Tests of hypotheses are appropriate in a cross-section analysis, in which the data underlying the regression study have been chosen as a sample of a population at a particular point in time, and in a time-series analysis, in which the data being evaluated cover a number of time periods. In either analysis, the expert may want to evaluate a specific hypothesis, usually relating to a question of liability or to the determination of whether there is measurable impact of an alleged violation. Thus, in a sex discrimination case, an expert may want to evaluate a null hypothesis of no discrimination against the alternative hypothesis that discrimination takes a particular form.[38] Alternatively, in an antitrust damages proceeding, the expert may want to test a null hypothesis of no legal impact against the alternative hypothesis that there was an impact. In either type of case, it is important to realize that rejection of the null hypothesis does not in itself prove legal liability. It is possible to reject the null hypothesis and believe that an alternative explanation other than one involving legal liability accounts for the results.[39]

Often, the null hypothesis is stated in terms of a particular regression coefficient being equal to 0. For example, in a wage discrimination case, the null hypothesis would be that there is no wage difference between sexes. If a negative difference is observed (meaning that women are found to earn less than men, after the expert has controlled statistically for legitimate alternative explanations), the difference is evaluated as to its statistical significance using the *t*-test.[40] The *t*-test uses the *t*-statistic to evaluate the hypothesis that a model parameter takes on a particular value, usually 0.

discrimination" in 2 of 37 statistical comparisons, but suggesting that "2 of 37 amounts to roughly 5% and is hardly indicative of a pattern of discrimination"), *aff'd*, 67 F.3d 972 (D.C. Cir. 1995).

37. *See* International Bhd. of Teamsters v. United States, 431 U.S. 324 (1977) (the Court inferred discrimination from overwhelming statistical evidence by a preponderance of the evidence).

38. Tests are also appropriate when comparing the outcomes of a set of employer decisions with those that would have been obtained had the employer chosen differently from among the available options.

39. *See* David H. Kaye & David A. Freedman, Reference Guide on Statistics § IV.C.5, in this manual.

40. The *t*-test is strictly valid only if a number of important assumptions hold. However, for many regression models, the test is approximately valid if the sample size is sufficiently large. See *infra* the Appendix for a more complete discussion of the assumptions underlying multiple regression.

2. *What Is the Appropriate Level of Statistical Significance?*

In most scientific work, the level of statistical significance required to reject the null hypothesis (i.e., to obtain a statistically significant result) is set conventionally at .05, or 5%.[41] The significance level measures the probability that the null hypothesis will be rejected incorrectly, assuming that the null hypothesis is true. In general, the lower the percentage required for statistical significance, the more difficult it is to reject the null hypothesis; therefore, the lower the probability that one will err in doing so. Although the 5% criterion is typical, reporting of more stringent 1% significance tests or less stringent 10% tests can also provide useful information.

In doing a statistical test, it is useful to compute an observed significance level, or *p*-value. The *p*-value associated with the null hypothesis that a regression coefficient is 0 is the probability that a coefficient of this magnitude or larger could have occurred by chance if the null hypothesis were true. If the *p*-value were less than or equal to 5%, the expert would reject the null hypothesis in favor of the alternative hypothesis; if the *p*-value were greater than 5%, the expert would fail to reject the null hypothesis.[42]

3. *Should Statistical Tests Be One-Tailed or Two-Tailed?*

When the expert evaluates the null hypothesis that a variable of interest has no association with a dependent variable against the alternative hypothesis that there is an association, a two-tailed test, which allows for the effect to be either positive or negative, is usually appropriate. A one-tailed test would usually be applied when the expert believes, perhaps on the basis of other direct evidence presented at trial, that the alternative hypothesis is either positive or negative, but not both. For example, an expert might use a one-tailed test in a patent infringement case if he or she strongly believes that the effect of the alleged infringement on the price of the infringed product was either zero or negative. (The sales of the infringing product competed with the sales of the infringed product, thereby lowering the price.)

41. *See, e.g.*, Palmer v. Shultz, 815 F.2d 84, 92 (D.C. Cir. 1987) ("'the .05 level of significance . . . [is] certainly sufficient to support an inference of discrimination'" (quoting Segar v. Smith, 738 F.2d 1249, 1283 (D.C. Cir. 1984), *cert. denied*, 471 U.S. 1115 (1985))).

42. The use of 1%, 5%, and, sometimes, 10% levels for determining statistical significance remains a subject of debate. One might argue, for example, that when regression analysis is used in a price-fixing antitrust case to test a relatively specific alternative to the null hypothesis (e.g., price-fixing), a somewhat lower level of confidence (a higher level of significance, such as 10%) might be appropriate. Otherwise, when the alternative to the null hypothesis is less specific, such as the rather vague alternative of "effect" (e.g., the price increase is caused by the increased cost of production, increased demand, a sharp increase in advertising, or price-fixing), a high level of confidence (associated with a low significance level, such as 1%) may be appropriate. *See, e.g.*, Vuyanich v. Republic Nat'l Bank, 505 F. Supp. 224, 272 (N.D. Tex. 1980) (noting the "arbitrary nature of the adoption of the 5% level of [statistical] significance" to be required in a legal context).

Because using a one-tailed test produces p-values that are one-half the size of p-values using a two-tailed test, the choice of a one-tailed test makes it easier for the expert to reject a null hypothesis. Correspondingly, the choice of a two-tailed test makes null hypothesis rejection less likely. Since there is some arbitrariness involved in the choice of an alternative hypothesis, courts should avoid relying solely on sharply defined statistical tests.[43] Reporting the p-value or a confidence interval should be encouraged, since it conveys useful information to the court, whether or not a null hypothesis is rejected.

B. Are the Regression Results Robust?

The issue of robustness—whether regression results are sensitive to slight modifications in assumptions (e.g., that the data are measured accurately)—is of vital importance. If the assumptions of the regression model are valid, standard statistical tests can be applied. However, when the assumptions of the model are violated, standard tests can overstate or understate the significance of the results.

The violation of an assumption does not necessarily invalidate a regression analysis, however. In some instances in which the assumptions of multiple regression analysis fail, there are other statistical methods that are appropriate. Consequently, experts should be encouraged to provide additional information that goes to the issue of whether regression assumptions are valid, and if they are not valid, the extent to which the regression results are robust. The following questions highlight some of the more important assumptions of regression analysis.

1. What Evidence Exists That the Explanatory Variable Causes Changes in the Dependent Variable?

In the multiple regression framework, the expert often assumes that changes in explanatory variables affect the dependent variable, but changes in the dependent variable do not affect the explanatory variables—that is, there is no feedback.[44] In making this assumption, the expert draws the conclusion that a correlation between an explanatory variable and the dependent variable is due to the effect of the former on the latter and not vice versa. Were the assumption not valid, spurious correlation might cause the expert and the trier of fact to reach the wrong conclusion.[45]

43. Courts have shown a preference for two-tailed tests. *See, e.g.,* Palmer v. Shultz, 815 F.2d 84, 95–96 (D.C. Cir. 1987) (rejecting the use of one-tailed tests, the court found that because some appellants were claiming overselection for certain jobs, a two-tailed test was more appropriate in Title VII cases). *See also* David H. Kaye & David A. Freedman, Reference Guide on Statistics § IV.C.2, in this manual; Csicseri v. Bowsher, 862 F. Supp. 547, 565 (D.D.C. 1994) (finding that although a one-tailed test is "not without merit," a two-tailed test is preferable).

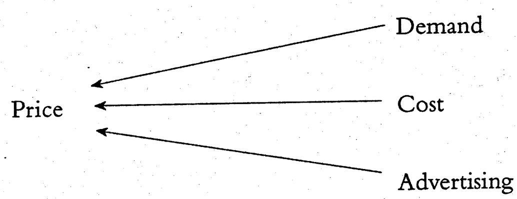
44. When both effects occur at the same time, this is described as "simultaneity."

45. The assumption of no feedback is especially important in litigation, because it is possible for the defendant (if responsible, for example, for price-fixing or discrimination) to affect the values of the explanatory variables and thus to bias the usual statistical tests that are used in multiple regression.

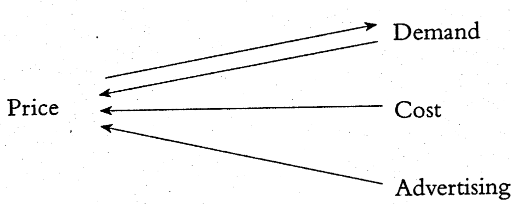
Figure 1 illustrates this point. In Figure 1(a), the dependent variable, Price, is explained through a multiple regression framework by three explanatory variables, Demand, Cost, and Advertising, with no feedback. In Figure 1(b), there is feedback, since Price affects Demand, and Demand, Cost, and Advertising affect Price. Cost and Advertising, however, are not affected by Price. As a general rule, there is no direct statistical test for determining the direction of causality; rather, the expert, when asked, should be prepared to defend his or her assumption based on an understanding of the underlying behavior of the firms or individuals involved.

Figure 1. Feedback

1(a). No Feedback



1(b). Feedback



Although there is no single approach that is entirely suitable for estimating models when the dependent variable affects one or more explanatory variables, one possibility is for the expert to drop the questionable variable from the regression to determine whether the variable's exclusion makes a difference. If it does not, the issue becomes moot. Another approach is for the expert to expand the multiple regression model by adding one or more equations that explain the relationship between the explanatory variable in question and the dependent variable.

Suppose, for example, that in a salary-based sex discrimination suit the defendant's expert considers employer-evaluated test scores to be an appropriate explanatory variable for the dependent variable, salary. If the plaintiff were to provide information that the employer adjusted the test scores in a manner that penalized women, the assumption that salaries were determined by test scores and not that test scores were affected by salaries might be invalid. If it is clearly inappropriate, the test-score variable should be removed from consideration. Alternatively, the information about the employer's use of the test scores could be translated into a second equation in which a new dependent variable, test score, is related to workers' salary and sex. A test of the hypothesis that salary and sex affect test scores would provide a suitable test of the absence of feedback.

2. To What Extent Are the Explanatory Variables Correlated with Each Other?

It is essential in multiple regression analysis that the explanatory variable of interest not be correlated perfectly with one or more of the other explanatory variables. If there were perfect correlation between two variables, the expert could not separate out the effect of the variable of interest on the dependent variable from the effect of the other variable. Suppose, for example, that in a sex discrimination suit a particular form of job experience is determined to be a valid source of high wages. If all men had the requisite job experience and all women did not, it would be impossible to tell whether wage differentials between men and women were due to sex discrimination or differences in experience.

When two or more explanatory variables are correlated perfectly—that is, when there is perfect collinearity—one cannot estimate the regression parameters. When two or more variables are highly, but not perfectly, correlated—that is, when there is multicollinearity—the regression can be estimated, but some concerns remain. The greater the multicollinearity between two variables, the less precise are the estimates of individual regression parameters (even though there is no problem in estimating the joint influence of the two variables and all other regression parameters).

Fortunately, the reported regression statistics take into account any multicollinearity that might be present.[46] It is important to note as a corollary, however, that a failure to find a strong relationship between a variable of interest and a dependent variable need not imply that there is no relationship.[47] A relatively

46. *See* Denny v. Westfield State College, 669 F. Supp. 1146, 1149 (D. Mass. 1987) (The court accepted the testimony of one expert that "the presence of multicollinearity would merely tend to *overestimate* the amount of error associated with the estimate . . . . In other words, *p*-values will be artificially higher than they would be if there were no multicollinearity present.") (emphasis added).

47. If an explanatory variable of concern and another explanatory variable are highly correlated, dropping the second variable from the regression can be instructive. If the coefficient on the explanatory variable of concern becomes significant, a relationship between the dependent variable and the explanatory variable of concern is suggested.

small sample, or even a large sample with substantial multicollinearity, may not provide sufficient information for the expert to determine whether there is a relationship.

3. To What Extent Are Individual Errors in the Regression Model Independent?

If the expert calculated the parameters of a multiple regression model using as data the entire population, the estimates might still measure the model's population parameters with error. Errors can arise for a number of reasons, including (1) the failure of the model to include the appropriate explanatory variables; (2) the failure of the model to reflect any nonlinearities that might be present; and (3) the inclusion of inappropriate variables in the model. (Of course, further sources of error will arise if a sample, or subset, of the population is used to estimate the regression parameters.)

It is useful to view the cumulative effect of all of these sources of modeling error as being represented by an additional variable, the error term, in the multiple regression model. An important assumption in multiple regression analysis is that the error term and each of the explanatory variables are independent of each other. (If the error term and an explanatory variable are independent, they are not correlated with each other.) To the extent this is true, the expert can estimate the parameters of the model without bias; the magnitude of the error term will affect the precision with which a model parameter is estimated, but will not cause that estimate to be consistently too high or too low.

The assumption of independence may be inappropriate in a number of circumstances. In some instances, failure of the assumption makes multiple regression analysis an unsuitable statistical technique; in other instances, modifications or adjustments within the regression framework can be made to accommodate the failure.

The independence assumption may fail, for example, in a study of individual behavior over time, in which an unusually high error value in one time period is likely to lead to an unusually high value in the next time period. For example, if an economic forecaster underpredicted this year's Gross National Product, he or she is likely to underpredict next year's as well; the factor that caused the prediction error (e.g., an incorrect assumption about Federal Reserve policy) is likely to be a source of error in the future.

Alternatively, the assumption of independence may fail in a study of a group of firms at a particular point in time, in which error terms for large firms are systematically higher than error terms for small firms. For example, an analysis of the profitability of firms may not accurately account for the importance of advertising as a source of increased sales and profits. To the extent that large firms advertise more than small firms, the regression errors would be large for the large firms and small for the small firms.

In some instances, there are statistical tests that are appropriate for evaluating the independence assumption.[48] If the assumption has failed, the expert should ask first whether the source of the lack of independence is the omission of an important explanatory variable from the regression. If so, that variable should be included when possible, or the potential effect of its omission should be estimated when inclusion is not possible. If there is no important missing explanatory variable, the expert should apply one or more procedures that modify the standard multiple regression technique to allow for more accurate estimates of the regression parameters.[49]

4. *To What Extent Are the Regression Results Sensitive to Individual Data Points?*

Estimated regression coefficients can be highly sensitive to particular data points. Suppose, for example, that one data point deviates greatly from its expected value, as indicated by the regression equation, whereas the remaining data points show little deviation. It would not be unusual in this situation for the coefficients in a multiple regression to change substantially if the data point in question were removed from the sample.

Evaluating the robustness of multiple regression results is a complex endeavor. Consequently, there is no agreed-on set of tests for robustness which analysts should apply. In general, it is important to explore the reasons for unusual data points. If the source is an error in recording data, the appropriate corrections can be made. If all the unusual data points have certain characteristics in common (e.g., they all are associated with a supervisor who consistently gives high ratings in an equal-pay case), the regression model should be modified appropriately.

One generally useful diagnostic technique is to determine to what extent the estimated parameter changes as each data point in the regression analysis is dropped from the sample. An influential data point—a point that causes the estimated parameter to change substantially—should be studied further to determine whether mistakes were made in the use of the data or whether important explanatory variables were omitted.[50]

48. In a time-series analysis, the correlation of error values over time, the serial correlation, can be tested (in most instances) using a Durbin-Watson test. The possibility that some error terms are consistently high in magnitude and others are systematically low, heteroscedasticity, can also be tested in a number of ways. *See, e.g.*, Pindyck & Rubinfeld, *supra* note 31, at 146–59.

49. When serial correlation is present, a number of closely related statistical methods are appropriate, including generalized differencing (a type of generalized least-squares) and maximum-likelihood estimation. When heteroscedasticity is the problem, weighted least-squares and maximum-likelihood estimation are appropriate. *See, e.g.*, *id.* All these techniques are readily available in a number of statistical computer packages. They also allow one to perform the appropriate statistical tests of the significance of the regression coefficients.

50. A more complete and formal treatment of the robustness issue appears in David A. Belsley et al., Regression Diagnostics: Identifying Influential Data and Sources of Collinearity 229–44 (1980). For a

5. To What Extent Are the Data Subject to Measurement Error?

In multiple regression analysis it is assumed that variables are measured accurately.[51] If there are measurement errors in the dependent variable, estimates of regression parameters will be less accurate, though they will not necessarily be biased. However, if one or more independent variables are measured with error, the corresponding parameter estimates are likely to be biased, typically toward zero.[52]

To understand why, suppose that the dependent variable, salary, is measured without error, and the explanatory variable, experience, is subject to measurement error. (Seniority or years of experience should be accurate, but the type of experience is subject to error, since applicants may overstate previous job responsibilities.) As the measurement error increases, the estimated parameter associated with the experience variable will tend toward 0, that is, eventually, there will be no relationship between salary and experience.

It is important for any source of measurement error to be carefully evaluated. In some circumstances, little can be done to correct the measurement-error problem; the regression results must be interpreted in that light. In other circumstances, however, the expert can correct measurement error by finding a new, more reliable data source. Finally, alternative estimation techniques (using related variables that are measured without error) can be applied to remedy the measurement-error problem in some situations.[53]

IV. The Expert

Multiple regression analysis is taught to students in extremely diverse fields, including statistics, economics, political science, sociology, psychology, anthropology, public health, and history. Consequently, any individual with substantial training in and experience with multiple regression and other statistical methods may be qualified as an expert.[54] A doctoral degree in a discipline that teaches theoretical or applied statistics, such as economics, history, and psychology, usu-

useful discussion of the detection of outliers and the evaluation of influential data points, see R.D. Cook & S. Weisberg, *Residuals and Influence in Regression, in* Monographs on Statistics and Applied Probability (1982).

51. Inaccuracy can occur not only in the precision with which a particular variable is measured, but also in the precision with which the variable to be measured corresponds to the appropriate theoretical construct specified by the regression model.

52. Other coefficient estimates are likely to be biased as well.

53. *See, e.g.*, Pindyck & Rubinfeld, *supra* note 31, at 178–98 (discussion of instrumental variables estimation).

54. A proposed expert whose only statistical tool is regression analysis may not be able to judge when a statistical analysis should be based on an approach other than regression analysis.

ally signifies to other scientists that the proposed expert meets this preliminary test of the qualification process.

The decision to qualify an expert in regression analysis rests with the court. Clearly, the proposed expert should be able to demonstrate an understanding of the discipline. Publications relating to regression analysis in peer-reviewed journals, active memberships in related professional organizations, courses taught on regression methods, and practical experience with regression analysis can indicate a professional's expertise. However, the expert's background and experience with the specific issues and tools that are applicable to a particular case should also be considered during the qualification process.

V. Presentation of Statistical Evidence

The costs of evaluating statistical evidence can be reduced and the precision of that evidence increased if the discovery process is used effectively. In evaluating the admissibility of statistical evidence, courts should consider the following issues:[55]

1. Has the expert provided sufficient information to replicate the multiple regression analysis?
2. Are the methodological choices that the expert made reasonable, or are they arbitrary and unjustified?

A. What Disagreements Exist Regarding Data on Which the Analysis Is Based?

In general, a clear and comprehensive statement of the underlying research methodology is a requisite part of the discovery process. The expert should be encouraged to reveal both the nature of the experimentation carried out and the sensitivity of the results to the data and to the methodology. The following suggestions are useful requirements that can substantially improve the discovery process.

1. To the extent possible, the parties should be encouraged to agree to use a common database. Even if disagreement about the significance of the data remains, early agreement on a common database can help focus the discovery process on the important issues in the case.
2. A party that offers data to be used in statistical work, including multiple regression analysis, should be encouraged to provide the following to the other parties: (a) a hard copy of the data when available and manageable in size, along with the underlying sources; (b) computer disks or tapes on

55. *See also* David H. Kaye & David A. Freedman, Reference Guide on Statistics § I.C, in this manual.

which the data are recorded; (c) complete documentation of the disks or tapes; (d) computer programs that were used to generate the data (in hard copy, on a computer disk or tape, or both); and (e) documentation of such computer programs.

3. A party offering data should make available the personnel involved in the compilation of such data to answer the other parties' technical questions concerning the data and the methods of collection or compilation.
4. A party proposing to offer an expert's regression analysis at trial should ask the expert to fully disclose: (a) the database and its sources;[56] (b) the method of collecting the data; and (c) the methods of analysis. When possible, this disclosure should be made sufficiently in advance of trial so that the opposing party can consult its experts and prepare cross-examination. The court must decide on a case-by-case basis where to draw the disclosure line.
5. An opposing party should be given the opportunity to object to a database or to a proposed method of analysis of the database to be offered at trial. Objections may be to simple clerical errors or to more complex issues relating to the selection of data, the construction of variables, and, on occasion, the particular form of statistical analysis to be used. Whenever possible, these objections should be resolved before trial.
6. The parties should be encouraged to resolve differences as to the appropriateness and precision of the data to the extent possible by informal conference. The court should make an effort to resolve differences before trial.

B. What Database Information and Analytical Procedures Will Aid in Resolving Disputes over Statistical Studies?[57]

The following are suggested guidelines that experts should follow in presenting database information and analytical procedures. Following these guidelines can be helpful in resolving disputes over statistical studies.

1. The expert should state clearly the objectives of the study, as well as the time frame to which it applies and the statistical population to which the results are being projected.
2. The expert should report the units of observation (e.g., consumers, businesses, or employees).

56. These sources would include all variables used in the statistical analyses conducted by the expert, not simply those variables used in a final analysis on which the expert expects to rely.

57. For a more complete discussion of these requirements, see The Evolving Role of Statistical Assessments as Evidence in the Courts app. F at 256 (Stephen E. Fienberg ed., 1989) (Recommended Standards on Disclosure of Procedures Used for Statistical Studies to Collect Data Submitted in Evidence in Legal Cases).

3. The expert should clearly define each variable.
4. The expert should clearly identify the sample for which data are being studied,[58] as well as the method by which the sample was obtained.
5. The expert should reveal if there are missing data, whether caused by a lack of availability (e.g., in business data) or nonresponse (e.g., in survey data), and the method used to handle the missing data (e.g., deletion of observations).
6. The expert should report investigations that were made into errors associated with the choice of variables and assumptions underlying the regression model.
7. If samples were chosen randomly from a population (i.e., probability sampling procedures were used),[59] the expert should make a good-faith effort to provide an estimate of a sampling error, the measure of the difference between the sample estimate of a parameter (such as the mean of a dependent variable under study) and the (unknown) population parameter (the population mean of the variable).[60]
8. If probability sampling procedures were not used, the expert should report the set of procedures that were used to minimize sampling errors.

58. The sample information is important because it allows the expert to make inferences about the underlying population.

59. In probability sampling, each representative of the population has a known probability of being in the sample. Probability sampling is ideal because it is highly structured, and in principle, it can be replicated by others. Nonprobability sampling is less desirable because it is often subjective, relying to a large extent on the judgment of the expert.

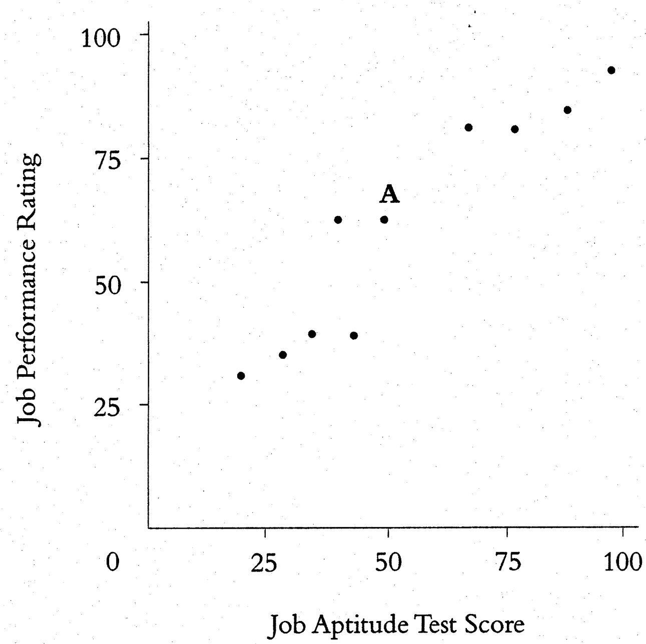
60. Sampling error is often reported in terms of standard errors or confidence intervals. See *infra* the Appendix for details.

Appendix: The Basics of Multiple Regression

I. Introduction

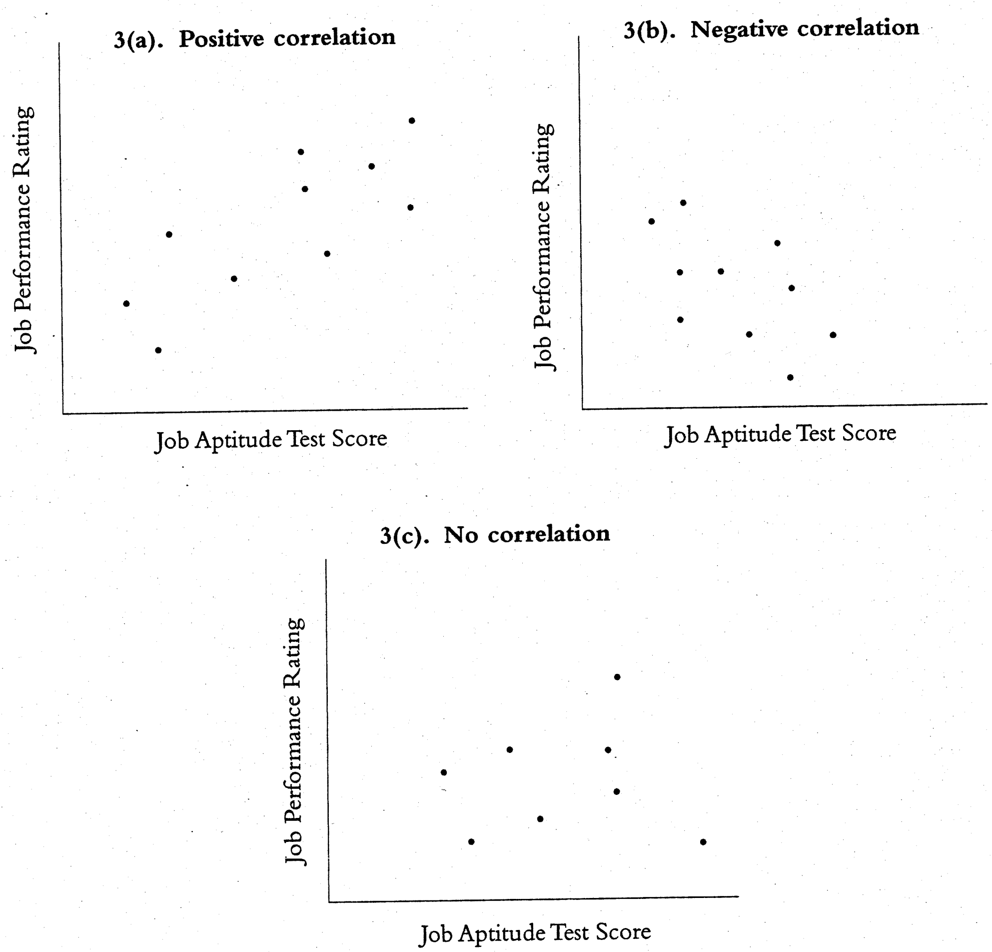
This appendix illustrates, through examples, the basics of multiple regression analysis in legal proceedings. Often, visual displays are used to describe the relationship between variables that are used in multiple regression analysis. Figure 2 is a scatterplot that relates scores on a job aptitude test (shown on the x-axis) and job performance ratings (shown on the y-axis). Each point on the scatterplot shows where a particular individual scored on the job aptitude test and how his or her job performance was rated. For example, the individual represented by Point A in Figure 2 scored 49 on the job aptitude test and had a job performance rating of 62.

Figure 2. Scatterplot



The relationship between two variables can be summarized by a correlation coefficient, which ranges in value from −1 (a perfect negative relationship) to +1 (a perfect positive relationship). Figure 3 depicts three possible relationships between the job aptitude variable and the job performance variable. In Figure 3(a), there is a positive correlation: In general, higher job performance ratings are associated with higher aptitude test scores, and lower job performance ratings are associated with lower aptitude test scores. In Figure 3(b), the correlation is negative: Higher job performance ratings are associated with lower aptitude test scores, and lower job performance ratings are associated with higher aptitude test scores. Positive and negative correlations can be relatively strong or relatively weak. If the relationship is sufficiently weak, there is effectively no correlation, as is illustrated in Figure 3(c).

Figure 3. Correlation



Multiple regression analysis goes beyond the calculation of correlations; it is a method in which a regression line is used to relate the average of one variable—the dependent variable—to the values of other explanatory variables. As a result, regression analysis can be used to predict the values of one variable using the values of others. For example, if average job performance ratings depend on aptitude test scores, regression analysis can use information about test scores to predict job performance.

A regression line is the best-fitting straight line through a set of points in a scatterplot. If there is only one explanatory variable, the straight line is defined by the equation

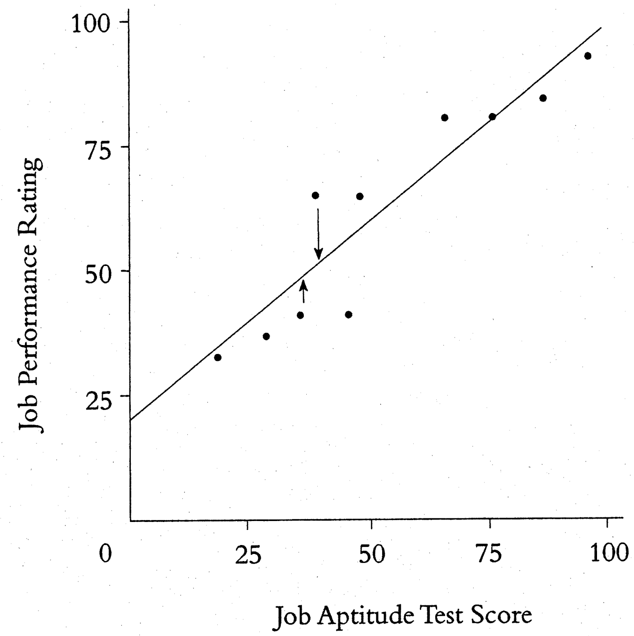
$$Y = a + bX \tag{1}$$

In the equation above, a is the intercept of the line with the y-axis when X equals 0, and b is the slope—the change in the dependent variable associated with a 1-unit change in the explanatory variable. In Figure 4, for example, when the aptitude test score is 0, the predicted (average) value of the job performance rating is the intercept, 18.4. Also, for each additional point on the test score, the job performance rating increases .73 units, which is given by the slope .73. Thus, the estimated regression line is

$$Y = 18.4 + .73X \tag{2}$$

The regression line typically is estimated using the standard method of least-squares, where the values of a and b are calculated so that the sum of the squared deviations of the points from the line are minimized. In this way, positive deviations and negative deviations of equal size are counted equally, and large deviations are counted more than small deviations. In Figure 4 the deviation lines are vertical because the equation is predicting job performance ratings from aptitude test scores, not aptitude test scores from job performance ratings.

Figure 4. Regression Line



The important variables that systematically might influence the dependent variable, and for which data can be obtained, typically should be included explicitly in a statistical model. All remaining influences, which should be small individually, but can be substantial in the aggregate, are included in an additional random error term.[61] Multiple regression is a procedure that separates the systematic effects (associated with the explanatory variables) from the random effects (associated with the error term) and also offers a method of assessing the success of the process.

II. Linear Regression Model

When there is an arbitrary number of explanatory variables, the linear regression model takes the following form:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k + \varepsilon \qquad (3)$$

where Y represents the dependent variable, such as the salary of an employee, and $X_1 \ldots X_k$ represent the explanatory variables (e.g., the experience of each

61. It is clearly advantageous for the random component of the regression relationship to be small relative to the variation in the dependent variable.

employee and his or her sex, coded as a 1 or 0, respectively). The error term, ε, represents the collective unobservable influence of any omitted variables. In a linear regression, each of the terms being added involves unknown parameters, $\beta_0, \beta_1, \ldots \beta_k$,[62] which are estimated by "fitting" the equation to the data using least-squares.

Most statisticians use the least-squares regression technique because of its simplicity and its desirable statistical properties. As a result, it also is used frequently in legal proceedings.

A. An Example

Suppose an expert wants to analyze the salaries of women and men at a large publishing house to discover whether a difference in salaries between employees with similar years of work experience provides evidence of discrimination.[63] To begin with the simplest case, Y, the salary in dollars per year, represents the dependent variable to be explained, and X_1 represents the explanatory variable—the number of years of experience of the employee. The regression model would be written

$$Y = \beta_0 + \beta_1 X_1 + \varepsilon \tag{4}$$

In equation (4), β_0 and β_1 are the parameters to be estimated from the data, and ε is the random error term. The parameter β_0 is the average salary of all employees with no experience. The parameter β_1 measures the average effect of an additional year of experience on the average salary of employees.

B. Regression Line

Once the parameters in a regression equation, such as equation (3), have been estimated, the fitted values for the dependent variable can be calculated. If we denote the estimated regression parameters, or regression coefficients, for the model in equation (3) by $b_0, b_1, \ldots b_k$, the fitted values for Y, denoted $\hat{Y}$, are given by

$$\hat{Y} = b_0 + b_1X_1 + b_2X_2 + \ldots b_kX_k \tag{5}$$

62. The variables themselves can appear in many different forms. For example, Y might represent the logarithm of an employee's salary, and X_1 might represent the logarithm of the employee's years of experience. The logarithmic representation is appropriate when Y increases exponentially as X increases—for each unit increase in X, the corresponding increase in Y becomes larger and larger. For example, if an expert were to graph the growth of the U.S. population (Y) over time (t), an equation of the form
$\log(Y) = \beta_0 + \beta_1\log(t)$ might be appropriate.

63. The regression results used in this example are based on data for 1,715 men and women, which were used by the defense in a sex discrimination case against the *New York Times* that was settled in 1978. Professor Orley Ashenfelter, of the Department of Economics, Princeton University, provided the data.

Figure 5 illustrates this for the example involving a single explanatory variable. The data are shown as a scatter of points; salary is on the vertical axis, and years of experience is on the horizontal axis. The estimated regression line is drawn through the data points. It is given by

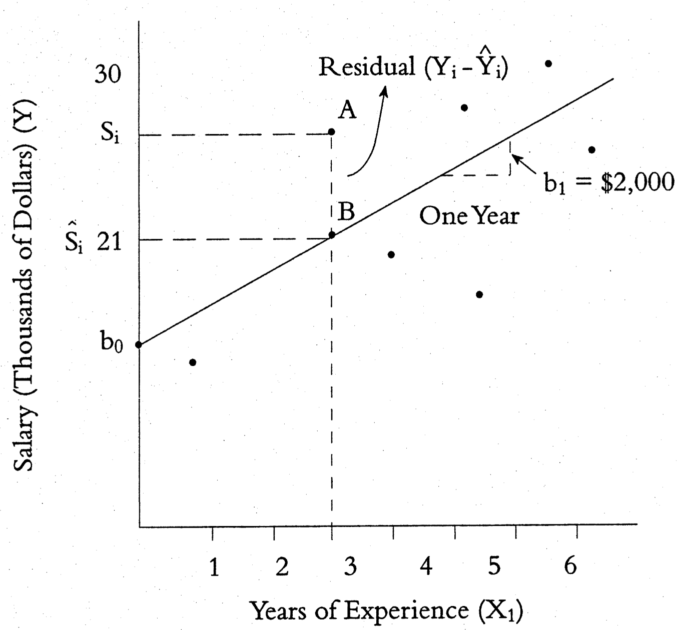
$$\hat{Y} = \$15{,}000 + \$2{,}000X_1 \qquad (6)$$

Thus, the fitted value for the salary associated with an individual's years of experience X_{1i} is given by

$$\hat{Y}_i = b_0 + b_1X_{1i} \text{ (at Point B).} \qquad (7)$$

The intercept of the straight line is the average value of the dependent variable when the explanatory variable or variables are equal to 0; the intercept b_0 is shown on the vertical axis in Figure 5. Similarly, the slope of the line measures the (average) change in the dependent variable associated with a unit increase in an explanatory variable; the slope b_1 also is shown. In equation (6), the intercept \$15,000 indicates that employees with no experience earn \$15,000 per year. The slope parameter implies that each year of experience adds \$2,000 to an "average" employee's salary.

Figure 5. Goodness-of-Fit



Now, suppose that the salary variable is related simply to the sex of the employee. The relevant indicator variable, often called a dummy variable, is X_2, which is equal to 1 if the employee is male, and 0 if the employee is female. Suppose the regression of salary Y on X_2 yields the following result: Y = \$30,449 + \$10,979X_2. The coefficient \$10,979 measures the difference between the average salary of men and the average salary of women.[64]

1. Regression Residuals

For each data point, the regression residual is the difference between the actual values and fitted values of the dependent variable. Suppose, for example, that we are studying an individual with three years of experience and a salary of \$27,000. According to the regression line in Figure 5, the average salary of an individual with three years of experience is \$21,000. Since the individual's salary is \$6,000 higher than the average salary, the residual (the individual's salary minus the average salary) is \$6,000. In general, the residual e associated with a data point, such as Point A in Figure 5, is given by $e = Y_i - \hat{Y}_i$. Each data point in the figure has a residual, which is the error made by the least-squares regression method for that individual.

2. Nonlinearities

Nonlinear models account for the possibility that the effect of an explanatory variable on the dependent variable may vary in magnitude as the level of the explanatory variable changes. One useful nonlinear model uses interactions among variables to produce this effect. For example, suppose that

$$S = \beta_1 + \beta_2\text{SEX} + \beta_3\text{EXP} + \beta_4(\text{EXP})(\text{SEX}) + \varepsilon \qquad (8)$$

where S is annual salary, SEX is equal to 1 for women and 0 for men, EXP represents years of job experience, and ε is a random error term. The coefficient β_2 measures the difference in average salary (across all experience levels) between men and women for employees with no experience. The coefficient β_3 measures the effect of experience on salary for men (when SEX = 0), and the coefficient β_4 measures the difference in the effect of experience on salary between men and women. It follows, for example, that the effect of one year of experience on salary for men is β_3, whereas the comparable effect for women is $\beta_3 + \beta_4$.[65]

64. To understand why, note that when X_2 equals 0, the average salary for women is \$30,449 + \$10,979 × 0 = \$30,449. Correspondingly, when X_2 equals 1, the average salary for men is \$30,449 + \$10,979 × 1 = \$41,428. The difference, \$41,428 – \$30,449, is \$10,979.

65. Estimating a regression in which there are interaction terms for all explanatory variables, as in equation (8), is essentially the same as estimating two separate regressions, one for men and one for women.

III. Interpreting Regression Results

To explain how regression results are interpreted, we can expand the earlier example associated with Figure 5 to consider the possibility of an additional explanatory variable—the square of the number of years of experience, X_3. The X_3 variable is designed to capture the fact that for most individuals, salaries increase with experience, but eventually salaries tend to level off. The estimated regression line using the third additional explanatory variable, as well as the first explanatory variable for years of experience (X_1) and the dummy variable for sex (X_2), is

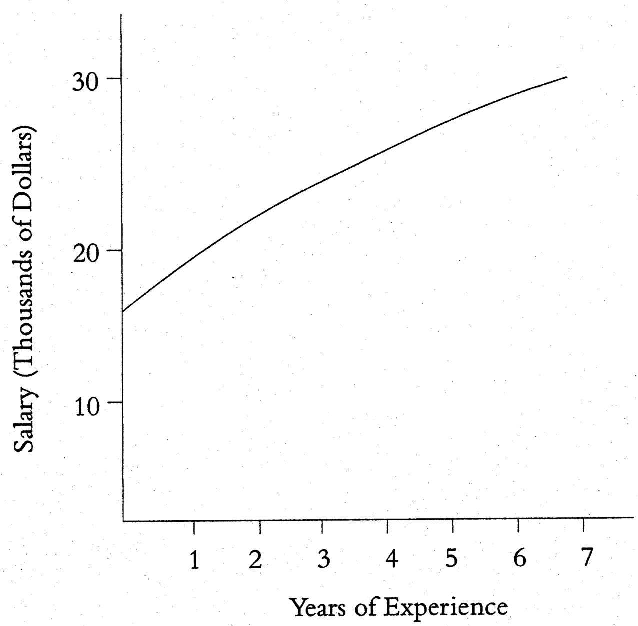
$$\hat{Y} = \$14{,}085 + \$2{,}323X_1 + \$1{,}675X_2 - \$36X_3 \qquad (9)$$

The importance of including relevant explanatory variables in a regression model is illustrated by the change in the regression results after the X_3 and X_1 variables are added. The coefficient on the variable X_2 measures the difference in the salaries of men and women while holding the effect of experience constant. The differential of $1,675 is substantially lower than the previously measured differential of $10,979. Clearly, failure to control for job experience in this example leads to an overstatement of the difference in salaries between men and women.

Now consider the interpretation of the explanatory variables for experience, X_1 and X_3. The positive sign on the X_1 coefficient shows that salary increases with experience. The negative sign on the X_3 coefficient indicates that the rate of salary increase decreases with experience. To determine the combined effect of the variables X_1 and X_3, some simple calculations can be made. For example, consider how the average salary of women ($X_2 = 0$) changes with the level of experience. As experience increases from 0 to 1 year, the average salary increases by $2,251, from $14,085 to $16,336. However, women with 2 years of experience earn only $2,179 more than women with 1 year of experience, and women with 3 years of experience earn only $2,127 more than women with 2 years. Furthermore, women with 7 years of experience earn $28,582 per year, which is only $1,855 more than the $26,727 earned by women with 6 years of experience.[66] Figure 6 illustrates the results; the regression line shown is for women's salaries; the corresponding line for men's salaries would be parallel and $1,675 higher.

66. These numbers can be calculated by substituting different values of X_1 and X_3 in equation (9).

Figure 6. Regression Slope



IV. Determining the Precision of the Regression Results

Least-squares regression provides not only parameter estimates that indicate the direction and magnitude of the effect of a change in the explanatory variable on the dependent variable, but also an estimate of the reliability of the parameter estimates and a measure of the overall goodness-of-fit of the regression model. Each of these factors is considered in turn.

A. Standard Errors of the Coefficients and t*-Statistics*

Estimates of the true but unknown parameters of a regression model are numbers that depend on the particular sample of observations under study. If a different sample were used, a different estimate would be calculated.[67] If the expert continued to collect more and more samples and generated additional estimates, as might happen when new data became available over time, the estimates of each parameter would follow a probability distribution (i.e., the expert could determine the percentage or frequency of the time that each estimate occurs). This probability distribution can be summarized by a mean and a measure of

67. The least-squares formula that generates the estimates is called the least-squares estimator, and its values vary from sample to sample.

dispersion around the mean, a standard deviation, which usually is referred to as the standard error of the coefficient, or the standard error (SE).[68]

Suppose, for example, that an expert is interested in estimating the average price paid for a gallon of unleaded gasoline by consumers in a particular geographic area of the United States at a particular point in time. The mean price for a sample of ten gas stations might be $1.25, while the mean for another sample might be $1.29, and the mean for a third, $1.21. On this basis, the expert also could calculate the overall mean price of gasoline to be $1.25 and the standard deviation to be $0.04.

Least-squares regression generalizes this result, by calculating means whose values depend on one or more explanatory variables. The standard error of a regression coefficient tells the expert how much parameter estimates are likely to vary from sample to sample. The greater the variation in parameter estimates from sample to sample, the larger the standard error and consequently the less reliable the regression results. Small standard errors imply results that are likely to be similar from sample to sample, whereas results with large standard errors show more variability.

Under appropriate assumptions, the least-squares estimators provide "best" determinations of the true underlying parameters.[69] In fact, least-squares has several desirable properties. First, least-squares estimators are unbiased. Intuitively, this means that if the regression were calculated over and over again with different samples, the average of the many estimates obtained for each coefficient would be the true parameter. Second, least-squares estimators are consistent; if the sample were very large, the estimates obtained would come close to the true parameters. Third, least-squares is efficient, in that its estimators have the smallest variance among all (linear) unbiased estimators.

If the further assumption is made that the probability distribution of each of the error terms is known, statistical statements can be made about the precision of the coefficient estimates. For relatively large samples (often, thirty or more data points will be sufficient for regressions with a small number of explanatory variables), the probability that the estimate of a parameter lies within an interval of 2 standard errors around the true parameter is approximately .95, or 95%. A frequent, although not always appropriate, assumption in statistical work is that the error term follows a normal distribution, from which it follows that the estimated parameters are normally distributed. The normal distribution has the

68. *See* David H. Kaye & David A. Freedman, Reference Guide on Statistics § IV.A, in this manual.

69. The necessary assumptions of the regression model include (a) the model is specified correctly; (b) errors associated with each observation are drawn randomly from the same probability distribution and are independent of each other; (c) errors associated with each observation are independent of the corresponding observations for each of the explanatory variables in the model; and (d) no explanatory variable is correlated perfectly with a combination of other variables.

property that the area within 1.96 standard errors of the mean is equal to 95% of the total area. Note that the normality assumption is not necessary for least-squares to be used, since most of the properties of least-squares apply regardless of normality.

In general, for any parameter estimate b, the expert can construct an interval around b such that there is a 95% probability that the interval covers the true parameter. This 95% confidence interval[70] is given by

$$b \pm 1.96 \times (\text{SE of } b) \qquad (10)^{71}$$

The expert can test the hypothesis that a parameter is actually equal to 0 (often stated as testing the null hypothesis) by looking at its t-statistic, which is defined as

$$t = \frac{b}{\text{SE}(b)} \qquad (11)$$

If the t-statistic is less than 1.96 in magnitude, the 95% confidence interval around b must include 0.[72] Because this means that the expert cannot reject the hypothesis that β equals 0, the estimate, whatever it may be, is said to be not statistically significant. Conversely, if the t-statistic is greater than 1.96 in absolute value, the expert concludes that the true value of β is unlikely to be 0 (intuitively, b is "too far" from 0 to be consistent with the true value of β being 0). In this case, the expert rejects the hypothesis that β equals 0 and calls the estimate statistically significant. If the null hypothesis β equals 0 is true, using a 95% confidence level will cause the expert to falsely reject the null hypothesis 5% of the time. Consequently, results often are said to be significant at the 5% level.[73]

As an example, consider a more complete set of regression results associated with the salary regression described in equation (9):

$$\begin{array}{lccccccc} \hat{Y} = & \$14{,}085 & + & \$2{,}323X_1 & + & \$1{,}675X_2 & - & \$36X_3 \\ & (1{,}577) & & (140) & & (1{,}435) & & (3.4) \\ t = & 8.9 & & 16.5 & & 1.2 & & -10.8 \end{array} \qquad (12)$$

The standard error of each estimated parameter is given in parentheses directly

70. Confidence intervals are used commonly in statistical analyses because the expert can never be certain that a parameter estimate is equal to the true population parameter.

71. If the number of data points in the sample is small, the standard error must be multiplied by a number larger than 1.96.

72. The t-statistic applies to any sample size. As the sample gets large, the underlying distribution, which is the source of the t-statistic (the student's t distribution), approximates the normal distribution.

73. A t-statistic of 2.57 in magnitude or greater is associated with a 99% confidence level, or a 1% level of significance, that includes a band of 2.57 standard deviations on either side of the estimated coefficient.

below the parameter, and the corresponding *t*-statistics appear below the standard error values.

Consider the coefficient on the dummy variable X_2. It indicates that \$1,675 is the best estimate of the mean salary difference between men and women. However, the standard error of \$1,435 is large in relation to its coefficient \$1,675. Because the standard error is relatively large, the range of possible values for measuring the true salary difference, the true parameter, is great. In fact, a 95% confidence interval is given by

$$\$1,675 \pm 1,435 \times 1.96 = \$1,675 \pm \$2,813 \tag{13}$$

In other words, the expert can have 95% confidence that the true value of the coefficient lies between –\$1,138 and \$4,488. Because this range includes 0, the effect of sex on salary is said to be insignificantly different from 0 at the 5% level. The *t* value of 1.2 is equal to \$1,675 divided by \$1,435. Because this *t*-statistic is less than 1.96 in magnitude (a condition equivalent to the inclusion of a 0 in the above confidence interval), the sex variable again is said to be an insignificant determinant of salary at the 5% level of significance.

Note also that experience is a highly significant determinant of salary, since both the X_1 and the X_3 variables have *t*-statistics substantially greater than 1.96 in magnitude. More experience has a significant positive effect on salary, but the size of this effect diminishes significantly with experience.

B. Goodness-of-Fit

Reported regression results usually contain not only the point estimates of the parameters and their standard errors or *t*-statistics, but also other information that tells how closely the regression line fits the data. One statistic, the standard error of the regression (SER), is an estimate of the overall size of the regression residuals.[74] An SER of 0 would occur only when all data points lie exactly on the regression line—an extremely unlikely possibility. Other things being equal, the larger the SER, the poorer the fit of the data to the model.

For a normally distributed error term, the expert would expect approximately 95% of the data points to lie within 2 SERs of the estimated regression line, as shown in Figure 7 (in Figure 7, the SER is approximately \$5,000).

R-square (R^2) is a statistic that measures the percentage of variation in the dependent variable that is accounted for by all the explanatory variables.[75] Thus, R^2 provides a measure of the overall goodness-of-fit of the multiple regression equation.[76] Its value ranges from 0 to 1. An R^2 of 0 means that the explanatory

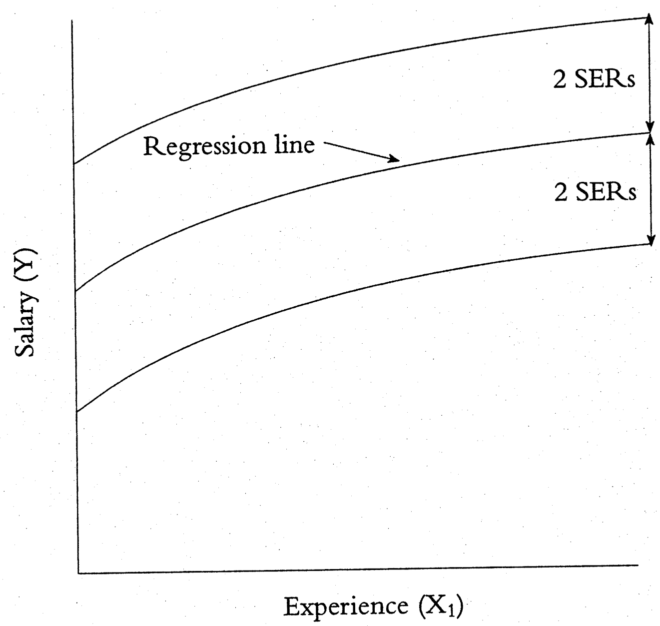
74. More specifically, it is a measure of the standard deviation of the regression error *e*. It sometimes is called the root mean square error of the regression line.

75. The variation is the square of the difference between each Y value and the average Y value, summed over all the Y values.

76. R^2 and SER provide similar information, because R^2 is approximately equal to $1 - \text{SER}^2/\text{Variance of Y}$.

variables explain none of the variation of the dependent variable; an R^2 of 1 means that the explanatory variables explain all of the variation. The R^2 associated with equation (12) is .56. This implies that the three explanatory variables explain 56% of the variation in salaries.

Figure 7. Standard Error of the Regression



What level of R^2, if any, should lead to a conclusion that the model is satisfactory? Unfortunately, there is no clear-cut answer to this question, since the magnitude of R^2 depends on the characteristics of the data being studied and, in particular, whether the data vary over time or over individuals. Typically, an R^2 is low in cross-section studies in which differences in individual behavior are explained. It is likely that these individual differences are caused by many factors that cannot be measured. As a result, the expert cannot hope to explain most of the variation. In time-series studies, in contrast, the expert is explaining the movement of aggregates over time. Since most aggregate time series have substantial growth, or trend, in common, it will not be difficult to "explain" one time series using another time series, simply because both are moving together. It follows as a corollary that a high R^2 does not by itself mean that the variables included in the model are the appropriate ones.

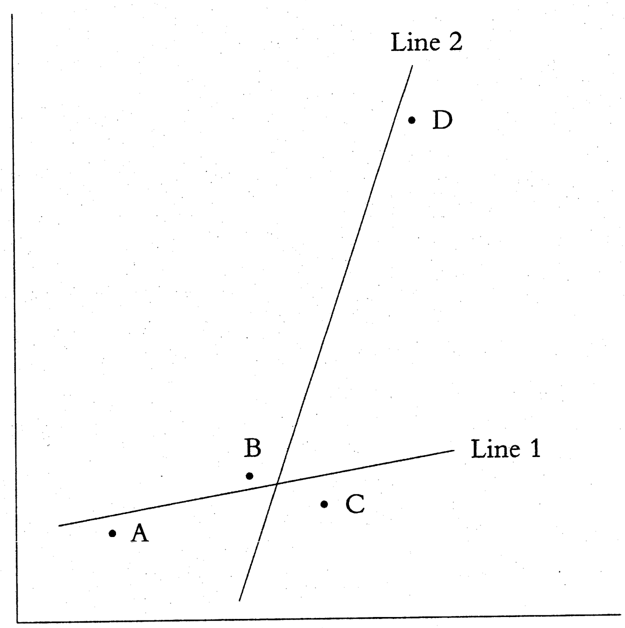
As a general rule, courts should be reluctant to rely solely on a statistic such as

R^2 to choose one model over another. Alternative procedures and tests are available.[77]

C. Sensitivity of Least-Squares Regression Results

The least-squares regression line can be sensitive to extreme data points. This sensitivity can be seen most easily in Figure 8. Assume initially that there are only three data points, A, B, and C, relating information about X_1 to the variable Y. The least-squares line describing the best-fitting relationship between Points A, B, and C is represented by Line 1. Point D is called an outlier because it lies far from the regression line that fits the remaining points. When a new, best-fitting least-squares line is reestimated to include Point D, Line 2 is obtained. Figure 8 shows that the outlier Point D is an influential data point, since it has a dominant effect on the slope and intercept of the least-squares line. Because least squares attempts to minimize the sum of squared deviations, the sensitivity of the line to individual points sometimes can be substantial.[78]

Figure 8. Least-Squares Regression



77. These include *F*-tests and specification error tests. *See* Pindyck & Rubinfeld, *supra* note 31, at 88–95, 128–36, 194–98.

78. This sensitivity is not always undesirable. In some instances it may be much more important to predict Point D when a big change occurs than to measure the effects of small changes accurately.

What makes the influential data problem even more difficult is that the effect of an outlier may not be seen readily if deviations are measured from the final regression line. The reason is that the influence of Point D on Line 2 is so substantial that its deviation from the regression line is not necessarily larger than the deviation of any of the remaining points from the regression line.[79] Although they are not as popular as least-squares, alternative estimation techniques that are less sensitive to outliers, such as robust estimation, are available.

V. Reading Multiple Regression Computer Output

Statistical computer packages that report multiple regression analyses vary to some extent in the information they provide and the form that the information takes. Table 1 contains a sample of the basic computer output that is associated with equation (9).

Table 1. Regression Output

Dependent Variable: Y		SSE DFE MSE	62346266124 561 111134164	*F* Test Prob > *F* R^2	174.71 0.0001 0.556
Variable	DF	Parameter Estimate	Standard Error	*t*-stat	Prob > |*t*|
Intercept	1	14084.89	1577.484	8.9287	.0001
X_1	1	2323.17	140.70	16.5115	.0001
X_2	1	1675.11	1435.422	1.1670	.2437
X_3	1	-36.71	3.41	-10.7573	.0001

Note: SSE = sum of squared errors; DFE = degrees of freedom associated with the error term; MSE = mean square error; DF = degrees of freedom; *t*-stat = *t*-statistic; Prob = probability.

In the lower portion of Table 1, note that the parameter estimates, the standard errors, and the *t*-statistics match the values given in equation (12).[80] The variable "Intercept" refers to the constant term b_0 in the regression. The column "DF" represents degrees of freedom. The "1" signifies that when the computer calculates the parameter estimates, each variable that is added to the linear regression adds an additional constraint that must be satisfied. The column labeled "Prob > |*t*|" lists the two-tailed *p*-values associated with each estimated param-

79. The importance of an outlier also depends on its location in the data set. Outliers associated with relatively extreme values of explanatory variables are likely to be especially influential. *See, e.g.*, Fisher v. Vassar College, 70 F.3d 1420, 1436 (2d Cir. 1995) (court required to include assessment of "service in academic community," since concept was too amorphous and not a significant factor in tenure review), *rev'd on other grounds*, 114 F.3d 1332 (2d Cir. 1997) (en banc).

80. Computer programs give results to more decimal places than are meaningful. This added detail should not be seen as evidence that the regression results are exact.

eter; the p-value measures the observed significance level—the probability of getting a test statistic as extreme or more extreme than the observed number if the model parameter is in fact 0. The very low p-values on the variables X_1 and X_3 imply that each variable is statistically significant at less than the 1% level—both highly significant results. In contrast, the X_2 coefficient is only significant at the 24% level, implying that it is insignificant at the traditional 5% level. Thus, the expert cannot reject with confidence the null hypothesis that salaries do not differ by sex after the expert has accounted for the effect of experience.

The top portion of Table 1 provides data that relate to the goodness-of-fit of the regression equation. The sum of squared errors (SSE) measures the sum of the squares of the regression residuals—the sum that is minimized by the least-squares procedure. The degrees of freedom associated with the error term (DFE) is given by the number of observations minus the number of parameters that were estimated. The mean square error (MSE) measures the variance of the error term (the square of the standard error of the regression). MSE is equal to SSE divided by DFE.

The R^2 of 0.556 indicates that 55.6% of the variation in salaries is explained by the regression variables, X_1, X_2, and X_3. Finally, the F-test is a test of the null hypothesis that all regression coefficients (except the intercept) are jointly equal to 0—that there is no association between the dependent variable and any of the explanatory variables. This is equivalent to the null hypothesis that R^2 is equal to 0. In this case, the F-ratio of 174.71 is sufficiently high that the expert can reject the null hypothesis with a very high degree of confidence (i.e., with a 1% level of significance).

VI. *Forecasting*

In general, a forecast is a prediction made about the values of the dependent variable using information about the explanatory variables. Often, ex ante forecasts are performed; in this situation, values of the dependent variable are predicted beyond the sample (e.g., beyond the time period in which the model has been estimated). However, ex post forecasts are frequently used in damage analyses.[81] An ex post forecast has a forecast period such that all values of the dependent and explanatory variables are known; ex post forecasts can be checked against existing data and provide a direct means of evaluation.

For example, to calculate the forecast for the salary regression discussed above, the expert uses the estimated salary equation

$$\hat{Y} = \$14,085 + \$2,323X_1 + \$1,675X_2 - \$36X_3 \tag{14}$$

81. Frequently, in cases involving damages, the question arises, what the world would have been like had a certain event not taken place. For example, in a price-fixing antitrust case, the expert can ask

To predict the salary of a man with two years' experience, the expert calculates

$$\hat{Y}(2) = \$14{,}085 + (\$2{,}323 \times 2) + \$1{,}675 - (\$36 \times 2^2) = \$20{,}262 \qquad (15)$$

The degree of accuracy of both ex ante and ex post forecasts can be calculated provided that the model specification is correct and the errors are normally distributed and independent. The statistic is known as the standard error of forecast (SEF). The SEF measures the standard deviation of the forecast error that is made within a sample in which the explanatory variables are known with certainty.[82] The SEF can be used to determine how accurate a given forecast is. In equation (15), the SEF associated with the forecast of \$20,262 is approximately \$5,000. If a large sample size is used, the probability is roughly 95% that the predicted salary will be within 1.96 standard errors of the forecasted value. In this case, the appropriate 95% interval for the prediction is \$10,822 to \$30,422. Because the estimated model does not explain salaries effectively, the SEF is large, as is the 95% interval. A more complete model with additional explanatory variables would result in a lower SEF and a smaller 95% interval for the prediction.

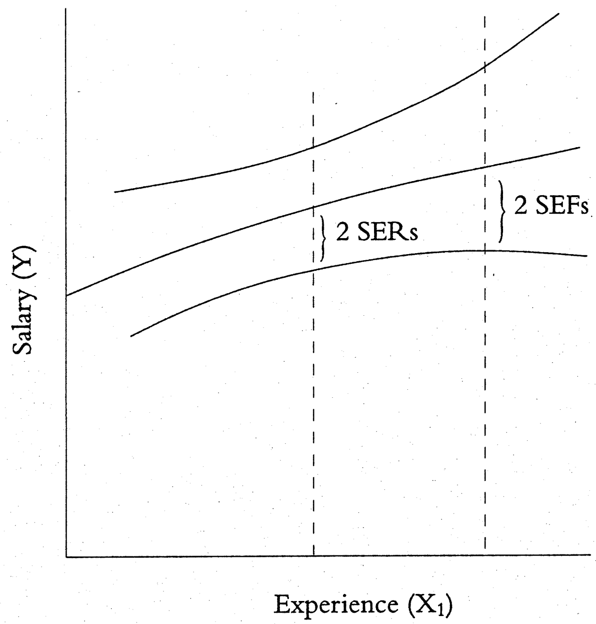
There is a danger when using the SEF, which applies to the standard errors of the estimated coefficients as well. The SEF is calculated on the assumption that the model includes the correct set of explanatory variables and the correct functional form. If the choice of variables or the functional form is wrong, the estimated forecast error may be misleading. In some instances, it may be smaller, perhaps substantially smaller, than the true SEF; in other instances, it may be larger, for example, if the wrong variables happen to capture the effects of the correct variables.

The difference between the SEF and the SER is shown in Figure 9. The SER measures deviations within the sample. The SEF is more general, since it calculates deviations within or without the sample period. In general, the difference between the SEF and the SER increases as the values of the explanatory variables increase in distance from the mean values. Figure 9 shows the 95% prediction interval created by the measurement of 2 SEFs about the regression line.

what the price of a product would have been had a certain event associated with the price-fixing agreement not occurred. If prices would have been lower, the evidence suggests impact. If the expert can predict how much lower they would have been, the data can help the expert develop a numerical estimate of the amount of damages.

82. There are actually two sources of error implicit in the SEF. The first source arises because the estimated parameters of the regression model may not be exactly equal to the true regression parameters. The second source is the error term itself; when forecasting, the expert typically sets the error equal to 0 when a turn of events not taken into account in the regression model may make it appropriate to make the error positive or negative.

Figure 9. Standard Error of Forecast



Glossary of Terms

The following terms and definitions are adapted from a variety of sources, including A Dictionary of Epidemiology (John M. Last et al. eds., 3d ed. 1995) and Robert S. Pindyck & Daniel L. Rubinfeld, Econometric Models and Economic Forecasts (4th ed. 1998).

alternative hypothesis. See hypothesis test.

association. The degree of statistical dependence between two or more events or variables. Events are said to be associated when they occur more frequently together than one would expect by chance.

bias. Any effect at any stage of investigation or inference tending to produce results that depart systematically from the true values (i.e., the results are either too high or too low). A biased estimator of a parameter differs on average from the true parameter.

coefficient. An estimated regression parameter.

confidence interval. An interval that contains a true regression parameter with a given degree of confidence.

consistent estimator. An estimator that tends to become more and more accurate as the sample size grows.

correlation. A statistical means of measuring the association between variables. Two variables are correlated positively if, on average, they move in the same direction; two variables are correlated negatively if, on average, they move in opposite directions.

cross-section analysis. A type of multiple regression analysis in which each data point is associated with a different unit of observation (e.g., an individual or a firm) measured at a particular point in time.

degrees of freedom (DF). The number of observations in a sample minus the number of estimated parameters in a regression model. A useful statistic in hypothesis testing.

dependent variable. The variable to be explained or predicted in a multiple regression model.

dummy variable. A variable that takes on only two values, usually 0 and 1, with one value indicating the presence of a characteristic, attribute, or effect (1) and the other value indicating its absence (0).

efficient estimator. An estimator of a parameter that produces the greatest precision possible.

error term. A variable in a multiple regression model that represents the cumulative effect of a number of sources of modeling error.

estimate. The calculated value of a parameter based on the use of a particular sample.

estimator. The sample statistic that estimates the value of a population parameter (e.g., a regression parameter); its values vary from sample to sample.

ex ante forecast. A prediction about the values of the dependent variable that go beyond the sample; consequently, the forecast must be based on predictions for the values of the explanatory variables in the regression model.

explanatory variable. A variable that is associated with changes in a dependent variable.

ex post forecast. A prediction about the values of the dependent variable made during a period in which all the values of the explanatory and dependent variables are known. Ex post forecasts provide a useful means of evaluating the fit of a regression model.

***F*-test.** A statistical test (based on an *F*-ratio) of the null hypothesis that a group of explanatory variables are jointly equal to 0. When applied to all the explanatory variables in a multiple regression model, the *F*-test becomes a test of the null hypothesis that R^2 equals 0.

feedback. When changes in an explanatory variable affect the values of the dependent variable, and changes in the dependent variable also affect the explanatory variable. When both effects occur at the same time, the two variables are described as being determined simultaneously.

fitted value. The estimated value for the dependent variable; in a linear regression this value is calculated as the intercept plus a weighted average of the values of the explanatory variables, with the estimated parameters used as weights.

heteroscedasticity. When the error associated with a multiple regression model has a nonconstant variance; that is, the error values associated with some observations are typically high, whereas the values associated with other observations are typically low.

hypothesis test. A statement about the parameters in a multiple regression model. The null hypothesis may assert that certain parameters have specified values or ranges; the alternative hypothesis would specify other values or ranges.

independence. When two variables are not correlated with each other (in the population).

independent variable. An explanatory variable that affects the dependent variable but is not affected by the dependent variable.

influential data point. A data point whose deletion from a regression sample causes one or more estimated regression parameters to change substantially.

interaction variable. The product of two explanatory variables in a regression model. Used in a particular form of nonlinear model.

intercept. The value of the dependent variable when each of the explanatory variables takes on the value of 0 in a regression equation.

least-squares. A common method for estimating regression parameters. Least-squares minimizes the sum of the squared differences between the actual values of the dependent variable and the values predicted by the regression equation.

linear regression model. A regression model in which the effect of a change in each of the explanatory variables on the dependent variable is the same, no matter what the values of those explanatory variables.

mean (sample). An average of the outcomes associated with a probability distribution, where the outcomes are weighted by the probability that each will occur.

mean square error (MSE). The estimated variance of the regression error, calculated as the average of the sum of the squares of the regression residuals.

model. A representation of an actual situation.

multicollinearity. When two or more variables are highly correlated in a multiple regression analysis. Substantial multicollinearity can cause regression parameters to be estimated imprecisely, as reflected in relatively high standard errors.

multiple regression analysis. A statistical tool for understanding the relationship between two or more variables.

nonlinear regression model. A model having the property that changes in explanatory variables will have differential effects on the dependent variable as the values of the explanatory variables change.

normal distribution. A bell-shaped probability distribution having the property that about 95% of the distribution lies within two standard deviations of the mean.

null hypothesis. In regression analysis the null hypothesis states that the results observed in a study with respect to a particular variable are no different from what might have occurred by chance, independent of the effect of that variable. See hypothesis test.

one-tailed test. A hypothesis test in which the alternative to the null hypothesis that a parameter is equal to 0 is for the parameter to be either positive or negative, but not both.

outlier. A data point that is more than some appropriate distance from a regression line that is estimated using all the other data points in the sample.

p-value. The significance level in a statistical test; the probability of getting a test statistic as extreme or more extreme than the observed value. The larger the p-value, the more likely the null hypothesis is true.

parameter. A numerical characteristic of a population or a model.

perfect collinearity. When two or more explanatory variables are correlated perfectly.

population. All the units of interest to the researcher; also, universe.

practical significance. Substantive importance. Statistical significance does not ensure practical significance, since, with large samples, small differences can be statistically significant.

probability distribution. The process that generates the values of a random variable. A probability distribution lists all possible outcomes and the probability that each will occur.

probability sampling. A process by which a sample of a population is chosen so that each unit of observation has a known probability of being selected.

random error term. A term in a regression model that reflects random error (sampling error) that is due to chance. As a consequence, the result obtained in the sample differs from the result that would be obtained if the entire population were studied.

regression coefficient. Also, regression parameter. The estimate of a population parameter obtained from a regression equation that is based on a particular sample.

regression residual. The difference between the actual value of a dependent variable and the value predicted by the regression equation.

robust estimation. An alternative to least-squares estimation that is less sensitive to outliers.

robustness. A statistic or procedure that does not change much when data or assumptions are slightly modified is robust.

R-square (R^2). A statistic that measures the percentage of the variation in the dependent variable that is accounted for by all of the explanatory variables in a regression model. R-square is the most commonly used measure of goodness-of-fit of a regression model.

sample. A selection of data chosen for a study; a subset of a population.

sampling error. A measure of the difference between the sample estimate of a parameter and the population parameter.

scatterplot. A graph showing the relationship between two variables in a study; each dot represents one subject. One variable is plotted along the horizontal axis; the other variable is plotted along the vertical axis.

serial correlation. The correlation of the values of regression errors over time.

slope. The change in the dependent variable associated with a 1-unit change in an explanatory variable.

spurious correlation. When two variables are correlated, but one is not the cause of the other.

standard deviation. The square root of the variance of a random variable. The variance is a measure of the spread of a probability distribution about its mean; it is calculated as a weighted average of the squares of the deviations of the outcomes of a random variable from its mean.

standard error of the coefficient; standard error (SE). A measure of the variation of a parameter estimate or coefficient about the true parameter. The standard error is a standard deviation that is calculated from the probability distribution of estimated parameters.

standard error of forecast (SEF). An estimate of the standard deviation of the forecast error; it is based on forecasts made within a sample in which the values of the explanatory variables are known with certainty.

standard error of the regression (SER). An estimate of the standard deviation of the regression error; it is calculated as an average of the squares of the residuals associated with a particular multiple regression analysis.

statistical significance. A test used to evaluate the degree of association between a dependent variable and one or more explanatory variables. If the calculated *p*-value is smaller than 5%, the result is said to be statistically significant (at the 5% level). If *p* is greater than 5%, the result is statistically insignificant (at the 5% level).

***t*-statistic.** A test statistic that describes how far an estimate of a parameter is from its hypothesized value (i.e., given a null hypothesis). If a *t*-statistic is sufficiently large (in absolute magnitude), an expert can reject the null hypothesis.

***t*-test.** A test of the null hypothesis that a regression parameter takes on a particular value, usually 0. The test is based on the *t*-statistic.

time-series analysis. A type of multiple regression analysis in which each data point is associated with a particular unit of observation (e.g., an individual or a firm) measured at different points in time.

two-tailed test. A hypothesis test in which the alternative to the null hypothesis that a parameter is equal to 0 is for the parameter to be either positive or negative, or both.

variable. Any attribute, phenomenon, condition, or event that can have two or more values.

variable of interest. The explanatory variable that is the focal point of a particular study or legal issue.

References on Multiple Regression

Jonathan A. Baker & Daniel L. Rubinfeld, *Empirical Methods in Antitrust: Review and Critique,* 1 Am. L. & Econ. Rev. 386 (1999).

Thomas J. Campbell, *Regression Analysis in Title VII Cases: Minimum Standards, Comparable Worth, and Other Issues Where Law and Statistics Meet,* 36 Stan. L. Rev. 1299 (1984).

Arthur P. Dempster, *Employment Discrimination and Statistical Science,* 3 Stat. Sci. 149 (1988).

The Evolving Role of Statistical Assessments as Evidence in the Courts (Stephen E. Fienberg ed., 1989).

Michael O. Finkelstein, *The Judicial Reception of Multiple Regression Studies in Race and Sex Discrimination Cases,* 80 Colum. L. Rev. 737 (1980).

Michael O. Finkelstein & Hans Levenbach, *Regression Estimates of Damages in Price-Fixing Cases,* Law & Contemp. Probs., Autumn 1983, at 145.

Franklin M. Fisher, *Statisticians, Econometricians, and Adversary Proceedings,* 81 J. Am. Stat. Ass'n 277 (1986).

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Joseph L. Gastwirth, *Methods for Assessing the Sensitivity of Statistical Comparisons Used in Title VII Cases to Omitted Variables,* 33 Jurimetrics J. 19 (1992).

Note, *Beyond the Prima Facie Case in Employment Discrimination Law: Statistical Proof and Rebuttal,* 89 Harv. L. Rev. 387 (1975).

Daniel L. Rubinfeld, *Econometrics in the Courtroom,* 85 Colum. L. Rev. 1048 (1985).

Daniel L. Rubinfeld & Peter O. Steiner, *Quantitative Methods in Antitrust Litigation,* Law & Contemp. Probs., Autumn 1983, at 69.

Symposium, *Statistical and Demographic Issues Underlying Voting Rights Cases,* 15 Evaluation Rev. 659 (1991).

September 26, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 19, 2006
Question No. 566

Request:

Referring to UE 180 – UE 181 – UE 184 / PGE /2000, Hager-Valach/57, line 14-15, is PGE aware of any Staff testimony that concludes that "any model should contain all possible explanatory factors?" If yes, please provide a listing of all such testimony.

Response:

PGE did not state or mean to infer that Staff made such a statement. Rather, as discussed in PGE's Response to OPUC Data Request No. 565, the conclusion follows from the testimony.

October 2, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 25, 2006
Question No. 631

Request:

Regarding UE 180 – UE 181 – UE 184/PGE/2000, Hager-Valach/58, lines 7-8, please list all additional variables PGE considered including in its regression analysis and the reason for each variable's exclusion from the regression analysis.

Response:

PGE did not consider adding additional variables to its Risk Positioning given the theoretical basis for the model, the more than satisfactory explanatory value of the regression, and the potential bias and possible other statistical problems created by adding another variable.

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 19, 2006
Question No. 559

Request:

Referring to UE 180 – UE 181 – UE 184 / PGE /2000, Hager-Valach/52, lines 17-19, please provide a listing of the witnesses who have used the risk positioning model, the jurisdiction where they used the model, and identify the docket in which the testimony was submitted.

Response:

We have performed an informal survey of the state regulatory commissions and we are aware of some other witnesses who have used a similar method. We have not surveyed or asked other ROE witnesses regarding the models they use. Thus, the data collected are limited. Nevertheless, given the number of witness, jurisdictions, and dockets, it is clear that the Risk Positioning and similar methods are not "unique."

Witness	Jurisdiction	Docket
Hager	OR	UE 115, UE 180
Zepp	OR, CA, AZ, AK	not available*
Hadaway	OR	UE 170, UE 179
Cutter	TX	12852

*Dr. Zepp is currently out of state. PGE will update the table when he returns.

PGE cites the jurisdictions that told us what models they were using in Exhibit 2011 as well as in our work papers, pages 199-216. PGE's survey did not request the names of witnesses. Attachment 559-A provides a copy of the testimony from Staff Witness Slade Cutter in Docket No. 12852.

```
SHAZAM - Version 10.0 -  JUL 2004 SYSTEM=WIN-XP   PAR= 11000 SITE=1784
|_genl pg = 1
|_do # = 1, 10
|_print pg
|_genr ROE = nor(1)
|_genr T = nor(1)
|_genr rpm = roe - t
|_ols rpm t
|_ols ROE t
|_genl pg = pg + 1
|_endo
```

```
 _do # = 1, 10
****** EXECUTION BEGINNING FOR DO LOOP  # =       1
#_        print pg
PG
   1.000000
#_        genr ROE = nor(1)
#_        genr T = nor(1)
#_        genr rpm = roe - t

#_        ols rpm t

REQUIRED MEMORY IS PAR=      28 CURRENT PAR=   11000
 OLS ESTIMATION
      500 OBSERVATIONS     DEPENDENT VARIABLE= RPM
...NOTE..SAMPLE RANGE SET TO:      1,    500

 R-SQUARE =   0.4791     R-SQUARE ADJUSTED =   0.4780
VARIANCE OF THE ESTIMATE-SIGMA**2 =   1.0078
STANDARD ERROR OF THE ESTIMATE-SIGMA =   1.0039
SUM OF SQUARED ERRORS-SSE=   501.88
MEAN OF DEPENDENT VARIABLE = -0.91028E-01
LOG OF THE LIKELIHOOD FUNCTION = -710.406

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
 AKAIKE (1969) FINAL PREDICTION ERROR - FPE =      1.0118
    (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
 AKAIKE (1973) INFORMATION CRITERION - LOG AIC =  0.11745E-01
 SCHWARZ (1978) CRITERION - LOG SC =              0.28604E-01
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
 CRAVEN-WAHBA (1979)
    GENERALIZED CROSS VALIDATION - GCV =           1.0118
 HANNAN AND QUINN (1979) CRITERION =               1.0185
 RICE (1984) CRITERION =                           1.0118
 SHIBATA (1981) CRITERION =                        1.0118
 SCHWARZ (1978) CRITERION - SC =                   1.0290
 AKAIKE (1974) INFORMATION CRITERION - AIC =       1.0118

                     ANALYSIS OF VARIANCE - FROM MEAN
                        SS          DF             MS               F
REGRESSION           461.55         1.         461.55           457.984
ERROR                501.88       498.         1.0078           P-VALUE
TOTAL                963.42       499.         1.9307             0.000

                     ANALYSIS OF VARIANCE - FROM ZERO
                        SS          DF             MS               F
REGRESSION           465.69         2.         232.85           231.048
ERROR                501.88       498.         1.0078           P-VALUE
TOTAL                967.57       500.         1.9351             0.000


VARIABLE   ESTIMATED  STANDARD   T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR     498 DF    P-VALUE CORR. COEFFICIENT  AT MEANS
T        -0.98109     0.4584E-01  -21.40     0.000-0.692     -0.6921     0.6843
CONSTANT -0.28742E-01 0.4499E-01 -0.6389     0.523-0.029      0.0000     0.3157
```

Staff/1301
Conway/58

```
#_        ols ROE t

REQUIRED MEMORY IS PAR=      28 CURRENT PAR=   11000
 OLS ESTIMATION
      500 OBSERVATIONS     DEPENDENT VARIABLE= ROE
...NOTE..SAMPLE RANGE SET TO:       1,    500

 R-SQUARE =   0.0003     R-SQUARE ADJUSTED =  -0.0017
VARIANCE OF THE ESTIMATE-SIGMA**2 =   1.0078
STANDARD ERROR OF THE ESTIMATE-SIGMA =   1.0039
SUM OF SQUARED ERRORS-SSE=   501.88
MEAN OF DEPENDENT VARIABLE = -0.27541E-01
LOG OF THE LIKELIHOOD FUNCTION = -710.406

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
 AKAIKE (1969) FINAL PREDICTION ERROR - FPE =       1.0118
    (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
 AKAIKE (1973) INFORMATION CRITERION - LOG AIC =  0.11745E-01
 SCHWARZ (1978) CRITERION - LOG SC =              0.28604E-01
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
 CRAVEN-WAHBA (1979)
    GENERALIZED CROSS VALIDATION - GCV =            1.0118
 HANNAN AND QUINN (1979) CRITERION =                1.0185
 RICE (1984) CRITERION =                            1.0118
 SHIBATA (1981) CRITERION =                         1.0118
 SCHWARZ (1978) CRITERION - SC =                    1.0290
 AKAIKE (1974) INFORMATION CRITERION - AIC =        1.0118

                   ANALYSIS OF VARIANCE - FROM MEAN
                     SS          DF          MS                 F
REGRESSION       0.17155         1.       0.17155            0.170
ERROR             501.88       498.        1.0078          P-VALUE
TOTAL             502.05       499.        1.0061            0.680

                   ANALYSIS OF VARIANCE - FROM ZERO
                     SS          DF          MS                 F
REGRESSION       0.55081         2.       0.27540            0.273
ERROR             501.88       498.        1.0078          P-VALUE
TOTAL             502.43       500.        1.0049            0.761

VARIABLE   ESTIMATED  STANDARD   T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR    498 DF   P-VALUE CORR. COEFFICIENT  AT MEANS
T          0.18915E-01 0.4584E-01  0.4126   0.680 0.018     0.0185    -0.0436
CONSTANT -0.28742E-01 0.4499E-01 -0.6389   0.523-0.029     0.0000     1.0436
#_         genl pg = pg + 1
#_         endo
#_         print pg
```

```
PG
   2.000000
#_        genr ROE = nor(1)
#_        genr T = nor(1)
#_        genr rpm = roe - t

#_        ols rpm t

REQUIRED MEMORY IS PAR=      28 CURRENT PAR=   11000
 OLS ESTIMATION
      500 OBSERVATIONS     DEPENDENT VARIABLE= RPM
...NOTE..SAMPLE RANGE SET TO:      1,    500

 R-SQUARE =   0.4939     R-SQUARE ADJUSTED =    0.4929
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.96019
STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.97989
SUM OF SQUARED ERRORS-SSE=   478.17
MEAN OF DEPENDENT VARIABLE = -0.66842E-01
LOG OF THE LIKELIHOOD FUNCTION = -698.310

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
 AKAIKE (1969) FINAL PREDICTION ERROR - FPE =      0.96403
    (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
 AKAIKE (1973) INFORMATION CRITERION - LOG AIC = -0.36637E-01
 SCHWARZ (1978) CRITERION - LOG SC =             -0.19779E-01
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
 CRAVEN-WAHBA (1979)
    GENERALIZED CROSS VALIDATION - GCV =          0.96404
 HANNAN AND QUINN (1979) CRITERION =              0.97042
 RICE (1984) CRITERION =                          0.96406
 SHIBATA (1981) CRITERION =                       0.96400
 SCHWARZ (1978) CRITERION - SC =                  0.98042
 AKAIKE (1974) INFORMATION CRITERION - AIC =      0.96403
```

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Conway/59

ANALYSIS OF VARIANCE - FROM MEAN

	SS	DF	MS	F
REGRESSION	466.68	1.	466.68	486.029
ERROR	478.17	498.	0.96019	P-VALUE
TOTAL	944.85	499.	1.8935	0.000

ANALYSIS OF VARIANCE - FROM ZERO

	SS	DF	MS	F
REGRESSION	468.91	2.	234.46	244.178
ERROR	478.17	498.	0.96019	P-VALUE
TOTAL	947.08	500.	1.8942	0.000

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 498 DF	P-VALUE	PARTIAL CORR.	STANDARDIZED COEFFICIENT	ELASTICITY AT MEANS
T	-0.95053	0.4312E-01	-22.05	0.000	-0.703	-0.7028	0.5305
CONSTANT	-0.31380E-01	0.4385E-01	-0.7156	0.475	-0.032	0.0000	0.4695

```
#_        ols ROE t

REQUIRED MEMORY IS PAR=      28 CURRENT PAR=   11000
 OLS ESTIMATION
      500 OBSERVATIONS     DEPENDENT VARIABLE= ROE
...NOTE..SAMPLE RANGE SET TO:      1,    500

 R-SQUARE =   0.0026     R-SQUARE ADJUSTED =   0.0006
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.96019
STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.97989
SUM OF SQUARED ERRORS-SSE=   478.17
MEAN OF DEPENDENT VARIABLE = -0.29534E-01
LOG OF THE LIKELIHOOD FUNCTION = -698.310

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
 AKAIKE (1969) FINAL PREDICTION ERROR - FPE =     0.96403
   (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
 AKAIKE (1973) INFORMATION CRITERION - LOG AIC = -0.36637E-01
 SCHWARZ (1978) CRITERION - LOG SC =             -0.19779E-01
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
 CRAVEN-WAHBA (1979)
   GENERALIZED CROSS VALIDATION - GCV =          0.96404
 HANNAN AND QUINN (1979) CRITERION =             0.97042
 RICE (1984) CRITERION =                         0.96406
 SHIBATA (1981) CRITERION =                      0.96400
 SCHWARZ (1978) CRITERION - SC =                 0.98042
 AKAIKE (1974) INFORMATION CRITERION - AIC =     0.96403

                      ANALYSIS OF VARIANCE - FROM MEAN
                     SS         DF         MS                F
REGRESSION         1.2641        1.      1.2641            1.317
ERROR              478.17      498.      0.96019          P-VALUE
TOTAL              479.44      499.      0.96079           0.252

                      ANALYSIS OF VARIANCE - FROM ZERO
                     SS         DF         MS                F
REGRESSION         1.7003        2.      0.85013           0.885
ERROR              478.17      498.      0.96019          P-VALUE
TOTAL              479.87      500.      0.95975           0.413

VARIABLE   ESTIMATED  STANDARD   T-RATIO        PARTIAL STANDARDIZED ELASTICITY
 NAME     COEFFICIENT   ERROR    498 DF   P-VALUE CORR. COEFFICIENT  AT MEANS
T          0.49471E-01 0.4312E-01   1.147    0.252 0.051      0.0513    -0.0625
CONSTANT -0.31380E-01 0.4385E-01 -0.7156    0.475-0.032      0.0000     1.0625
#_        genl pg = pg + 1
#_        endo
#_        print pg
```

Staff/1301
Conway/60

Staff/1301
Conway/61

```
PG
   3.000000
#_        genr ROE = nor(1)
#_        genr T = nor(1)
#_        genr rpm = roe - t

#_        ols rpm t

REQUIRED MEMORY IS PAR=      28 CURRENT PAR=   11000
 OLS ESTIMATION
      500 OBSERVATIONS     DEPENDENT VARIABLE= RPM
...NOTE..SAMPLE RANGE SET TO:      1,     500

 R-SQUARE =   0.4909     R-SQUARE ADJUSTED =   0.4898
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.99155
STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.99576
SUM OF SQUARED ERRORS-SSE=   493.79
MEAN OF DEPENDENT VARIABLE = -0.57942E-01
LOG OF THE LIKELIHOOD FUNCTION = -706.345

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
 AKAIKE (1969) FINAL PREDICTION ERROR - FPE =      0.99551
    (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
 AKAIKE (1973) INFORMATION CRITERION - LOG AIC = -0.44971E-02
 SCHWARZ (1978) CRITERION - LOG SC =             0.12361E-01
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
 CRAVEN-WAHBA (1979)
    GENERALIZED CROSS VALIDATION - GCV =         0.99553
 HANNAN AND QUINN (1979) CRITERION =              1.0021
 RICE (1984) CRITERION =                         0.99555
 SHIBATA (1981) CRITERION =                      0.99548
 SCHWARZ (1978) CRITERION - SC =                  1.0124
 AKAIKE (1974) INFORMATION CRITERION - AIC =     0.99551
```

ANALYSIS OF VARIANCE - FROM MEAN

	SS	DF	MS	F
REGRESSION	476.07	1.	476.07	480.131
ERROR	493.79	498.	0.99155	P-VALUE
TOTAL	969.86	499.	1.9436	0.000

ANALYSIS OF VARIANCE - FROM ZERO

	SS	DF	MS	F
REGRESSION	477.75	2.	238.88	240.912
ERROR	493.79	498.	0.99155	P-VALUE
TOTAL	971.54	500.	1.9431	0.000

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 498 DF	P-VALUE	PARTIAL CORR.	STANDARDIZED COEFFICIENT	ELASTICITY AT MEANS
T	-1.0075	0.4598E-01	-21.91	0.000	-0.701	-0.7006	-0.7661
CONSTANT	-0.10233	0.4458E-01	-2.296	0.022	-0.102	0.0000	1.7661

```
#_        ols ROE t

REQUIRED MEMORY IS PAR=      28 CURRENT PAR=   11000
 OLS ESTIMATION
      500 OBSERVATIONS     DEPENDENT VARIABLE= ROE
...NOTE..SAMPLE RANGE SET TO:       1,    500

 R-SQUARE =   0.0001     R-SQUARE ADJUSTED =  -0.0020
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.99155
STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.99576
SUM OF SQUARED ERRORS-SSE=   493.79
MEAN OF DEPENDENT VARIABLE = -0.10200
LOG OF THE LIKELIHOOD FUNCTION = -706.345

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
 AKAIKE (1969) FINAL PREDICTION ERROR - FPE =      0.99551
    (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
 AKAIKE (1973) INFORMATION CRITERION - LOG AIC = -0.44971E-02
 SCHWARZ (1978) CRITERION - LOG SC =              0.12361E-01
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
 CRAVEN-WAHBA (1979)
    GENERALIZED CROSS VALIDATION - GCV =          0.99553
 HANNAN AND QUINN (1979) CRITERION =               1.0021
 RICE (1984) CRITERION =                          0.99555
 SHIBATA (1981) CRITERION =                       0.99548
 SCHWARZ (1978) CRITERION - SC =                   1.0124
 AKAIKE (1974) INFORMATION CRITERION - AIC =      0.99551

                      ANALYSIS OF VARIANCE - FROM MEAN
                        SS          DF          MS                 F
REGRESSION        0.26141E-01       1.      0.26141E-01          0.026
ERROR              493.79         498.      0.99155             P-VALUE
TOTAL              493.82         499.      0.98961              0.871

                      ANALYSIS OF VARIANCE - FROM ZERO
                        SS          DF          MS                 F
REGRESSION         5.2283           2.       2.6141              2.636
ERROR              493.79         498.      0.99155             P-VALUE
TOTAL              499.02         500.      0.99804              0.073

VARIABLE   ESTIMATED  STANDARD   T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR    498 DF   P-VALUE CORR. COEFFICIENT  AT MEANS
T         -0.74654E-02 0.4598E-01 -0.1624   0.871-0.007    -0.0073    -0.0032
CONSTANT -0.10233     0.4458E-01  -2.296   0.022-0.102     0.0000     1.0032
#_          genl pg = pg + 1
#_          endo
#_          print pg
```

Staff/1301
Conway/63

```
PG
   4.000000
#_        genr ROE = nor(1)
#_        genr T = nor(1)
#_        genr rpm = roe - t

#_        ols rpm t

REQUIRED MEMORY IS PAR=      28 CURRENT PAR=   11000
 OLS ESTIMATION
      500 OBSERVATIONS     DEPENDENT VARIABLE= RPM
...NOTE..SAMPLE RANGE SET TO:      1,    500

 R-SQUARE =   0.4826     R-SQUARE ADJUSTED =   0.4816
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.99652
STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.99826
SUM OF SQUARED ERRORS-SSE=   496.27
MEAN OF DEPENDENT VARIABLE = -0.72952E-01
LOG OF THE LIKELIHOOD FUNCTION = -707.596

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
 AKAIKE (1969) FINAL PREDICTION ERROR - FPE =      1.0005
    (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
 AKAIKE (1973) INFORMATION CRITERION - LOG AIC =  0.50858E-03
 SCHWARZ (1978) CRITERION - LOG SC =             0.17367E-01
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
 CRAVEN-WAHBA (1979)
    GENERALIZED CROSS VALIDATION - GCV =           1.0005
 HANNAN AND QUINN (1979) CRITERION =               1.0071
 RICE (1984) CRITERION =                           1.0005
 SHIBATA (1981) CRITERION =                        1.0005
 SCHWARZ (1978) CRITERION - SC =                   1.0175
 AKAIKE (1974) INFORMATION CRITERION - AIC =       1.0005

                    ANALYSIS OF VARIANCE - FROM MEAN
                      SS           DF           MS                F
REGRESSION          462.98          1.        462.98            464.594
ERROR               496.27        498.       0.99652            P-VALUE
TOTAL               959.25        499.        1.9223              0.000

                    ANALYSIS OF VARIANCE - FROM ZERO
                      SS           DF           MS                F
REGRESSION          465.64          2.        232.82            233.632
ERROR               496.27        498.       0.99652            P-VALUE
TOTAL               961.91        500.        1.9238              0.000

VARIABLE   ESTIMATED  STANDARD   T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR    498 DF    P-VALUE CORR. COEFFICIENT  AT MEANS
T         -0.93834    0.4353E-01  -21.55    0.000-0.695    -0.6947     0.3187
CONSTANT -0.49702E-01 0.4466E-01  -1.113    0.266-0.050     0.0000     0.6813
```

```
#_        ols ROE t

REQUIRED MEMORY IS PAR=      28 CURRENT PAR=   11000
 OLS ESTIMATION
      500 OBSERVATIONS     DEPENDENT VARIABLE= ROE
...NOTE..SAMPLE RANGE SET TO:      1,    500

 R-SQUARE =   0.0040     R-SQUARE ADJUSTED =   0.0020
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.99652
STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.99826
SUM OF SQUARED ERRORS-SSE=   496.27
MEAN OF DEPENDENT VARIABLE = -0.48174E-01
LOG OF THE LIKELIHOOD FUNCTION = -707.596

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
 AKAIKE (1969) FINAL PREDICTION ERROR - FPE =      1.0005
    (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
 AKAIKE (1973) INFORMATION CRITERION - LOG AIC =  0.50858E-03
 SCHWARZ (1978) CRITERION - LOG SC =              0.17367E-01
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
 CRAVEN-WAHBA (1979)
    GENERALIZED CROSS VALIDATION - GCV =           1.0005
 HANNAN AND QUINN (1979) CRITERION =               1.0071
 RICE (1984) CRITERION =                           1.0005
 SHIBATA (1981) CRITERION =                        1.0005
 SCHWARZ (1978) CRITERION - SC =                   1.0175
 AKAIKE (1974) INFORMATION CRITERION - AIC =       1.0005

                    ANALYSIS OF VARIANCE - FROM MEAN
                      SS         DF          MS                F
REGRESSION          1.9990        1.       1.9990            2.006
ERROR               496.27      498.      0.99652          P-VALUE
TOTAL               498.27      499.      0.99853            0.157

                    ANALYSIS OF VARIANCE - FROM ZERO
                      SS         DF          MS                F
REGRESSION          3.1594        2.       1.5797            1.585
ERROR               496.27      498.      0.99652          P-VALUE
TOTAL               499.43      500.      0.99886            0.206


VARIABLE   ESTIMATED  STANDARD   T-RATIO         PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR    498 DF   P-VALUE CORR. COEFFICIENT  AT MEANS
T          0.61658E-01 0.4353E-01   1.416    0.157 0.063     0.0633    -0.0317
CONSTANT -0.49702E-01 0.4466E-01  -1.113    0.266-0.050     0.0000     1.0317
#_         genl pg = pg + 1
#_         endo
#_         print pg
```

```
PG
  5.000000
#_       genr ROE = nor(1)
#_       genr T = nor(1)
#_       genr rpm = roe - t

#_       ols rpm t

REQUIRED MEMORY IS PAR=      28 CURRENT PAR=   11000
 OLS ESTIMATION
      500 OBSERVATIONS     DEPENDENT VARIABLE= RPM
...NOTE..SAMPLE RANGE SET TO:      1,     500

 R-SQUARE =   0.4448     R-SQUARE ADJUSTED =   0.4437
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.99134
STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.99566
SUM OF SQUARED ERRORS-SSE=   493.69
MEAN OF DEPENDENT VARIABLE =  0.11896
LOG OF THE LIKELIHOOD FUNCTION = -706.294

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
 AKAIKE (1969) FINAL PREDICTION ERROR - FPE =      0.99531
    (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
 AKAIKE (1973) INFORMATION CRITERION - LOG AIC = -0.47027E-02
 SCHWARZ (1978) CRITERION - LOG SC =             0.12156E-01
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
 CRAVEN-WAHBA (1979)
    GENERALIZED CROSS VALIDATION - GCV =         0.99532
 HANNAN AND QUINN (1979) CRITERION =              1.0019
 RICE (1984) CRITERION =                         0.99534
 SHIBATA (1981) CRITERION =                      0.99528
 SCHWARZ (1978) CRITERION - SC =                  1.0122
 AKAIKE (1974) INFORMATION CRITERION - AIC =     0.99531

                    ANALYSIS OF VARIANCE - FROM MEAN
                     SS          DF          MS                    F
REGRESSION         395.56         1.       395.56               399.015
ERROR              493.69       498.      0.99134               P-VALUE
TOTAL              889.25       499.       1.7821                 0.000

                    ANALYSIS OF VARIANCE - FROM ZERO
                     SS          DF          MS                    F
REGRESSION         402.64         2.       201.32               203.076
ERROR              493.69       498.      0.99134               P-VALUE
TOTAL              896.33       500.       1.7927                 0.000

VARIABLE   ESTIMATED  STANDARD   T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR     498 DF   P-VALUE CORR. COEFFICIENT  AT MEANS
T         -0.91426    0.4577E-01  -19.98    0.000-0.667    -0.6670     0.4173
CONSTANT  0.69321E-01 0.4460E-01   1.554    0.121 0.069     0.0000     0.5827
```

```
#_        ols ROE t
```

Staff/1301
Conway/66

```
REQUIRED MEMORY IS PAR=      28 CURRENT PAR=   11000
 OLS ESTIMATION
      500 OBSERVATIONS     DEPENDENT VARIABLE= ROE
...NOTE..SAMPLE RANGE SET TO:      1,     500

 R-SQUARE =    0.0070     R-SQUARE ADJUSTED =    0.0050
VARIANCE OF THE ESTIMATE-SIGMA**2 =   0.99134
STANDARD ERROR OF THE ESTIMATE-SIGMA =   0.99566
SUM OF SQUARED ERRORS-SSE=   493.69
MEAN OF DEPENDENT VARIABLE =  0.64666E-01
LOG OF THE LIKELIHOOD FUNCTION = -706.294

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
 AKAIKE (1969) FINAL PREDICTION ERROR - FPE =      0.99531
    (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
 AKAIKE (1973) INFORMATION CRITERION - LOG AIC = -0.47027E-02
 SCHWARZ (1978) CRITERION - LOG SC =              0.12156E-01
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
 CRAVEN-WAHBA (1979)
    GENERALIZED CROSS VALIDATION - GCV =          0.99532
 HANNAN AND QUINN (1979) CRITERION =               1.0019
 RICE (1984) CRITERION =                          0.99534
 SHIBATA (1981) CRITERION =                       0.99528
 SCHWARZ (1978) CRITERION - SC =                   1.0122
 AKAIKE (1974) INFORMATION CRITERION - AIC =      0.99531
```

ANALYSIS OF VARIANCE - FROM MEAN

	SS	DF	MS	F
REGRESSION	3.4788	1.	3.4788	3.509
ERROR	493.69	498.	0.99134	P-VALUE
TOTAL	497.17	499.	0.99633	0.062

ANALYSIS OF VARIANCE - FROM ZERO

	SS	DF	MS	F
REGRESSION	5.5696	2.	2.7848	2.809
ERROR	493.69	498.	0.99134	P-VALUE
TOTAL	499.26	500.	0.99852	0.061

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 498 DF	P-VALUE	PARTIAL CORR.	STANDARDIZED COEFFICIENT	ELASTICITY AT MEANS
T	0.85739E-01	0.4577E-01	1.873	0.062	0.084	0.0836	-0.0720
CONSTANT	0.69321E-01	0.4460E-01	1.554	0.121	0.069	0.0000	1.0720

```
#_        genl pg = pg + 1
#_        endo
#_        print pg
```

```
PG
   6.000000
#_        genr ROE = nor(1)
#_        genr T = nor(1)
#_        genr rpm = roe - t

#_        ols rpm t

REQUIRED MEMORY IS PAR=      28 CURRENT PAR=   11000
 OLS ESTIMATION
      500 OBSERVATIONS     DEPENDENT VARIABLE= RPM
...NOTE..SAMPLE RANGE SET TO:      1,     500

 R-SQUARE =   0.4947     R-SQUARE ADJUSTED =   0.4937
VARIANCE OF THE ESTIMATE-SIGMA**2 =   1.0464
STANDARD ERROR OF THE ESTIMATE-SIGMA =   1.0229
SUM OF SQUARED ERRORS-SSE=   521.09
MEAN OF DEPENDENT VARIABLE =  0.68252E-03
LOG OF THE LIKELIHOOD FUNCTION = -719.796

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
 AKAIKE (1969) FINAL PREDICTION ERROR - FPE =      1.0505
    (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
 AKAIKE (1973) INFORMATION CRITERION - LOG AIC =  0.49306E-01
 SCHWARZ (1978) CRITERION - LOG SC =             0.66164E-01
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
 CRAVEN-WAHBA (1979)
    GENERALIZED CROSS VALIDATION - GCV =           1.0506
 HANNAN AND QUINN (1979) CRITERION =               1.0575
 RICE (1984) CRITERION =                           1.0506
 SHIBATA (1981) CRITERION =                        1.0505
 SCHWARZ (1978) CRITERION - SC =                   1.0684
 AKAIKE (1974) INFORMATION CRITERION - AIC =       1.0505

                     ANALYSIS OF VARIANCE - FROM MEAN
                      SS           DF           MS                 F
REGRESSION          510.14          1.        510.14            487.537
ERROR               521.09        498.        1.0464            P-VALUE
TOTAL               1031.2        499.        2.0666              0.000

                     ANALYSIS OF VARIANCE - FROM ZERO
                      SS           DF           MS                 F
REGRESSION          510.14          2.        255.07            243.769
ERROR               521.09        498.        1.0464            P-VALUE
TOTAL               1031.2        500.        2.0624              0.000


VARIABLE   ESTIMATED  STANDARD   T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR     498 DF   P-VALUE CORR. COEFFICIENT  AT MEANS
T          -1.0037    0.4546E-01  -22.08    0.000-0.703    -0.7033   -45.0923
CONSTANT  0.31459E-01 0.4577E-01  0.6874    0.492 0.031     0.0000    46.0923
```

```
#_        ols ROE t

REQUIRED MEMORY IS PAR=      28 CURRENT PAR=   11000
 OLS ESTIMATION
      500 OBSERVATIONS     DEPENDENT VARIABLE= ROE
...NOTE..SAMPLE RANGE SET TO:      1,    500

 R-SQUARE =   0.0000    R-SQUARE ADJUSTED =  -0.0020
VARIANCE OF THE ESTIMATE-SIGMA**2 =   1.0464
STANDARD ERROR OF THE ESTIMATE-SIGMA =   1.0229
SUM OF SQUARED ERRORS-SSE=   521.09
MEAN OF DEPENDENT VARIABLE =  0.31346E-01
LOG OF THE LIKELIHOOD FUNCTION = -719.796

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
 AKAIKE (1969) FINAL PREDICTION ERROR - FPE =      1.0505
    (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
 AKAIKE (1973) INFORMATION CRITERION - LOG AIC =  0.49306E-01
 SCHWARZ (1978) CRITERION - LOG SC =              0.66164E-01
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
 CRAVEN-WAHBA (1979)
    GENERALIZED CROSS VALIDATION - GCV =           1.0506
 HANNAN AND QUINN (1979) CRITERION =               1.0575
 RICE (1984) CRITERION =                           1.0506
 SHIBATA (1981) CRITERION =                        1.0505
 SCHWARZ (1978) CRITERION - SC =                   1.0684
 AKAIKE (1974) INFORMATION CRITERION - AIC =       1.0505

                   ANALYSIS OF VARIANCE - FROM MEAN
                     SS          DF          MS                  F
REGRESSION      0.67952E-02      1.      0.67952E-02           0.006
ERROR             521.09       498.        1.0464            P-VALUE
TOTAL             521.09       499.        1.0443              0.936

                   ANALYSIS OF VARIANCE - FROM ZERO
                     SS          DF          MS                  F
REGRESSION      0.49810          2.      0.24905               0.238
ERROR             521.09       498.        1.0464            P-VALUE
TOTAL             521.58       500.        1.0432              0.788

VARIABLE   ESTIMATED  STANDARD   T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR    498 DF   P-VALUE CORR. COEFFICIENT  AT MEANS
T        -0.36631E-02 0.4546E-01 -0.8059E-01 0.936-0.004    -0.0036    -0.0036
CONSTANT  0.31459E-01 0.4577E-01  0.6874     0.492 0.031     0.0000     1.0036
#_        genl pg = pg + 1
#_        endo
#_        print pg
```

```
PG
   7.000000
#_        genr ROE = nor(1)
#_        genr T = nor(1)
#_        genr rpm = roe - t

#_        ols rpm t

REQUIRED MEMORY IS PAR=      28 CURRENT PAR=   11000
 OLS ESTIMATION
      500 OBSERVATIONS     DEPENDENT VARIABLE= RPM
...NOTE..SAMPLE RANGE SET TO:      1,    500

 R-SQUARE =   0.5300     R-SQUARE ADJUSTED =   0.5290
VARIANCE OF THE ESTIMATE-SIGMA**2 =   1.0117
STANDARD ERROR OF THE ESTIMATE-SIGMA =   1.0058
SUM OF SQUARED ERRORS-SSE=   503.83
MEAN OF DEPENDENT VARIABLE =  0.65233E-02
LOG OF THE LIKELIHOOD FUNCTION = -711.375

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
 AKAIKE (1969) FINAL PREDICTION ERROR - FPE =       1.0157
    (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
 AKAIKE (1973) INFORMATION CRITERION - LOG AIC =  0.15622E-01
 SCHWARZ (1978) CRITERION - LOG SC =              0.32480E-01
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
 CRAVEN-WAHBA (1979)
    GENERALIZED CROSS VALIDATION - GCV =           1.0158
 HANNAN AND QUINN (1979) CRITERION =               1.0225
 RICE (1984) CRITERION =                           1.0158
 SHIBATA (1981) CRITERION =                        1.0157
 SCHWARZ (1978) CRITERION - SC =                   1.0330
 AKAIKE (1974) INFORMATION CRITERION - AIC =       1.0157

                    ANALYSIS OF VARIANCE - FROM MEAN
                       SS          DF          MS                 F
REGRESSION          568.12          1.       568.12            561.554
ERROR               503.83        498.       1.0117            P-VALUE
TOTAL               1071.9        499.       2.1482              0.000

                    ANALYSIS OF VARIANCE - FROM ZERO
                       SS          DF          MS                 F
REGRESSION          568.14          2.       284.07            280.787
ERROR               503.83        498.       1.0117            P-VALUE
TOTAL               1072.0        500.       2.1439              0.000


VARIABLE   ESTIMATED  STANDARD   T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR     498 DF    P-VALUE CORR. COEFFICIENT  AT MEANS
T          -1.0557     0.4455E-01  -23.70     0.000-0.728    -0.7280    10.5003
CONSTANT -0.61974E-01 0.4507E-01  -1.375     0.170-0.061     0.0000    -9.5003
```

```
#_        ols ROE t

REQUIRED MEMORY IS PAR=      28 CURRENT PAR=   11000
 OLS ESTIMATION
      500 OBSERVATIONS     DEPENDENT VARIABLE= ROE
...NOTE..SAMPLE RANGE SET TO:      1,    500

 R-SQUARE =   0.0031     R-SQUARE ADJUSTED =   0.0011
VARIANCE OF THE ESTIMATE-SIGMA**2 =   1.0117
STANDARD ERROR OF THE ESTIMATE-SIGMA =   1.0058
SUM OF SQUARED ERRORS-SSE=   503.83
MEAN OF DEPENDENT VARIABLE = -0.58360E-01
LOG OF THE LIKELIHOOD FUNCTION = -711.375

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
 AKAIKE (1969) FINAL PREDICTION ERROR - FPE =      1.0157
    (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
 AKAIKE (1973) INFORMATION CRITERION - LOG AIC =  0.15622E-01
 SCHWARZ (1978) CRITERION - LOG SC =              0.32480E-01
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
 CRAVEN-WAHBA (1979)
    GENERALIZED CROSS VALIDATION - GCV =            1.0158
 HANNAN AND QUINN (1979) CRITERION =                1.0225
 RICE (1984) CRITERION =                            1.0158
 SHIBATA (1981) CRITERION =                         1.0157
 SCHWARZ (1978) CRITERION - SC =                    1.0330
 AKAIKE (1974) INFORMATION CRITERION - AIC =        1.0157

                     ANALYSIS OF VARIANCE - FROM MEAN
                      SS          DF          MS                  F
REGRESSION          1.5810        1.        1.5810              1.563
ERROR               503.83      498.        1.0117             P-VALUE
TOTAL               505.41      499.        1.0128              0.212

                     ANALYSIS OF VARIANCE - FROM ZERO
                      SS          DF          MS                  F
REGRESSION          3.2840        2.        1.6420              1.623
ERROR               503.83      498.        1.0117             P-VALUE
TOTAL               507.11      500.        1.0142              0.198

VARIABLE   ESTIMATED  STANDARD   T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR     498 DF   P-VALUE CORR. COEFFICIENT  AT MEANS
T        -0.55691E-01 0.4455E-01  -1.250    0.212-0.056    -0.0559    -0.0619
CONSTANT -0.61974E-01 0.4507E-01  -1.375    0.170-0.061     0.0000     1.0619
#_        genl pg = pg + 1
#_        endo
#_        print pg
```

Staff/1301
Conway/71

```
PG
   8.000000
#_        genr ROE = nor(1)
#_        genr T = nor(1)
#_        genr rpm = roe - t

#_        ols rpm t

REQUIRED MEMORY IS PAR=      28 CURRENT PAR=   11000
 OLS ESTIMATION
      500 OBSERVATIONS     DEPENDENT VARIABLE= RPM
...NOTE..SAMPLE RANGE SET TO:      1,    500

 R-SQUARE =   0.5518     R-SQUARE ADJUSTED =   0.5509
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.94455
STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.97188
SUM OF SQUARED ERRORS-SSE=   470.39
MEAN OF DEPENDENT VARIABLE =  0.57071E-01
LOG OF THE LIKELIHOOD FUNCTION = -694.206

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
 AKAIKE (1969) FINAL PREDICTION ERROR - FPE =      0.94833
    (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
 AKAIKE (1973) INFORMATION CRITERION - LOG AIC = -0.53055E-01
 SCHWARZ (1978) CRITERION - LOG SC =             -0.36197E-01
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
 CRAVEN-WAHBA (1979)
    GENERALIZED CROSS VALIDATION - GCV =           0.94834
 HANNAN AND QUINN (1979) CRITERION =               0.95462
 RICE (1984) CRITERION =                           0.94836
 SHIBATA (1981) CRITERION =                        0.94830
 SCHWARZ (1978) CRITERION - SC =                   0.96445
 AKAIKE (1974) INFORMATION CRITERION - AIC =       0.94833

                     ANALYSIS OF VARIANCE - FROM MEAN
                      SS           DF           MS                  F
REGRESSION          579.01          1.        579.01             612.999
ERROR               470.39        498.       0.94455             P-VALUE
TOTAL               1049.4        499.        2.1030               0.000

                     ANALYSIS OF VARIANCE - FROM ZERO
                      SS           DF           MS                  F
REGRESSION          580.64          2.        290.32             307.361
ERROR               470.39        498.       0.94455             P-VALUE
TOTAL               1051.0        500.        2.1020               0.000


VARIABLE   ESTIMATED  STANDARD   T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR     498 DF   P-VALUE CORR. COEFFICIENT  AT MEANS
T          -1.1061    0.4467E-01  -24.76    0.000-0.743    -0.7428     0.6180
CONSTANT  0.21799E-01 0.4349E-01  0.5013    0.616 0.022     0.0000     0.3820
```

```
#_        ols ROE t
```



```
REQUIRED MEMORY IS PAR=      28 CURRENT PAR=   11000
 OLS ESTIMATION
      500 OBSERVATIONS     DEPENDENT VARIABLE= ROE
...NOTE..SAMPLE RANGE SET TO:      1,    500

 R-SQUARE =    0.0112     R-SQUARE ADJUSTED =   0.0092
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.94455
STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.97188
SUM OF SQUARED ERRORS-SSE=   470.39
MEAN OF DEPENDENT VARIABLE =  0.25181E-01
LOG OF THE LIKELIHOOD FUNCTION = -694.206

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
 AKAIKE (1969) FINAL PREDICTION ERROR - FPE =      0.94833
   (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
 AKAIKE (1973) INFORMATION CRITERION - LOG AIC = -0.53055E-01
 SCHWARZ (1978) CRITERION - LOG SC =             -0.36197E-01
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
 CRAVEN-WAHBA (1979)
    GENERALIZED CROSS VALIDATION - GCV =          0.94834
 HANNAN AND QUINN (1979) CRITERION =              0.95462
 RICE (1984) CRITERION =                          0.94836
 SHIBATA (1981) CRITERION =                       0.94830
 SCHWARZ (1978) CRITERION - SC =                  0.96445
 AKAIKE (1974) INFORMATION CRITERION - AIC =      0.94833

                     ANALYSIS OF VARIANCE - FROM MEAN
                      SS          DF           MS                  F
REGRESSION          5.3232        1.         5.3232              5.636
ERROR               470.39       498.       0.94455            P-VALUE
TOTAL               475.71       499.       0.95332              0.018

                     ANALYSIS OF VARIANCE - FROM ZERO
                      SS          DF           MS                  F
REGRESSION          5.6403        2.         2.8201              2.986
ERROR               470.39       498.       0.94455            P-VALUE
TOTAL               476.03       500.       0.95205              0.051


VARIABLE   ESTIMATED  STANDARD   T-RATIO       PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR    498 DF   P-VALUE CORR. COEFFICIENT  AT MEANS
T         -0.10605    0.4467E-01  -2.374   0.018-0.106    -0.1058      0.1343
CONSTANT  0.21799E-01 0.4349E-01  0.5013   0.616 0.022     0.0000      0.8657
#_        gen1 pg = pg + 1
#_        endo
#_        print pg
```

Staff/1301
Conway/73

```
PG
   9.000000
#_        genr ROE = nor(1)
#_        genr T = nor(1)
#_        genr rpm = roe - t

#_        ols rpm t

REQUIRED MEMORY IS PAR=      28 CURRENT PAR=   11000
 OLS ESTIMATION
      500 OBSERVATIONS     DEPENDENT VARIABLE= RPM
...NOTE..SAMPLE RANGE SET TO:      1,    500

 R-SQUARE =   0.5044     R-SQUARE ADJUSTED =   0.5034
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.95760
STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.97857
SUM OF SQUARED ERRORS-SSE=   476.88
MEAN OF DEPENDENT VARIABLE =  0.88535E-01
LOG OF THE LIKELIHOOD FUNCTION = -697.636

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
 AKAIKE (1969) FINAL PREDICTION ERROR - FPE =     0.96143
    (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
 AKAIKE (1973) INFORMATION CRITERION - LOG AIC = -0.39334E-01
 SCHWARZ (1978) CRITERION - LOG SC =             -0.22476E-01
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
 CRAVEN-WAHBA (1979)
    GENERALIZED CROSS VALIDATION - GCV =          0.96144
 HANNAN AND QUINN (1979) CRITERION =              0.96781
 RICE (1984) CRITERION =                          0.96146
 SHIBATA (1981) CRITERION =                       0.96140
 SCHWARZ (1978) CRITERION - SC =                  0.97778
 AKAIKE (1974) INFORMATION CRITERION - AIC =      0.96143
```

ANALYSIS OF VARIANCE - FROM MEAN

	SS	DF	MS	F
REGRESSION	485.33	1.	485.33	506.819
ERROR	476.88	498.	0.95760	P-VALUE
TOTAL	962.21	499.	1.9283	0.000

ANALYSIS OF VARIANCE - FROM ZERO

	SS	DF	MS	F
REGRESSION	489.25	2.	244.62	255.456
ERROR	476.88	498.	0.95760	P-VALUE
TOTAL	966.13	500.	1.9323	0.000

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 498 DF	P-VALUE	PARTIAL CORR.	STANDARDIZED COEFFICIENT	ELASTICITY AT MEANS
T	-0.99029	0.4399E-01	-22.51	0.000	-0.710	-0.7102	0.5573
CONSTANT	0.39192E-01	0.4382E-01	0.8944	0.372	0.040	0.0000	0.4427

Staff/1301
Conway/74

```
#_        ols ROE t

REQUIRED MEMORY IS PAR=      28 CURRENT PAR=   11000
 OLS ESTIMATION
      500 OBSERVATIONS     DEPENDENT VARIABLE= ROE
...NOTE..SAMPLE RANGE SET TO:      1,    500

 R-SQUARE =   0.0001     R-SQUARE ADJUSTED =  -0.0019
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.95760
STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.97857
SUM OF SQUARED ERRORS-SSE=   476.88
MEAN OF DEPENDENT VARIABLE =  0.38708E-01
LOG OF THE LIKELIHOOD FUNCTION = -697.636

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
 AKAIKE (1969) FINAL PREDICTION ERROR - FPE =      0.96143
    (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
 AKAIKE (1973) INFORMATION CRITERION - LOG AIC = -0.39334E-01
 SCHWARZ (1978) CRITERION - LOG SC =            -0.22476E-01
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
 CRAVEN-WAHBA (1979)
    GENERALIZED CROSS VALIDATION - GCV =         0.96144
 HANNAN AND QUINN (1979) CRITERION =             0.96781
 RICE (1984) CRITERION =                         0.96146
 SHIBATA (1981) CRITERION =                      0.96140
 SCHWARZ (1978) CRITERION - SC =                 0.97778
 AKAIKE (1974) INFORMATION CRITERION - AIC =     0.96143

                     ANALYSIS OF VARIANCE - FROM MEAN
                      SS          DF          MS                    F
REGRESSION       0.46707E-01     1.      0.46707E-01              0.049
ERROR             476.88       498.      0.95760                P-VALUE
TOTAL             476.93       499.      0.95577                  0.825

                     ANALYSIS OF VARIANCE - FROM ZERO
                      SS          DF          MS                    F
REGRESSION        0.79584        2.      0.39792                  0.416
ERROR             476.88       498.      0.95760                P-VALUE
TOTAL             477.68       500.      0.95536                  0.660

VARIABLE   ESTIMATED  STANDARD   T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR    498 DF    P-VALUE CORR. COEFFICIENT  AT MEANS
T         0.97148E-02 0.4399E-01  0.2209    0.825 0.010     0.0099    -0.0125
CONSTANT  0.39192E-01 0.4382E-01  0.8944    0.372 0.040     0.0000     1.0125
#_        genl pg = pg + 1
#_        endo
#_        print pg
```

```
PG
  10.00000
#_        genr ROE = nor(1)
#_        genr T = nor(1)
#_        genr rpm = roe - t

#_        ols rpm t

REQUIRED MEMORY IS PAR=      28 CURRENT PAR=   11000
 OLS ESTIMATION
      500 OBSERVATIONS     DEPENDENT VARIABLE= RPM
...NOTE..SAMPLE RANGE SET TO:      1,    500

 R-SQUARE =   0.4953     R-SQUARE ADJUSTED =   0.4943
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.92533
STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.96194
SUM OF SQUARED ERRORS-SSE=   460.82
MEAN OF DEPENDENT VARIABLE = -0.12451
LOG OF THE LIKELIHOOD FUNCTION = -689.067

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
 AKAIKE (1969) FINAL PREDICTION ERROR - FPE =      0.92903
    (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
 AKAIKE (1973) INFORMATION CRITERION - LOG AIC = -0.73610E-01
 SCHWARZ (1978) CRITERION - LOG SC =            -0.56752E-01
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
 CRAVEN-WAHBA (1979)
    GENERALIZED CROSS VALIDATION - GCV =           0.92905
 HANNAN AND QUINN (1979) CRITERION =               0.93520
 RICE (1984) CRITERION =                           0.92906
 SHIBATA (1981) CRITERION =                        0.92900
 SCHWARZ (1978) CRITERION - SC =                   0.94483
 AKAIKE (1974) INFORMATION CRITERION - AIC =       0.92903
```

ANALYSIS OF VARIANCE - FROM MEAN

	SS	DF	MS	F
REGRESSION	452.22	1.	452.22	488.711
ERROR	460.82	498.	0.92533	P-VALUE
TOTAL	913.04	499.	1.8297	0.000

ANALYSIS OF VARIANCE - FROM ZERO

	SS	DF	MS	F
REGRESSION	459.97	2.	229.99	248.544
ERROR	460.82	498.	0.92533	P-VALUE
TOTAL	920.79	500.	1.8416	0.000

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 498 DF	P-VALUE	PARTIAL CORR.	STANDARDIZED COEFFICIENT	ELASTICITY AT MEANS
T	-0.97923	0.4430E-01	-22.11	0.000	-0.704	-0.7038	0.7720
CONSTANT	-0.28392E-01	0.4324E-01	-0.6566	0.512	-0.029	0.0000	0.2280

```
#_        ols ROE t

REQUIRED MEMORY IS PAR=      28 CURRENT PAR=   11000
 OLS ESTIMATION
      500 OBSERVATIONS     DEPENDENT VARIABLE= ROE
...NOTE..SAMPLE RANGE SET TO:      1,    500

 R-SQUARE =   0.0004     R-SQUARE ADJUSTED =  -0.0016
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.92533
STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.96194
SUM OF SQUARED ERRORS-SSE=   460.82
MEAN OF DEPENDENT VARIABLE = -0.26354E-01
LOG OF THE LIKELIHOOD FUNCTION = -689.067

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
 AKAIKE (1969) FINAL PREDICTION ERROR - FPE =      0.92903
    (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
 AKAIKE (1973) INFORMATION CRITERION - LOG AIC = -0.73610E-01
 SCHWARZ (1978) CRITERION - LOG SC =             -0.56752E-01
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
 CRAVEN-WAHBA (1979)
    GENERALIZED CROSS VALIDATION - GCV =          0.92905
 HANNAN AND QUINN (1979) CRITERION =              0.93520
 RICE (1984) CRITERION =                          0.92906
 SHIBATA (1981) CRITERION =                       0.92900
 SCHWARZ (1978) CRITERION - SC =                  0.94483
 AKAIKE (1974) INFORMATION CRITERION - AIC =      0.92903

                     ANALYSIS OF VARIANCE - FROM MEAN
                      SS         DF          MS                 F
REGRESSION        0.20343        1.      0.20343              0.220
ERROR              460.82      498.      0.92533            P-VALUE
TOTAL              461.02      499.      0.92389              0.639

                     ANALYSIS OF VARIANCE - FROM ZERO
                      SS         DF          MS                 F
REGRESSION        0.55069        2.      0.27534              0.298
ERROR              460.82      498.      0.92533            P-VALUE
TOTAL              461.37      500.      0.92273              0.743


VARIABLE   ESTIMATED  STANDARD   T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR    498 DF    P-VALUE CORR. COEFFICIENT  AT MEANS
T         0.20769E-01 0.4430E-01  0.4689     0.639 0.021     0.0210     -0.0774
CONSTANT -0.28392E-01 0.4324E-01 -0.6566     0.512-0.029     0.0000      1.0774
#_        genl pg = pg + 1
#_        endo
#_        print pg
****** EXECUTION FINISHED FOR DO LOOP  #=      10
```

September 26, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 19, 2006
Question No. 562

Request:

Referring to UE 180 – UE 181 – UE 184 / PGE /2000, Hager-Valach/56, lines 21-22, please provide all evidence that PGE relied upon to conclude that the most important factor is interest rates.

Response:

Our statement referred to the specification of the model. We use Treasuries as a risk-free rate. The regression then models the risk premium required by the market as a function of the interest rate. The Technical Appendix provides additional information on the model specification. We did not say in our testimony that we had "evidence." We relied upon the theory of model specification and, in turn, attempted to quantify elements of the general risk model specified in Hager/Valach 1100/21. For a fuller discussion of model specification see A. Koustsoyiannis, Theory of Econometrics, Second edition, 1977, Pages 22-30. A copy of these pages is included as Attachment 562-A.

In addition, PGE Exhibit 2019 contains several variations of our initial Risk Positioning model and the estimated implied ROEs are close to our initial estimate.

UE 180
Attachment 562-A

Excerpt Theory of Economietrics
Second edition
A. Koustsoyiannis

UE 180
PGE's Response to OPUC Data Request No. 562
Attachment 562-A

A. Koutsoyiannis

Theory of Econometrics

Second edition

THEORY OF ECONOMETRICS

An Introductory Exposition of Econometric Methods

A. KOUTSOYIANNIS

Professor of Economics
University of Ottawa, Ontario

SECOND EDITION

Foreword by C. F. CARTER

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examine their implications for the estimates of the parameters. Strictly speaking the assumptions relate (a) to the form of the distribution of the random variable u and (b) to the relationships among the explanatory variables. They are assumptions concerning the variables of the model and not the particular method which is applied for the estimation of the model. However, they are usually stated as assumptions of the particular technique. In any case the explicit statement of these assumptions is a very important task; if these assumptions are violated, either the estimates of the parameters will be biased, or it will not be possible to assess their reliability, or both. On the basis of the assumptions of each method the econometrician determines the econometric criteria, which will be used for the evaluation of the results of the computations (see section 2.3 below).

2.2.5. 'EXPERIMENTAL APPROACH' VERSUS 'ORTHODOX APPROACH'

In applying econometric methods for the estimation of economic models two approaches have been developed, the 'orthodox approach' and the 'experimental approach'.

The 'orthodox' econometric approach consists in formulating a mathematical model on *a priori* theoretical grounds, and attempting to measure the parameters of that model on the basis of the best available data. Data deficiencies might lead to minor modifications of the model before it could be tested statistically, but broadly speaking, having established his model the 'orthodox' econometrician would tend to stick to it, despite unfavourable statistical results. In other words, following the orthodox approach of econometric research one would proceed as follows:

(1) Collect all information, from theory or from practice, relevant to the phenomenon being studied.

(2) Decide on *a priori* reasoning on the particular mathematical expression of the model.

(3) Estimate the model with the available statistical data.

The model constructed on *a priori* assumptions is considered by the orthodox econometrician as the only true model, irrespective of the results obtained. If these results are 'unfavourable', that is the signs and size of the parameters do not conform to *a priori* knowledge, the econometrician will not reject the model, but would try to explain the results by attributing them to data deficiencies mainly. The initial model is considered as 'correct' and would not be revised.

It is obvious that such a rigid approach to applied econometric research is not commendable. First of all in order to stick to an initial formulation of the model, one should be certain that he commands perfect knowledge of all the aspects of the phenomenon being analysed. Such a pretention would be outrageous, given the complexity of economic phenomena and the loose exposition of economic theory. Furthermore, one may pretend to have followed the orthodox approach, while in reality one has experimented to a considerable extent, before settling for the model, which one may present afterwards as being compiled by the most orthodox econometric methodology.

Today most econometric research is attempted by the experimental approach. Experimentation with various models has been facilitated by the expansion of the use of electronic computers. In following the experimental approach one starts with simple models containing a small number of equations and variables. These models are formulated on *a priori* considerations, like the models of the orthodox approach, but they are not considered as being rigid. On the contrary, they are modified gradually, on the basis of the statistical evidence accruing from the computations. The econometrician starts from a simple model, which on *a priori* grounds is believed to contain the most important factors of the relationship being analysed. Then additional variables are added, and perhaps the formulation is given a more complex appearance (non-linear forms, etc.). In other words the econometrician experiments with various theoretically plausible models including various variables and/or various mathematical formulations.

The experimental approach combines the theoretical considerations (*a priori* criteria) with the empirical observations available and is designed to extract the maximum of information from the available data. As calculations are carried out by adding other explanatory variables in various combinations, or by adding other equations, or by changing the mathematical form of the functions, or by using alternative econometric methods for the estimation of the models, the econometrician is able to observe the effects of such changes in an attempt to achieve the best model, the best explanation of the phenomenon being analysed. Each time a new variable (or any other change) is introduced because it is thought to improve the explanation of the phenomenon, three statistical effects on the model will normally result.

(1) The new variable (or change) will have some effect, minor or major, on the systematic part of the relation. In other words, the new variable will or will not be shown to explain a significant part of the variation in the dependent variable.

(2) It will affect the non-systematic (residual) part of the relationship, for example because of errors of measurement in this new variable.

(3) It will have some minor or major effect upon the coefficients of the variables already included in the equation (model). We should notice that if an important variable is omitted, not only will the overall fit of the relation be worse, but the coefficients of the included variables may well be distorted from the values which would be obtained from a complete analysis. In this case the introduction of the new variable will 'correct' the value of the coefficients of the other explanatory variables.[1]

It is obvious from the above discussion that the experimental approach to econometric analysis has more advantages in comparison to the orthodox approach. In particular it renders possible a better use of the available data and information. The experimentation may involve models with (a) various variables,

[1] See R. Stone, 'The Analysis of Market Demand', *Journal of the Royal Statistical Society*, Great Britain 1945, vol. CVIII. See also Chapter 11.8.

(b) various mathematical forms, (c) various numbers of equations, (d) various econometric methods. The process of choosing between the various models involves both the *a priori* and economic-theoretical considerations of the 'orthodox' econometrician, and also a sifting of the statistical evidence given by the experimental approach.

We should note that both the alternative lines of approach have a certain degree of arbitrariness: the orthodox approach makes *a priori* assumptions, while the second makes *a posteriori* choice. What matters is that the investigator should give a full description of his method of research, so that one can judge how much reliability can be attached to the results obtained.[1]

Some authors have criticised the experimental approach on the grounds that (a) the degree of subjective judgement it involves is higher than in the orthodox approach, and (b) the use of the same sample of data for the estimation of various models implies a loss of degrees of freedom which is overlooked in most cases. The meaning of 'degrees of freedom' is discussed briefly in Appendix I.

We agree that the experimental approach is not *the* perfect approach. There is a considerable realism in the argument that if an econometrician is clever and persistent he can always find an equation that fits the data satisfactorily. What is worse, he may argue that his equation is theoretically plausible, i.e. he may attempt to revise economic theory on the basis of his results, a procedure which may not always be justifiable.

The argument of loss of degrees of freedom is often referred to as '*the problem of data mining*'. (See M. Friedman, in 'Conference on Business Cycles', Universities NBER (New York, 1951), pp. 107–14. Also C. F. Christ, *Econometric Models and Methods,* Wiley 1966, New York, pp. 8–9.) This argument is based on purely statistical considerations and runs as follows. The reliability of the estimates is judged on the basis of statistical tests of significance (discussed in Chapter 5), which assume that the maintained hypothesis (the model which we test against the data) is known with certainty. In the experimental approach the maintained hypothesis is not known with certainty, but is chosen because it gives the best fit to the available sample data. This decision implies that in the hypothetical repeating sampling procedure on which the classical tests of significance are based, we use not all possible samples, but only those samples that fit the data well: in this way we introduce a non-random factor in the process for selecting samples, which restricts our freedom of choice. This loss of degrees of freedom should be taken into account in order to adjust the test procedure, otherwise the tests will not be valid. In most cases, however, the appropriately adjusted statistical test is not known. Thus researchers tend mostly to ignore the problem completely. Some writers have suggested a new method of research which incorporates actual numerical *a priori* knowledge in the model, a fact that reduces the need for experimentation to a great extent.

[1] See A. Koutsoyiannis, *An Econometric Study of the Leaf Tobacco Market of Greece*, 1962, Papadimitropoulous Press, pp. 8–9.

This method is known as 'mixed estimation' and will be discussed in Chapter 17. It is the author's belief that the 'data mining' problem is not important for econometrics. Statistical considerations may become highly restrictive for the purposes of econometrics. Some 'loose' interpretation of statistical rules is at times essential if econometrics is to be helpful in testing economic theory and in measuring economic relationships.

2.3. STAGE C. EVALUATION OF ESTIMATES

After the estimation of the model the econometrician must proceed with the evaluation of the results of the calculations, that is with the determination of the reliability of these results. The evaluation consists of deciding whether the estimates of the parameters are theoretically meaningful and statistically satisfactory. For this purpose we use various criteria which may be classified into three groups. Firstly, economic *a priori* criteria, which are determined by economic theory. Secondly, statistical criteria, determined by statistical theory. Thirdly, econometric criteria, determined by econometric theory.

2.3.1. ECONOMIC '*A PRIORI*' CRITERIA

These are determined by the principles of economic theory and refer to the sign and the size of the parameters of economic relationships.

As we have already mentioned, the coefficients of economic models are the 'constants' of economic theory: elasticities, marginal values, multipliers, propensities, etc. Economic theory defines the signs of these coefficients and in broad lines their magnitude. In econometric jargon we say that economic theory imposes restrictions on the signs and values of the parameters of economic relationships.

For example, let us examine the liquidity preference function of an economy. The Keynesian theory of liquidity preference postulates that the main determinants of the demand for money are the level of income (Y) and the rate of interest (i). This theory suggests that there is a positive relationship between the demand for money (M) and the level of income: the larger the income, the larger the amount of money held in the form of cash balances, because the larger the income, the larger the amount required to carry out the transactions. On the contrary, there is a negative relationship between the demand for money and the rate of interest: the higher the rate of interest, the lower the amount of money demanded (to hold in idle balances), because (a) the loss from not lending the money is high, and (b) because a high i implies a low price of bonds and other securities, a fact that makes the purchase of such securities attractive in the expectation of reselling them at a higher price later and thus having capital gains. The liquidity preference function may be expressed in the mathematical form

$$M = b_0 + b_1 Y + b_2 i + u$$

On the basis of the above theory the *a priori* criteria to be used for the evaluation of the estimates of the liquidity preference function may be stated as follows.

The sign of b_1 is expected to be positive while the sign of b_2 is expected to be negative. As regards the magnitude of these parameters not much information is provided by the theory of liquidity preference. However, knowledge of the habits of firms and individuals of an economy may help in setting *a priori* limits to the sizes of b_1 and b_2.

If the estimates of the parameters turn up with signs or size not conforming to economic theory, they should be rejected, unless there is good reason to believe that in the particular instance the principles of economic theory do not hold. In such cases the reasons for accepting the estimates with the 'wrong' sign or magnitude must be stated clearly. However, in most cases the wrong sign or size of the parameters may be attributed to deficiencies of the empirical data employed for the estimation of the model.[1] In other words either the observations are not representative of the relationship, or their number is inadequate, or some assumptions of the method employed are violated. In general, if the *a priori* theoretical criteria are not satisfied, the estimate should be considered unsatisfactory.

2.3.2. STATISTICAL CRITERIA: FIRST-ORDER TESTS

These are determined by statistical theory and aim at the evaluation of the statistical reliability of the estimates of the parameters of the model. The most widely used statistical criteria are the *correlation coefficient* and *the standard deviation* (or standard error) *of the estimates.* These criteria will be explained in subsequent chapters, but a few comments are appropriate here.

The estimates of the parameters of the model are obtained from a sample of observations of the variables included in the relationship. The sampling theory of statistics prescribes some tests for finding out how accurate these estimates are.

The square of the correlation coefficient is a statistical number, computed from the data of the sample, which shows the percentage of the total variation of the dependent variable being explained by the changes of the explanatory variables. It is a measure of the extent to which the explanatory variables are responsible for the changes in the dependent variable of the relationship (see Chapter 5).

The standard deviation or standard error of the estimates is a measure of the dispersion of the estimates around the true parameter. The larger the standard error of a parameter, the less reliable it is, and vice versa (see Chapter 5 and Appendix I).

It should be noted that the statistical criteria are secondary only to the *a priori* theoretical criteria. The estimates of the parameters should be rejected in general if they happen to have the 'wrong' sign (or size) even though the correlation coefficient is high, or the standard errors suggest that the estimates are statistically significant. In such cases the parameters, though statistically satisfactory, are theoretically implausible, that is to say they make no sense on the basis of the *a priori* theoretical-economic criteria.

[1] See, for example, J. Johnston, *Statistical Cost Analysis*, McGraw-Hill, 1962, for a discussion of the data problems in estimating cost functions.

The importance of the statistical criteria in evaluating the results of the estimates of the coefficients is further discussed in Chapter 5.

2.3.3. ECONOMETRIC CRITERIA: SECOND-ORDER TESTS

These are set by the theory of econometrics and aim at the investigation of whether the assumptions of the econometric method employed are satisfied or not in any particular case. The econometric criteria serve as second-order tests (as tests of the statistical tests); in other words they determine the reliability of the statistical criteria, and in particular of the standard errors of the parameter estimates. They help us establish whether the estimates have the desirable properties of unbiasedness, consistency, etc. (see Chapter 6).

If the assumptions of the econometric method applied by the investigator are not satisfied, either the estimates of the parameters cease to possess some of their desirable properties (for example become biased) or the statistical criteria lose their validity and become unreliable for the determination of the significance of these estimates.

We said that the econometric criteria aim at the detection of the violation or validity of the assumptions of the econometric method employed in any particular application. The assumptions of the various econometric techniques differ and hence there are various econometric criteria for each method. These will be discussed in connection with the various techniques. Some examples may illustrate the meaning of the econometric criteria.

All econometric techniques listed in page 20 have the common assumption that the values of the random variable included in the model are not connected one to the other. This is known as the assumption of non-autocorrelated random disturbances (see Chapters 4 and 10). If this assumption is violated the standard errors of the parameters are not a reliable criterion for the evaluation of the statistical significance of the coefficients. To test the validity of the assumption of non-autocorrelated disturbances, we may compute a statistic, known as the 'Durbin–Watson d statistic', from the names of the inventors (see Chapter 10). The 'd' statistic is an econometric criterion used in the evaluation of the results of the estimates.

Another example is the 'test' aiming at establishing the identification conditions of a relationship. All econometric methods assume that the function to which they are applied is identified, since otherwise the estimation of the coefficients is meaningless. The application of the formal rules of identification, which will be developed in Chapter 15, consists of an econometric test, aiming at the detection of the fulfilment of one of the basic assumptions of all econometric techniques.

From the above discussion it should be clear that the evaluation of the results obtained from the estimation of the model, is a very complex procedure. The econometrician must use all the above criteria, economic, statistical and econometric, before he can accept or reject the estimates.

When the assumptions of an econometric technique are not satisfied it is customary to respecify the model (e.g. introduce new variables or omit some others, transform the original variables, etc.) so as to produce a new form which meets the assumptions of the econometric theory. We then proceed with re-estimation of the new model and with re-application of all the tests. This process of re-specification of the model and re-estimation will continue until the results pass all the economic, statistical and econometric tests. (See E. Kane, *Economic Statistics and Econometrics*, Harper & Row, International edition, 1969, pp. 352–3.)

2.4. STAGE D. EVALUATION OF THE FORECASTING POWER OF THE ESTIMATED MODEL

We have said that the objective of any econometric research is to obtain good numerical estimates of the coefficients of economic relationships and to use them for the prediction of the values of economic variables. Forecasting is one of the prime aims of econometric research.

Before using an estimated model for forecasting the value of the dependent variable we must assess by some way or another the predictive power of the model. It is conceivably possible that the model is economically meaningful and statistically and econometrically correct for the sample period for which the model has been estimated, yet it may very well not be suitable for forecasting due, for example, to rapid change in the structural parameters of the relationship in the real world.

The final stage of any applied econometric research is the investigation of the stability of the estimates, their sensitivity to changes in the size of the sample. We must establish whether the estimated function performs adequately outside the sample of data, whose 'average' variation it represents. Extra-sample performance is an important and independent test of the results obtained by applying an econometric technique. It is a test independent of the statistical and econometric tests applied in the previous stage.

One way of establishing the forecasting power of a model is to use the estimates of the model for a period not included in the sample. The estimated value (forecast value) is compared with the actual (realised) magnitude of the relevant dependent variable. Usually there will be a difference between the actual and the forecast value of the variable, which is tested with the aim of establishing whether it is (statistically) significant. If after conducting the relevant test of significance, we find that the difference between the realised value of the dependent variable and that estimated from the model is statistically significant, we conclude that the forecasting power of the model, its extra-sample performance, is poor.

Another way of establishing the stability of the estimates and the performance of the model outside the sample of data from which it has been estimated, is to re-estimate the function with an expanded sample, that is a sample including additional observations. The original estimates will normally differ from the new estimates. The difference is tested for statistical significance with appropriate methods. Such tests will be developed in Chapters 8 and 20.

There may be various reasons for a model's poor forecasting performance. (a) The values of the explanatory variables used in the forecast may not be accurate. (b) The estimates of the coefficients ($\hat{b}$'s) may be poor, due to deficiencies of the sample data. (c) The estimates are 'good' for the period of the sample, but the structural background conditions of the model may have changed from the period that was used as the basis for the estimation of the model, and therefore the old estimates are not 'good' for forecasting. In this event the whole model needs re-estimation before it can be used for prediction.

We shall discuss the problems of the forecasting performance of estimated models in Chapter 20, but for the moment we give a simplified example of the forecasting procedure. Suppose that we estimate the demand function for a given commodity with a single equation model using time series data for the period 1950–68, as follows

$$\hat{Q}_t = 100 + 5\,Y_t - 30\,P_t$$

This equation is then used for 'forecasting' the demand of the commodity in the year 1970, a period outside the sample data.

Given $\quad Y_{1970} = £1000 \quad$ and $\quad P_{1970} = 5$ shillings

$$\hat{Q}_t = 100 + 5\,(1000) - 30\,(5) = 4{,}950 \text{ tons}$$

If the actual demand for this commodity in 1970 is 4,500 tons, there is a difference of 450 tons between the estimated from the model and the actual market demand for the product. This difference can be tested for significance by various methods (see Chapters 8 and 20). If it is found significant, we try to find out what are the sources of the error in the forecast, in order to improve the forecasting power of our model.

2.5. DESIRABLE PROPERTIES OF AN ECONOMETRIC MODEL

An econometric model is a model whose parameters have been estimated with some appropriate econometric technique.

The 'goodness' of an econometric model is judged customarily according to the following desirable properties.

(1) *Theoretical plausibility.* The model should be compatible with the postulates of economic theory. It must describe adequately the economic phenomena to which it relates.

(2) *Explanatory ability.* The model should be able to explain the observations of the actual world. It must be consistent with the observed behaviour of the economic variables whose relationship it determines.

(3) *Accuracy of the estimates of the parameters.* The estimates of the coefficients should be accurate in the sense that they should approximate as best as possible the true parameters of the structural model. The estimates should if possible possess the desirable properties of unbiasedness, consistency and efficiency discussed in Chapter 6.

(4) *Forecasting ability*. The model should produce satisfactory predictions of future values of the dependent (endogenous) variables.

(5) *Simplicity*. The model should represent the economic relationships with maximum simplicity. The fewer the equations and the simpler their mathematical form, the better the model is considered, *ceteris paribus* (that is to say provided that the other desirable properties are not affected by the simplifications of the model).

The more of the above properties a model possesses, the better it is considered for any practical purpose. (See C. Christ, *Econometric Models and Methods*, pp. 4–6. Also H. Theil, *Economic Forecasts and Policy*, North-Holland, Amsterdam 1965, pp. 204–8.)

EXERCISES

Exercises relating to the material of this chapter are included in Appendix III.

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CASE: UE 180 – UE 181 – UE 184
WITNESS: Thomas D. Morgan

PUBLIC UTILITY COMMISSION
OF
OREGON

STAFF EXHIBIT 1400

Surrebuttal Testimony

REDACTED VERSION
October 6, 2006

Q. PLEASE STATE YOUR NAME, OCCUPATION, AND BUSINESS ADDRESS.

A. My name is Thomas D. Morgan. My business address is 550 Capitol Street NE Suite 215, Salem, Oregon 97301-2551.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND WORK EXPERIENCE.

A. My Witness Qualification Statement is found in Exhibit Staff/1001.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to respond to assertions PGE made in its rebuttal testimony and to update the cost of equity and capital structure recommendations.

Q. HOW IS YOUR TESTIMONY ORGANIZED?

A. My testimony is organized as follows:

UPDATED ANALYSIS RESULTS

Q. HAVE YOU UPDATED YOUR ANALYSIS?

A. Yes. I have made some adjustments to my sample selection, by removing two companies. I have updated Value Line and reported growth rate information. Staff improperly included one company (WPS Resources) in its sample, and PGE pointed out that the credit rating of another company had deteriorated since Staff's initial selection (Empire District Electric.) Therefore Staff removed both companies from its updated analysis.

Q. WHAT IS THE RESULT OF YOUR UPDATED DCF MODELS?

A. I recommend an ROE in the range 9.0 to 9.75 percent.

Q. WHAT RETURN ON EQUITY AND CAPITAL STRUCTURE DO YOU RECOMMEND?

A. I recommend a return on equity of 9.40 percent for PGE, coupled with a 50 percent equity layer and 50 percent debt ratio. This recommendation is higher than that proposed in my initial testimony. The increased range is primarily due to the results of my sensitivity analysis, which relied on an assumption proposed by Dr. Zepp.

RESPONSE TO PGE'S TESTIMONY

Q. WHAT ISSUES DOES PGE RAISE TO WHICH YOU WILL RESPOND?

A. PGE raises several issues, including 1) the capital structure I recommend; 2) the final ROE figure that I have recommended; 3) a disagreement with the sample I selected including an argument that PGE is riskier than the sample; and, 4) claims of errors of theory in my application of the DCF model.

CAPITAL STRUCTURE

Q. HOW DID PGE RESPOND TO YOUR PROPOSED CAPITAL STRUCTURE?

A. PGE indicates that the equity ratio that I recommend is significantly less than its proposal. It indicates that the capital structure, coupled with my ROE proposal, would "push PGE closer to non-investment grade." *See* PGE /2000 Hager-Valach /27, line 3.

Although PGE did not indicate specifically what it means by "non-investment grade" I understand their argument to mean that the Company fears that it will be re-rated, from a credit rating perspective, to a level that is not within the investment-grade range of the ratings continuum. PGE argues that Staff's recommendations would cause a serious degradation in PGE's financial integrity and would limit its ability to access to capital on reasonable terms.

Further, PGE states that Staff's recommended capital structure could conceivably affect PGE's bond rating. See PGE/2000 Hager-Valach/28, lines 4-5.

Q. HOW DO YOU RESPOND?

A. First, it is very important to note that PGE lost its access to equity capital markets in 2001, when Enron filed for bankruptcy. At that time, it began "accumulating" excess capital and investing the capital in "short-term" investments. It maintained, during two acquisition proceedings, (UM 1045 and UM 1121) that it had too much equity and planned to issue a "special dividend" to balance its capital structure upon consummation of either of the transactions. It also planned a dividend to Enron regardless of whether a transaction occurred. *See* Confidential Exhibit Staff/1403 Morgan/6 and Morgan/23.

PGE experienced the threat of a severe "liquidity crunch" and it was likely prudent for Enron to direct PGE to conserve capital, since Enron would have difficulty providing PGE with additional capital. To date, PGE has still not sold any new equity, which is also indicative that it is maintaining a balance that is somewhat greater than it actually "needs".

[CONFIDENTIAL/] [redacted] **[/CONFIDENTIAL]** *See* Confidential Exhibit Staff/1403 Morgan/8-9; Morgan/22; and Morgan/44.

When I discuss sample selection issues later in my testimony, I will provide some evidence pertaining to the capital structure PGE is actually anticipating, which is significantly different from what it proposes in this proceeding.

It is also important to note that PGE's calculation of its financial metrics at PGE /2000 Hager-Valach / 29 (Table 5) are based on its comparison of results for one year, assuming a 10.75 percent ROE, versus the 9.4 percent recommended. Its analysis also uses the estimates for only one year, which is inappropriate, since rating agencies use a longer-term outlook when considering metrics. I will further address the credit metric issue later in my testimony. Second, PGE provides additional forecasts of its financial metrics, which provide a broad range of results. These are provided, confidentially, at Staff/1403 Morgan/10; Morgan/17-20; Morgan/28; Morgan/36-40 and Morgan/87-90. These figures are from PGE's 2005 and 2006-2007 Finance and Investment Plan, and from PGE's response to Staff Data Requests 119 and 574.

PGE's reported actual Total Debt to Total Capital was only **[CONFIDENTIAL/]** [redacted] **[/CONFIDENTIAL]** Additionally, this range of capitalizations indicates that credit ratings are not as highly sensitive to individual metrics as PGE's testimony implies.

Q. HOW DOES PGE'S CAPITAL STRUCTURE COMPARE TO YOUR SAMPLE'S CAPITAL STRUCTURE?

A. PGE's recommended common equity ratio is well above the equity ratios of Staff's proxy companies. If the capital structure that is being recommended would actually cause a serious impact on credit ratings, then the underlying companies in the sample would not have met the filtering criteria. The argument is somewhat circular, since the individual companies are all well in the investment-grade level.

Additionally, PGE has represented to the financial community a capitalization ratio that is significantly different than the one that it argues for in this docket. *See* Staff/1003, Morgan/439. PGE indicates that its capitalization will be comprised of 51 percent debt in 2007. Additionally, PGE represents in its 2006-2007 Finance and Investment Plan that it has **[CONFIDENTIAL/]** [redacted] **[/CONFIDENTIAL**] *See* Confidential Exhibit Staff/1403 Morgan/26.

Finally, PGE answered two data requests that clearly indicate that it expects to maintain its capital structure in-line with my proposals. *See* Staff/1402 Morgan/67.

Q. WHY DO YOU SUPPORT THE USE OF THE COHORT AVERAGE CAPITAL STRUCTURE?

A. It would be improper to match the cost of equity indications from the sample with a company-specific capital structure without a counterbalancing adjustment to ROE. If a utility has less equity than the sample, then the cost of equity should be adjusted upwards. If a utility has more equity, as is the case for PGE, then the cost of equity should be adjusted downwards. Alternatively, you can adopt the cohort average capital structure and make no adjustment to the cost of equity.

Referring to my proposed capital structure as “hypothetical” is not the best characterization. The sample group of companies represents the market prices investors are willing to pay. The current capitalization of the companies represents the current requirements for the cost of equity. Even though there may be an adjustment to the capital structures in the future, it is appropriate to calculate the cost of capital, based on the companies’ current conditions. Any adjustment should be reasonably known and measurable.

Q. WHAT OTHER REASONS DOES PGE GIVE TO SUPPORT ITS ASSERTION THAT YOU SHOULD NOT USE STAFF’S CAPITAL STRUCTURE?

A. PGE appears to be under the mistaken belief that Staff’s proposed capital structure is designed to give it “guidance” regarding its prudent capital structure. *See* PGE/2000 Hager-Valach/30, lines 7-8 and PGE’s response to Data Request 577, at Staff/1402 Morgan/59. It appears as if PGE is asserting that there will be consequences should the Commission not adopt its proposed capital structure.

However, Staff is not "recommending" a capital structure for PGE to adhere to and PGE is free to optimally manage its capital structure going forward subject to conditions it agreed to in UM 1206.

Staff's position is that estimating a cost of equity using a set of comparable companies requires a matching of the capitalization of these same companies. To the extent PGE argues that its capitalization should be different, then PGE should also advocate for an offsetting adjustment to its cost of equity.

The only consequence of assuming a higher percentage of equity when setting PGE's rates than that found in the cohort companies without a corresponding downward adjustment to PGE's cost of equity is to effectively provide an "adder" or bonus to PGE's cost of equity.

Q. IS THIS CONSTRUCT ANY DIFFERENT THAN OTHER TYPICAL ADJUSTMENTS MADE DURING A RATE CASE?

A. No. The Commission establishes a revenue requirement and the Company is not bound, obligated or required to match the Commission decision. For example, using industry benchmarks such as for forced outage rates, does not have any implications for actual forced outage rates for PGE specific plants.

Q. DID THE COMMISSION MAKE AN ADJUSTMENT TO ROE BASED ON CAPITAL STRUCTURE IN PGE'S LAST RATE CASE, UE 115?

A. Yes. The Commission, in Order 01-777, made an adjustment to the ROE of four basis points for each one point change in the equity capitalization percentage. That is, for each of the additional 7.5 points that PGE proposes in capital structure, the cost of equity should decrease by a corresponding 30 basis points (7.5 x 4 basis points = 30 basis points.) Therefore, if the Commission were to adopt PGE's proposed capital structure, the ROE should be reduced to 9.1 percent, from my proposed 9.4 percent ROE, which is based on a hypothetical capital structure that mirrors the sample group of companies. This adjustment would properly reflect the Commission's decision in that order, which included the following statement:

> "It is well understood by finance practitioners and theoreticians that the cost of equity drops as the percentage of common equity in the capital structure increases. Because the average amount of common equity in the capital structure of the comparable group of electric companies was 45.14 percent compared to 52.16 percent for PGE, it necessarily follows that PGE has a lower cost of equity. PGE's capital structure is therefore less risky, and its cost of common equity should be adjusted accordingly.
>
> The question therefore becomes how much of an adjustment should be made.
>
> "This record contains varying estimates that the cost of equity for regulated electric utilities decrease anywhere from 4 to 13.8 basis points for each one percent increase in the level of common equity in the capital structure. We find Rothschild's proposed 25 basis point reduction to be a reasonable adjustment to account for the above average percentage of common equity in PGE's capital structure. Contrary to PGE's arguments, this reduction does not constitute a "penalty." Rather, it is simply an adjustment to acknowledge PGE's reduced financial risk due to its increased level of common equity in its capital structure. Reliance on the stipulation in docket UM 814 is

> reasonable for the purpose of establishing a capital structure for PGE. The stipulation, however, cannot reasonably be used to argue for an ROE that does not correspond to the adopted capital structure.

Q. IS THERE ADDITIONAL THEORETICAL SUPPORT FOR AN ADJUSTMENT IN ROE THAT RELATES TO CHANGING LEVERAGE IN A COMPANY'S CAPITAL STRUCTURE?

A. Yes. It is possible to estimate the effect on the cost of equity using an adjustment technique to the CAPM Beta. I described Beta in detail at Staff/1003 Morgan/33.

The following calculation "decomposes" the observed Beta and relates it to the Beta that exists for a different level of debt financing.

$$B_L = B_U * [1+ (1+T)*D/E]$$

- B_L is the observed levered beta, B_U is the unlevered, i.e., debt-free, Beta for the same observation, without debt in its capital structure.
- D/E is the debt-to-equity ratio
- T is the corporate tax rate

The following example shows a two-step process for estimating the impact of a change in leverage.

First, the "unleveraged" Beta is calculated.

Then, the "re-leveraged" capital structure is input into the model.

The initial, observed Beta is assumed to be 0.85, which approximates the sample of companies' Beta, as reported by Value Line.

The initial debt-to-equity ratio is assumed to be 54% and taxes are assumed to be 40%.

The unleveraged Beta is therefore, 0.85 = B_U * [1+ (1+.40)*54%]

Solving the above equation, B_U = .48

The second step is to estimate the leveraged Beta of a business using the same equation in reverse.

This calculation assumes that the debt-to-equity is 45 percent, indicating a less leveraged structure.

B_L = 0.46 * [1+ (1+.40)*45%]. Solving the above equation, B_L = .79

Therefore, the example indicates that the amount of risk is reduced by about seven percent. (.79/.85 = 93%).

In order to apply this adjustment, one would have to make judgments of the appropriate market risk premium (M_{rp}). Using the 6.3 percent figure provided by Mr. Gorman at ICNU-CUB/300 Gorman/27, line 15, the following calculations indicate the proper adjustment to the ROE based on this technique: M_{rp} x (B_1 – B_2), where B_1 is the initial observed Beta and B_2 is the "releveraged" Beta.

The calculation for this example is: 6.3% (.85 - .78), or 6.2% x .07, which equals a 44 basis points downward adjustment to the ROE, or a decrease of about 5.9 basis points for each percentage point increase change in the common equity portion of the capital structure.

RELIANCE ON OTHER COMMISSION ROE DECISIONS

Q. SHOULD THE ROE YOU RECOMMEND NECESSARILY BE QUITE CLOSE TO THOSE ORDERED BY OTHER COMMISSIONS?

A. No. Any assertion that my recommendation is simply out of step with other state utility regulators' ROE findings and with ROEs expected by investors should be discounted. Each regulatory decision should be considered along with the underlying factors of each decision.

As I indicated in my opening testimony, if the findings in ROE decisions were predicated on past results in other commissions, then the end result would be static ROE decisions. This issue "overlaps" with the Company's risk-premium model, since it also uses Commission ROE decisions as its basis.

The highly-contentious issue of ROE cannot be boiled down to simply taking the average of other Commission's decisions. The cost of equity, as I discussed at length, is based on the required returns of investors and simply averaging other ROE decisions from other jurisdictions is circular and cedes the important authority for ROE decisions in Oregon to the ROE decisions in other states. In other words, the market sets the required ROE, not other Commissions.

The prices that investors are willing to pay for shares, in conjunction with the earnings of a company, combine to provide important road signs towards the investors' required returns. If a company's ROE is set higher than that demanded by investors, the share price will increase until the required return is at equilibrium.[1]

A little later in my testimony, I discuss the expected return on equity that PGE's investment advisor expects, which supports my overall recommendation.

Q. ON PAGE 27 OF ITS TESTIMONY, PGE INDICATES THAT STAFF'S RESULTS ARE "EXTREME WHEN COMPARED WITH RECENTLY DETERMINED ROES FROM AROUND THE COUNTRY." WHAT IS YOUR RESPONSE?

A. PGE makes this assertion without attempting to control for the various factors that influence cost of equity. For example, focusing on only the ROE without considering the capital structure would lead to erroneous conclusions. The following table identifies a limited selection of 16 regulatory decisions in 2004 and 2005. The table shows that while the ROE averages 10.3 percent, the percentage of equity in the capital structure averaged only 41.13 percent. The table also shows that, considering both figures together, the Commissions have adopted average "contributory returns to equity", i.e., weighted by the amount of equity in the capital structures, of only 4.23 percent.

If we view these Commission decisions and make adjustments related to leverage only (adopting Staff's 50 percent common equity recommendation), the "average common equity decision" ranges from 9.15 percent to 9.95

[1] Any shifts in allowed ROEs, either higher or lower, can be expected to affect share prices. This is the foundation of the DCF model.

percent using the range of adjustments for decreased leverage identified in Order No. 01-777 (UE 115). Using my leveraged beta approach, the resulting cost of equity would be 9.78 percent. In contrast, applying these same adjustments factors to PGE's requested cost of equity results in a range of adjusted ROE decisions of 10.99 percent to 11.55 percent. Using my leveraged beta approach, PGE's requested cost of equity is actually 11.11 percent, which is higher than any of the cost of equity decisions identified.

Considering these results, in conjunction with my proposed capital structure and ROE, the Company's argument to consider the ROE absent capital structures should not be considered.

					4.0 basis points	5.9 basis points	13.0 basis points
Date	**Company (Jurisdiction)**	**ROE**	**% Equity**	**Contribution**	**Adjusted ROE**	**Adjusted ROE**	**Adjusted ROE**
3/26/2004	Nevada Power (NV)	10.25%	33.97%	3.48%	9.61%	9.30%	8.17%
5/18/2004	PSI Energy (IN)	10.50%	44.44%	4.67%	10.28%	10.17%	9.78%
5/25/2004	Idaho Power (ID)	10.25%	45.97%	4.71%	10.09%	10.01%	9.73%
5/27/2004	Sierra Pacific (NV)	10.25%	35.77%	3.67%	9.68%	9.41%	8.40%
9/9/2004	Avista (ID)	10.40%	42.59%	4.43%	10.10%	9.96%	9.44%
11/23/2004	Detroit Edison (MI)	11.00%	38.08%	4.19%	10.52%	10.30%	9.45%
1/28/2005	Aquila Networks (KS)	10.50%	33.63%	3.53%	9.85%	9.53%	8.37%
2/18/2005	Puget Sound Energy (WA)	10.30%	43.00%	4.43%	10.02%	9.89%	9.39%
3/31/2005	Texas-New Mexico Pwr (TX)	10.25%	40.00%	4.10%	9.85%	9.66%	8.95%
5/26/2005	Atlantic City Electric (NJ)	9.75%	46.22%	4.51%	9.60%	9.53%	9.26%
6/1/2005	Jersey Central Power & Light (NJ)	9.75%	46.00%	4.49%	9.59%	9.51%	9.23%
8/15/2005	AEP Texas Central (TX)	10.13%	40.00%	4.05%	9.73%	9.54%	8.83%
9/28/2005	PacifiCorp	10.00%	47.56%	4.76%	9.90%	9.86%	9.68%
12/21/2005	Avista (WA)	10.40%	40.00%	4.16%	10.00%	9.81%	9.10%
12/22/2005	Consumers Energy (MI)	11.15%	36.31%	4.05%	10.60%	10.34%	9.37%
12/28/2005	Kansas Gas & Electric (KS)	10.00%	44.59%	4.46%	9.78%	9.68%	9.30%
	Average	**10.31%**	**41.13%**	**4.23%**	**9.95%**	**9.78%**	**9.15%**
	Median	**10.28%**	**41.86%**	**4.33%**	**9.93%**	**9.80%**	**9.28%**
October-06	PGE-proposed	10.75%	56.12%	6.03%	10.99%	11.11%	11.55%
October-06	**Staff-proposed**	**9.40%**	**50.00%**	**4.70%**			

The following tables provide a range of capital structures and ROEs that result in the same overall rate of return that is being recommended by Staff

	Staff Recommended		
Capital Component	**Cost**	**Ratio**	**Weighted Cost**
Long-Term Debt	6.31%	50.00%	3.16%
Preferred Stock	0.00%	0.00%	0.00%
Common Equity	9.40%	50.00%	4.70%
TOTAL		100.00%	7.86%

	Staff Recommended		
Capital Component	**Cost**	**Ratio**	**Weighted Cost**
Long-Term Debt	6.31%	60.00%	3.79%
Preferred Stock	0.00%	0.00%	0.00%
Common Equity	10.18%	40.00%	4.07%
TOTAL		100.00%	7.86%

	Staff Recommended		
Capital Component	**Cost**	**Ratio**	**Weighted Cost**
Long-Term Debt	6.31%	58.00%	3.66%
Preferred Stock	0.00%	0.00%	0.00%
Common Equity	10.00%	42.00%	4.20%
TOTAL		100.00%	7.86%

	Staff Recommended		
Capital Component	**Cost**	**Ratio**	**Weighted Cost**
Long-Term Debt	6.31%	44.00%	2.78%
Preferred Stock	0.00%	0.00%	0.00%
Common Equity	9.07%	56.00%	5.08%
TOTAL		100.00%	7.86%

SAMPLE SELECTION

Q. THE COMPANY ARGUES THE SAMPLE YOU SELECTED IS LESS RISKY THAN PGE. HOW DO YOU RESPOND?

A. PGE's argument is difficult to rebut because it provided only general statements regarding "risk" factors that should be considered, without a quantitative analysis pertaining to what adjustment would be necessary. In

PGE's own "Distribution Advisory" report by Lehman Brother's, **[CONFIDENTIAL/]** it relied on 13 companies that are expected to provide to [redacted]. [redacted] **[/CONFIDENTIAL]** *See* Confidential Exhibit Staff/1403 Morgan/88.

CREDIT METRICS AND CREDIT RATINGS

Q. ARE THE CREDIT RATING METRICS GOOD IDENTIFIERS OF WHERE THE ROE SHOULD BE SET?

A. No. Credit ratings are not set based on a single year's expectations. Not only do credit rating analysts take a more macro view of the industry, they also consider metrics over several years.

The metrics that are published by S&P are not "predictive" but provide the *benchmarks* for the companies that rating agency follows. If a company falls outside the range on one or more of the statistics, it is not necessarily downgraded.

Q. DO CREDIT RATINGS DEPEND ONLY ON ALLOWED ROES?

A. No. A recent commentary by Standard & Poor's indicates that, even though ROEs directly impact cash flow metrics, there are other regulatory mechanisms that impact the creditworthiness of companies. Other factors, such as Resource Valuation Mechanisms (RVMs) and Power Cost Adjustment Mechanisms (PCA) are designed to help stabilize rates to make minor adjustments to the base rates to reflect actual cost of fuel used in electrical generation. Treatment of pension costs and other considerations are important when considering the creditworthiness of a company.

Standard & Poor's indicates that, "...ratings analysis is not driven solely by these financial ratios, nor has it ever been. In fact, the new financial guidelines that Standard & Poor's is incorporating for the specified rating categories reinforce the analytical framework whereby other factors can outweigh the achievement of otherwise acceptable financial ratios. These factors include:

- Effectiveness of liability and liquidity management;
- Analysis of internal funding sources;
- Return on invested capital;
- The record of execution of stated business strategies;
- Accuracy of projected performance versus actual results, as well as the trend;

- Assessment of management's financial policies and attitude toward credit; and
- Corporate governance practices.

Q. THE COMPANY ARGUES THAT ITS CASH FLOW METRICS WOULD SUFFER. HOW DO YOU RESPOND?

A. This argument is a red-herring. Any ROE decision that is lower than a company's proposal would, all else equal, cause "weaker" metrics than would occur if the company's proposal were granted. Additionally, there is interplay among different factors. Credit ratings are not as simple as generalized mathematical formulas.

Q. DO CREDIT RATINGS DETERMINE A COMPANY'S ABILITY TO ACCESS THE CAPITAL MARKETS?

A. No. A company's ability to attract capital is not limited to the consideration of only debt ratings. As long as a company has a solid investment-grade rating, there is no reason to assume that the capital attraction standard is not met. It would not be appropriate to attempt to set the cost of capital based on the maintenance of any specific credit rating category.

There is no indication that a Commission decision of 9.40 percent ROE would cause a ratings downgrade, or that the Company would have trouble selling common equity.

Q. WOULD AN ROE DECISION OF 9.4 PERCENT WEAKEN THE COMPANY'S CREDIT PROFILE?

A. No. This assertion is misdirected because the Company assumes that the financial metrics used by credit rating agencies were sole determinants of credit ratings. They are not. There is a large subjective component relating to credit ratings. The metrics might, in a theoretical sense, be altered every time the equity rate of return is lowered in a rate case. Conversely, every time the ROE is increased, the “metrics” would be “increased”.

Clearly, the higher an ROE determination, the better some financial ratios would appear. However, the ROE does not affect the leverage ratio (debt to total capitalization). Higher ROEs, all else equal, would cause shareholders to “bid-up” share price until the “required return” was equal to the expected return.

This argument is incorrect because it is contrary to the foundation of rate of return determinations, which require allowed returns to be set at a company’s cost of capital.

Q. DO YOU HAVE INFORMATION REGARDING PGE’S CREDIT METRICS?

A. Yes. Based on PGE’s 2006-2007 Finance and Investment Plan, **[CONFIDENTIAL/]** [redacted]

[redacted]

[redacted]

[/CONFIDENTIAL]

These metrics are volatile over time. The volatility does not cause immediate changes in ratings. In fact, the proposed metrics that PGE calculates based on Staff's proposal appear to be within reasonable investment-grade parameters.

Standard & Poor's publishes its financial benchmarks, which tend to indicate that Staff's proposals provide sufficient flexibility to the company. The benchmark figures are available at Staff/1402 Morgan/16. While the forecast for 2007 provides slightly different metrics, they are still within a very reasonable range.

ERRORS IN THEORY AND IN THE DCF MODEL

Q. ON PAGE 31 AND 34 OF ITS TESTIMONY, PGE INDICATES THAT STAFF "COMMITTED NUMEROUS ERRORS IN THEORY AND APPLICATION." HOW DO YOU RESPOND?

A. Since the Company provided their arguments in bulleted format, I will respond similarly to the issues that do not require a lot of explanation. I will first address the bulleted items on page 31 and follow them with the bulleted list on page 34. I will then expound on one specific issue regarding using spot prices rather than longer-run historical average pricing.

Page 31 Bullet Points:

- PGE indicates that the Commission Order No. 05-1250, which requires PGE to maintain an equity capitalization ratio of at least 48 percent, requires that the Commission reflect a higher equity ratio in rates than that proposed by Staff. PGE is incorrect. First, I have already indicated that the amount of leverage on which rates are based should match the sample group, and Staff's recommendation does not mean that PGE is required to maintain the levels implicit in Staff's analysis. Additionally, Staff's updated proposal is consistent with PGE's actual capitalization target. Finally, PGE's requirement to maintain an additional $40 million of equity until 30 days after the present rate case is concluded is immaterial since it would not affect PGE once the rate case is concluded. The additional equity requirement was designed to protect customers from the impact of Enron's ownership, and should not be a factor in the case.

- PGE also indicates that it must maintain liquidity for unexpected margin calls due to fluctuating wholesale prices and unresolved litigation issues. PGE has a sufficiently-large revolving line of credit in order to maintain liquidity.
- The third and fourth points relate to capital expenditure requirements. The underlying capital needs of a company should not impact the capital structure in the long run, since companies are expected to manage their capital structure over time. As I indicated above, PGE is expecting a capital structure that is consistent with Staff's revised proposal. PGE's arguments regarding these issues are red-herrings.
- PGE argues in the next point simply that it "must be able to offer assurance to its equity and bond investors of sufficient cash flow." However, PGE does not indicate how this point is relevant to PGE's riskiness, or how Staff's proposal would actually cause a deleterious effect.
- The final point states that the capital structure does not include the Company's current short-term debt or revolvers. PGE does not indicate why the level of short term debt impacts riskiness, and PGE also does not discuss the fact that PGE has maintained surplus capital on its balance sheet, in the form of "short-term" investments, that have not been maintained to support PGE's regulated enterprise.

Page 34 Bullet Points:

- Although Staff used only one model, staff considered the final results and recommendations in light of the expected return to the overall market, with knowledge that regulated public utilities are considered less-risky. As I indicated in my initial testimony, the market's overall return outlook should set the 'ceiling' for the required return for a company's rate regulated assets. I explain part of the basis for this at Staff/1003 Morgan/38 to 40.

- Dr. Zepp indicated in response to Staff Data Request 608 that he believes the stock market, on average, will return 12.35 percent to 14.45 percent. *See* Staff/1402 Morgan/49. Staff provided several reliable sources that indicate that 10 to 11 percent may even be somewhat of a high forecast. (*See* Staff/1003 Morgan/5-19) The Federal Reserve estimates that the next ten years, the S&P will only return seven percent per year, nominally. I provide a copy of this report beginning at Staff/1402 Morgan/17, and this statistic is provided at Morgan/20.

- While Staff did not specifically mention the Hope and Bluefield standards, such omission should not imply Staff disregarded those standards, or the relevance of ORS 756.040.
- As indicated on page 2 of this testimony, Staff does agree with PGE that two companies should be removed from Staff's sample, one based on a credit downgrade, and the other due to it being erroneously included. The recommendations contained in this testimony reflect staff's analysis of the revised sample.
- Regarding PGE's assertion that Staff failed to consider PGE-specific risks, PGE has not indicated how it adjusted its analysis for the risks mentioned. PGE mischaracterizes Staff's analysis, which did consider many

components of PGE's risk profile. PGE has not indicated exactly which risks it feels should receive adjustment factors, or what those factors should be.

  - Most importantly, PGE did not develop an expanded explanation of its sample-selection process that would indicate how each discrete adjustment could be made, or to what extent each of its comparable companies compared with PGE regarding each "risk-factor" PGE addresses in its description of risks.

- PGE implies that I relied on "evidence" that was non-existent, and was simply my own judgment. It is true that the examples that PGE provides reflect my judgment on some very complex issues. However, I will respond to such examples. Each example provided mischaracterizes my understanding of the issues. *See also*, Exhibit 2023 Hager-Valach/1. PGE appears to argue that, without maintaining a file with current reports, witnesses cannot rely on their existing knowledge base without the risk of being personally attacked. The following evidence refutes PGE assertion that my knowledge and judgment is not sufficient with respect to the issues raised by PGE. In each issue, I provide support for my positions, most of which comes from information provided in my testimony.
  - Regarding the varying risk-premium issue, please refer to Staff/1003, Morgan/13 referring to Dr Cornell's book, <u>The Equity Risk Premium</u>. Additionally, Staff/1003 Morgan/15 references a statement that "a substantial decrease in the equity risk premium is largely responsible for the sharp rise in market multiples." Additionally, at Staff/1003,

Morgan/16-17, I reference a survey by Professor Welch, whereby the "risk premium" expectations by American economists have been reduced from about 7.0 percent to 5.5 percent. Drs. Graham and Harvey, also mentioned on that page, report on the views of chief financial officers. They, too, found that risk premiums decreased. Further evidence can be found at Staff/1003 Morgan/201, which suggests a declining risk premium and at Staff/1003 Morgan/267-270 and Morgan/304-306. Finally, a cursory review of PGE Exhibit 2110 Zepp/1 clearly shows that the risk premium from year to year is not constant.

- PGE also argues that my statement regarding the current interest rate environment is erroneous. Since I made that statement, interest rates have decreased, consistent with my reported perception. The full response to the data request included additional insight, which was omitted from that exhibit. In it, I indicated: "Staff is referring to its perception of the current interest rate environment, including the recent actions by the Federal Reserve Board, as an indication that interest rates should remain reasonably stable." For additional information, *see* Staff/1003 Morgan/407." The referenced exhibit includes interest rate projections through 2015. In addition, Staff did not maintain in its possession a copy of the survey, however, at http://www.philadelphiafed.org/files/spf/survq106.html, the Federal

Reserve Bank of Philadelphia provides the following quote (emphasis added):

> *<u>Forecasters Trim Estimates for Long-Run Growth in Output and Productivity</u>*
> In first-quarter surveys, we ask the forecasters for their long-run projections for an expanded set of variables, including growth in output and productivity, as well as returns on financial assets. As the table below shows, the forecasters have trimmed the long-run outlook for real GDP growth and growth in productivity, but only by a very small amount. Over the next 10 years, the forecasters think real GDP will grow at an annual rate of 3.20 percent. Part of that growth comes from a more productive labor force. The forecasters see labor productivity growing over the next 10 years at an annual rate of 2.44 percent. **Over the next 10 years, equities (as measured by the S&P 500 index) will return 7 percent per year and 10-year Treasury bonds will return 5 percent, estimates that are unchanged from the survey conducted last year.** Three-month Treasury bills will, in contrast, return a bit more than the forecasters previously thought. They now think bills will return 4.25 percent per year over the next 10 years, up from their previous estimate of 3.70 percent.

- Regarding the Arithmetic versus Geometric average issue, Staff has again not compiled a listing of the literature upon which the statement at Staff/1003 Morgan/28 was based. This is a complex issue, however, Staff/1003 Morgan/288 provides some input. Arithmetic averaging is biased upward, when compared to geometric rates. Because the DCF model is based on a geometric progression, it requires a compounded growth rate.

PGE's statement at PGE/2000 Hager-Valach/47, lines 10-16 are disingenuous. PGE states that "Staff created the misimpression that its analysis was supported by additional documentation or financial literature. By citing evidence, Staff implies that there is third-party support for their statements or conclusions. In fact, though, Staff in many cases had no evidence and it was indeed Staff's opinion, which is accorded less weight than if supported by the opinions or analyses of outside experts."

The Commission should reject PGE's attempt to depict my testimony and my positions as being poorly-founded. It is also not clear to me what PGE means when it states that Staff's opinions are less valuable than those of "outside experts." The Commission should reject this assertion, since it lacks merit.

- PGE argues that the capital structure requirements imposed by existing Commission Orders must be considered by Staff. This is an erroneous conclusion based on my earlier commentary. First, Staff does not provide a recommendation of PGE's capital structure, only the structure that should be considered to set rates. Second, Staff's capital structure is similar to PGE's own long-term target.
- PGE argues that Staff rejects the use of historic GDP growth, yet Staff considers historic growth rates of the utility companies. While GDP growth does not directly relate to earnings in electric utilities, historic earnings in the industry itself is useful to consider. In my initial testimony, I showed that utilities have comprised a lower proportion of GDP over time. See Staff/1003 Morgan/22.
- PGE argues that Staff has incorrectly evaluated the impact of institutional ownership in the DCF analysis. I indicated that the ownership of shares by large institutions "can create stability in share pricing." See Staff/1003 Morgan/44. PGE states that they "wouldn't say that mutual fund companies

are necessarily more stable." PGE/2000 Hager-Valach/50, lines4-5. However, in PGE's Distribution Advisory from Lehman Brothers, PGE was advised of a **[CONFIDENTIAL/]**[redacted]**[/CONFIDENTIAL]** *See* Confidential Exhibit Staff/1403 Morgan/68 and Morgan/70.

Finally, on page 36, PGE argues that the results of Staff's analyses should be questioned, simply because the results are not within the 10%-11% range derived from other commission decisions. This argument has been discussed in detail, and I have provided results from other commission decisions that indicate the Staff's proposals are not out of line with other commissions. PGE indicates that "it would appear that other commissions have placed less emphasis on the DCF results." I am unaware that other commissions have actually disregarded the DCF model in any way, and PGE's assertion is not backed up with empirical evidence.

Q. HOW DO YOU RESPOND TO PGE'S ASSERTION THAT OTHER COMMISSION'S DECISIONS OVER 10 PERCENT DISCOUNT THE RESULTS OF YOUR ANALYSIS?

A. I have already identified reasons why the Commission should not rely on the tenuous argument that other commissions' ROE decisions should require an ROE above ten percent.

I have provided a presentation titled, "Why Are Allowed Rates of Returns Too High?" *See* Staff/1003 Morgan/184—208. This exhibit was produced by Dr. Woolridge, the Professor of Finance at the Smeal College of Business at Pennsylvania State University. Dr. Woolridge's analysis reflects that Commission decisions may be lagging behind the impact of changes in the interest rate environment. The author cites 10 ROE decisions that have been under 10 percent (page 186). The reason given is partially based on the fact that Treasury rates are at 40-year lows (page 187) and that regulated utilities are among the lowest risk businesses of the industries covered by Value Line (page 188).

The author provides a summary of DCF equity cost rates that indicates electric utilities require ROEs of 9.6 percent (page 190). This result is based on 5-year analyst growth estimates that are "upwardly biased measured of actual growth (page 191).

Regarding equity risk premiums, the author indicates that historic risk premiums cannot be justified based on economic fundamentals (page 192). He summarizes 25 sources that support his contention and provides a discussion of the problems with using straight historic averages to project the future. He also indicates that attempting to base the expected risk premium using Value Line's projections produces expected market returns well above actual market returns (page 200). This evidence refutes Dr. Zepp's reliance on such data, which produce an overall equity return of 13.6 percent from 1986 to

2006. *See* Staff/1402 Morgan/57, which is identical to PGE's Exhibit 2108, with additional summary statistics.

The author summarizes the risk premium analysis on page 202, where he calculates an average 7.4 percent return on equity for gas, electric and water utilities.

The report then reflects the underlying significance of market-to-book ratios that are in excess of one, indicating that if the ROE is greater than the cost of equity, then the market-to-book ratio will be greater than one. The author states, "The average return on equity and market-to-book ratios are 10.6% and 1.87, respectively. These results clearly show that the required return on common equity is well below the current range. See Staff/1003 Morgan/203-204.

The report finally addresses the impact of the new tax law, which has "further reduced the cost of equity capital (page 205.) He indicates that a 10 percent ROE would have been reduced by 118 basis points, to 8.82 percent, based only on the impact of the reduced taxation of dividends.

He concludes his report by stating,

- Allowed returns on equity above 10 percent are clearly excessive.
- Interest rates are at historic lows and utility risk is still much lower than most industries.
- DCF equity cost rates are in the 8-9 percent range.
- …Historic risk premiums are excessive…risk premiums (are) 3-4 percent above long-term Treasuries.

- Returns on equity and market-to-book ratios also support utility equity cost rates below 10%.
- The new tax law has lowered equity cost rates for utilities – by up to 100 basis points.

Q. HOW DO YOU ADDRESS THE ISSUE OF SPOT PRICES VERSUS HISTORIC AVERAGE PRICES?

A. The Company argues that "average prices" rather than "spot prices" should be used. It is true that stock price fluctuations *could* skew the results of the DCF for an individual company. However, based on theory, current prices are the most appropriate.[2]

One advantage of using a cohort sample of companies is that, even if anomalous pricing behavior may exist for a portion of the sample, on average, the effect should not skew the results. While a single company's share price may suffer from a lot of volatility, the larger sample of companies used by PGE and myself should reduce the impact on the results of the DCF models.

However, the result of my analyses is the same today as it was when I first filed testimony. Therefore, the change in prices that cause a decrease in the

[2] "An 'efficient' market is defined as a market where there are large numbers of rational, profit-maximizers actively competing, with each trying to predict future market values of individual securities, and where important current information is almost freely available to all participants. In an efficient market, competition among the many intelligent participants leads to a situation where, at any point in time, actual prices of individual securities already reflect the effects of information based both on events that have already occurred and on events which, as of now, the market expects to take place in the future. In other words, in an efficient market at any point in time the actual price of a security will be a good estimate of its intrinsic value." Eugene F. Fama, "Random Walks in Stock Market Prices," *Financial Analysts Journal*, September/October 1965

cost of equity has been persistent. I do not think that anomalous pricing has occurred that caused any impact on my analysis.

In UE 170, PacifiCorp's witness, Dr. Hadaway, made a similar argument. Dr. Hadaway indicates, "Although in theory either average or "spot" stock prices can be used in the DCF analysis, a reasonably current price consistent with present market conditions and with the other data employed in the analysis is most appropriate. Since the cost of equity is a forward-looking concept, the important issue is that the price should be representative of current market conditions and not unduly influenced by unusual or special circumstances." (*See* UE 170 PPL/200 Hadaway/22.)

The use of spot prices is based on historic Commission practice, and is theoretically appropriate, because all known events are contained in current prices. Using three months of average prices may cause incorrect information to persist in the DCF models. If the market is trending upward or downward, such a technique would tend to cause skewed results that are not "averaged" away. I continue to recommend the use of spot pricing.

Finally, it should be noted that the end results of the DCF models are much more sensitive to the issue of growth, than to changes in price assumptions.

DR. ZEPP'S TESTIMONY

Q. DR. ZEPP'S INDICATES THAT INVESTORS MAY NOT USE THE DCF MODEL FOR THEIR INVESTING DECISIONS. DO YOU AGREE?

A. No. Even though Dr. Zepp makes an allusion that investors may not rely on the DCF model (PGE/2100 Zepp/15, lines 6-7,) this perception is unfounded. I indicated that the DCF model is used by major investment banks when they analyze companies for transactions. The DCF was used by Berkshire Hathaway when MEHC analyzed PacifiCorp for its acquisition. The model was also used by NW Natural and Texas Pacific Group (Oregon Electric Utility Company) for both companies' proposed purchase of PGE.

At Staff/1003 Morgan/289, I show that Fidelity Investments promotes the use of the DCF model. AG Edwards, Prudential-Bache and Merrill Lynch all use the DCF model. Even Lehman Brothers, PGE's advisor for its recent stock distribution, applied the DCF model. See Confidential Exhibit Staff/1403 Morgan/63-65; Morgan/84; Morgan/92 and Morgan/95. The DCF model is a valuable tool that is clearly used by investors.

Dr. Zepp also states that "…if investors do rely on the DCF model, Morgan does not consider all of the assumptions investors might reasonably consider when they price electric utility stocks with such a model. See PGE/2100 Zepp/15, lines 6-8. Dr. Zepp again alludes to "phantom" assumptions that he applies to the three stage 40-year DCF model. Those assumptions, as I described before, create unreasonable growth results.

Q. WHAT ARE YOUR COMMENTS REGARDING DR. ZEPP'S TESTIMONY?

A. I have several comments regarding his testimony. I address these comments in the following order.

First, I respond to some new models that he proposes, including a DCF model that he developed using water utility companies and "risk-premium" models he provides. One risk premium method is designed to estimate the overall return on the market and the other is based on a large sample of Moody's utility companies. A final model is based on a technique apparently supported by the Department of Ratepayer Advocates of the California PUC. I do not respond to this model because Dr. Zepp did not sufficiently outline the assumptions of the model, nor did he provide the underlying data for verification. In any case, it is based on data that includes only the past decade, and appears to be based on earned returns at the company level, rather than returns to the underlying investors. Therefore, it suffers some of the same problems as PGE's initial risk-premium model.

Secondly, I address the mechanical manipulation he applied to my 40-year DCF model that creates calculations that are beyond a reasonable range.

Thirdly, I address a "market-value" capital structure adjustment that Dr. Zepp discusses.

Finally, I address some assertions that Dr. Zepp makes regarding my testimony.

Q. WHAT NEW MODELS DOES DR. ZEPP PROPOSE AND WHAT IS YOUR RESPONSE?

A. First, Dr. Zepp includes results from a single-stage DCF model that is based on a sample of six water utilities. *See* PGE Exhibit/2104 Zepp/1. I presume that the inclusion of the analysis is to show an alternative cohort sample that may support PGE's requested ROE. The problem with the inclusion of a new model is that there is no demonstration that the companies are comparable to PGE. The terminal growth rate is 7.71 percent, which seems, at first blush, to be an extremely high level of perpetual growth. Since historic data was not provided, it is impossible to determine the supportability of the level of growth. Since the growth is significantly higher than growth in the overall economy, such results seem spurious.

Second, Exhibit 2108 reflects a risk premium analysis using the years 1986 to 2006. This model is based on the assumption that Value Lines reported short-term growth is a reasonable proxy for perpetual growth for the overall market. The expected growth rate increased substantially over the period and, in 2006, Dr. Zepp's model reflects the composite group growing at 12.68 percent. This level of growth is simply untenable, based on the fact that it is substantially larger than the projected growth in the overall economy. A basic tenet of economics is that companies cannot grow faster than the economy, or they would eventually surpass the economy itself. As I indicated earlier, attempting to base the expected risk premium using Value Line's projections produces expected market returns well above actual market returns. *See* Staff/1003 Morgan/200.

Finally, on page 36 of his testimony, Dr. Zepp includes a much abbreviated discussion of an additional risk-premium analysis based on a sample that includes “Moody’s Electric Utility” companies. He provides the results of his calculations at PGE/2101 Zepp/1. The model includes data from 1950 to 2005 and uses actual market-derived returns and Moody’s bond rates from Baa-rates issues. Major problems with this new model include the fact that Moody’s uses a very broad-based group of companies, which include many companies that are not purely rate-regulated. Since it is a new model, Staff has not had sufficient time to review the companies included in each year.

Additionally, the model uses general corporate bond rates, without addressing the actual rates of the underlying sample of companies. Finally, the model does not address the overall decrease in risk premiums that I have addressed previously, nor does it address the appropriate holding period assumptions, which is related to the arithmetic and geometric average arguments. *See* Staff/1003 Morgan/27. The calculation of the average compounded return over the period is reduced to 10.23 percent, reflecting a risk-premium of only 2.22 percent. Holding all else in his model equal, the indicated cost of equity would be only 9.42 percent (7.2 percent cost of debt + 2.2 percent risk premium.) Assuming that the current marginal cost of debt remains constant at 6.32 percent, the model results in an 8.54 percent cost of equity. Using Dr. Zepp’s figures with the current cost of debt results in a cost of equity indication of only 9.87 percent.

While this newly-added model appears to be heading in the right direction compared to PGE's initial risk-positioning model, it is fraught with weaknesses that make it unacceptable.

Q. WHAT IS THE NEXT ISSUE YOU WILL ADDRESS?

A. Next, I address Dr. Zepp's new assumptions that he uses to "re-run" my 40-year, three-stage DCF model.

Dr. Zepp recalculates the model with adjustments that he feels "should be considered". The primary adjustments that he makes in the two versions of the model include a higher terminal ROE, an adjustment of a "v x s" factor, and he applies initial growth rates based on a calculation of historic growth that he feels should be applied on an ex-ante, or going-forward basis.

The first two adjustments are interrelated. The ROE that I assumed in the sensitivity analysis and which generates the terminal growth rate already implicitly includes the impact of the "v x s" factor. The "v x s" formula considers the impact of earnings from issuing new equity shares at a price that is greater than book value. This factor has the impact of increasing earnings per share. The factor is a simple calculation: it subtracts 1 from the market-to-book ratio and is then multiplied by the average percentage of common equity sold each year to arrive at the percentage increment to book value. This percentage increment to book value is then multiplied by the average book value to arrive at the increment to book value in dollars. Although Dr. Zepp calls the exclusion an "obvious flaw", (See PGE/2100 Zepp/18, line 12,) the omission was intentional. The "terminal ROE" already includes the return from all sources.

Because Dr. Zepp "double-counts" the impact of selling shares, he generates a higher growth rate factor in the model.

Q. WHAT IS THE IMPACT OF HIS ADJUSTMENTS?

A. The primary impact is that first-stage growth is 7.6 percent one version and 8.8 percent in the other version, with one version's first-stage extending five years and the other version's first-stage extends to ten years. The growth rates he uses are based on the assumption that the future growth will "mirror" the past growth over each period.

To expound on this concept, Dr. Zepp calculates the 7.6 percent figure based on the earnings growth from 1996-2005. He then applies it to the ten-year future period. Similarly, he calculates the 8.8 percent growth as the rate from 2001-2005 and applies this to the future five-year period.

Implicit in this approach is that the growth over the past five- and ten-year periods provides reasonable rates, even though it contradicts all the available sources of growth that I identified in my initial testimony.

Dr. Zepp indicates that, "We do not know what cash flows investors expect to receive from electric utility stocks. If they expect the pattern of past EPS to repeat itself in the future, the indicated cost of equity range of 10.31% to 10.50% is just slightly below PGE's requested ROE of 10.75." See PGE/2100 Zepp/25.

The second impact is that terminal growth is increased to 7.5 percent after the first ten years (Exhibit 2105) and it is increased to 6.55 percent after the first five year's (Exhibit 2106.) The terminal ROE in both versions is the same, 12.97 percent.

A side-effect of the mechanically-applied assumptions Dr. Zepp creates is a terminal retention rate of 54.5 percent in Exhibit 2105 and 47.3 percent in Exhibit 2106. Both of these figures are far beyond the actual retention rates that are expected into the future, based on Value Line's estimates.

Dr. Zepp refers to these adjustments as being based on "alternative assumptions Mr. Morgan said should be considered but he did not incorporate in his analysis." *See* PGE/2100 Zepp/4, lines 13-14.

Dr. Zepp's adjustment is puzzling. He states that he assumes investors expect future EPS growth during the next ten years will be the same as it was in the last 10 years. The only basis he states for this assumption appears to be that "At numerous places, Mr. Morgan advises the Commission it should consider historic utility growth rates in a DCF analysis." *See* PGE/2100 Zepp/23, lines 10-11. This is not an accurate depiction of my testimony. At Staff/100 Morgan/13, I provide three paragraphs pertaining to "historic" growth rates. I indicated that historic growth could provide "guidance" regarding future growth. I also indicated that past dividend growth, if stable, could be assumed to continue, all else equal. The last ten years' of growth for my sample of companies did not approach the rate he assumes, but averaged less than three percent.

While I analyzed historic growth rates, my growth rate recommendation was based on growth rates that are supportable into perpetuity. The historic data I referenced served as a check of reasonableness for my future projections.

Q. DID DR. ZEPP RELY ON FORECASTS OF GROWTH FROM ANALYSTS?

A. No. It appears that Dr. Zepp has discounted growth forecasts in favor of using past growth rates.

Dr. Zepp states that "Analysts are justifiably cautious about forecasting realistic earnings per share growth rates" and "it may be that analysts are generally pessimistic about prospects in the electric utility industry. See PGE/2100 Zepp/19, lines 11-14.

However, PGE's own internal earnings growth target is four to five percent. See Staff/1003 Morgan/440. **[CONFIDENTIAL/]** [redacted] **[/CONFIDENTIAL]** See Confidential Exhibit/1403 Morgan/90; Morgan/92 and Morgan/95.

Q. DID YOU RELY ON HISTORICAL GROWTH RATES FOR INCLUSION IN YOUR MODEL?

A. No. The historic information supports only the low-end of my growth rate, and cost of equity indications. It should be clear that the earnings growth rate that can be expected into the future, especially for rate-regulated companies, must be considered in conjunction with growth rates in book value. As I stated in my direct testimony, as book values increase, they provide the "asset base" upon which earnings are based. Of course, earnings provide the driver for dividend payments. The past levels of book value growth should be considered in order to derive meaningful expectations about forward-looking earnings growth. In my final conclusion, I relied upon the quite conservative future projections that favor the Company's position and did not give much weight to the historic information.

Q. SHOULD ONE CONSIDER HISTORIC GROWTH RATES?

A. Yes. Historic growth rates should be used, at a minimum, as a check of reasonableness for future projections. Historical data requires reasoned judgment and requires an emphasis on the future and can provide valuable information if applied correctly.

Q. HAS THE COMMISSION RULED ON THE ISSUE OF USING HISTORIC DATA?

A. Yes. In Order 01-777, the Commission stated:

> We concur with PGE that the use of a forecasted retention rate should be used in this docket. We are not precluding the use of historical retention rate information in future dockets, but parties advocating such usage must justify the use of such data.
>
> Staff disagrees and believes it inappropriate for PGE to favor the use of historical data to estimate *s*, while strenuously arguing that forward-looking projections should be used for both *b* and *r*. We agree. Moreover, while we acknowledge the difficulty in predicting large offerings, PGE failed to establish that *Value Line* expressly excludes the possibility of such offerings in forecasting future sales of newly

> issued stock. Moreover, Staff demonstrated that the historic data is misleading, since new stock sales as a percentage of the amount of stock outstanding has been in a steep decline. Based on this record, we conclude that projections should be used to estimate the sale of newly issued stock in this docket."

Q. ARE THESE ASSUMPTIONS REASONABLE?

A. No. Not only is the 12.97 percent terminal ROE beyond the range of reasonableness for the sample of companies, both the first- and second-stage growth factors are extreme. The terminal growth rate is far outside the range I proposed in my initial testimony of four to five percent. The end result of the contortions to the model reflects the various ways that DCF models can be misused.

Q. DOES THE 12.50 PERCENT ROE FORECAST FROM VALUE LINE ASSUME THAT REGULATED UTILITIES SHOULD BE GRANTED ROES IN THAT RANGE?

A. No. Dr. Zepp informs us that Value Line's current ROE "forecast" for the utility industry is 12.50, however, he does not mention why this may or may not be appropriate into "perpetuity".

I provided a sensitivity analysis that extends ROE to 12.0 percent, however, that figure was used for purposes of the sensitivity analysis only. Unfortunately, Dr. Zepp appears to have been misled by my DCF analysis. The fact that market-to-book ratios are greater than 1.0 implies that investors, over all, also do not require such high returns. In any case, Value Line now estimates a future ROE of only 11.5 percent.

Value Line covers a total of 60 electric companies throughout the US. These companies are not all predominantly rate-regulated. In fact, of these companies, I include only fourteen in my initial “cohort” sample (and 12 in my updated sample). This group was represented as being a “close fit” to purely rate-regulated enterprises. Therefore, there are 46 to 48 additional companies making up the Value Line universe that were filtered as not being predominantly rate-regulated.

The impact of unregulated operations and investments clearly impacts the equity returns that are expected to be earned from these companies. This information does not support a requirement of such high equity returns for purely rate-regulated operations. Given the calculations I provided above, a perpetual growth rate of 6.55 to 7.50 percent is unlikely even for the entire universe of companies covered by Value Line.

Q. ARE VALUE LINE’S FORWARD-LOOKING ROES USEFUL FOR THE COMMISSION TO MAKE A JUDGMENT?

A. Yes. Value Line’s short-term, forward looking ROEs, in aggregate, are anticipated to be in the 10.5 – 11.5 range.

My selected sample of companies is more appropriate to develop ROE estimates to use in the DCF model. This is because the filtering process is designed to remove some of the bias of unregulated operations. Value Line is estimating “earned” ROEs, which may not be consistent with the investment returns actually achieved by investors, includes the impact on current pricing. A market-to-book ratio greater than 1.0 indicates that my sample of utilities is expected to earn accounting ROEs greater than the utilities' costs of equity. An accounting ROE forecast should not be used as a proxy for the cost of equity because it would over-estimate the cost of equity when the market-to-book ratio exceeds 1.0. However, the accounting ROEs are useful for calculating "b x r" growth rates, and they already implicitly includes the "v x s" factor.

Dr. Zepp's adjustment is erroneous because the Value Line figure of 12.50 percent included the entire population of electric companies Value Line covers. In any case, the 12.5 percent figure is "dated", and has been updated by Value Line to reflect only 11.50 percent. *See* Staff/1402 Morgan/1-3.

Q. WHAT OTHER ARGUMENTS DOES DR. ZEPP MAKE?

A. Dr. Zepp indicates that PGE is "more risky" than staff's sample. *See* PGE/2100 Zepp/6, lines 18-21. He calculates Standard & Poor's "business profile" ranking to the sample of companies, resulting in an average of 3.9 percent. Based on this metric, which is subjectively formulated by S&P, he argues that the sample is less risky. He also calculates an "average" bond rating figure to further support his argument. Finally, he iterates some of the "risk factors" that were contained in PGE's Hager-Valach testimony.

Dr. Zepp does not provide an analysis regarding which risk factors are properly considered in a cost of equity analysis. The only risk factors that are useful in determining the cost of equity are those that increase a company's non-diversifiable risks. Unfortunately, although some of the risk factors may be considered in a bond-rating analysis, they are not particularly useful in a cost of equity analysis.

Q. DR. ZEPP ARGUES THAT A 9.3 PERCENT ROE IS ONLY 210 BASIS POINTS GREATER THAN THE CONSENSUS ESTIMATES OF BAA BONDS RATES FOR THE SECOND QUARTER OF 2007. HOW DO YOU RESPOND?

A. The updated 9.4 percent ROE that I recommend is 300 basis points greater than the 6.40 percent rate, as reported by the Federal Reserve as of 9/22/2006. *See* http://research.stlouisfed.org/fred2/series/WBAA?&cid=119.

Q. DR. ZEPP USES THE CHANGE IN INTEREST RATES TO UPDATE A RECENT COST OF EQUITY DECISION IN OREGON AS SUPPORT FOR HIS CONTENTION THAT STAFF'S PROPOSED ROE IS TOO LOW. IS THIS A REASONABLE APPROACH?

A. No. The Order in NW Natural's rate case, Docket No. UG 152, was based on a settlement among parties. Staff's proposal in that case was almost 50 basis points lower and had factored in the expectation that interest rates would not remain at the historic lows of that period (2002). An order from four years ago should not set precedence in ROEs today.

Q. WHAT OTHER ARGUMENTS DOES DR. ZEPP MAKE?

A. Dr. Zepp argues that the proposed ROE is lower than national regulatory decisions. This argument has already been addressed, and should be disregarded.

Dr. Zepp then indicates that a "wealth of information available to determine benchmark equity costs that Mr. Morgan has chosen to exclude from his analysis." *See* PGE/2100 Zepp/14.

Dr. Zepp appears to make this assertion to cause the Commission to rely on points that PGE makes that I have already discussed, including 1) the water-utility DCF analysis that I discussed earlier in my testimony, 2) the adjustments he makes to my DCF model, 3) the market-value "analysis" that explains why the results of DCF models are expected to understate ROEs, 4) the risk positioning model proposed by PGE, and 5) the new risk premium models that Dr. Zepp proposes.

CHECK OF REASONABLENESS

Q. DID YOU CONSIDER OTHER EXPECTATIONS FOR ROES?

A. Yes. I have included information that supports the expectation of ROE decisions under 10.0 percent, and potentially as low as 9.0 percent. *See* Staff/1003 Morgan/184-208.

Q. HOW DID YOU DETERMINE THE REASONABLENESS OF YOUR CONCLUSION?

A. I provided various reports indicating what overall market returns are expected to be over the foreseeable future. These figures range as low as about eight percent and as high as 11 percent. The overall market expectations can be viewed as an upper limit to reasonable required ROEs for the public utility sector.

As I described in my opening testimony, regulated public utilities have lower risk than the overall market and should have returns lower than that required by the market. This notion is well-founded. Because the average Beta[3] is lower than 1.0, equity returns for regulated public utilities would necessarily be lower than that of the market. The CAPM framework requires a "risk-free rate", a market risk premium, and estimates of Beta. (*See* CUB-ICNU/400 Gorman/26, line 12.) This evidence is useful as a check of reasonableness.

Q. WHAT DOES THIS IMPLY ABOUT THE COST OF EQUITY FOR REGULATED UTILITIES?

A. Although Staff's historic CAPM practice employs some technical adjustments, I will simplify the process for calculating the model. Current 10-year Treasuries are about five percent, which will suffice as the "risk-free" rate.

As I mentioned earlier, the market return is expected to be no greater than 11.0 percent, and likely as low as 10 percent. Based on a return of 11 percent, the market risk premium would be six percent (11.0% – 5.0% = 6.0%). I will use a Beta of 0.85, which is near the middle of the sample group's Betas, as published by Value Line.[4] Therefore, the sample group's risk premium is 5.1 percent (6.0% x .85 = 5.10%). Adding this public utility risk premium to the current 4.8 percent risk-rate indicates an ROE of 9.9 percent (4.8% + 5.10% = 9.9%). Using the 10 percent market return to set a lower bound, the results

[3] *See* Staff/1003 Morgan/33 for a discussion of Beta.

[4] Whether Value Line's Beta is the most reflective for use in the CAPM has been debated. It likely provides an upper bound of reasonable Betas, depending on the measurement process. Because Value Line's Beta calculations are available and are independent, they are reasonable for this discussion.

would be a 4.25 percent risk premium (5.0% x .085) and an ROE of 9.05 percent.

These indications bracket my recommended 9.40 percent cost of equity. While this analysis is not proffered as a rigorous CAPM analysis, it does provide a check of reasonableness.

Q. DO YOU CONTINUE TO RECOMMEND THAT THE COMMISSION REJECT PGE'S RISK POSITIONING MODEL AND PGE'S ASSERTION THAT THIS COMMISSION SHOULD DETERMINE AN ROE IN-LINE WITH OTHER COMMISSIONS?

A. Yes. The Commission ruled on a similar model in a prior docket. Order 01-777 stated:

> This Commission rejected a similar risk-positioning method proposed by another utility in a recent rate case. We reach the same conclusion here. As Staff notes, PGE's proposed methodology using authorized ROEs and yields on treasuries and corporate bonds is unconventional and has not been accepted by other regulatory agencies as a reliable means for determining cost of equity. Because the methodology is not based on accepted regulatory principles, we decline to adopt it for use in this proceeding.
>
> **ROEs Authorized by other Regulatory Commissions**
>
> In addition to their DCF and Risk Positioning Method estimates, Hager-Valach rely on recent authorized ROE decisions by other regulatory commissions. Hager-Valach note that, during the last twelve months, electric utilities received an average authorized ROE of 11.6 percent, with a range of 11.0 to 12.9 percent. Because an investor will consider this type of information when making an investment, Hager-Valach

believe that PGE should be awarded a common equity return within this range. Staff objects and contends that PGE's proposal is circular in reasoning, because decisions would simply be based by looking at what other commissions allow. Staff adds that PGE's proposal would have the effect of improperly transferring to other jurisdictions the Commission's obligation of setting cost of equity for Oregon utilities. Finally, Staff notes that the Commission rejected a similar request made by NW Natural in docket UG 132.

"NW Natural contends that the Commission should rely on recent common equity return decisions made in other jurisdictions. We disagree. As Staff and NWIGU point out, there is frequently a substantial lag between the time evidence is prepared in a rate case and when a decision is finally rendered. Because interest rates have been steadily declining during the past several years, the failure to account for the regulatory lag could result in an overstatement of cost of capital. Moreover, as noted above, the authorized ROE is just one component of setting rates and is often tied to other, unknown elements in a rate case. Therefore, while other ROE determinations may provide evidence to confirm a decision, we are reluctant to base an award for NW Natural on unknowable parameters from other cases, set in other jurisdictions and different capital market conditions." (Order No. 99-697 at 23.)

"PGE believes that a review of other authorized ROEs is relevant to determine investor's expectations. Because an investor views a commission decision as the utility's best estimate of the cost of equity at the time of the decision, PGE maintains that the investor will go elsewhere if the authorized ROE is set too low for the risk of the investment. PGE adds that, contrary to its argument here, Staff has

> previously asked the Commission to consider ROE decisions from other jurisdictions. As an example, PGE notes that Staff referred the Commission to a decision by Nevada Commission to justify its ROE recommendation in docket UG 132. We adhere to our prior determination that, while other ROE determinations may provide confirmation of a decision, they should not be used as an independent method on which to base an award. Capital market conditions, not regulatory decisions, determine a utility's cost of equity. While we agree that regulatory agencies generally make every effort to capture those conditions, a review of past decisions cannot replace an independent analysis of current market conditions and how they affect the particular utility. Moreover, ROE determinations are made not just in traditional rate cases, but also in a range of other proceedings, such as industry restructuring plans, merger approval cases, or erformance-based regulatory plans. Thus, the ROE awards may have been based, in part, on other unknown parameters relevant in that particular docket. Accordingly, we will continue to review ROEs authorized in other jurisdictions to help gauge the reasonableness of the cost of equity estimates derived from independent methodologies. We will not, however, rely on such decisions to base an ROE award for a utility.

CONCLUSION

PGE provided an updated analysis at Exhibit 2002. Consistent with my initial testimony, omitting the results from the "historic GDP growth" formula, PGE's range of ROEs is from 8.39 to 9.93 percent, based on "closing prices". The sample with the highest results contains a very broad sample of companies, yet does not support PGE's 10.75 percent ROE conclusion. It is unknown what the capital structure of this sample is, however it is highly unlikely that it contains more than 45 percent to 48 percent equity in its capital structure.

Edison Electric Institute's Electric Perspectives "The Dividend Advantage" provides an example of the change in costs of equity due to the dividend tax cut implemented in 2003. *See* Staff/1402 Morgan/33. The example provided in this article indicated a decrease in the cost of equity of 150 basis points, from 10.81 percent to 9.29 percent, reflecting a 152 basis point reduction in the cost of equity due solely to the reduction in taxes applicable to dividends. It is clear that the reduction in taxes applied to dividends reduces the cost of capital, and the results of my DCF analysis are in-line with the expected impact of the tax cut.

The Commission should adopt staff's recommendation of a 9.4 percent cost of equity. It should also adopt staff's recommendation regarding the capital structure, containing 50 percent equity and 50 percent debt. My recommendations are consistent with investors' required return on capital, and would not negatively impact PGE's access to the capital market.

Q. DOES THIS CONCLUDE YOUR REBUTTAL TESTIMONY?

A. Yes.

CASE: UE 180/UE 181/UE 184
WITNESS: Thomas D. Morgan

PUBLIC UTILITY COMMISSION
OF
OREGON

STAFF EXHIBIT 1401

Exhibits in Support
Of Surrebuttal Testimony

October 6, 2006

Single-Stage DCF Model Results

UE 180

Schedule 1 - Single Stage Model

COMPANY	TICKER	[A] Next 12-months Dividend	[B] Current Price	[C] Dividend Yield	[D] Growth Rate	[E] Selected Companies
Alliant Energy	LNT	1.20	$36.28	3.31%	3.49%	6.80%
Amer. Elec. Power	AEP	1.54	$37.06	4.16%	3.54%	7.70%
Consol. Edison	ED	2.31	$46.62	4.95%	3.09%	8.04%
Energy East Corp.	EAS	1.16	$24.04	4.83%	4.27%	9.09%
IDACORP, Inc.	IDA	1.20	$38.61	3.11%	4.65%	7.76%
MGE Energy	MGEE	1.39	$32.40	4.29%	6.00%	10.29%
NSTAR	NST	1.26	$33.66	3.74%	4.76%	8.50%
OGE Energy	OGE	1.35	$36.33	3.72%	3.80%	7.52%
Progress Energy	PGN	2.45	$45.81	5.35%	3.76%	9.11%
Southern Co.	SO	1.58	$34.96	4.52%	4.64%	9.16%
Wisconsin Energy	WEC	0.94	$43.80	2.15%	7.35%	9.50%
Xcel Energy Inc.	XEL	0.90	$20.76	4.34%	4.89%	9.23%
AVERAGE		**$1.44**	**$35.86**	**4.04%**	**4.52%**	**8.56%**
MEDIAN		**$1.31**	**$36.31**	**4.22%**	**4.45%**	**8.80%**

[A] Value Line Summary and Index, September, 15 2006
[B] Most current stock quotes provided by MSN Money, www.moneycentral.msn.com
[C] Dividend rate divided by market price [C] / [B]
[D] Growth Rates from average of Kiplinger's; Firstcall; Zack's; Reuters; Value Line
[E] Dividend Yield + Growth [C] + [D]

Single-Stage DCF Model, Sensitivity Analysis

UE 180

Schedule 1A - Sensitivity Analysis

COMPANY	TICKER	Next 12-months Dividend	Current price	Div Yield	Minimum Analyst Estimate	COE Results	Maximum Analyst Estimate	COE Results
Alliant Energy	LNT	$1.20	$36.28	3.31%	2.30%	5.61%	4.50%	7.81%
Amer. Elec. Power	AEP	$1.54	$37.06	4.16%	3.00%	7.16%	5.00%	9.16%
Consol. Edison	ED	$2.31	$46.62	4.95%	1.50%	6.45%	4.00%	8.95%
Energy East Corp.	EAS	$1.16	$24.04	4.83%	4.00%	8.83%	4.50%	9.33%
IDACORP, Inc.	IDA	$1.20	$38.61	3.11%	4.00%	7.11%	5.00%	8.11%
MGE Energy	MGEE	$1.39	$32.40	4.29%	6.00%	10.29%	6.00%	10.29%
NSTAR	NST	$1.26	$33.66	3.74%	2.50%	6.24%	5.80%	9.54%
OGE Energy	OGE	$1.35	$36.33	3.72%	3.00%	6.72%	5.00%	8.72%
Progress Energy	PGN	$2.45	$45.81	5.35%	3.50%	8.85%	4.00%	9.35%
Southern Co.	SO	$1.58	$34.96	4.52%	4.00%	8.52%	5.00%	9.52%
Wisconsin Energy	WEC	$0.94	$43.80	2.15%	6.50%	8.65%	8.00%	10.15%
Xcel Energy Inc.	XEL	$0.90	$20.76	4.34%	4.00%	8.34%	7.50%	11.84%
AVERAGE		**$1.44**	**$35.86**	**4.04%**	**3.69%**	**7.73%**	**5.36%**	**9.40%**
MEDIAN		**$1.31**	**$36.31**	**4.22%**	**3.75%**	**7.75%**	**5.00%**	**9.34%**

150-Year Horizon DCF UE 180

Schedule 2 - Sensitivity Range Analysis - Low

===> to year 150

STAFF-SELECTED COMPANIES	(ticker)	IRR	[1] Most Current Price [A]	[2] Dividend EOY 1 [B]	[3] Dividend EOY 2 [B]	[4] Dividend EOY 3 [B]	[5] Dividend EOY 4 [B]	LT Growth Dividend EOY 5 [C]	Dividend EOY 6	Dividend EOY 7	Dividend EOY 8	Dividend EOY 9	Dividend EOY 10
Alliant Energy	LNT	5.91%	($36.28)	$1.23	$1.30	$1.36	$1.42	$1.45	$1.48	$1.51	$1.55	$1.59	$1.62
Amer. Elec. Power	AEP	7.59%	($37.06)	$1.57	$1.68	$1.78	$1.88	$1.93	$1.99	$2.05	$2.11	$2.17	$2.24
Consol. Edison	ED	6.38%	($46.62)	$2.32	$2.34	$2.36	$2.38	$2.41	$2.45	$2.48	$2.52	$2.56	$2.60
Energy East Corp.	EAS	9.07%	($24.04)	$1.16	$1.22	$1.30	$1.38	$1.44	$1.49	$1.55	$1.61	$1.68	$1.75
IDACORP, Inc.	IDA	6.72%	($38.61)	$1.20	$1.20	$1.20	$1.20	$1.25	$1.30	$1.35	$1.40	$1.46	$1.52
MGE Energy	MGEE	9.74%	($32.40)	$1.40	$1.41	$1.42	$1.44	$1.52	$1.61	$1.71	$1.81	$1.92	$2.04
NSTAR	NST	6.67%	($33.66)	$1.26	$1.35	$1.44	$1.53	$1.57	$1.60	$1.64	$1.69	$1.73	$1.77
OGE Energy	OGE	6.73%	($36.33)	$1.35	$1.40	$1.44	$1.49	$1.53	$1.58	$1.63	$1.68	$1.73	$1.78
Progress Energy	PGN	8.48%	($45.81)	$2.46	$2.48	$2.50	$2.52	$2.60	$2.69	$2.79	$2.89	$2.99	$3.09
Southern Co.	SO	8.53%	($34.96)	$1.59	$1.65	$1.72	$1.78	$1.85	$1.93	$2.01	$2.09	$2.17	$2.26
Wisconsin Energy	WEC	8.42%	($43.80)	$0.95	$1.00	$1.04	$1.09	$1.16	$1.23	$1.31	$1.40	$1.49	$1.59
Xcel Energy Inc.	XEL	8.62%	($20.76)	$0.92	$0.97	$1.03	$1.09	$1.13	$1.17	$1.22	$1.27	$1.32	$1.37
AGGREGATE		7.96%	($430.33)	$17.39	$17.97	$18.57	$19.17	$19.84	$20.54	$21.26	$22.02	$22.80	$23.62
Average		7.74%											
Stdev		1.23%						3.50%					
Min		5.91%											
Max		9.74%											
Median		8.01%											
25 percentile		6.71%											
75 percentile		8.55%											

Sources:
[A] Most current stock quotes provided by MSN Money, www.moneycentral.msn.com
[B] Value Line Data (See Schedule 3)
[C] Long-term growth is the input variable, based on consensus analyst growth expectations.

150-Year Horizon DCF **UE 180** **Schedule 2A - Sensitivity Range Analysis - High**

			[1]	[2]	[3]	[4]	[5]	LT Growth					===> to year 150
COHORT COMPANY DATA													
SELECTED FINANCIAL DATA			Current Price	Dividend EOY 1	Dividend EOY 2	Dividend EOY 3	Dividend EOY 4	Dividend EOY 5	Dividend EOY 6	Dividend EOY 7	Dividend EOY 8	Dividend EOY 9	Dividend EOY 10
			[A]	[B]	[B]	[B]	[B]	[C]					
STAFF-SELECTED COMPANIES	(ticker)	**IRR**											
Alliant Energy	LNT	7.89%	($36.28)	$1.23	$1.30	$1.36	$1.42	$1.48	$1.55	$1.61	$1.69	$1.76	$1.84
Amer. Elec. Power	AEP	9.35%	($37.06)	$1.57	$1.68	$1.78	$1.88	$1.97	$2.07	$2.17	$2.28	$2.39	$2.51
Consol. Edison	ED	8.56%	($46.62)	$2.32	$2.34	$2.36	$2.38	$2.47	$2.57	$2.67	$2.78	$2.89	$3.01
Energy East Corp.	EAS	9.51%	($24.04)	$1.16	$1.22	$1.30	$1.38	$1.44	$1.51	$1.57	$1.65	$1.72	$1.80
IDACORP, Inc.	IDA	7.64%	($38.61)	$1.20	$1.20	$1.20	$1.20	$1.26	$1.32	$1.39	$1.46	$1.53	$1.61
MGE Energy	MGEE	9.74%	($32.40)	$1.40	$1.41	$1.42	$1.44	$1.52	$1.61	$1.71	$1.81	$1.92	$2.04
NSTAR	NST	9.61%	($33.66)	$1.26	$1.35	$1.44	$1.53	$1.62	$1.71	$1.81	$1.91	$2.02	$2.14
OGE Energy	OGE	8.53%	($36.33)	$1.35	$1.40	$1.44	$1.49	$1.56	$1.64	$1.72	$1.81	$1.90	$1.99
Progress Energy	PGN	8.92%	($45.81)	$2.46	$2.48	$2.50	$2.52	$2.62	$2.72	$2.83	$2.94	$3.06	$3.18
Southern Co.	SO	9.41%	($34.96)	$1.59	$1.65	$1.72	$1.78	$1.87	$1.97	$2.06	$2.17	$2.28	$2.39
Wisconsin Energy	WEC	9.82%	($43.80)	$0.95	$1.00	$1.04	$1.09	$1.18	$1.27	$1.37	$1.48	$1.60	$1.73
Xcel Energy Inc.	XEL	11.71%	($20.76)	$0.92	$0.97	$1.03	$1.09	$1.17	$1.25	$1.35	$1.45	$1.56	$1.68
AGGREGATE		9.33%	(430.33)	17.39	17.97	18.57	19.17	20.15	21.19	22.28	23.43	24.64	25.92
Average		9.22%											
Stdev		1.02%											
Min		7.64%											
Max		11.71%											
Median		9.38%											
25 percentile		8.55%											
75 percentile		9.64%											

[A] Most current stock quotes provided by MSN Money, www.moneycentral.msn.com
[B] Value Line Data (See Schedule 3)
[C] Long-term growth is the input variable, based on consensus analyst growth expectations.

150-Year Horizon DCF **UE 180**

Schedule 2B - Analyst Growth Estimates Consensus

LT Growth ===> to year 150
Based on Analysts' Estimates *(See Schedule 8)*

COHORT COMPANY DATA

SELECTED FINANCIAL DATA

GAS COMPANIES	(ticker)	IRR	[1] Most Current Price	[2] Dividend EOY 1	[3] Dividend EOY 2	[4] Dividend EOY 3	[5] Dividend EOY 4	Dividend EOY 5	Dividend EOY 6	Dividend EOY 7	Dividend EOY 8	Dividend EOY 9	Dividend EOY 10
			[A]	[B]	[B]	[B]	[B]	[B]	[C]				
Alliant Energy	LNT	6.98%	($36.28)	$1.23	$1.30	$1.36	$1.42	$1.46	$1.52	$1.57	$1.62	$1.68	$1.74
Amer. Elec. Power	AEP	8.07%	($37.06)	$1.57	$1.68	$1.78	$1.88	$1.94	$2.01	$2.08	$2.15	$2.23	$2.31
Consol. Edison	ED	7.76%	($46.62)	$2.32	$2.34	$2.36	$2.38	$2.45	$2.52	$2.60	$2.68	$2.77	$2.85
Energy East Corp.	EAS	9.30%	($24.04)	$1.16	$1.22	$1.30	$1.38	$1.44	$1.50	$1.56	$1.63	$1.70	$1.77
IDACORP, Inc.	IDA	7.32%	($38.61)	$1.20	$1.20	$1.20	$1.20	$1.26	$1.31	$1.38	$1.44	$1.51	$1.58
MGE Energy	MGEE	9.74%	($32.40)	$1.40	$1.41	$1.42	$1.44	$1.52	$1.61	$1.71	$1.81	$1.92	$2.04
NSTAR	NST	8.68%	($33.66)	$1.26	$1.35	$1.44	$1.53	$1.60	$1.68	$1.76	$1.84	$1.93	$2.02
OGE Energy	OGE	7.45%	($36.33)	$1.35	$1.40	$1.44	$1.49	$1.54	$1.60	$1.66	$1.73	$1.79	$1.86
Progress Energy	PGN	8.71%	($45.81)	$2.46	$2.48	$2.50	$2.52	$2.61	$2.71	$2.81	$2.91	$3.02	$3.14
Southern Co.	SO	9.09%	($34.96)	$1.59	$1.65	$1.72	$1.78	$1.87	$1.95	$2.04	$2.14	$2.24	$2.34
Wisconsin Energy	WEC	9.22%	($43.80)	$0.95	$1.00	$1.04	$1.09	$1.17	$1.25	$1.35	$1.45	$1.55	$1.67
Xcel Energy Inc.	XEL	9.41%	($20.76)	$0.92	$0.97	$1.03	$1.09	$1.14	$1.19	$1.25	$1.31	$1.38	$1.45
AGGREGATE		8.59%	($430.33)	$17.39	$17.97	$18.57	$19.17	$20.00	$20.87	$21.78	$22.73	$23.72	$24.76

	IRR
Average	8.48%
Stdev	0.89%
Min	6.98%
Max	9.74%
Median	8.69%
25 percentile	7.68%
75 percentile	9.24%

[A] Most current stock quotes provided by MSN Money, www.moneycentral.msn.com
[B] Value Line Data (See Schedule 3)
[C] Long-term growth is the input variable, based on consensus analyst growth expectations.

Value Line Data

Schedule 3

COHORT ELECTRIC COMPANIES UE 180

VALUE LINE'S EARNINGS PER SHARE PROJECTIONS

	2006	2007	2008	2009	2010
Alliant Energy	$2.30	$2.35	$2.38	$2.42	$2.45
Amer. Elec. Power	$2.80	$2.85	$3.07	$3.28	$3.50
Consol. Edison	$3.00	$3.05	$3.10	$3.15	$3.20
Energy East Corp.	$1.60	$1.55	$1.70	$1.85	$2.00
IDACORP, Inc.	$1.85	$1.90	$1.93	$1.97	$2.00
MGE Energy	$1.80	$2.00	$2.15	$2.30	$2.45
NSTAR	$1.95	$2.10	$2.23	$2.37	$2.50
OGE Energy	$2.40	$2.30	$2.28	$2.27	$2.25
Progress Energy	$2.55	$2.65	$2.73	$2.82	$2.90
Southern Co.	$2.05	$2.15	$2.27	$2.38	$2.50
Wisconsin Energy	$2.55	$2.65	$2.85	$3.05	$3.25
Xcel Energy Inc.	$1.35	$1.40	$1.52	$1.63	$1.75
AVERAGE	**$2.18**	**$2.25**	**$2.35**	**$2.46**	**$2.56**

Note: Data are from the most current Value Line report(s)

Value Line's Dividends Per Share

COMPANY	2006	2007	2008	2009	2010
Alliant Energy	$1.15	$1.25	$1.31	$1.37	$1.43
Amer. Elec. Power	$1.48	$1.60	$1.70	$1.80	$1.90
Consol. Edison	$2.30	$2.32	$2.34	$2.36	$2.38
Energy East Corp.	$1.16	$1.16	$1.24	$1.32	$1.40
IDACORP, Inc.	$1.20	$1.20	$1.20	$1.20	$1.20
MGE Energy	$1.39	$1.40	$1.41	$1.43	$1.44
NSTAR	$1.21	$1.28	$1.37	$1.46	$1.55
OGE Energy	$1.33	$1.36	$1.41	$1.45	$1.50
Progress Energy	$2.44	$2.46	$2.48	$2.50	$2.52
Southern Co.	$1.54	$1.60	$1.67	$1.73	$1.80
Wisconsin Energy	$0.92	$0.96	$1.01	$1.05	$1.10
Xcel Energy Inc.	$0.88	$0.93	$0.99	$1.04	$1.10
AVERAGE	**$1.42**	**$1.46**	**$1.51**	**$1.56**	**$1.61**

Retention Rate

(Earnings less Dividends divided by Earnings)

	2006	2007	2008	2009	2010
Alliant Energy	50.0%	46.8%	$0.45	$0.43	41.6%
Amer. Elec. Power	47.1%	43.9%	$0.45	$0.45	45.7%
Consol. Edison	23.3%	23.9%	$0.25	$0.25	25.6%
Energy East Corp.	27.5%	25.2%	$0.27	$0.29	30.0%
IDACORP, Inc.	35.1%	36.8%	$0.38	$0.39	40.0%
MGE Energy	22.8%	30.0%	$0.34	$0.38	41.2%
NSTAR	37.9%	39.0%	$0.39	$0.38	38.0%
OGE Energy	44.6%	40.9%	$0.38	$0.36	33.3%
Progress Energy	4.3%	7.2%	$0.09	$0.11	13.1%
Southern Co.	24.9%	25.6%	$0.26	$0.27	28.0%
Wisconsin Energy	63.9%	63.8%	$0.65	$0.65	66.2%
Xcel Energy Inc.	34.8%	33.6%	$0.35	$0.36	37.1%
AVERAGE	**34.7%**	**34.7%**	**35.5%**	**36.1%**	**36.7%**

RETAINED EARNINGS

	2006	2007	2008	2009	2010
Alliant Energy	$1.15	$1.10	$1.07	$1.05	$1.02
Amer. Elec. Power	$1.32	$1.25	$1.37	$1.48	$1.60
Consol. Edison	$0.70	$0.73	$0.76	$0.79	$0.82
Energy East Corp.	$0.44	$0.39	$0.46	$0.53	$0.60
IDACORP, Inc.	$0.65	$0.70	$0.73	$0.77	$0.80
MGE Energy	$0.41	$0.60	$0.74	$0.87	$1.01
NSTAR	$0.74	$0.82	$0.86	$0.91	$0.95
OGE Energy	$1.07	$0.94	$0.88	$0.81	$0.75
Progress Energy	$0.11	$0.19	$0.25	$0.32	$0.38
Southern Co.	$0.51	$0.55	$0.60	$0.65	$0.70
Wisconsin Energy	$1.63	$1.69	$1.84	$2.00	$2.15
Xcel Energy Inc.	$0.47	$0.47	$0.53	$0.59	$0.65
AVERAGE	**$0.77**	**$0.79**	**$0.84**	**$0.90**	**$0.95**

VALUE LINE'S BOOK VALUE PER SHARE PROJECTIONS

	2005	2006	2007	2008	2009	2010
Alliant Energy	$22.13	$20.85	$22.70	$24.32	$25.93	$27.55
Amer. Elec. Power	$21.32	$23.08	$24.40	$26.27	$28.13	$30.00
Consol. Edison	$29.09	$29.80	$30.85	$32.07	$33.28	$34.50
Energy East Corp.	$17.89	$19.45	$19.25	$19.83	$20.42	$21.00
IDACORP, Inc.	$23.88	$24.04	$24.95	$26.05	$27.15	$28.25
MGE Energy	$16.59	$16.82	$17.00	$17.65	$18.30	$18.95
NSTAR	$13.52	$14.37	$15.15	$16.43	$17.72	$19.00
OGE Energy	$14.28	$15.19	$16.75	$17.92	$19.08	$20.25
Progress Energy	$30.90	$31.90	$21.15	$25.42	$29.68	$33.95
Southern Co.	$13.86	$14.41	$15.05	$15.95	$16.85	$17.75
Wisconsin Energy	$21.31	$22.91	$24.25	$26.25	$28.25	$30.25
Xcel Energy Inc.	$12.99	$13.37	$13.95	$14.63	$15.32	$16.00
AVERAGE	**$19.81**	**$20.52**	**$20.45**	**$21.90**	**$23.34**	**$24.79**

UE 180

Schedule 4B

COMPARATIVE COMPANIES
EXTERNAL FINANCING RATE
(Millions of Shares)

COMPANIES	2006	2009-2011		Common Stock Outstanding Compound Annual Growth 2007-2010
Alliant Energy	115.00	116.00		0.22%
Amer. Elec. Power	394.00	400.00		0.38%
Consol. Edison	255.00	263.00		0.78%
Energy East Corp.	148.00	149.00		0.17%
IDACORP, Inc.	43.90	46.10		1.23%
MGE Energy	20.60	20.60		0.00%
NSTAR	106.81	106.81		0.00%
OGE Energy	91.20	93.50		0.62%
Progress Energy	254.00	261.00		0.68%
Southern Co.	747.00	770.00		0.76%
Wisconsin Energy	117.00	117.00		0.00%
Xcel Energy Inc.	406.00	435.00		1.74%
			Average	0.55%
			Round to	55.00%

Source: Forecasts are from the most current editions of Value Line.

SELECTED COMPANIES 40-YEAR MULTISTAGE DCF METHOD

UE 180

Schedule 4 - 40-year 3-stage DCF Model
Page 1

RESULTING IRR 9.43%

Based on the Recent Price reported in Value Line

	Year	[1] Year End Book	[2] Retention Rate	[3] Dividend	[4] Earnings Per Share	[5] Retained Earnings Per Share	[6] Total Increment to Book	[7] Market Price	[8] Mkt to Book	[9] Expect. Ret. on Equity	[10] Cash Fl. from Stock Trans.	[11] Cash Fl. from Div.	[12] Total Cash Flow	
		[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]	[K]	[L]	
	2005	$19.81												
	2006	$20.52						$35.86	1.79		($35.86)		($35.86)	
First Stage	2007	$20.45	34.99%	$1.46	$2.25			$36.65	1.79	10.96%		$1.46	$1.46	First Stage
	2008	$21.90	35.78%	$1.51	$2.35			$39.24	1.79	11.10%		$1.51	$1.51	
	2009	$23.34	36.51%	$1.56	$2.46			$41.83	1.79	10.86%		$1.56	$1.56	
	2010	$24.79	37.17%	$1.61	$2.56			$44.42	1.79	10.65%		$1.61	$1.61	
	2011	$26.06	40.00%	$1.91	$3.18	$1.27	$1.27	$46.70	1.79	12.50%		$1.91	$1.91	
	2012	$27.39	40.00%	$2.00	$3.34	$1.34	$1.34	$49.09	1.79	12.50%		$2.00	$2.00	
	2013	$28.80	40.00%	$2.11	$3.51	$1.40	$1.40	$51.61	1.79	12.50%		$2.11	$2.11	
	2014	$30.28	40.00%	$2.22	$3.69	$1.48	$1.48	$54.26	1.79	12.50%		$2.22	$2.22	
	2015	$31.83	40.00%	$2.33	$3.88	$1.55	$1.55	$57.04	1.79	12.50%		$2.33	$2.33	
	2016	$33.46	40.00%	$2.45	$4.08	$1.63	$1.63	$59.96	1.79	12.50%		$2.45	$2.45	
	2017	$35.18	40.00%	$2.57	$4.29	$1.72	$1.72	$63.04	1.79	12.50%		$2.57	$2.57	
	2018	$36.98	40.00%	$2.71	$4.51	$1.80	$1.80	$66.27	1.79	12.50%		$2.71	$2.71	
	2019	$38.88	40.00%	$2.84	$4.74	$1.90	$1.90	$69.67	1.79	12.50%		$2.84	$2.84	
	2020	$40.87	40.00%	$2.99	$4.98	$1.99	$1.99	$73.24	1.79	12.50%		$2.99	$2.99	
	2021	$42.97	40.00%	$3.14	$5.24	$2.10	$2.10	$77.00	1.79	12.50%		$3.14	$3.14	
Second Stage	2022	$45.17	40.00%	$3.31	$5.51	$2.20	$2.20	$80.95	1.79	12.50%		$3.31	$3.31	Second Stage
	2023	$47.49	40.00%	$3.47	$5.79	$2.32	$2.32	$85.10	1.79	12.50%		$3.47	$3.47	
	2024	$49.92	40.00%	$3.65	$6.09	$2.44	$2.44	$89.46	1.79	12.50%		$3.65	$3.65	
	2025	$52.48	40.00%	$3.84	$6.40	$2.56	$2.56	$94.05	1.79	12.50%		$3.84	$3.84	
	2026	$55.17	40.00%	$4.04	$6.73	$2.69	$2.69	$98.88	1.79	12.50%		$4.04	$4.04	
	2027	$58.00	40.00%	$4.24	$7.07	$2.83	$2.83	$103.95	1.79	12.50%		$4.24	$4.24	
	2028	$60.98	40.00%	$4.46	$7.44	$2.97	$2.97	$109.28	1.79	12.50%		$4.46	$4.46	
	2029	$64.11	40.00%	$4.69	$7.82	$3.13	$3.13	$114.88	1.79	12.50%		$4.69	$4.69	
	2030	$67.39	40.00%	$4.93	$8.22	$3.29	$3.29	$120.77	1.79	12.50%		$4.93	$4.93	
	2031	$70.85	40.00%	$5.18	$8.64	$3.46	$3.46	$126.97	1.79	12.50%		$5.18	$5.18	
	2032	$74.48	40.00%	$5.45	$9.08	$3.63	$3.63	$133.48	1.79	12.50%		$5.45	$5.45	
	2033	$78.30	40.00%	$5.73	$9.55	$3.82	$3.82	$140.32	1.79	12.50%		$5.73	$5.73	
	2034	$82.32	40.00%	$6.02	$10.04	$4.02	$4.02	$147.52	1.79	12.50%		$6.02	$6.02	
	2035	$86.54	40.00%	$6.33	$10.55	$4.22	$4.22	$155.08	1.79	12.50%		$6.33	$6.33	
	2036	$90.98	40.00%	$6.66	$11.09	$4.44	$4.44	$163.03	1.79	12.50%		$6.66	$6.66	
	2037	$95.64	40.00%	$7.00	$11.66	$4.67	$4.67	$171.40	1.79	12.50%		$7.00	$7.00	
	2038	$100.55	40.00%	$7.36	$12.26	$4.90	$4.90	$180.19	1.79	12.50%		$7.36	$7.36	
	2039	$105.70	40.00%	$7.73	$12.89	$5.16	$5.16	$189.43	1.79	12.50%		$7.73	$7.73	
	2040	$111.12	40.00%	$8.13	$13.55	$5.42	$5.42	$199.14	1.79	12.50%		$8.13	$8.13	
	2041	$116.82	40.00%	$8.55	$14.25	$5.70	$5.70	$209.35	1.79	12.50%		$8.55	$8.55	
	2042	$122.81	40.00%	$8.99	$14.98	$5.99	$5.99	$220.09	1.79	12.50%		$8.99	$8.99	
	2043	$129.11	40.00%	$9.45	$15.75	$6.30	$6.30	$231.37	1.79	12.50%		$9.45	$9.45	
	2044	$135.73	40.00%	$9.93	$16.55	$6.62	$6.62	$243.24	1.79	12.50%		$9.93	$9.93	
3rd Stage	2045	$142.69	40.00%	$10.44	$17.40	$6.96	$6.96	$255.71	1.79	12.50%	$255.71	$10.44	$266.15	3rd Stage

Long-run Retention Rate
40.00%
ROE
12.50%
GROWTH
5.00%

Internal Rate of Return 9.43%

Source:

[A] First Stage is average from Value Line. Second stage is prior years' book value plus value from Col. [6]
[B] First Stage is (Col. [4]-Col.[3]/Col.[4]). First year of second stage computed by 1-dividends/earnings; subsequent years use the same retention rate.
[C] First Stage is from Value Line. First year of second stage determined by Terminal Retention rate and ROE.
Subsequent years of second stage is Col. [4] x (1-Col. [2])
[D] First Stage is from Value line. Second stage is average of current and prior year's value from Col. [1] x Col. [9]
[E] Col. [4] - Col. [3]
[F] Col. [4] - Col. [3]
[G] Col. [1] x Col. [10]
[H] Staff/1002 Morgan/10 (Schedule 7)
[I] First stage is Col. [4]/Ave. of Current and prior year's Col. [1]. Second stage is input.
[J] Input is "negative" Col. [7] for year of purchase, "positive" Col. [7] for year of sale.
[K] Col. [3]
[L] Col. [10] + Col. [11]

SELECTED COMPANIES 40-YEAR MULTISTAGE DCF METHOD

Schedule 4 - 40-year 3-stage DCF Model Sensitivity Analysis
Page 2

SENSITIVITY ANALYSES, EXPECTED INTERNAL RATE OF RETURN

Terminal Retention Rate	Terminal ROE								
	10.00%	**10.50%**	**11.00%**	**11.50%**	**12.00%**	**12.50%**	**13.00%**	**13.50%**	**14.00%**
30.00%	7.46%	7.75%	8.05%	8.35%	8.64%	8.93%	9.22%	9.50%	9.79%
35.00%	7.64%	7.95%	8.26%	8.57%	8.87%	9.17%	9.47%	9.77%	10.07%
40.00%	7.83%	8.15%	8.47%	8.79%	9.11%	9.43%	9.74%	10.05%	10.36%
45.00%	8.03%	8.36%	8.69%	9.03%	9.36%	9.68%	10.01%	10.34%	10.66%
50.00%	8.22%	8.57%	8.92%	9.26%	9.61%	9.95%	10.29%	10.63%	10.97%

SENSITIVITY ANALYSES, EXPECTED ORGANIC GROWTH RATE

Terminal Retention Rate	Terminal ROE								
	10.00%	**10.50%**	**11.00%**	**11.50%**	**12.00%**	**12.50%**	**13.00%**	**13.50%**	**14.00%**
30.00%	3.00%	3.15%	3.30%	3.45%	3.60%	3.75%	3.90%	4.05%	4.20%
35.00%	3.50%	3.68%	3.85%	4.03%	4.20%	4.38%	4.55%	4.73%	4.90%
40.00%	4.00%	4.20%	4.40%	4.60%	4.80%	5.00%	5.20%	5.40%	5.60%
45.00%	4.50%	4.73%	4.95%	5.18%	5.40%	5.63%	5.85%	6.08%	6.30%
50.00%	5.00%	5.25%	5.50%	5.75%	6.00%	6.25%	6.50%	6.75%	7.00%

Terminal Retention Rate	IRR
25.00%	8.69%
30.00%	8.93%
35.00%	9.17%
40.00%	9.43%
45.00%	9.68%

Terminal ROE	COE
9.50%	7.51%
10.00%	7.83%
10.50%	8.15%
11.00%	8.47%
11.50%	8.79%
12.00%	9.11%

SELECTED COMPANIES 40-YEAR MULTISTAGE DCF METHOD **UE 180** **Schedule 4A - 40-year 3-stage DCF Model**

Page 1

RESULTING IRR 9.81%

Based on the Recent Price reported in Value Line

Stage	Year	[1] Year End Book	[2] Retention Rate	[3] Dividend	[4] Earnings Per Share	[5] Retained Earnings Per Share	[5a] Increment to Retained Earnings Per Share	[6] Total Increment to Book	[7] Market Price	[8] Mkt to Book	[9] Expect. Ret. on Equity	[10] Cash Fl. from Stock Trans.	[11] Cash Fl. from Div.	[12] Total Cash Flow	Stage
		[A]	[B]	[C]	[D]	[E]	[E-2]	[F]	[G]	[H]	[I]	[J]	[K]	[L]	
	2006	$20.52							$35.86	1.79		($35.86)		($35.86)	
First Stage	2007	$20.45	34.99%	$1.46	$2.25				$36.65	1.79	10.96%		$1.46	$1.46	First Stage
	2008	$21.90	35.78%	$1.51	$2.35				$39.24	1.79	11.10%		$1.51	$1.51	
	2009	$23.34	36.51%	$1.56	$2.46				$41.83	1.79	10.86%		$1.56	$1.56	
	2010	$24.79	37.17%	$1.61	$2.56				$44.42	1.79	10.65%		$1.61	$1.61	
	2011	$26.17	40.00%	$1.91	$3.18	$1.27	$0.11	$1.38	$46.90	1.79	12.50%		$1.91	$1.91	
	2012	$27.63	40.00%	$2.02	$3.36	$1.35	$0.12	$1.46	$49.52	1.79	12.50%		$2.02	$2.02	
	2013	$29.18	40.00%	$2.13	$3.55	$1.42	$0.12	$1.54	$52.29	1.79	12.50%		$2.13	$2.13	
	2014	$30.81	40.00%	$2.25	$3.75	$1.50	$0.13	$1.63	$55.21	1.79	12.50%		$2.25	$2.25	
	2015	$32.53	40.00%	$2.38	$3.96	$1.58	$0.14	$1.72	$58.30	1.79	12.50%		$2.38	$2.38	
	2016	$34.35	40.00%	$2.51	$4.18	$1.67	$0.15	$1.82	$61.55	1.79	12.50%		$2.51	$2.51	
	2017	$36.27	40.00%	$2.65	$4.41	$1.77	$0.15	$1.92	$64.99	1.79	12.50%		$2.65	$2.65	
	2018	$38.29	40.00%	$2.80	$4.66	$1.86	$0.16	$2.03	$68.62	1.79	12.50%		$2.80	$2.80	
	2019	$40.43	40.00%	$2.95	$4.92	$1.97	$0.17	$2.14	$72.46	1.79	12.50%		$2.95	$2.95	
	2020	$42.69	40.00%	$3.12	$5.20	$2.08	$0.18	$2.26	$76.51	1.79	12.50%		$3.12	$3.12	
	2021	$45.08	40.00%	$3.29	$5.49	$2.19	$0.19	$2.39	$80.78	1.79	12.50%		$3.29	$3.29	
	2022	$47.60	40.00%	$3.48	$5.79	$2.32	$0.20	$2.52	$85.30	1.79	12.50%		$3.48	$3.48	
	2023	$50.26	40.00%	$3.67	$6.12	$2.45	$0.21	$2.66	$90.06	1.79	12.50%		$3.67	$3.67	
Second Stage	2024	$53.06	40.00%	$3.87	$6.46	$2.58	$0.23	$2.81	$95.09	1.79	12.50%		$3.87	$3.87	Second Stage
	2025	$56.03	40.00%	$4.09	$6.82	$2.73	$0.24	$2.96	$100.41	1.79	12.50%		$4.09	$4.09	
	2026	$59.16	40.00%	$4.32	$7.20	$2.88	$0.25	$3.13	$106.02	1.79	12.50%		$4.32	$4.32	
	2027	$62.47	40.00%	$4.56	$7.60	$3.04	$0.26	$3.31	$111.94	1.79	12.50%		$4.56	$4.56	
	2028	$65.96	40.00%	$4.82	$8.03	$3.21	$0.28	$3.49	$118.20	1.79	12.50%		$4.82	$4.82	
	2029	$69.64	40.00%	$5.08	$8.47	$3.39	$0.30	$3.69	$124.80	1.79	12.50%		$5.08	$5.08	
	2030	$73.53	40.00%	$5.37	$8.95	$3.58	$0.31	$3.89	$131.77	1.79	12.50%		$5.37	$5.37	
	2031	$77.64	40.00%	$5.67	$9.45	$3.78	$0.33	$4.11	$139.14	1.79	12.50%		$5.67	$5.67	
	2032	$81.98	40.00%	$5.99	$9.98	$3.99	$0.35	$4.34	$146.91	1.79	12.50%		$5.99	$5.99	
	2033	$86.56	40.00%	$6.32	$10.53	$4.21	$0.37	$4.58	$155.12	1.79	12.50%		$6.32	$6.32	
	2034	$91.40	40.00%	$6.67	$11.12	$4.45	$0.39	$4.84	$163.79	1.79	12.50%		$6.67	$6.67	
	2035	$96.50	40.00%	$7.05	$11.74	$4.70	$0.41	$5.11	$172.94	1.79	12.50%		$7.05	$7.05	
	2036	$101.90	40.00%	$7.44	$12.40	$4.96	$0.43	$5.39	$182.60	1.79	12.50%		$7.44	$7.44	
	2037	$107.59	40.00%	$7.86	$13.09	$5.24	$0.46	$5.69	$192.80	1.79	12.50%		$7.86	$7.86	
	2038	$113.60	40.00%	$8.29	$13.82	$5.53	$0.48	$6.01	$203.58	1.79	12.50%		$8.29	$8.29	
	2039	$119.95	40.00%	$8.76	$14.60	$5.84	$0.51	$6.35	$214.95	1.79	12.50%		$8.76	$8.76	
	2040	$126.65	40.00%	$9.25	$15.41	$6.16	$0.54	$6.70	$226.96	1.79	12.50%		$9.25	$9.25	
	2041	$133.73	40.00%	$9.76	$16.27	$6.51	$0.57	$7.08	$239.64	1.79	12.50%		$9.76	$9.76	
	2042	$141.20	40.00%	$10.31	$17.18	$6.87	$0.60	$7.47	$253.03	1.79	12.50%		$10.31	$10.31	
	2043	$149.09	40.00%	$10.89	$18.14	$7.26	$0.63	$7.89	$267.17	1.79	12.50%		$10.89	$10.89	
	2044	$157.42	40.00%	$11.49	$19.16	$7.66	$0.67	$8.33	$282.10	1.79	12.50%		$11.49	$11.49	
	2045	$166.21	40.00%	$12.14	$20.23	$8.09	$0.70	$8.80	$297.86	1.79	12.50%		$12.14	$12.14	
3rd Stage	2046	$175.50	40.00%	$12.81	$21.36	$8.54	$0.74	$9.29	$314.50	1.79	12.50%	$314.50	$12.81	$327.32	3rd Stage

Long-run Retention Rate	40.00%
ROE	12.50%
"b x r" GROWTH	5.00%

Calculated ROE 12.94%

Calc'ed "br + sv" Growth 5.59%

Internal Rate of Return 9.81%

Source:

[A] First Stage is average from Value Line. Second stage is prior years' book value plus value from Col. [6]
[B] First Stage is (Col. [4]-Col.[3]/Col.[4]). First year of second stage computed by 1-dividends/earnings; subsequent years use the same retention rate.
[C] First Stage is from Value Line. First year of second stage determined by Terminal Retention rate and ROE.
Subsequent years of second stage is Col. [4] x (1-Col. [2])
[D] First Stage is from Value line. Second stage is average of current and prior year's value from Col. [1] x Col. [9]
[E] Col. [4] - Col. [3]
[E-2] Book Value multiplied by the "s x v" factor (.2365%). Calculated as follows: "s" is the External Financing rate of 0.55% (2006-2010 Value Line growth);
"v" is the Equity Growth Accretion rate of 0.43 [calculated as 1-(1/1.76)]
[F] Col. [4] - Col. [3]
[G] Col. [1] x Col. [10]
[H] Staff/1002 Morgan/10 (Schedule 7)
[I] First stage is Col. [4]/Ave. of Current and prior year's Col. [1]. Second stage is input.
[J] Input is "negative" Col. [7] for year of purchase, "positive" Col. [7] for year of sale.
[K] Col. [3]
[L] Col. [10] + Col. [11]

SELECTED COMPANIES 40-YEAR MULTISTAGE DCF METHOD

Schedule 4 - 40-year 3-stage DCF Model Sensitivity Analysis
Page 2

SENSITIVITY ANALYSES, EXPECTED INTERNAL RATE OF RETURN

Terminal Retention Rate	Terminal ROE								
	10.00%	10.50%	11.00%	11.50%	12.00%	12.50%	13.00%	13.50%	14.00%
30.00%	7.83%	8.13%	8.42%	8.72%	9.01%	9.30%	9.59%	9.87%	10.16%
35.00%	8.02%	8.33%	8.64%	8.94%	9.25%	9.55%	9.85%	10.15%	10.45%
40.00%	8.21%	8.53%	8.86%	9.17%	9.49%	9.81%	10.12%	10.44%	10.75%
45.00%	8.41%	8.75%	9.08%	9.41%	9.74%	10.07%	10.40%	10.73%	11.05%
50.00%	8.61%	8.96%	9.31%	9.65%	10.00%	10.34%	10.69%	11.03%	11.37%

SENSITIVITY ANALYSES, EXPECTED ORGANIC GROWTH RATE

Terminal Retention Rate	Terminal ROE								
	10.00%	10.50%	11.00%	11.50%	12.00%	12.50%	13.00%	13.50%	14.00%
30.00%	3.00%	3.15%	3.30%	3.45%	3.60%	3.75%	3.90%	4.05%	4.20%
35.00%	3.50%	3.68%	3.85%	4.03%	4.20%	4.38%	4.55%	4.73%	4.90%
40.00%	4.00%	4.20%	4.40%	4.60%	4.80%	5.00%	5.20%	5.40%	5.60%
45.00%	4.50%	4.73%	4.95%	5.18%	5.40%	5.63%	5.85%	6.08%	6.30%
50.00%	5.00%	5.25%	5.50%	5.75%	6.00%	6.25%	6.50%	6.75%	7.00%

Terminal Retention Rate	IRR
25.00%	9.05%
30.00%	9.30%
35.00%	9.55%
40.00%	9.81%
45.00%	10.07%

Terminal ROE	COE
9.50%	7.89%
10.00%	8.21%
10.50%	8.53%
11.00%	8.86%
11.50%	9.17%
12.00%	9.49%

Stock Prices Used in DCF Models Data from: 8/8/2006 **Schedule 5**

UE 180

Stock Quotes Provided by MSN Money

Click here to visit MSN Money

			Last	Previous Close	High	Low	Volume	Change	% Change	52 Wk High	52 Wk Low	Market Cap	EPS	P/E Ratio	# Shares Ou
Alliant Energy Corporation	Chart	News	36.28	36.4	36.55	36.16	618,200	-0.12	-0.33%	37.16	25.79	4,272,263,724	0.79	43.8	117,758,10
American Electric Power Company,	Chart	News	37.06	36.81	37.19	36.7	2,287,900	0.25	0.68%	40.8	32.27	14,600,717,747	2.02	14.4	393,975,10
Consolidated Edison, Inc.	Chart	News	46.62	46.35	46.64	46.04	1,813,000	0.27	0.58%	48.97	41.17	11,490,272,629	2.97	15.4	246,466,60
The Empire District Electric Company	Chart	News	22.57	22.42	22.71	22.32	101,800	0.15	0.67%	23.17	19.25	679,537,551	1.13	19.8	30,108,00
Energy East Corporation	Chart	News	24.04	24.03	24.19	23.93	547,200	0.01	0.04%	25.95	22.18	3,550,744,195	1.67	14.4	147,701,50
Green Mountain Power Corp	Chart	News	33.42	33.24	33.42	33.22	1,800	0.18	0.54%	34	26.62	176,329,926	2.16	15.7	5,276,18
IDACORP, Inc.	Chart	News	38.61	38.04	38.85	38.08	468,800	0.57	1.50%	38.81	27.46	1,652,705,323	1.8	20	42,805,11
MGE Energy, Inc.	Chart	News	32.4	32.6	32.72	32.26	48,315	-0.2	-0.61%	37.25	29.2	666,047,479	1.81	18	20,557,02
NSTAR	Chart	News	33.66	33.83	33.97	33.6	531,300	-0.17	-0.50%	34.07	24.9	3,595,170,728	1.92	17.6	106,808,40
OGE Energy Corp.	Chart	News	36.33	36.42	36.55	36.2	370,300	-0.09	-0.25%	39.15	24.41	3,305,019,103	3.13	16	90,972,17
Progress Energy, Inc.	Chart	News	45.81	46	46	45.4	1,483,000	-0.19	-0.41%	46.22	40.19	11,605,885,971	2.42	16.8	253,348,30
The Southern Company	Chart	News	34.96	34.81	35.14	34.69	3,336,800	0.15	0.43%	36.33	30.48	25,950,321,376	2.06	16.9	742,286,10
Wisconsin Energy Corporation	Chart	News	43.8	43.76	43.95	43.45	371,900	0.04	0.09%	44.02	36.49	5,123,675,731	2.75	16.2	116,978,90
WPS Resources Corp	Chart	News	49.76	49.75	49.82	49.18	324,000	0.01	0.02%	58.95	47.39	2,146,042,739	4.05	11.9	43,127,87
Xcel Energy Inc.	Chart	News	20.76	20.76	20.86	20.57	2,054,000	unch	0.00%	21.05	17.8	8,427,883,317	1.34	15.9	405,967,40

COMPARATIVE ELECTRIC COMPANIES **Docket UE 180** **Schedule 6 - Capital Structure Analysis**
Percentage of Common Equity in the Capital Structure
Excluding Short-term Debt

COMPANIES	Ticker	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.	2007	'09 - '11	Ave. '96-'06	Ave. '96-'10	Ave. '99-'10
Alliant Energy	LNT			49.2%	57.4%	50.2%	42.7%	39.2%	50.0%	50.2%	53.1%	59.0%	57.5%	52.5%	50.1%	51.0%	51.2%
Amer. Elec. Power	AEP					44.4%	44.6%	43.1%	38.7%	43.1%	44.9%	41.5%	40.0%	40.5%	42.9%	42.3%	42.3%
Consol. Edison	ED	55.7%	56.8%	58.4%	53.1%	49.1%	49.6%	48.1%	48.0%	51.0%	49.0%	50.0%	50.0%	50.5%	51.7%	51.5%	49.8%
Energy East Corp.	EAS	51.9%	52.8%	53.5%	53.0%	41.8%	38.4%	39.2%	38.5%	40.6%	43.8%	43.5%	43.0%	45.0%	45.2%	45.0%	42.7%
IDACORP, Inc.	IDA	45.1%	46.8%	44.2%	44.8%	45.9%	47.9%	47.9%	46.4%	50.7%	50.0%	50.5%	50.0%	50.5%	47.3%	47.7%	48.5%
MGE Energy	MGEE	58.1%	58.2%	53.3%	55.5%	52.2%	57.8%	54.2%	56.5%	62.6%	60.7%	60.5%	60.5%	61.0%	57.2%	57.8%	58.2%
NSTAR	NST	44.5%	46.5%	50.1%	47.2%	39.4%	39.5%	37.8%	40.2%	40.2%	38.6%	39.0%	42.0%	51.5%	42.1%	42.8%	41.5%
OGE Energy	OGE	52.3%	52.5%	52.7%	47.2%	39.2%	40.5%	39.6%	45.6%	47.4%	50.5%	49.5%	51.0%	55.0%	47.0%	47.9%	46.6%
Progress Energy	PGN	50.2%	53.2%	52.4%	52.5%	47.6%	38.5%	40.4%	43.4%	44.3%	43.3%	45.5%	47.5%	49.0%	46.5%	46.8%	45.2%
Southern Co.	SO	49.7%	43.5%	42.9%	37.8%	50.6%	42.2%	43.4%	43.6%	44.1%	44.3%	44.0%	43.5%	43.5%	44.2%	44.1%	43.7%
Wisconsin Energy	WEC	57.4%	54.4%	51.7%	45.9%	40.5%	37.2%	39.6%	39.6%	43.3%	46.7%	44.0%	47.0%	48.5%	45.5%	45.8%	43.2%
Xcel Energy Inc.	XEL						32.8%	39.5%	43.8%	44.1%	47.3%	46.0%	49.0%	52.0%	42.3%	44.3%	44.3%
Average		51.7%	51.6%	50.8%	49.4%	45.5%	42.6%	42.7%	44.5%	46.8%	47.7%	47.8%	48.4%	50.0%	46.8%	47.3%	46.4%
Standard Deviation		4.9%	5.0%	4.6%	5.9%	4.8%	6.6%	5.0%	5.3%	6.2%	5.6%	6.6%	6.1%	5.4%	4.4%	4.4%	4.8%
25th Percentile		49.7%	46.8%	49.4%	46.2%	41.2%	38.5%	39.4%	40.1%	43.3%	44.2%	43.9%	43.4%	47.6%	43.9%	44.3%	43.1%
Median		51.9%	52.8%	52.1%	49.9%	45.9%	41.4%	40.0%	43.7%	44.2%	47.0%	45.8%	48.3%	50.5%	46.0%	46.3%	44.8%
75th Percentile		55.7%	54.4%	53.2%	53.1%	49.7%	45.4%	44.5%	46.8%	50.3%	50.1%	50.1%	50.3%	52.1%	48.0%	48.7%	48.8%
Minimum		44.5%	43.5%	42.9%	37.8%	39.2%	32.8%	37.8%	38.5%	40.2%	38.6%	39.0%	40.0%	40.5%	42.1%	42.3%	41.5%
Maximum		58.1%	58.2%	58.4%	57.4%	52.2%	57.8%	54.2%	56.5%	62.6%	60.7%	60.5%	60.5%	61.0%	57.2%	57.8%	58.2%

Source: Value Line ***Most current through: Oct-06***

Schedule 7

	Line	Symbol	DivYld	Wt'ed M/B M/B	EOY 2006 M/B
Alliant Energy	1	LNT	3.31%	1.63	1.60
Amer. Elec. Power	2	AEP	4.16%	1.54	1.52
Consol. Edison	3	ED	4.95%	1.52	1.51
Energy East Corp.	4	EAS	4.83%	1.25	1.25
IDACORP, Inc.	5	IDA	3.11%	1.56	1.55
MGE Energy	6	MGEE	4.29%	1.91	1.91
NSTAR	7	NST	3.74%	2.25	2.22
OGE Energy	8	OGE	3.72%	2.22	2.17
Progress Energy	9	PGN	5.35%	1.92	2.17
Southern Co.	10	SO	4.52%	2.35	2.32
Wisconsin Energy	11	WEC	2.15%	1.83	1.81
Xcel Energy Inc.	12	XEL	4.34%	1.50	1.49
			DivYld	**M/B**	**M/B**
Average			4.04%	1.79	1.79
Std. Deviation			0.85%	0.33	0.34
Maximum Value			5.35%	2.35	2.32
Minimum Value			2.15%	1.25	1.25
25th Percentile			3.61%	1.54	1.52
Median			4.22%	1.73	1.70
75th Percentile			4.60%	2.00	2.17

Schedule 7

OUTSTANDING SHARES (millions)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	'09-'11
Alliant Energy									77.63	78.98	79.01	89.68	92.30	110.96	115.74	117.04	115.00	113.00	116.00
Amer. Elec. Power											322.02	322.24	338.84	395.02	395.86	393.72	394.00	396.00	400.00
Consol. Edison	228.23	228.33	233.93	234.37	234.91	234.96	234.99	235.49	232.83	213.81	212.03	212.15	213.93	225.84	242.51	245.29	255.00	257.00	263.00
Energy East Corp.	124.86	126.80	138.88	141.19	143.01	143.01	139.34	135.02	125.89	109.34	117.66	116.72	144.97	146.26	147.12	147.70	148.00	148.25	149.00
IDACORP, Inc.	33.98	33.98	36.19	37.09	37.61	37.61	37.61	37.61	37.61	37.61	37.61	37.63	38.02	38.34	42.22	42.66	43.90	45.20	46.10
MGE Energy	16.02	16.05	16.05	16.08	16.08	16.08	16.08	16.08	16.08	16.16	16.62	17.07	17.57	18.34	20.39	20.45	20.60	20.60	20.60
NSTAR	78.00	84.09	89.53	90.26	91.07	96.01	97.02	97.03	94.37	116.12	106.07	106.07	106.07	106.07	106.55	106.81	106.81	106.81	106.81
OGE Energy	80.60	80.60	80.66	80.69	80.71	80.75	80.76	80.77	80.80	77.86	77.92	77.99	78.50	87.40	90.00	90.60	91.20	91.80	93.50
Progress Energy												218.73	232.43	246.00	247.00	252.00	254.00	256.00	261.00
Southern Co.					657.00	670.00	677.00	685.00	698.63	666.00	682.00	699.00	716.90	734.80	741.80	741.60	747.00	753.00	770.00
Wisconsin Energy	101.04	101.04	103.09	105.32	108.94	110.82	111.68	112.87	115.61	118.90	118.65	115.42	116.03	118.43	116.99	116.98	117.00	117.00	117.00
Xcel Energy Inc.												345.02	398.71	398.96	400.46	403.39	406.00	427.00	435.00

Average
Std. Deviation
Maximum Value
Minimum Value
25th Percentile
Median
75th Percentile

Schedule 7

BOOK VALUE PER SHARE

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	'09-'11
Alliant Energy									20.69	27.29	25.79	21.39	19.89	21.37	22.13	20.85	22.70	24.55	27.55
Amer. Elec. Power											25.01	25.54	20.85	19.93	21.32	23.08	24.40	25.75	30.00
Consol. Edison	19.73	20.18	20.89	21.63	22.62	23.51	24.37	25.18	25.88	25.31	25.81	26.71	27.68	28.44	29.09	29.80	30.85	31.75	34.50
Energy East Corp.	10.93	11.08	11.42	11.44	11.64	12.19	12.70	13.36	13.61	12.84	14.59	15.26	16.97	17.59	17.89	19.45	19.25	19.65	21.00
IDACORP, Inc.	17.40	17.06	17.28	17.86	17.91	18.15	18.47	18.93	19.42	20.02	21.82	23.15	23.01	22.54	23.88	24.04	24.95	25.90	28.25
MGE Energy	10.62	10.98	11.24	11.51	11.78	12.01	11.14	11.25	11.34	11.49	12.05	12.67	12.94	14.34	16.59	16.82	17.00	17.45	18.95
NSTAR	8.61	8.96	9.39	9.71	10.06	10.31	10.54	10.98	11.14	13.29	12.65	11.90	12.25	12.84	13.52	14.37	15.15	16.00	19.00
OGE Energy	10.96	11.30	11.18	11.24	11.41	11.61	11.91	12.19	12.91	13.09	13.66	13.34	12.53	13.75	14.28	15.19	16.75	17.75	20.25
Progress Energy												27.45	28.73	30.26	30.90	31.90	21.15	32.50	33.95
Southern Co.					12.46	13.09	13.61	14.08	14.02	13.82	15.67	11.42	12.15	13.13	13.86	14.41	15.05	15.70	17.75
Wisconsin Energy	13.70	14.35	14.97	15.67	16.01	16.89	17.42	16.51	16.46	16.89	17.00	17.81	18.44	19.92	21.31	22.91	24.25	25.60	30.25
Xcel Energy Inc.												17.95	11.70	12.95	12.99	13.37	13.95	14.40	16.00
Average	13.14	13.42	13.77	14.15	14.24	14.72	15.02	15.31	16.16	17.12	18.41	18.72	18.10	18.92	19.81	20.52	20.45	22.25	24.79
Std. Deviation	3.75	3.70	3.82	4.04	4.00	4.17	4.43	4.50	4.66	5.49	5.34	5.72	5.84	5.74	5.79	5.84	4.92	5.99	6.35
Maximum Value	19.73	20.18	20.89	21.63	22.62	23.51	24.37	25.18	25.88	27.29	25.81	27.45	28.73	30.26	30.90	31.90	30.85	32.50	34.50
Minimum Value	8.61	8.96	9.39	9.71	10.06	10.31	10.54	10.98	11.14	11.49	12.05	11.42	11.70	12.84	12.99	13.37	13.95	14.40	16.00
25th Percentile	10.78	11.03	11.21	11.34	11.58	11.91	11.72	11.96	12.91	13.09	13.89	13.17	12.46	13.60	14.18	15.00	16.35	17.09	18.99
Median	10.96	11.30	11.42	11.51	12.12	12.64	13.16	13.72	14.02	13.82	16.34	17.88	17.71	18.76	19.60	20.15	20.20	22.10	24.28
75th Percentile	15.55	15.71	16.13	16.77	16.49	17.21	17.68	17.12	19.42	20.02	24.21	23.75	21.39	21.66	22.57	23.32	24.29	25.79	30.06

Schedule 7

DIVIDENDS DECLARED PER SHARE

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	'09-'11
Alliant Energy									2.00	2.00	2.00	2.00	2.00	1.00	1.02	1.05	1.15	1.25	1.43
Amer. Elec. Power											2.40	2.40	2.40	1.65	1.40	1.42	1.48	1.60	1.90
Consol. Edison	1.82	1.86	1.90	1.94	2.00	2.04	2.08	2.10	2.12	2.14	2.18	2.20	2.22	2.24	2.26	2.28	2.30	2.32	2.38
Energy East Corp.	1.03	1.05	1.07	1.09	1.00	0.70	0.70	0.70	0.78	0.84	0.88	0.92	0.96	1.00	1.06	1.12	1.16	1.16	1.40
IDACORP, Inc.	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.70	1.20	1.20	1.20	1.20	1.20
MGE Energy	1.15	1.17	1.19	1.19	1.25	1.26	1.28	1.29	1.30	1.31	1.32	1.33	1.34	1.35	1.36	1.37	1.39	1.40	1.44
NSTAR	0.77	0.80	0.83	0.86	0.89	0.92	0.94	0.94	0.95	0.98	1.01	1.04	1.07	1.09	1.13	0.87	1.21	1.28	1.55
OGE Energy	1.26	1.30	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.36	1.50
Progress Energy												2.14	2.18	2.26	2.32	2.38	2.44	2.46	2.52
Southern Co.							1.26	1.30	1.34	1.34	1.34	1.34	1.36	1.39	1.42	1.48	1.54	1.60	1.80
Wisconsin Energy	1.16	1.23	1.29	1.34	1.40	1.46	1.51	1.54	1.56	1.56	1.37	0.80	0.80	0.80	0.83	0.88	0.92	0.96	1.10
Xcel Energy Inc.												1.50	1.13	0.75	0.81	0.85	0.88	0.93	1.10
Average	1.29	1.32	1.35	1.37	1.39	1.37	1.37	1.38	1.47	1.48	1.57	1.57	1.55	1.38	1.35	1.35	1.42	1.46	1.61
Std. Deviation	0.37	0.37	0.37	0.37	0.38	0.44	0.42	0.43	0.43	0.42	0.48	0.51	0.53	0.48	0.47	0.48	0.47	0.46	0.44
Maximum Value	1.86	1.86	1.90	1.94	2.00	2.04	2.08	2.10	2.12	2.14	2.40	2.40	2.40	2.26	2.32	2.38	2.44	2.46	2.52
Minimum Value	0.77	0.80	0.83	0.86	0.89	0.70	0.70	0.70	0.78	0.84	0.88	0.80	0.80	0.75	0.81	0.85	0.88	0.93	1.10
25th Percentile	1.09	1.11	1.13	1.14	1.13	1.09	1.18	1.20	1.30	1.31	1.32	1.26	1.12	1.00	1.05	1.01	1.16	1.19	1.35
Median	1.16	1.23	1.29	1.33	1.33	1.33	1.31	1.32	1.34	1.34	1.36	1.42	1.35	1.34	1.27	1.27	1.27	1.32	1.47
75th Percentile	1.54	1.58	1.60	1.60	1.63	1.66	1.60	1.62	1.86	1.86	1.97	2.04	2.05	1.66	1.41	1.44	1.50	1.60	1.83

Schedule 7

EARNINGS PER SHARE

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	'09-'11
Alliant Energy									1.26	2.19	2.47	2.42	1.18	1.57	1.85	2.21	2.30	2.35	2.45
Amer. Elec. Power											1.04	3.27	2.86	2.53	2.61	2.64	2.80	2.85	3.50
Consol. Edison	2.34	2.32	2.46	2.66	2.98	2.93	2.93	2.95	3.04	3.13	2.74	3.21	3.13	2.83	2.32	2.99	3.00	3.05	3.20
Energy East Corp.	1.24	1.18	1.20	1.04	1.19	1.25	1.26	1.29	1.51	1.91	2.07	2.00	1.50	1.43	1.62	1.74	1.60	1.55	2.00
IDACORP, Inc.	1.91	1.56	1.55	1.97	1.80	2.10	2.21	2.32	2.37	2.43	3.50	3.35	1.63	0.96	1.90	1.75	1.85	1.90	2.00
MGE Energy	1.36	1.52	1.45	1.51	1.53	1.49	0.82	1.40	1.38	1.48	1.67	1.62	1.69	1.71	1.77	1.57	1.80	2.00	2.45
NSTAR	0.80	0.98	1.05	1.14	1.21	1.04	1.31	1.36	1.38	1.39	1.60	1.64	1.69	1.74	1.76	1.83	1.95	2.10	2.50
OGE Energy	1.69	1.64	1.21	1.39	1.51	1.52	1.62	1.61	2.04	1.94	1.89	1.29	1.43	1.73	1.78	1.83	2.40	2.30	2.25
Progress Energy												3.43	3.84	3.41	3.10	2.94	2.55	2.65	2.90
Southern Co.					1.52	1.66	1.68	1.58	1.73	1.83	2.01	1.61	1.85	1.97	2.06	2.13	2.05	2.15	2.50
Wisconsin Energy	1.85	1.87	1.67	1.81	1.67	2.13	1.97	0.54	1.65	1.88	1.08	1.84	2.32	2.26	1.85	2.56	2.55	2.65	3.25
Xcel Energy Inc.												2.27	0.42	1.23	1.27	1.20	1.35	1.40	1.75
Average	1.60	1.58	1.51	1.65	1.68	1.77	1.73	1.63	1.82	2.02	2.01	2.33	1.96	1.95	1.99	2.12	2.18	2.25	2.56
Std. Deviation	0.47	0.41	0.44	0.52	0.53	0.56	0.61	0.68	0.54	0.49	0.71	0.76	0.89	0.67	0.46	0.54	0.48	0.48	0.52
Maximum Value	2.34	2.32	2.46	2.66	2.98	2.93	2.93	2.95	3.04	3.13	3.50	3.43	3.84	3.41	3.10	2.99	3.00	3.05	3.50
Minimum Value	0.80	0.98	1.05	1.04	1.19	1.04	0.82	0.54	1.26	1.39	1.04	1.29	0.42	0.96	1.27	1.20	1.35	1.40	1.75
25th Percentile	1.30	1.35	1.21	1.27	1.44	1.43	1.30	1.34	1.38	1.83	1.62	1.64	1.48	1.54	1.77	1.75	1.84	1.98	2.19
Median	1.69	1.56	1.45	1.51	1.53	1.59	1.65	1.49	1.65	1.91	1.95	2.14	1.69	1.74	1.85	1.98	2.18	2.23	2.48
75th Percentile	1.88	1.76	1.61	1.89	1.70	2.11	2.03	1.79	2.04	2.19	2.37	3.23	2.46	2.33	2.13	2.58	2.55	2.65	2.98

Schedule 7

VALUE LINE'S REPORTED RETURN ON EQUITY (ROE)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	'09-'11
Alliant Energy			6.0%	8.0%	9.6%	9.8%	5.8%	6.7%	8.2%	13.1%	10.5%	9.5%	9.0%
Amer. Elec. Power						12.8%	13.7%	12.4%	12.2%	11.3%	11.5%	11.0%	11.5%
Consol. Edison	11.7%	11.7%	11.8%	12.9%	10.7%	12.0%	11.3%	9.8%	7.8%	9.7%	9.5%	9.5%	9.5%
Energy East Corp.	10.1%	9.7%	11.3%	15.8%	13.8%	13.1%	8.0%	8.1%	9.0%	8.9%	8.5%	8.0%	9.0%
IDACORP, Inc.	11.9%	12.2%	12.2%	12.1%	16.0%	14.4%	7.0%	4.2%	7.2%	6.2%	7.5%	7.0%	7.0%
MGE Energy	7.4%	12.4%	12.2%	12.8%	13.7%	12.6%	12.8%	11.6%	10.0%	9.3%	10.5%	11.5%	12.0%
NSTAR	12.3%	12.3%	12.6%	9.1%	13.0%	13.7%	13.8%	13.7%	13.1%	12.8%	13.0%	13.5%	13.5%
OGE Energy	13.6%	13.2%	15.8%	14.8%	13.8%	9.7%	11.4%	11.8%	12.3%	12.1%	14.5%	13.0%	11.0%
Progress Energy						11.5%	12.1%	10.9%	9.9%	9.0%	8.0%	8.0%	8.5%
Southern Co.	12.2%	11.2%	12.2%	13.6%	12.3%	14.0%	15.1%	14.8%	14.9%	14.9%	13.5%	13.5%	14.0%
Wisconsin Energy	11.2%	3.3%	9.9%	10.9%	6.5%	10.6%	12.6%	11.4%	8.8%	11.3%	10.5%	10.5%	11.0%
Xcel Energy Inc.						12.6%	3.7%	9.8%	10.0%	9.2%	10.0%	9.5%	10.5%
Average	11.30%	10.75%	11.56%	12.22%	12.16%	12.23%	10.61%	10.43%	10.28%	10.65%	10.63%	10.38%	10.54%
Std. Deviation	1.74%	2.98%	2.45%	2.39%	2.67%	1.50%	3.45%	2.84%	2.26%	2.27%	2.09%	2.10%	1.97%
Maximum Value	13.60%	13.20%	15.80%	15.80%	16.00%	14.40%	15.10%	14.80%	14.90%	14.90%	14.50%	13.50%	14.00%
Minimum Value	7.40%	3.30%	6.00%	8.00%	6.50%	9.70%	3.70%	4.20%	7.20%	6.20%	7.50%	7.00%	7.00%
25th Percentile	10.93%	10.83%	11.30%	10.90%	10.70%	11.28%	7.75%	9.38%	8.65%	9.15%	9.25%	9.13%	9.00%
Median	11.80%	11.95%	12.20%	12.80%	13.00%	12.60%	11.75%	11.15%	9.95%	10.50%	10.50%	10.00%	10.75%
75th Percentile	12.23%	12.33%	12.20%	13.60%	13.80%	13.25%	13.03%	11.95%	12.23%	12.28%	11.88%	11.88%	11.63%

Analyst Earnings Growth Expectations
UE 180

Schedule 8

Electric Companies		Kiplinger's		Firstcall		Zack's	Reuters	Value Line	Average	Median	Minimum	Maximum
		Last 5 years	Next 5 years	Last 5 years	Next 5 years	Next 5 years	Next 5 years	Next 5 years				
Alliant Energy	LNT	N/A	3.00%	2.80%	2.30%	4.00%	3.67%	4.50%	3.49%	3.67%	2.30%	4.50%
Amer. Elec. Power	AEP	N/A	3.00%	-6.40%	3.00%	3.20%	3.50%	5.00%	3.54%	3.20%	3.00%	5.00%
Consol. Edison	ED	-3.00%	3.00%	-3.00%	4.00%	3.50%	3.44%	1.50%	3.09%	3.44%	1.50%	4.00%
Energy East Corp.	EAS	0.00%	4.00%	-3.10%	4.00%	4.50%	4.33%	4.50%	4.27%	4.33%	4.00%	4.50%
IDACORP, Inc.	IDA	-12.00%	5.00%	-7.40%	5.00%	4.00%	4.75%	4.50%	4.65%	4.75%	4.00%	5.00%
MGE Energy	MGEE	0.00%	N/A	N/A	N/A	N/A	N/A	6.00%	6.00%	6.00%	6.00%	6.00%
NSTAR	NST	N/A	5.00%	2.30%	5.00%	5.80%	5.50%	2.50%	4.76%	5.00%	2.50%	5.80%
OGE Energy	OGE	15.00%	3.00%	7.40%	3.00%	5.00%	4.00%	4.00%	3.80%	4.00%	3.00%	5.00%
Progress Energy	PGN	0.00%	4.00%	-2.90%	3.50%	3.60%	3.93%	N/A	3.76%	3.77%	3.50%	4.00%
Southern Co.	SO	4.00%	5.00%	6.40%	5.00%	4.70%	4.50%	4.00%	4.64%	4.70%	4.00%	5.00%
Wisconsin Energy	WEC	12.00%	8.00%	6.10%	8.00%	7.00%	7.27%	6.50%	7.35%	7.27%	6.50%	8.00%
Xcel Energy Inc.	XEL	N/A	4.00%	-14.30%	4.50%	4.30%	4.17%	7.50%	4.89%	4.30%	4.00%	7.50%
AVERAGE		**2.00%**	**4.27%**	**-1.10%**	**4.30%**	**4.51%**	**4.46%**	**4.59%**	**4.52%**	**4.54%**	**3.69%**	**5.36%**
MEDIAN		**0.00%**	**4.00%**	**-2.90%**	**4.00%**	**4.30%**	**4.17%**	**4.50%**	**4.45%**	**4.32%**	**3.75%**	**5.00%**
MIN		**-12.00%**	**3.00%**	**-14.30%**	**2.30%**	**3.20%**	**3.44%**	**1.50%**	**3.09%**	**3.20%**	**1.50%**	**4.00%**
MAX		**15.00%**	**8.00%**	**7.40%**	**8.00%**	**7.00%**	**7.27%**	**7.50%**	**7.35%**	**7.27%**	**6.50%**	**8.00%**

CASE: UE 180/UE 181/UE 184
WITNESS: Thomas D. Morgan

PUBLIC UTILITY COMMISSION OF OREGON

STAFF EXHIBIT 1402

Exhibits in Support Of Surrebuttal Testimony

REDACTED VERSION
October 6, 2006

CERTAIN INFORMATION CONTAINED IN STAFF EXHIBIT 1402

IS CONFIDENTIAL AND SUBJECT TO PROTECTIVE

ORDER NO. 06-111. YOU MUST HAVE SIGNED

APPENDIX B OF THE PROTECTIVE ORDER IN

DOCKET UE 180 TO RECEIVE THE

CONFIDENTIAL VERSION

OF THIS EXHIBIT.

All of the major electric utilities located in the western region of the United States are reviewed in this Issue; eastern electrics, in Issue 1; and the remaining utilities, in Issue 5.

Merger and acquisition activity has returned to the Electric Utility Industry. We will discuss the reasons for this and evaluate the possibility of additional deals.

Despite rising interest rates, utility stocks have performed well of late. We continue to believe that most of these equities are richly priced.

More Mergers

For a period of nearly four years, from February of 2001 through December of 2004, there were no announced mergers or acquisitions involving two investor-owned utilities. (Ameren bought two utilities in Illinois during that period, but they were corporate subsidiaries, not entire companies.) The turmoil that affected this industry after the power markets began to collapse in 2001 precluded M&A activity. Numerous companies had to adopt "back to basics" strategies to get their houses in order. For most, this process was completed within the past couple of years, so dealmaking has returned.

Three major combinations have been announced since December of 2004. That month, Exelon agreed to acquire Public Service Enterprise Group. In May of 2005, Duke Energy agreed to buy Cinergy. In December of 2005, FPL Group agreed to purchase Constellation Energy. Each of these companies owns nonregulated generating assets, and in each case, expected synergies on the nonregulated side of the businesses drove the deals much more so than the possibility of utility-related expense reductions. What has happened since then illustrates one of the problems in executing utility mergers.

Obtaining state regulatory approval for utility combinations is often difficult. The Exelon/PSEG and FPL/Constellation deals have run into opposition in New Jersey and Maryland, respectively. Officials in New Jersey are concerned that the benefits to customers there might not be significant enough to justify the deal. Officials in Maryland are displeased about the upcoming large rise in the generation portion of customers' bills since market-based rates in the state began in mid-2006—despite the fact that the FPL deal had nothing to do with this. Thus, each of these transactions is in danger of falling apart. Duke's takeover of Cinergy was completed in less than 12 months—very fast for a utility combination—but the companies had to accelerate the benefits for customers in order to obtain regulatory approval.

INDUSTRY TIMELINESS: 74 (of 97)

Smaller deals are also occurring. In June, a Canadian company agreed to acquire Green Mountain Power, a little electric utility in Vermont. Last month, three more transactions were announced. A consortium led by an Australian bank agreed to buy Duquesne Light. WPS Resources, an electric and gas utility in Wisconsin that had already expanded its gas business by purchasing Aquila's utilities in Michigan and Minnesota, agreed to acquire Peoples Energy, the holding company for the gas utility that serves Chicago. *MDU Resources*, which owns electric and gas utilities in North Dakota and four neighboring states, agreed to buy Cascade Natural Gas, which has utilities in Washington and Oregon. The latter two deals should produce little controversy, but the idea of a foreign company buying the local utility could produce opposition to the former two buyouts.

Takeover speculation has apparently boosted the prices of some smaller utilities lately. Aquila has not confirmed rumors that it is shopping itself. In the West, the stocks of *El Paso Electric*, long considered a takeover candidate, and *Avista*, which was involved in a failed deal with *Sierra Pacific Resources* in the mid-1990s, have risen more than most utility shares in recent weeks.

Investment Advice

We do not advise investors to purchase any of the aforementioned stocks just because of takeover possibilities. We are also concerned about the lofty valuations of many of these equities. As uncertainty about the broad market has risen of late, investors have become more interested in utilities due to their above-average dividend yields and defensive characteristics. The high valuation of electric utility issues, in general, is evident by the fact that many of them are trading well within their 2009-2011 Target Price Ranges.

Paul E. Debbas, CFA

Composite Statistics: ELECTRIC UTILITY INDUSTRY

2002	2003	2004	2005	2006	2007		09-11
283.5	311.7	321.8	353.4	***375***	***395***	Revenues ($bill)	***450***
17.4	20.2	21.7	25.6	***29.0***	***32.0***	Net Profit ($bill)	***39.0***
30.2%	30.7%	30.4%	29.6%	***33.5%***	***33.5%***	Income Tax Rate	***34.5%***
5.4%	4.8%	3.7%	3.5%	***4.0%***	***4.0%***	AFUDC % to Net Profit	***3.0%***
58.9%	59.1%	56.7%	55.1%	***53.0%***	***52.0%***	Long-Term Debt Ratio	***49.5%***
38.1%	39.3%	42.2%	43.8%	***46.0%***	***47.0%***	Common Equity Ratio	***49.5%***
446.5	474.0	475.3	477.1	***510***	***530***	Total Capital ($bill)	***600***
431.8	478.9	487.1	498.5	***535***	***560***	Net Plant ($bill)	***620***
5.9%	6.2%	6.5%	7.2%	***7.0%***	***7.0%***	Return on Total Cap'l	***7.5%***
9.5%	10.4%	10.5%	12.0%	***11.0%***	***11.0%***	Return on Shr. Equity	***11.5%***
9.7%	10.5%	10.6%	12.1%	***11.0%***	***11.5%***	Return on Com Equity	***11.5%***
2.5%	4.4%	4.5%	5.3%	***5.0%***	***5.0%***	Retained to Com Eq	***5.0%***
75%	60%	59%	57%	***63%***	***59%***	All Div'ds to Net Prof	***59%***
16.7	13.8	15.3	16.0	*Bold figures are*	*Value Line*	Avg Ann'l P/E Ratio	***13.5***
.91	.79	.81	.85	*estimates*		Relative P/E Ratio	***.90***
6.9%	4.3%	3.8%	3.5%			Avg Ann'l Div'd Yield	***4.4%***

COMPOSITE OPERATING STATISTICS: ELECTRIC UTILITY INDUSTRY

	2003	2004	2005
% Change Retail Sales (kwh)	+1.3	+.3	+5.4
Average Indust. Use (mwh)	1662	1384	1497
Avg. Indust. Revs. per kwh (¢)	5.07	5.25	5.78
Capacity at Peak (mw)	NA	NA	NA
Peak Load, Summer (mw)	NA	NA	NA
Annual Load Factor (%)	NA	NA	NA
% Change Customers (yr.-end)	+1.9	+1.6	+1.2
Fixed Charge Coverage (%)	207	230	260

Sources: Annual Reports; Estimates, Value Line; Edison Electric Institute

ELECTRIC UTILITY (CENTRAL) INDUSTRY

All of the major utilities in the central United States are reviewed in this Issue. Those serving the western region may be found in Issue 11. The eastern companies are covered in Issue 1.

To cope with the increased demand for power in the U.S., estimated at 2% annually, utilities have stepped up construction of fossil-fueled plants. At the same time, because of the high price of oil and natural gas, they continue to look for other sources of energy. This report reviews prospects for synthetic fuel and wind power,

Synthetic Fuel

To reduce dependence on imported oil, the federal government passed legislation promoting alternative energy sources. The statute, which will expire at the end of 2007, authorized tax credits for the production and sale of coal-based synthetic fuels provided that the fuel differed significantly in chemical composition from the coal used to produce the fuel and that the operation was placed in service before July 1, 1998. The credits, which were based on the barrel of oil equivalent of the synthetic fuel sold, were phased out in a year that the annual average market price for crude oil exceeded certain prices. From mid-1998 through June 30, 2006, Progress Energy was the largest utility producer and seller of synthetic fuel. During this period, it generated tax credits of $1.8 billion. But, it ceased synthetic fuel operations last May because of the gradual phase-out of credits when the price of oil rose above $60.50 a barrel. It stated that resumption of operations would depend on a reduction in oil prices and the enactment of future federal tax legislation. If credits were no longer available, resumption of operations would be impracticable, because the production and sale of synthetic fuel without credits would be uneconomical. Since credits in any calendar year are limited by the amount of federal income tax liability, the company had been unable to use all credits granted in prior years. But, it will benefit from a clause in the statute that allows credits not utilized in any given year to be carried forward indefinitely.

Investments in synthetic fuel operations have attracted a number of other utilities. Included in the group is *Vectren*, which has a minority interest in a company that recently halted synthetic fuel operations. Though its contract with the majority owner requires paying its proportionate share of expenses, credits already earned have generated an alternative minimum tax credit carryforward of $47 million, which the company will begin using this year. *WPS Resources*, for another, anticipating credit phase-outs, hedged its position to provide alternatives that do not involve production curtailment. *Alliant Energy*, which is divesting almost all noncore assets, sold its stake in synthetic fuels at the end of 2005. The sale resulted in alternative minimum tax credits of $46 million.

Though the high price of oil is currently limiting synthetic fuel tax benefits, utilities that participated in the program have, by and large, done well.

INDUSTRY TIMELINESS: 60 (of 97)

Wind-Driven Power

This source of clean energy received a big boost from the federal Energy Policy Act of 2005, which granted builders of wind power tax credits of 1.8 cents per kilowatt hour of electricity generated and extended the credit for the first 20 years of a project. Rising fossil- fuel prices, regulation in many states requiring increased percentages of energy output from renewables, and environmental considerations provided additional incentives. Moreover, since the Act expires at the end of 2007, an increasing number of utilities have begun construction of wind-powered plants in order to put them in service before the deadline. Once the units are operating, the credits are grandfathered. Among companies taking advantage of the law, the largest is FPL Group. It owns 4,016 megawatts (mw) of wind generation and plans another 750 mw by the end of next year. Numerous others have followed suit. Of concern, however, is that wind does not provide guaranteed steady output and should be backed up with fossil-fueled sources for reliability. At this time, wind and other renewables account for less than 10% of total electric generating capacity. A more permanent tax credit might be necessary before potential developers place their money here.

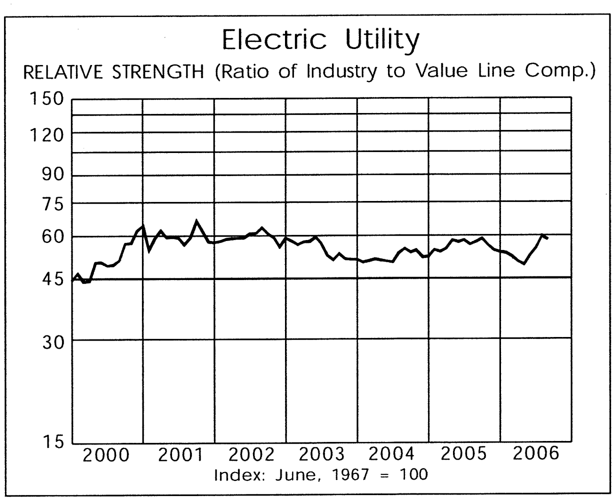
Investment Advice

The electric utility industry continues to carry a Below-Average Timeliness rank. But, the average yield of 3.6%, about twice that of all dividend-paying stocks under *Value Line* review, might interest income-oriented investors. Those of a conservative bent might consider a position in companies with at least an average yield, reasonable growth prospects, and a Safety rank of 2 or higher.

Arthur H. Medalie

Composite Statistics: Electric Utility Industry

2002	2003	2004	2005	2006	2007		09-11
295.5	316.1	326.5	354.1	**375**	**395**	Revenues ($bill)	**450**
17.8	20.6	21.6	25.7	**29.0**	**32.0**	Net Profit ($bill)	**39.0**
30.1%	30.5%	30.0%	29.7%	**33.5%**	**33.5%**	Income Tax Rate	**34.5%**
5.1%	4.3%	3.5%	3.3%	**4.0%**	**4.0%**	AFUDC % to Net Profit	**3.0%**
58.7%	59.0%	56.6%	55.0%	**53.0%**	**52.0%**	Long-Term Debt Ratio	**49.5%**
38.2%	39.4%	42.3%	43.9%	**46.0%**	**47.0%**	Common Equity Ratio	**49.5%**
454.3	481.9	483.8	473.9	**510**	**530**	Total Capital ($bill)	**600**
440.5	488.5	497.0	496.6	**535**	**560**	Net Plant ($bill)	**620**
5.9%	6.2%	6.3%	7.3%	**7.0%**	**7.0%**	Return on Total Cap'l	**7.5%**
9.5%	10.4%	10.3%	12.2%	**11.0%**	**11.0%**	Return on Shr. Equity	**11.5%**
9.8%	10.5%	10.4%	12.4%	**11.0%**	**11.5%**	Return on Com Equity	**11.5%**
2.5%	4.3%	4.1%	5.5%	**5.0%**	**5.0%**	Retained to Com Eq	**5.0%**
75%	60%	61%	56%	**63%**	**59%**	All Div'ds to Net Prof	**59%**
16.7	13.8	16.3	15.8	*Bold figures are Value Line estimates*		Avg Ann'l P/E Ratio	**13.5**
.91	.79	.87	.85			Relative P/E Ratio	**.90**
4.5%	4.3%	3.7%	3.5%			Avg Ann'l Div'd Yield	**4.4%**



ELECTRIC UTILITY (EAST) INDUSTRY

All of the major utilities in the eastern region of the U.S. are reviewed in this Issue. Those serving the central region will be found in Issue 5. All of the western companies are covered in Issue 11.

In the period since our June report, market indexes were quite volatile due to economic uncertainty. The eastern electric utilities benefited, as investors sought a greater measure of downside protection. Indeed, the group rose a good number of places in the *Value Line* industry ranking system. Slower economic growth over the next several quarters might raise the appeal of the electrics. Too, these interest rate-sensitive stocks would gain if the Federal Reserve Board does not soon return to a tight monetary policy.

Investors should note that regulatory risk is a limiting factor in utility valuations. Clearer federal rules now provide for favorable returns on transmission investment, and we expect reasonable rulings on current distribution tariff requests. Still, rising wholesale supply rates might well force some state authorities to contain delivery companies' allowed rates of return. On balance, we recommend that investors re-evaluate their portfolios to ensure an adequate weighting of utilities to limit market risk in the year ahead.

Supply Concerns

Sultry temperatures across the country this summer brought to light the vulnerability of the national power grid. The march toward industry deregulation that began in the early 1990s, which has slowed lately, created much uncertainty regarding the recovery of investments in capacity, transmission and distribution. Thus, utilities were reluctant to expand their capital budgets. Hot weather this July and August caused demand surges, and system operators, in the face of razor-thin reserve margins, successfully scrambled to avoid another massive blackout like the one that occurred in the Northeast in 2003. Ample hydroelectric capacity in the Northwest and Northeast helped to provide a supply cushion.

Torrid weather aside, America's demand for electricity continues to advance at a solid pace, especially in these still-healthy economic times. Over the next 3 to 5 years, power supply will be hard-pressed to keep up with rising demand. Regulators and utilities are aware of the situation and capital spending is on the upswing.

New Power Plants

At this juncture, given high oil and gas prices, coal is

INDUSTRY TIMELINESS: 42 (of 97)

a particularly attractive source of generation. Most visibly, TXU Corp. plans to spend $10 billion on new coal-fired capacity, before stricter emissions standards are enacted. Also, among the eastern electrics, *Duke Energy* is constructing coal plants in North Carolina that will utilize the latest pollution-control technology. Although *Allegheny Energy* is not building significant capacity, it is raising outlays for scrubbers and other emissions equipment. This will allow the company to use more economical, high-sulfur coal supplies.

Though gas-fired generation is not as popular, *Southern Co.* is adding to this source to round out its base. *Dominion Resources* and *Northeast Utilities* are investing in liquefied natural gas projects to diversify their fuel supplies, as well.

Duke, Exelon, Entergy and *Southern,* among others, are laying plans to construct a nuclear facility. Nuclear power is the most economical source, thanks largely to federal incentives. A new plant, however, is not likely to come on line until the middle of next decade.

Capital requirements are substantial. In recent years, managements have, over all, done a good job in strengthening finances. Balance sheets are generally in decent enough shape to shoulder coming outlays. Revenue- and asset-backed bonds will provide economical funding. Also, utilities are consolidating to improve their market clout in fuel and purchase power sourcing. Notably, greater scale in coal and nuclear power production can translate into rich net profits. Two big pending mergers include *Exelon/Public Service Enterprise Group* and *Constellation Energy/FPL Group.*

Upgrading Transmission & Distribution

Federal authorities have detailed provisions that allow for easier siting of transmission lines and favorable returns on assets. A number of large projects are in the works. American Electric Power, *Allegheny Energy* and *Pepco Holdings* are examples of utilities that have major lines under development. The new lines will help to relieve grid congestion and contain wholesale prices.

Utilities have also stepped up attention to their aging retail distribution systems. *Duquesne Light Holdings* is one company that has identified necessary improvements and is petitioning state regulators for recovery of related spending. Most state commissions, wanting to avoid service disruptions, view such spending favorably and grant sufficient rate relief.

David M. Reimer

Composite Statistics: Electric Utility Industry

2002	2003	2004	2005	2006	2007		09-11
283.5	311.7	321.8	353.4	***375***	***395***	Revenues ($bill)	***450***
17.4	20.2	21.7	25.6	***29.0***	***32.0***	Net Profit ($bill)	***39.0***
30.2%	30.7%	30.4%	29.6%	***33.5%***	***33.5%***	Income Tax Rate	***34.5%***
5.4%	4.8%	3.7%	3.5%	***4.0%***	***4.0%***	AFUDC % to Net Profit	***3.0%***
58.9%	59.1%	56.7%	55.1%	***53.0%***	***52.0%***	Long-Term Debt Ratio	***49.5%***
38.1%	39.3%	42.2%	43.8%	***46.0%***	***47.0%***	Common Equity Ratio	***49.5%***
446.5	474.0	475.3	477.1	***510***	***530***	Total Capital ($bill)	***600***
431.8	478.9	487.1	498.5	***535***	***560***	Net Plant ($bill)	***620***
5.9%	6.2%	6.5%	7.2%	***7.0%***	***7.0%***	Return on Total Cap'l	***7.5%***
9.5%	10.4%	10.5%	12.0%	***11.0%***	***11.0%***	Return on Shr. Equity	***11.5%***
9.7%	10.5%	10.6%	12.1%	***11.0%***	***11.5%***	Return on Com Equity	***11.5%***
2.5%	4.4%	4.5%	5.3%	***5.0%***	***5.0%***	Retained to Com Eq	***5.0%***
75%	60%	59%	57%	***63%***	***59%***	All Div'ds to Net Prof	***59%***
16.7	13.8	15.3	16.0	***Bold figures are***		Avg Ann'l P/E Ratio	***13.5***
.91	.79	.81	.85	***Value Line***		Relative P/E Ratio	***.90***
4.4%	4.3%	3.8%	3.5%	***estimates***		Avg Ann'l Div'd Yield	***4.4%***

COMPOSITE OPERATING STATISTICS: ELECTRIC UTILITY INDUSTRY

	2003	2004	2005
% Change Retail Sales (kwh)	+1.3	+.3	+5.4
Average Indust. Use (mwh)	1662	1384	1497
Avg. Indust. Revs. per kwh (¢)	5.07	5.25	5.78
Regulated Cap. at Peak (mw)	NA	NA	NA
Peak Load, Summer (mw)	NA	NA	NA
Annual Load Factor (%)	NA	NA	NA
% Change Customers (yr.-end)	+1.9	+1.6	+1.2
Fixed Charge Coverage (%)	207	230	260

Sources: Annual Reports; Estimates, Value Line; Edison Electric Institute

ALLIANT ENERGY NYSE-LNT

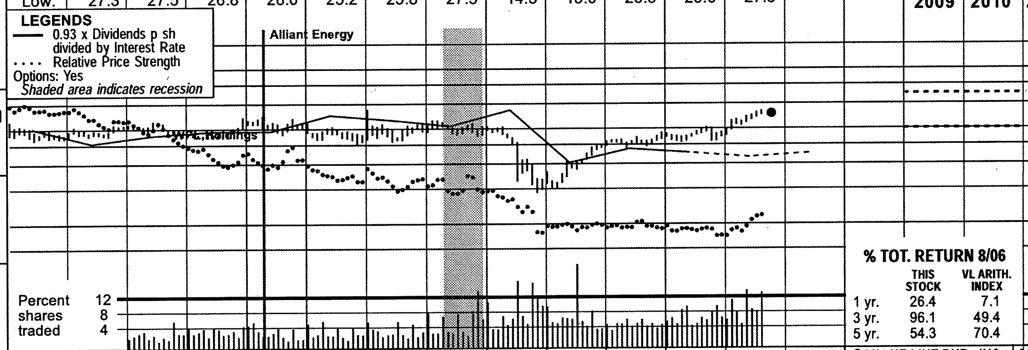
RECENT PRICE 35.62 | P/E RATIO 15.9 (Trailing: 14.0; Median: 13.0) | RELATIVE P/E RATIO 0.90 | DIV'D YLD 3.4% | VALUE LINE

TIMELINESS 3 Lowered 11/12/04
SAFETY 3 Lowered 4/4/03
TECHNICAL 3 Lowered 9/15/06
BETA .90 (1.00 = Market)

High:	31.6	32.9	34.4	34.9	32.4	37.8	33.2	31.0	25.1	28.8	30.6	37.2
Low:	27.3	27.5	26.8	28.0	25.2	25.8	27.5	14.3	15.0	23.5	25.6	27.5

Target Price Range 2009 | 2010 | 2011

LEGENDS
— 0.93 x Dividends p sh divided by Interest Rate
.... Relative Price Strength
Options: Yes
Shaded area indicates recession



2009-11 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	45	(+25%)	9%
Low	30	(-15%)	Nil

Insider Decisions

	N	D	J	F	M	A	M	J	J
to Buy	0	0	0	0	0	0	0	0	0
Options	0	0	0	6	0	0	0	0	0
to Sell	0	0	0	5	0	0	0	0	0

Institutional Decisions

	4Q2005	1Q2006	2Q2006
to Buy	126	119	135
to Sell	94	100	96
Hld's(000)	63074	65743	67723

% TOT. RETURN 8/06

	THIS STOCK	VL ARITH. INDEX
1 yr.	26.4	7.1
3 yr.	96.1	49.4
5 yr.	54.3	70.4

Alliant Energy, formerly called Interstate Energy Corporation, was formed on April 21, 1998 through the merger of WPL Holdings, IES Industries, and Interstate Power. WPL stockholders received one share of Interstate Energy stock for each WPL share, IES stockholders received 1.14 Interstate Energy shares for each IES share, and Interstate Power stockholders received 1.11 Interstate Energy shares for each Interstate Power share. Data prior to 1998 are for WPL Holdings only and are not comparable with Alliant Energy data.

1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	© VALUE LINE PUB., INC.	09-11
30.31	29.86	27.45	27.83	30.44	30.97	28.26	28.19	25.56	28.02	***30.15***	***32.20***	Revenues per sh	***35.85***
5.11	5.60	4.85	5.71	6.57	5.82	4.52	4.19	4.69	5.46	***5.40***	***5.75***	"Cash Flow" per sh	***6.50***
2.27	1.90	1.26	2.19	2.47	2.42	1.18	1.57	1.85	2.21	***2.30***	***2.35***	Earnings per sh A	***2.45***
1.97	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.02	1.05	***1.15***	***1.25***	Div'd Decl'd per sh B ■ †	***1.43***
4.81	4.10	4.79	6.06	13.50	9.13	7.12	7.69	5.55	4.51	***4.15***	***5.30***	Cap'l Spending per sh	***4.30***
19.74	19.73	20.69	27.29	25.79	21.39	19.89	21.37	22.13	20.85	***22.70***	***24.55***	Book Value per sh C	***27.55***
30.77	30.79	77.63	78.98	79.01	89.68	92.30	110.96	115.74	117.04	***115.00***	***113.00***	Common Shs Outst'g D	***116.00***
13.3	15.0	25.1	13.0	11.8	12.6	19.9	12.7	14.0	12.6	***Bold figures are***		Avg Ann'l P/E Ratio	***15.0***
.83	.86	1.31	.74	.77	.65	1.09	.72	.74	.67	***Value Line***		Relative P/E Ratio	***1.00***
6.5%	7.0%	6.3%	7.0%	6.9%	6.6%	8.5%	5.0%	3.9%	3.8%	***estimates***		Avg Ann'l Div'd Yield	***4.2%***
932.8	919.3	2130.9	2198.0	2405.0	2777.3	2608.8	3128.2	2958.7	3279.6	***3470***	***3640***	Revenues ($mill)	***4160***
69.8	64.6	103.4	178.2	203.1	194.9	113.1	176.6	229.5	337.8	***290***	***290***	Net Profit ($mill)	***300***
38.2%	30.8%	36.0%	40.3%	54.0%	23.5%	24.2%	28.9%	26.7%	19.0%	***27.0%***	***27.0%***	Income Tax Rate	***27.0%***
1.3%	4.3%	6.6%	4.1%	4.3%	5.7%	6.8%	11.7%	8.1%	3.0%	***4.0%***	***4.0%***	AFUDC % to Net Profit	***4.0%***
35.2%	40.7%	47.3%	39.6%	47.0%	54.7%	56.4%	44.8%	45.0%	41.6%	***35.5%***	***38.0%***	Long-Term Debt Ratio	***43.0%***
59.0%	54.0%	49.2%	57.4%	50.2%	42.7%	39.2%	50.0%	50.2%	53.1%	***59.0%***	***57.5%***	Common Equity Ratio	***52.5%***
1029.9	1125.1	3262.9	3756.0	4061.4	4490.2	4679.1	4738.4	5104.7	4599.1	***4415***	***4870***	Total Capital ($mill)	***5930***
1294.9	1244.8	3101.7	3486.0	3719.3	3862.8	3729.2	4432.6	5284.6	4866.2	***4990***	***5210***	Net Plant ($mill)	***5390***
8.0%	7.4%	4.9%	6.1%	6.6%	6.2%	4.1%	5.7%	6.1%	8.9%	***8.0%***	***7.5%***	Return on Total Cap'l	***6.5%***
10.5%	9.7%	6.0%	7.9%	9.4%	9.6%	5.5%	6.8%	8.2%	12.6%	***10.0%***	***9.5%***	Return on Shr. Equity	***9.0%***
10.9%	10.1%	6.0%	8.0%	9.6%	9.8%	5.8%	6.7%	8.2%	13.1%	***10.5%***	***9.5%***	Return on Com Equity E	***9.0%***
1.0%	NMF	NMF	.7%	1.9%	1.6%	NMF	2.5%	3.8%	8.1%	***5.0%***	***4.5%***	Retained to Com Eq	***4.0%***
92%	100%	NMF	92%	81%	85%	NMF	67%	58%	42%	***53%***	***56%***	All Div'ds to Net Prof	***61%***

CAPITAL STRUCTURE as of 6/30/06
Total Debt $1812.6 mill. **Due in 5 Yrs** $852.2 mill.
LT Debt $1474.3 mill. **LT Interest** $107.8 mill.
(LT interest earned: 5.6x)
Pension Assets-12/05 $664.6 mill. **Oblig.** $915.7 mill.
Pfd Stock $243.8 mill. **Pfd Div'd** $18.7 mill.
449,765 shs. $100 par; 8,199,460 shs. $25 par; 1,127,787 shs. $50 par.

Common Stock 117,758,136 shs. **as of 7/31/06**
MARKET CAP: $4.2 billion (Mid Cap)

ELECTRIC OPERATING STATISTICS

	2003	2004	2005
% Change Retail Sales (KWH)	+2.6	+.3	+4.6
Avg. Indust. Use (MWH)	4254	4320	4215
Avg. Indust. Revs. per KWH (¢)	4.64	4.84	5.26
Capacity at Peak (Mw)	5156	5737	5446
Peak Load, Summer (Mw)	5887	5644	5932
Annual Load Factor (%)	52.3	48.6	55.6
% Change Customers (yr-end)	+1.0	+1.1	+1.3
Fixed Charge Cov. (%)	188	235	252

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '03-'05 to '09-'11
Revenues	.5%	-1.0%	*4.5%*
"Cash Flow"	--	-3.5%	*5.5%*
Earnings	-1.5%	-1.0%	*4.5%*
Dividends	-6.0%	-12.5%	*6.0%*
Book Value	1.0%	-2.5%	*4.5%*

Cal-endar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	895.8	646.3	759.6	826.5	3128.2
2004	891.0	662.1	730.7	674.9	2958.7
2005	825.2	686.7	860.9	906.8	3279.6
2006	930.9	***696.8***	***890***	***952.3***	***3470***
2007	***960***	***740***	***950***	***990***	***3640***

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	.06	.26	.78	.47	1.57
2004	.33	.30	.76	.46	1.85
2005	.23	.41	1.05	.52	2.21
2006	.56	.39	***.88***	***.47***	***2.30***
2007	***.50***	***.43***	***.90***	***.52***	***2.35***

Cal-endar	QUARTERLY DIVIDENDS PAID B ■† Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2002	.50	.50	.50	.50	2.00
2003	.25	.25	.25	.25	1.00
2004	.25	.25	.25	.263	1.01
2005	.263	.263	.263	.263	1.05
2006	.288	.288	.288		

BUSINESS: Alliant Energy, formerly named Interstate Energy, is a holding company formed through the merger of WPL Holdings, IES Industries, and Interstate Power. Supplies elect. (68% of revs.), gas (19%), and other services (13%) in Wisconsin, Iowa, Minnesota, & Illinois. Elect. revs. by state: WI, 47%; IA, 48%; MN, 3%; IL, 2%. Elect. rev.: resid., 35%; comm'l, 21%; ind'l, 29%; wholesale, 12%; other, 3%. Fuel sources, '05: coal & gas, 57%; nuclear, 10%; purch., 33%. Fuel costs: 44% of revs. '05 deprec. rate: 3.5%. Est'd plant age: 10 yrs. Has 5,239 empls., Chrmn.: Erroll B. Davis, Jr. Pres. & CEO: William D. Harvey. Inc.: WI. Address: 4902 N. Biltmore Lane, P.O. Box 77007, Madison, WI 53707-1007. Tel.: 608-458-3391. Internet: www.alliant-energy.com.

Alliant Energy expects to divest almost all of its noncore assets by yearend. In the first half of 2006, it sold its unproductive $347 million investment in Brazil for $152 million. It also completed the sale of its gas gathering pipeline system, a water utility in Illinois, and one of four owned generating facilities in China. The company is now proceeding with the sale of its three remaining plants in China and its $90 million stake in a resort on the Gulf of Mexico, which had been hampered by development problems. Finally, management is considering options for its holdings in New Zealand. A sale of the $100 million investment there is likely, though no deal has yet been consummated. Proceeds from these sales will be applied to long-term debt reductions and other corporate needs. After the sales have been finalized, Alliant will return to its basic utility roots. That should result in more-predictable, but slower earnings gains.

The company has plans for meeting long-term power needs. It currently buys 450 megawatts (mw) yearly from Calpine's RockGen facility, but Calpine's pending bankruptcy filing has created uncertainty about the purchase. As a result, LNT sought and received replacement proposals from outside parties for up to 450 mw of peaking power for the summer months of 2007 through 2009. For the longer term, it will add 100 mw of wind farm ownership and two clean-coal-fired plants, each with a capacity of 250 mw. In addition, in an effort to reduce customer demand, the company has an energy efficiency program in place to lower power usage by 13 mw annually.

Earnings should rise for the fourth consecutive year in 2006. Benefits include lower interest expense, a reduced payroll, and the buyback of two million common shares. All told, we estimate 2006 earnings will increase by 4%, to $2.30 a share. An order due by yearend on a filing for $96 million in higher rates points to modest improvement next year.

The yield is a cut below the industry norm. But, a low payout ratio and slow but steady earnings gains to 2009-2011 suggest above-average dividend growth over the same period. Income-oriented investors might take a look here.

Arthur H. Medalie *September 29, 2006*

(A) Diluted EPS. Excl. nonrecur. gains (losses): '96, net 7¢; '99, 32¢; '00, $2.56; '01, (28¢); '03, net 24¢; '04, (58¢); '05, ($1.05); 1Q'06, (48¢). Next egs. rpt. due late Oct. (B) Div'ds historically paid in mid-Feb., mid-May, mid-Aug., and mid-Nov. ■ Div'd reinvest. plan avail. † shareholder invest. plan avail. (C) Incl. deferred chgs. in '05: $304.2 mill., $2.60/sh. (D) In mill. (E) Rate base: Orig. cost. Rate allowed on com. eq.: in '05, WI, 11.5%; in '05, IA., 10.7%; earned on avg. com. eq., '05: 10.8%. Regul. Clim.: WI, Above Avg.; IA, Below Avg.

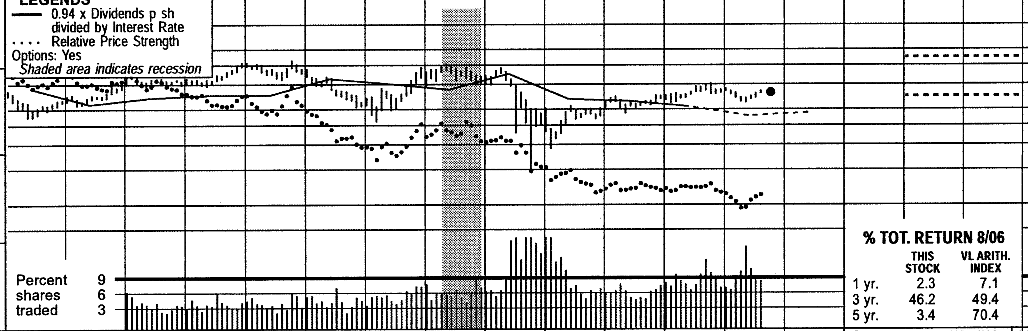
Company's Financial Strength	B+
Stock's Price Stability	85
Price Growth Persistence	15
Earnings Predictability	60

AMERICAN ELEC. PWR. NYSE-AEP

RECENT PRICE	36.49	P/E RATIO	13.3 (Trailing: 14.2; Median: 14.0)	RELATIVE P/E RATIO	0.76	DIV'D YLD	4.3%	VALUE LINE

TIMELINESS 3 Lowered 12/23/05
SAFETY 3 Lowered 10/4/02
TECHNICAL 3 Raised 8/18/06
BETA 1.25 (1.00 = Market)

High:	40.6	44.8	52.0	53.3	48.2	48.9	51.2	48.8	31.5	35.5	40.8	38.5
Low:	31.3	38.6	39.1	42.1	30.6	25.9	39.3	15.1	19.0	28.5	32.3	32.3



% TOT. RETURN 8/06	THIS STOCK	VL ARITH. INDEX
1 yr.	2.3	7.1
3 yr.	46.2	49.4
5 yr.	3.4	70.4

2009-11 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	55	(+50%)	*15%*
Low	35	(-5%)	*4%*

Insider Decisions

	N	D	J	F	M	A	M	J	J
to Buy	0	0	0	0	0	0	0	0	0
Options	0	0	0	1	0	0	0	0	0
to Sell	0	0	0	1	0	0	1	0	0

Institutional Decisions

	4Q2005	1Q2006	2Q2006
to Buy	201	186	207
to Sell	177	193	180
Hld's(000)	264615	261490	259874

American Electric Power acquired Central and South West Corporation (CSW) in 2000. CSW common stockholders received 0.6 of an AEP common share for each of their shares, for a total of $4.5 billion. The transaction was effected under pooling-of-interests accounting rules. The data on this page prior to 2000 do not reflect the addition of CSW.

1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	© VALUE LINE PUB., INC.	09-11
31.07	32.43	33.08	35.63	42.53	190.10	42.96	36.82	35.51	30.76	*31.60*	*32.70*	Revenues per sh	*37.50*
6.31	6.47	6.03	6.36	5.11	7.65	6.99	5.76	5.89	5.96	*6.15*	*6.25*	"Cash Flow" per sh	*7.25*
3.14	3.28	2.81	2.69	1.04	3.27	2.86	2.53	2.61	2.64	*2.80*	*2.85*	Earnings per sh A	*3.50*
2.40	2.40	2.40	2.40	2.40	2.40	2.40	1.65	1.40	1.42	*1.48*	*1.60*	Div'd Decl'd per sh B ■ †	*1.90*
3.07	4.00	4.13	4.47	5.51	5.69	5.08	3.44	4.28	6.11	*9.45*	*9.25*	Cap'l Spending per sh	*8.25*
24.15	24.62	25.24	25.79	25.01	25.54	20.85	19.93	21.32	23.08	*24.40*	*25.75*	Book Value per sh C	*30.00*
188.24	189.99	191.82	194.10	322.02	322.24	338.84	395.02	395.86	393.72	*394.00*	*396.00*	Common Shs Outst'g D	*400.00*
13.2	13.4	17.0	14.3	34.3	13.9	12.7	10.7	12.4	13.7	*Bold figures are*		Avg Ann'l P/E Ratio	*13.0*
.83	.77	.88	.82	2.23	.71	.69	.61	.66	.73	*Value Line*		Relative P/E Ratio	*.85*
5.8%	5.5%	5.0%	6.2%	6.7%	5.3%	6.6%	6.1%	4.3%	3.9%	*estimates*		Avg Ann'l Div'd Yield	*4.2%*
5849.2	6161.4	6345.9	6916.0	13694	61257	14555	14545	14057	12111	*12450*	*12950*	Revenues ($mill)	*15000*
628.9	638.2	547.1	532.0	332.0	1063.0	976.0	984.0	1038.0	1036.0	*1115*	*1130*	Net Profit ($mill)	*1380*
35.2%	34.8%	36.6%	32.8%	66.1%	36.0%	25.2%	38.8%	33.1%	29.3%	*33.5%*	*33.5%*	Income Tax Rate	*33.5%*
1.6%	1.6%	1.7%	1.9%	--	--	--	3.8%	3.6%	5.4%	*5.0%*	*5.0%*	AFUDC % to Net Profit	*3.0%*
48.2%	51.4%	57.6%	55.1%	52.9%	54.6%	56.0%	60.6%	56.2%	54.8%	*58.0%*	*59.5%*	Long-Term Debt Ratio	*59.0%*
45.7%	46.9%	41.0%	43.5%	44.4%	44.6%	43.1%	38.7%	43.1%	44.9%	*41.5%*	*40.0%*	Common Equity Ratio	*40.5%*
9942.3	9981.0	11815	11506	18151	18459	16393	20333	19584	20222	*23200*	*25450*	Total Capital ($mill)	*29500*
11420	11633	11730	13055	22393	24543	21684	22029	22801	24284	*26700*	*29000*	Net Plant ($mill)	*34900*
8.1%	8.1%	6.2%	6.6%	3.8%	7.5%	7.5%	6.6%	7.0%	6.6%	*6.0%*	*6.0%*	Return on Total Cap'l	*6.5%*
12.2%	13.2%	10.9%	10.3%	3.9%	12.7%	13.5%	12.3%	12.1%	11.3%	*11.5%*	*11.0%*	Return on Shr. Equity	*11.5%*
12.9%	13.3%	11.1%	10.4%	3.7%	12.8%	13.7%	12.4%	12.2%	11.3%	*11.5%*	*11.0%*	Return on Com Equity E	*11.5%*
3.0%	3.6%	1.6%	1.1%	NMF	3.4%	2.4%	4.5%	5.7%	5.2%	*5.5%*	*5.0%*	Retained to Com Eq	*5.0%*
78%	74%	86%	89%	NMF	74%	82%	64%	54%	54%	*53%*	*57%*	All Div'ds to Net Prof	*55%*

CAPITAL STRUCTURE as of 6/30/06
Total Debt $12804 mill. **Due in 5 Yrs** $3501 mill.
LT Debt $11845 mill. **LT Interest** $592 mill.
Incl. $321 mill. 7.875%-8.00% Mandatorily Redeemable Preferred Securities of Subsidiary Trusts; $345 mill. Equity Unit Senior Notes; $669 mill. securitized bonds.
(LT interest earned: 3.5x)
Leases, Uncapitalized Annual rentals $313 mill.
Pension Assets-12/05 $4.14 bill. **Oblig.** $4.35 bill.
Pfd Stock $61 mill. **Pfd Div'd** $3 mill.
607,940 shs. 4%-5%, cum., 278,100 shs. 5.90%-5.92%, cum., 482,450 shs. 6.02%-6⅞%, cum.
Common Stock 393,975,064 shs.
as of 7/31/06
MARKET CAP: $14 billion (Large Cap)

ELECTRIC OPERATING STATISTICS

	2003	2004	2005
% Change Retail Sales (KWH)	-1.9	+.7	+3.7
Avg. Indust. Use (MWH)	NA	NA	NA
Avg. Indust. Revs. per KWH (¢)	3.81	3.57	3.75
Capacity at Peak (Mw)	NA	NA	NA
Peak Load (Mw)	NA	NA	NA
Annual Load Factor (%)	NA	NA	NA
% Change Customers (yr-end)	+.9	+.6	+.8
Fixed Charge Cov. (%)	267	244	258

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '03-'05 to '09-'11
Revenues	1.5%	-1.5%	*1.5%*
"Cash Flow"	--	--	*3.5%*
Earnings	-.5%	3.5%	*5.0%*
Dividends	-4.5%	-9.0%	*4.0%*
Book Value	-.5%	-3.5%	*6.0%*

Cal-endar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	3834	3451	3940	3320	14545
2004	3364	3408	3780	3505	14057
2005	3065	2819	3328	2899	12111
2006	3108	2936	*3450*	*2956*	*12450*
2007	*3250*	*3050*	*3600*	*3050*	*12950*

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	.72	.43	.89	.51	2.53
2004	.73	.38	.80	.69	2.61
2005	.90	.57	.95	.23	2.64
2006	.95	.44	*.95*	*.46*	*2.80*
2007	*.90*	*.47*	*.98*	*.50*	*2.85*

Cal-endar	QUARTERLY DIVIDENDS PAID B ■ † Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2002	.60	.60	.60	.60	2.40
2003	.60	.35	.35	.35	1.65
2004	.35	.35	.35	.35	1.40
2005	.35	.35	.35	.37	1.42
2006	.37	.37	.37		

BUSINESS: American Electric Power Company, Inc. (AEP), via 10 operating utilities, serves about 5.1 million customers in Arkansas, Kentucky, Indiana, Louisiana, Michigan, Ohio, Oklahoma, Tennessee, Texas, Virginia, and West Virginia. Electric revenue breakdown, '05: residential, 31%; commercial, 22%; industrial, 20%; other, 27%. Sold 50% stake in Yorkshire Holdings (British utility) '01; sold SEEBOARD (British utility) '02; sold Houston Pipeline '05. Generating sources not available. Fuel costs: 37% of revenues. '05 depreciation rate: 3.4%. Has 19,600 employees. Chairman, President & CEO: Michael G. Morris. Incorporated: New York. Address: 1 Riverside Plaza, Columbus, Ohio 43215-2373. Telephone: 614-716-1000. Internet: www.aep.com.

American Electric Power is benefiting from rate relief. The company has already received $415 million of the $500 million in higher rates that is reflected in its earnings target of $2.65-$2.80 a share. Some regulatory matters are still pending. In Indiana, the utility wants to reduce depreciation by $70 million annually to reflect lower depreciation rates for the Cook nuclear station and other assets. In Virginia, AEP has two cases outstanding. The utility filed for the recovery of $21.1 million in environmental and reliability costs and is seeking a $198.5 million (25%) base rate hike, based on an 11.5% return on equity. An interim rate increase will take effect on October 2nd.

We have raised our 2006 earnings estimate by $0.10 a share, to $2.80. That's the high end of management's guidance. Besides the aforementioned rate relief, AEP is benefiting from the strong performance of its barge subsidiary, thanks to higher rates and increased volume. New power-supply contracts (such as a 20-year pact the company signed with a power co-operative in Indiana last month) are helping, too. We have boosted our 2007 estimate by a nickel a share, to $2.85. The one negative factor is rising coal costs, which are likely to be up 11% in 2006 and rise again next year. AEP is exposed to about 20% of any fuel-cost increases; the rest are recoverable through fuel-adjustment and other regulatory mechanisms.

AEP has agreed to sell a cogeneration facility for $64 million. It plans to use the proceeds, some tax credits, and $344 million in commercial paper to retire $525 million of debt associated with the plant. The interest expense on the commercial paper will be far lower than the project's losses, an estimated $37 million in 2006. AEP will record a loss of $136 million ($0.34 a share) on the sale, which we will exclude from our earnings presentation. Our figures won't reflect the deal until it closes, probably in December.

This stock offers an above-average yield, even by utility standards. Dividend-growth potential through the end of the decade is good, too. This, along with earnings growth, should produce an above-average total return (for a utility) over that time.

Paul E. Debbas, CFA *September 29, 2006*

(A) Excl. extra. gain (losses): '00, (21¢); '01, (26¢) net; '02, ($3.86); '03, ($1.92) net; '04, 24¢; '05, (62¢); gains (losses) on disc. ops.: '02, (57¢); '03, (32¢); '04, 15¢; '05, 7¢. '03 EPS don't add due to chng. in shs., '04 & '05 due to rounding. Next egs. due late Oct. (B) Div'ds historically paid in early Mar., June, Sept., and Dec. ■ Div'd reinvest. plan avail. † Shareholder invest. plan avail. (C) Incl. intang. In '05: $9.98/sh. (D) In mill. (E) Rate base: various. Rates all'd on com. eq.: 10.0%-14.5%; earned on avg. com. eq., '05: 11.7%. Reg. Clim.: Avg.

Company's Financial Strength	B++
Stock's Price Stability	45
Price Growth Persistence	10
Earnings Predictability	60

Staff/1402
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CON. EDISON NYSE-ED

RECENT PRICE 45.15 | P/E RATIO 15.0 (Trailing: 15.0 Median: 13.0) | RELATIVE P/E RATIO 0.89 | DIV'D YLD 5.1% | VALUE LINE

High:	32.3	34.8	41.5	56.1	53.4	39.5	43.4	45.4	46.0	45.6	49.3	47.5
Low:	25.5	25.9	27.0	39.1	33.6	26.2	31.4	32.7	36.6	37.2	41.1	41.2

Target Price Range 2009 | 2010 | 2011

TIMELINESS 3 Raised 8/11/06
SAFETY 1 New 7/27/90
TECHNICAL 3 Raised 6/2/06
BETA .70 (1.00 = Market)

2009-11 PROJECTIONS

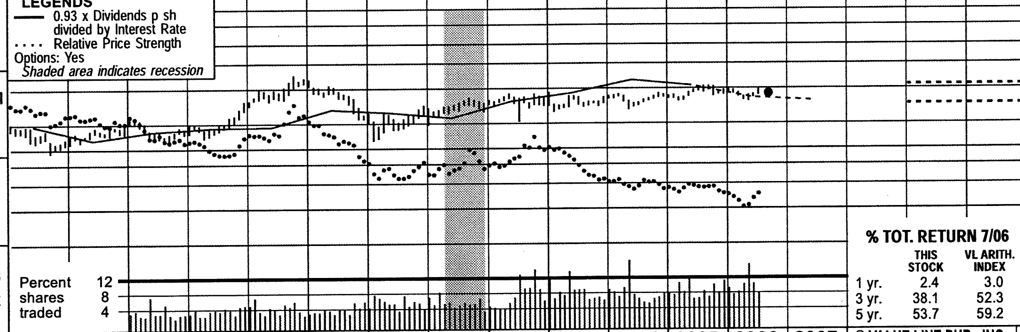
	Price	Gain	Ann'l Total Return
High	50	(+10%)	7%
Low	40	(-10%)	3%

Insider Decisions

	O	N	D	J	F	M	A	M	J
to Buy	0	0	1	0	0	0	1	0	0
Options	0	0	0	0	0	0	0	0	0
to Sell	0	0	0	0	0	1	0	0	0

Institutional Decisions

	3Q2005	4Q2005	1Q2006
to Buy	189	178	153
to Sell	134	158	177
Hld's(000)	113014	120875	118857



% TOT. RETURN 7/06

	THIS STOCK	VL ARITH. INDEX
1 yr.	2.4	3.0
3 yr.	38.1	52.3
5 yr.	53.7	59.2

1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	© VALUE LINE PUB., INC.	09-11
25.15	25.72	25.36	26.73	27.13	27.82	29.62	30.24	30.46	35.04	44.48	45.41	39.65	43.51	40.24	47.66	*49.00*	*49.70*	Revenues per sh	*51.75*
3.84	3.90	4.06	4.38	4.77	4.87	4.97	5.08	5.29	5.74	5.51	5.70	5.44	5.12	4.54	5.27	*5.50*	*5.80*	"Cash Flow" per sh	*6.55*
2.34	2.32	2.46	2.66	2.98	2.93	2.93	2.95	3.04	3.13	2.74	3.21	3.13	2.83	2.32	2.99	*3.00*	*3.05*	Earnings per sh A	*3.20*
1.82	1.86	1.90	1.94	2.00	2.04	2.08	2.10	2.12	2.14	2.18	2.20	2.22	2.24	2.26	2.28	*2.30*	*2.32*	Div'd Decl'd per sh B ■	*2.38*
3.05	3.39	3.40	3.37	3.22	2.95	2.87	2.78	2.66	3.17	4.52	5.20	5.68	5.72	5.60	6.59	*7.20*	*7.15*	Cap'l Spending per sh	*5.70*
19.73	20.18	20.89	21.63	22.62	23.51	24.37	25.18	25.88	25.31	25.81	26.71	27.68	28.44	29.09	29.80	*30.85*	*31.75*	Book Value per sh C	*34.50*
228.23	228.33	233.93	234.37	234.91	234.96	234.99	235.49	232.83	213.81	212.03	212.15	213.93	225.84	242.51	245.29	*255.00*	*257.00*	Common Shs Outst'g	*263.00*
10.3	10.8	11.9	13.1	9.3	9.8	10.1	10.9	15.3	14.0	12.0	12.0	13.3	14.3	18.2	15.1	Bold figures are		Avg Ann'l P/E Ratio	*14.5*
.77	.69	.72	.77	.61	.66	.63	.63	.80	.80	.78	.61	.73	.82	.96	.80	Value Line		Relative P/E Ratio	*.95*
7.5%	7.5%	6.5%	5.6%	7.2%	7.1%	7.0%	6.5%	4.6%	4.9%	6.6%	5.7%	5.3%	5.5%	5.3%	5.0%	estimates		Avg Ann'l Div'd Yield	*5.2%*

CAPITAL STRUCTURE as of 6/30/06
Total Debt $8459 mill. Due in 5 Yrs $1714 mill.
LT Debt $8063 mill. LT Interest $450.0 mill.
(LT interest earned: 3.4x)
Pension Assets-12/05 $7.5 bill. Oblig. $8.1 bill.

Pfd Stock $212.6 mill. Pfd Div'd $12.5 mill.
1,915,319 shs. $5 cum. no par, call. $105 a sh.; 375,626 shs. 4.65% cum. $100 par, call. $101 to $102.50 a sh. Sinking Fund ends 2009.

Common Stock 246,466,627 shs. as of 7/31/06
MARKET CAP: $11.1 billion (Large Cap)

1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007		09-11
6959.7	7121.3	7093.1	7491.3	9431.4	9634.0	8482.0	9827.0	9758.0	11690	*12500*	*12770*	Revenues ($mill)	*13610*
694.1	712.8	729.8	714.2	596.4	695.8	682.1	639.0	560.0	719.0	*760*	*795*	Net Profit ($mill)	*850*
36.4%	34.8%	35.8%	34.3%	34.8%	40.0%	36.9%	33.7%	34.3%	33.6%	*34.0%*	*34.0%*	Income Tax Rate	*34.0%*
.7%	.9%	.5%	.8%	1.2%	1.3%	2.2%	4.2%	7.7%	2.2%	*3.0%*	*3.0%*	AFUDC % to Net Profit	*3.0%*
41.2%	40.1%	39.2%	44.4%	48.6%	48.2%	50.1%	50.4%	47.4%	49.6%	*49.0%*	*49.0%*	Long-Term Debt Ratio	*48.0%*
55.7%	56.8%	58.4%	53.1%	49.1%	49.6%	48.1%	48.0%	51.0%	49.0%	*50.0%*	*50.0%*	Common Equity Ratio	*50.5%*
10289	10437	10325	10186	11137	11417	12302	13369	13828	14921	*15785*	*16360*	Total Capital ($mill)	*17830*
11067	11267	11407	11354	11893	12248	13329	15225	16106	17112	*18290*	*19420*	Net Plant ($mill)	*21600*
8.2%	8.4%	8.6%	8.6%	7.0%	7.8%	7.1%	6.3%	5.6%	6.3%	*6.5%*	*6.5%*	Return on Total Cap'l	*6.0%*
11.5%	11.4%	11.6%	12.6%	10.4%	11.8%	11.1%	9.6%	7.7%	9.6%	*9.5%*	*9.5%*	Return on Shr. Equity	*9.0%*
11.7%	11.7%	11.8%	12.9%	10.7%	12.0%	11.3%	9.8%	7.8%	9.7%	*9.5%*	*9.5%*	Return on Com Equity D	*9.5%*
3.2%	3.4%	3.6%	4.1%	2.2%	3.8%	4.0%	2.9%	.8%	2.6%	*2.0%*	*2.5%*	Retained to Com Eq	*2.5%*
74%	72%	70%	69%	80%	69%	65%	71%	89%	74%	*77%*	*76%*	All Div'ds to Net Prof	*75%*

ELECTRIC OPERATING STATISTICS

	2003	2004	2005
% Change Retail Sales (KWH)	-3.4	-2.8	-1.8
Avg. Indust. Use (MWH)	NA	NA	NA
Avg. Indust. Revs. per KWH (¢)	NA	NA	NA
Capacity at Peak (Mw)	630	565	565
Peak Load, Summer (Mw)	11875	11327	13059
Annual Load Factor (%)	NMF	NMF	NMF
% Change Customers (yr-end)	+.6	+.6	+.8
Fixed Charge Cov. (%)	289	257	312

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '03-'05 to '09-'11
Revenues	5.0%	3.5%	*3.0%*
"Cash Flow"	.5%	-2.0%	*4.5%*
Earnings	-.5%	-2.0%	*3.0%*
Dividends	1.5%	1.0%	*1.0%*
Book Value	2.5%	2.5%	*3.0%*

Cal-endar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	2571	2176	2801	2279	9827.0
2004	2679	2164	2734	2181	9758.0
2005	2801	2406	3375	3108	11690
2006	3317	2555	*3450*	*3178*	*12500*
2007	*3375*	*2625*	*3520*	*3250*	*12770*

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	.72	.29	1.16	.66	2.83
2004	.69	.38	1.03	.22	2.32
2005	.75	.48	1.17	.59	2.99
2006	.74	.51	*1.20*	*.55*	*3.00*
2007	*.75*	*.47*	*1.20*	*.63*	*3.05*

Cal-endar	QUARTERLY DIVIDENDS PAID B ■ Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2002	.555	.555	.555	.555	2.22
2003	.56	.56	.56	.56	2.24
2004	.565	.565	.565	.565	2.26
2005	.57	.57	.57	.57	2.28
2006	.575	.575			

BUSINESS: Consolidated Edison, Inc., parent of Consolidated Edison Company of New York, Inc., sells electricity (77% of revs.), gas (16%), steam (7%) in most of New York City and Westchester County. Acquired Orange & Rockland Utilities 7/99. Commercial rev. ratio (52%) compares with 32% for the industry. Nonincome taxes and average price per kwh are among the highest in U.S. Fuel costs: 62% of revenues; labor costs, 14%. 2005 reported depreciation rate: 2.9%. In '05, purchases almost all energy it sold on firm contracts with nonutility generators. Has 14,537 employees. Chairman, Chief Executive Officer & President: Kevin Burke. Inc.: N.Y. Add.: 4 Irving Place, New York, N.Y. 10003. Tel.: 212-460-3903. Internet: www.coned.com.

Last July, Consolidated Edison Queens' customers suffered a serious power outage. The company is incurring substantial costs to provide compensation for spoilage of food and other perishables. It also faces large operating and capital expense resulting from the outage. The 2005 electric rate agreement includes penalties for service interruptions. The regulators are investigating the outage and the company's response. Meanwhile, lawsuits have been filed against ED for breach of duty. Management is unable to predict whether the outage will have a serious effect on operations.

The Orange & Rockland utility subsidiary has an agreement for higher gas rates. Under the settlement. it will receive a $12 million hike in November, followed by $0.7 million one year later and an additional $1.1 million in 2008. The deal provides for phasing in the first year's increase over two years. A regulatory order on the package is due shortly.

The IRS has disallowed tax losses on two lease in/lease out transactions. These are deals in which a taxpayer leases property and immediately subleases it back to the lessor. In 1997 and 1999, ED entered into arrangements involving gas distribution and electric generating facilities in the Netherlands, with a total investment of $259 million. As of last March 31st, the investment in the two transactions, net of deferred tax liabilities, amounted to $69 million. On audit of the company's 1997 tax return, the IRS disallowed tax losses of $145 million. Con Edison has appealed the ruling in federal court.

We look for only flat earnings in 2006. An improving local economy and a full year of rate increases granted in 2005 are pluses. But these positives will be offset by higher real estate taxes, increased interest expense, and more common shares outstanding. Putting it all together, we estimate 2006 earnings will mark time. Only modest improvement is likely next year.

The stock offers an above-average yield for a utility. That reflects prospects of slow earnings and dividend growth to 2009-2011. Conservative investors might still take a look here because of Con Edison's top-notch finances.

Arthur H. Medalie *September 1, 2006*

(A) EPS diluted. Excl. nonrecur.: '02, (11¢); '03, (45¢). Next egs. report due late Oct. (B) Dividends historically paid in mid-Mar., mid-June, mid-Sept., and mid-Dec. ■ Div'd reinvest. plan avail. (C) Includes intangibles. In '05: $11.61/sh. (D) Rate base: net original cost. Rate all'd elec. common equity: '05, 11.4% to 13.0%; earned on '05 average common equity: 10.0%. Regulatory Climate: Average.

Company's Financial Strength	A++
Stock's Price Stability	100
Price Growth Persistence	35
Earnings Predictability	85

Staff/1402
Morgan/7

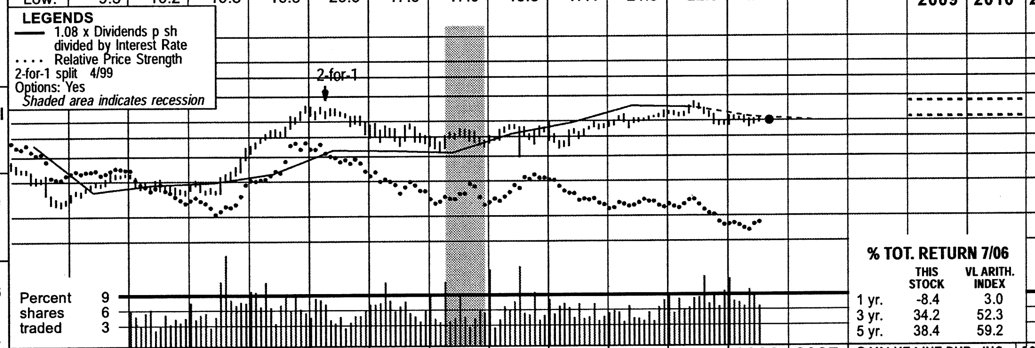
ENERGY EAST CORP. NYSE-EAS

RECENT PRICE 24.03 | P/E RATIO 15.5 (Trailing: 14.5; Median: 13.0) | RELATIVE P/E RATIO 0.92 | DIV'D YLD 4.8% | VALUE LINE

TIMELINESS 3 Raised 8/25/06
SAFETY 2 Lowered 3/9/01
TECHNICAL 3 Lowered 8/18/06
BETA .90 (1.00 = Market)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
High:	13.4	13.2	17.9	29.0	28.6	23.6	22.1	23.1	23.7	27.1	30.1	25.6
Low:	9.5	10.2	10.3	16.5	20.6	17.9	17.0	15.8	17.4	21.8	22.5	22.2

LEGENDS
— 1.08 x Dividends p sh divided by Interest Rate
.... Relative Price Strength
2-for-1 split 4/99
Options: Yes
Shaded area indicates recession



Target Price Range
2009 | 2010 | 2011

2009-11 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	30	(+25%)	*10%*
Low	25	(+5%)	*6%*

Insider Decisions

	O	N	D	J	F	M	A	M	J
to Buy	0	0	0	0	0	0	0	0	0
Options	0	0	0	0	0	1	1	0	0
to Sell	0	0	0	0	0	1	1	0	0

Institutional Decisions

	3Q2005	4Q2005	1Q2006
to Buy	133	124	111
to Sell	96	102	101
Hld's(000)	69758	68731	66528

% TOT. RETURN 7/06

	THIS STOCK	VL ARITH. INDEX
1 yr.	-8.4	3.0
3 yr.	34.2	52.3
5 yr.	38.4	59.2

1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	© VALUE LINE PUB., INC.	09-11
11.99	12.27	12.18	12.75	13.28	14.05	14.78	15.78	19.85	20.84	25.15	32.21	27.65	31.41	32.33	35.87	*37.85*	*39.45*	Revenues per sh	*45.75*
2.35	2.37	2.32	2.20	2.43	2.54	2.64	2.77	3.06	3.37	3.42	3.75	3.12	4.28	4.18	4.33	*4.25*	*4.40*	"Cash Flow" per sh	*5.00*
1.24	1.18	1.20	1.04	1.19	1.25	1.26	1.29	1.51	1.91	2.07	2.00	1.50	1.43	1.62	1.74	*1.60*	*1.55*	Earnings per sh A	*2.00*
1.03	1.05	1.07	1.09	1.00	.70	.70	.70	.78	.84	.88	.92	.96	1.00	1.06	1.12	*1.16*	*1.16*	Div'd Decl'd per sh B ■	*1.40*
1.69	1.92	1.75	1.88	1.72	1.14	1.54	.92	1.04	.64	1.32	1.79	1.55	1.98	2.07	2.26	*3.05*	*2.70*	Cap'l Spending per sh	*2.50*
10.93	11.08	11.42	11.44	11.64	12.19	12.70	13.36	13.61	12.84	14.59	15.26	16.97	17.59	17.89	19.45	*19.25*	*19.65*	Book Value per sh C	*21.00*
124.86	126.80	138.88	141.19	143.01	143.01	139.34	135.02	125.89	109.34	117.66	116.72	144.97	146.26	147.12	147.70	*148.00*	*148.25*	Common Shs Outst'g D	*149.00*
9.9	11.1	12.3	16.2	9.9	9.3	9.1	9.7	14.6	13.4	10.1	9.8	14.0	14.6	15.1	14.9	*Bold figures are*		Avg Ann'l P/E Ratio	*14.0*
.74	.71	.75	.96	.65	.62	.57	.56	.76	.76	.66	.50	.76	.83	.80	.80	*Value Line*		Relative P/E Ratio	*.95*
8.4%	8.0%	7.3%	6.5%	8.5%	6.0%	6.1%	5.6%	3.5%	3.3%	4.2%	4.7%	4.6%	4.8%	4.3%	4.3%	*estimates*		Avg Ann'l Div'd Yield	*5.0%*

CAPITAL STRUCTURE as of 3/31/06
Total Debt $4011.9 mill. **Due in 5 Yrs** $1069.5 mill.
LT Debt $3706.3 mill. **LT Interest** $222.4 mill.
Incl. $345 mill. 8¼% mand. redeem. trust pfd. sec.
(LT interest earned: 2.7x)
Pension Assets-12/05 $2.58 bill. **Oblig.** $2.37 bill.
Pfd Stock $24.6 mill. **Pfd Div'd** $1.1 mill.
242,917 shs. 3.75%-6.00%, cum., $100 par, redeemable at $100-$110; 108,706 shs. 8.0%, cum., $3.125 par, noncallable.

Common Stock 147,679,358 shs.
as of 4/28/06
MARKET CAP: $3.5 billion (Mid Cap)

1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	© VALUE LINE PUB., INC.	09-11
2059.4	2130.0	2499.4	2278.6	2959.5	3759.8	4008.9	4593.8	4756.7	5298.5	*5600*	*5850*	Revenues ($mill)	*6800*
188.2	184.6	202.8	225.1	237.6	235.4	199.6	212.1	241.3	258.3	*240*	*235*	Net Profit ($mill)	*290*
37.6%	38.9%	40.4%	36.7%	39.7%	44.2%	34.1%	37.6%	51.0%	39.7%	*40.0%*	*40.0%*	Income Tax Rate	*40.0%*
1.3%	.4%	.2%	.1%	.4%	.3%	.7%	.9%	.2%	.6%	*2.0%*	*1.0%*	AFUDC % to Net Profit	*1.0%*
43.4%	42.5%	44.8%	46.6%	57.1%	60.7%	58.9%	59.8%	58.6%	55.9%	*56.0%*	*56.5%*	Long-Term Debt Ratio	*55.0%*
51.9%	52.8%	53.5%	53.0%	41.8%	38.4%	39.2%	38.5%	40.6%	43.8%	*43.5%*	*43.0%*	Common Equity Ratio	*45.0%*
3410.2	3413.0	3203.0	2649.2	4106.7	4640.8	6273.5	6681.3	6475.6	6564.4	*6515*	*6730*	Total Capital ($mill)	*7000*
3982.4	3922.3	3862.7	2139.8	3632.9	3626.4	4801.8	5778.1	5662.2	5783.5	*5960*	*6065*	Net Plant ($mill)	*6250*
7.1%	7.0%	7.9%	10.5%	7.4%	7.2%	5.1%	5.1%	5.5%	5.7%	*5.5%*	*5.0%*	Return on Total Cap'l	*5.5%*
9.8%	9.4%	11.5%	15.9%	13.5%	12.9%	7.7%	7.9%	9.0%	8.9%	*8.5%*	*8.0%*	Return on Shr. Equity	*9.0%*
10.1%	9.7%	11.3%	15.8%	13.8%	13.1%	8.0%	8.1%	9.0%	8.9%	*8.5%*	*8.0%*	Return on Com Equity E	*9.0%*
4.3%	4.4%	5.5%	8.8%	8.0%	7.1%	2.9%	3.1%	3.8%	3.7%	*2.5%*	*2.0%*	Retained to Com Eq	*2.5%*
59%	57%	54%	45%	42%	46%	65%	63%	58%	59%	*72%*	*74%*	All Div'ds to Net Prof	*73%*

ELECTRIC OPERATING STATISTICS

	2003	2004	2005
% Change Retail Sales (KWH)	+13.9	+1.4	+3.2
Avg. Indust. Use (MWH)	NA	NA	NA
Avg. Indust. Revs. per KWH (¢)	4.65	3.82	3.66
Capacity at Peak (Mw)	NMF	NMF	NMF
Peak Load, Winter (Mw)	NA	NA	NA
Annual Load Factor (%)	NMF	NMF	NMF
% Change Customers (yr-end)	+1.1	+.9	+.9
Fixed Charge Cov. (%)	211	264	238

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '03-'05 to '09-'11
Revenues	9.5%	8.5%	*5.5%*
"Cash Flow"	6.0%	5.5%	*2.5%*
Earnings	3.5%	-2.5%	*4.0%*
Dividends	1.5%	5.0%	*4.5%*
Book Value	4.5%	6.0%	*2.5%*

Cal-endar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	1508.3	986.1	903.1	1196.3	4593.8
2004	1551.4	968.9	967.8	1268.6	4756.7
2005	1637.3	1081.9	1095.9	1483.4	5298.5
2006	1697	1113	*1190*	*1600*	*5600*
2007	*1850*	*1175*	*1175*	*1650*	*5850*

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	.90	.20	.01	.31	1.43
2004	.83	.29	.12	.38	1.62
2005	1.05	.12	.14	.43	1.74
2006	.90	.19	*.06*	*.45*	*1.60*
2007	*.85*	*.20*	*.10*	*.40*	*1.55*

Cal-endar	QUARTERLY DIVIDENDS PAID B ■ Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2002	.24	.24	.24	.24	.96
2003	.25	.25	.25	.25	1.00
2004	.26	.26	.26	.275	1.06
2005	.275	.275	.275	.275	1.10
2006	.29	.29	.29		

BUSINESS: Energy East Corporation is a holding company for New York State Electric & Gas (NYSEG), Rochester Gas and Electric, Central Maine Power, Connecticut Natural Gas, & Southern Connecticut Gas. Serves 1.8 million electric, 916,000 gas customers in NY & New England. Acq'd Connecticut Energy 2/00; CMP Group, CTG Resources & Berkshire Energy 9/00; RGS Energy 6/02. Electric revenue breakdown, '05: residential, 43%; commercial, 18%; industrial, 9%; other, 30%. Purchases most of its power. Fuel costs: 58% of revenues. '05 reported deprec. rate: 3.3%. Has 6,100 employees. Chairman, Pres. & CEO: Wesley W. von Schack. Inc.: New York. Address: P.O. Box 12904, Albany, New York 12212-2904. Tel.: 518-434-3049. Internet: www.energyeast.com.

Energy East's largest subsidiary was hit with an unfavorable electric rate order. New York State Electric & Gas (NYSEG) sought a $58 million boost in distribution rates, based on an 11% return on a 50% common-equity ratio. But the New York commission ordered a $36.2 million rate *decrease* (effective at the start of 2007), based on a 9.55% return on a 41.6% common-equity ratio. The commission also changed NYSEG's customer-choice program in an unfavorable manner for the company. The utility intends to appeal the order.

Due to the size of the rate reduction, we estimate that earnings will decline next year. That's despite the fact that the comparison should have been easy. Mild weather and storm-restoration costs hurt earnings in the first quarter of 2006, and an estimated $11 million charge for the early retirement of $345 million of trust preferred securities hurt earnings in the current quarter. We have reduced our 2007 earnings estimate by $0.10 a share, to $1.55.

The dividend is secure, but we expect no increase this year or next. Energy East has had a good record of dividend growth since 1998. The most recent boost in the disbursement was declared in October of 2005. But Energy East is targeting a payout ratio of 65%-75%, which would be near the high end based on our 2007 estimate, so we aren't estimating a raise in the dividend until earnings improve.

Connecticut Natural Gas is about to file a rate case. The utility is feeling the effects of reduced customer usage stemming from the high cost of gas. So it will file a rate application by the end of September. CNG expects to request a base tariff hike of $36.5 million (10.4%). New rates would take effect at the start of the second quarter of 2007. Any rate increase won't do much to help earnings next year because the order will come too late for the seasonally strong first quarter.

We advise investors to stay on the sidelines. Despite the adverse rate order (and the investor concern that preceded it), the stock is up over 5% since our last report three months ago. Thus, we believe this equity has become less attractive, despite its high dividend yield.

Paul E. Debbas, CFA *September 1, 2006*

(A) Diluted EPS. Excl. nonrec. losses: '00, 40¢; '01, 39¢; '02, 6¢; gain (loss) from discont. ops.: '03, 2¢; '04, (5¢). '03 EPS don't add due to rounding. Next earnings report due early Nov. (B) Div'ds historically paid in mid-Feb., May, Aug., and Nov. ■ Div'd reinvestment plan available. (C) Incl. intang. In '05: $22.85/sh. (D) In mill., adj. for split. (E) Rate base: Net orig. cost. Rate all'd on com. eq. for NYSEG in '07: 9.55% elec., 10.5% gas; RG&E in '04: 12.25% elec., 12% gas; earned on avg. com. eq., '05: 9.3%. Regulatory Climate: Average.

Company's Financial Strength	B++
Stock's Price Stability	95
Price Growth Persistence	50
Earnings Predictability	80

IDACORP, INC. NYSE-IDA

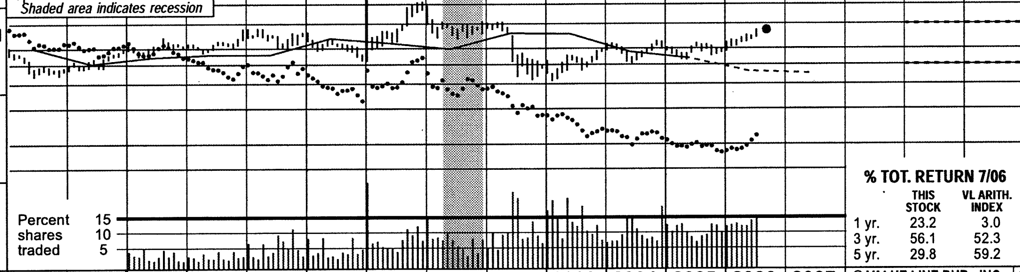
RECENT PRICE	37.14	P/E RATIO	20.1 (Trailing: 20.6 / Median: 14.0)	RELATIVE P/E RATIO	1.16	DIV'D YLD	3.2%	VALUE LINE

TIMELINESS 2 Raised 6/16/06
SAFETY 3 Lowered 2/14/03
TECHNICAL 3 Lowered 7/7/06
BETA 1.00 (1.00 = Market)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
High:	30.0	34.3	37.8	38.1	36.5	53.0	49.4	41.0	30.2	32.9	32.1	37.5
Low:	23.4	27.3	28.5	29.9	26.0	25.9	33.6	20.9	20.6	25.3	26.2	29.0

Target Price Range
2009 | 2010 | 2011

LEGENDS
—— 0.96 x Dividends p sh divided by Interest Rate
.... Relative Price Strength
Options: Yes
Shaded area indicates recession



2009-11 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	40	(+10%)	*5%*
Low	25	(-35%)	*-5%*

Insider Decisions

	S	O	N	D	J	F	M	A	M
to Buy	0	0	0	0	0	0	0	0	0
Options	0	0	0	0	0	0	0	0	1
to Sell	0	0	0	0	0	0	0	0	2

Institutional Decisions

	3Q2005	4Q2005	1Q2006
to Buy	75	74	83
to Sell	51	63	62
Hld's(000)	22819	22320	24812

% TOT. RETURN 7/06

	THIS STOCK	VL ARITH. INDEX
1 yr.	23.2	3.0
3 yr.	56.1	52.3
5 yr.	29.8	59.2

1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	© VALUE LINE PUB., INC.	09-11
13.68	14.22	13.76	14.57	14.45	14.51	15.38	19.90	29.83	17.50	27.10	150.10	24.43	20.41	20.00	20.15	*24.15*	*24.65*	Revenues per sh	*28.20*
3.53	3.26	3.16	3.53	3.39	3.89	4.05	4.22	4.69	4.50	5.63	5.63	4.08	3.50	4.12	3.87	*4.20*	*4.40*	"Cash Flow" per sh	*5.10*
1.91	1.56	1.55	1.97	1.80	2.10	2.21	2.32	2.37	2.43	3.50	3.35	1.63	.96	1.90	1.75	*1.85*	*1.90*	Earnings per sh A	*2.00*
1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.70	1.20	1.20	*1.20*	*1.20*	Div'd Decl'd per sh B† ■	*1.20*
2.29	3.94	3.26	3.32	2.94	2.23	2.49	2.51	2.37	2.95	3.73	4.78	3.53	3.89	4.73	4.53	*5.20*	*6.65*	Cap'l Spending per sh	*4.90*
17.40	17.06	17.28	17.86	17.91	18.15	18.47	18.93	19.42	20.02	21.82	23.15	23.01	22.54	23.88	24.04	*24.95*	*25.90*	Book Value per sh C	*28.25*
33.98	33.98	36.19	37.09	37.61	37.61	37.61	37.61	37.61	37.61	37.61	37.63	38.02	38.34	42.22	42.66	*43.90*	*45.20*	Common Shs Outst'g D	*46.10*
13.4	16.8	17.0	15.4	13.9	12.4	13.7	13.6	14.4	12.7	10.9	11.4	18.9	26.5	15.5	16.7	*Bold figures are*		Avg Ann'l P/E Ratio	*16.5*
1.00	1.07	1.03	.91	.91	.83	.86	.78	.75	.72	.71	.58	1.03	1.51	.82	.89	*Value Line*		Relative P/E Ratio	*1.10*
7.2%	7.1%	7.1%	6.1%	7.4%	7.2%	6.1%	5.9%	5.4%	6.0%	4.9%	4.9%	6.0%	6.7%	4.1%	4.1%	*estimates*		Avg Ann'l Div'd Yield	*3.6%*

CAPITAL STRUCTURE as of 3/31/06
Total Debt $1097.7 mill. **Due in 5 Yrs** $213.9 mill.
LT Debt $1021.1 mill. **LT Interest** $56.9 mill.
(LT interest earned: 2.3x)

Pension Assets-12/05 $368.1 mill. **Oblig.** $406.0 mill.

Pfd Stock None

Common Stock 42,792,810 shs.
MARKET CAP: $1.6 billion (Mid Cap)

1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	© VALUE LINE PUB., INC.	09-11
578.5	748.5	1122.0	658.3	1019.4	5648.0	928.8	782.7	844.5	859.5	*1060*	*1115*	Revenues ($mill)	*1300*
90.6	92.3	94.8	96.9	137.6	130.0	66.3	40.1	77.8	63.7	*80.0*	*85.0*	Net Profit ($mill)	*90.0*
36.5%	33.5%	32.0%	32.0%	32.1%	33.3%	--	--	--	16.9%	*17.0%*	*17.0%*	Income Tax Rate	*17.0%*
.4%	.6%	1.3%	3.2%	3.6%	3.1%	3.0%	7.5%	3.9%	4.7%	*5.0%*	*5.0%*	AFUDC % to Net Profit	*5.0%*
48.0%	46.2%	49.4%	48.9%	48.3%	46.4%	49.2%	50.8%	49.3%	50.0%	*49.5%*	*50.0%*	Long-Term Debt Ratio	*49.5%*
45.1%	46.8%	44.2%	44.8%	45.9%	47.9%	47.9%	46.4%	50.7%	50.0%	*50.5%*	*50.0%*	Common Equity Ratio	*50.5%*
1540.1	1522.2	1652.3	1680.3	1790.0	1818.0	1826.9	1862.5	1987.8	2048.8	*2170*	*2345*	Total Capital ($mill)	*2575*
1694.6	1716.9	1711.5	1745.7	1805.0	1886.0	1906.5	2088.3	2209.5	2314.3	*2440*	*2625*	Net Plant ($mill)	*2970*
7.6%	7.8%	7.3%	7.4%	9.2%	8.7%	5.1%	3.7%	5.3%	4.5%	*5.0%*	*5.0%*	Return on Total Cap'l	*5.0%*
11.3%	11.3%	11.3%	11.3%	14.9%	13.3%	7.1%	4.4%	7.7%	6.2%	*7.5%*	*7.0%*	Return on Shr. Equity	*7.0%*
11.9%	12.2%	12.2%	12.1%	16.0%	14.4%	7.0%	4.2%	7.2%	6.2%	*7.5%*	*7.0%*	Return on Com Equity E	*7.0%*
1.9%	2.4%	2.6%	2.9%	7.5%	6.3%	NMF	NMF	2.7%	1.3%	*2.5%*	*2.5%*	Retained to Com Eq	*3.0%*
86%	82%	80%	78%	55%	58%	113%	NMF	65%	80%	*65%*	*63%*	All Div'ds to Net Prof	*60%*

ELECTRIC OPERATING STATISTICS

	2003	2004	2005
% Change Retail Sales (KWH)	-1.0	+2.0	--
Avg. Indust. Use (MWH)	28372	26548	26535
Avg. Indust. Revs. per KWH (¢)	4.01	3.35	3.45
Capacity at Peak (Mw)	2912	2912	3084
Peak Load, Summer (Mw)	2944	2843	2963
Annual Load Factor (%)	NA	NA	NA
% Change Customers (yr-end)	+2.8	+3.2	+3.8
Fixed Charge Cov. (%)	104	148	207

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '03-'05 to '09-'11
Revenues	3.5%	-4.0%	*5.5%*
"Cash Flow"	.5%	-5.0%	*5.0%*
Earnings	-2.5%	-11.0%	*4.5%*
Dividends	-3.0%	-6.0%	*-2.0%*
Book Value	2.5%	3.0%	*3.0%*

Cal-endar	QUARTERLY REVENUES($ mill.) Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	200.1	188.5	227.3	166.8	782.7
2004	188.2	211.9	246.7	197.7	844.5
2005	195.6	204.9	248.4	210.6	859.5
2006	273.6	*250*	*270*	*266.4*	*1060*
2007	*285*	*265*	*285*	*280*	*1115*

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	d.08	d.02	.96	.10	.96
2004	.51	.34	.68	.37	1.90
2005	.55	.22	.56	.42	1.75
2006	.60	*.25*	*.60*	*.40*	*1.85*
2007	*.60*	*.28*	*.60*	*.42*	*1.90*

Cal-endar	QUARTERLY DIVIDENDS PAID B†■ Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2002	.465	.465	.465	.465	1.86
2003	.465	.465	.465	.30	1.70
2004	.30	.30	.30	.30	1.20
2005	.30	.30	.30	.30	1.20
2006	.30	.30			

BUSINESS: IDACORP, Inc. is the holding company for Idaho Power, a hydroelectric utility that partly owns three coal plants and markets natural gas through trading operations. Also has interests in a patented fuel cell system. Sells electricity in Idaho (96% of revs.) and Oregon (4%). Revenue breakdown: residential, 36%; commercial, 21%; industrial, 14%; other, 29%. Fuel and purchased power cost: 40% of '05 rev.; estimated labor costs: 9.0%. 2005 depreciation rate: 2.9%. Fuel sources: hydro, 36%; thermal, 42%; purchases, 22%. Has 1,993 employees, 17,016 common stockholders. Chairman: Jon H. Miller. CEO & Pres.: J. LaMont Keen. Incorporated: Idaho. Addr.: 1221 W. Idaho St., Boise, Idaho 83702. Tel.: 208-388-2200. Internet: www.idacorpinc.com.

IDACORP plans new capacity to meet future load demand. To cover a projected 2%-3% yearly growth in energy usage, it expects to add 1,270 megawatts (mw) of power by 2014. The largest item would be a 500-mw coal-fired plant that might consist of two 250-mw units and would be owned with a partner. Management may build the plant at an existing location. The portfolio would also include 100 mw of geothermal generation, 350 mw of wind power (provided that it can be purchased at a reasonable price), and a 170mw gas-fired plant built by Westinghouse. IDA also filed with regulators to increase the capacity of the Shoshone Falls hydro unit from 12.5 mw to 52.5 mw. Other additions will be made as needed.

The company has sold its IDACORP Technologies subsidiary. This unit, which converts hydrogen into electricity, was undergoing research and wasn't ready for large-scale manufacturing. Because of the potential size, IDA was unable to handle this without a partner. So, it arranged an outright sale, which will yield an after-tax gain of $0.24 to $0.26 a share.

The remaining noncore businesses will generate a small profit this year. IDACORP Financial, which receives tax credits for investments in affordable housing, contributed $0.26 a share to corporate net last year and should do equally well in 2006. The company also has an investment in communications, which lost money last year and for which it's considering various alternatives.

Improved hydro conditions point to higher earnings in 2006. After six years of below-average winter snowpack, stream flows to date are 115% above the norm. This permits increased hydro output and reduces the need for more costly fossil-fuel generation. IDA will also benefit from $27.5 million in higher rates. All told, we estimate 2006 earnings will rise 6%, to $1.85 a share. A small gain is likely next year. The stock is timely.

Dividend growth is not the company's strong suit. Though the yield is average by utility standards, we look for no hike in the payout over the next 3 to 5 years because of the need to conserve funds for the building program. Income-oriented investors will likely fare better elsewhere.

Arthur H. Medalie *August 11, 2006*

(A) EPS diluted. Excl. nonrecur.gains (loss): '93, 16¢; '00, 22¢; '03, 26¢; '05, (.24). Next egs. rpt. due mid-Aug.. (B) Div'ds historically paid in late Feb., late May, late Aug., and late Nov. ■ Div'd reinvestment plan avail. † Shareholder investment plan avail. (C) Incl. deferred debits. In '05: $10.15/sh. (D) In mill. (E) Rate Base: Net original cost. Rate allowed on com. eq. in Idaho in '04: 10.25%. Earned on '05 avg. system com. eq.: 9.3%. Regul. Clim.: Above Average.

Company's Financial Strength	B+
Stock's Price Stability	75
Price Growth Persistence	20
Earnings Predictability	45

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MGE ENERGY INC. NDQ-MGEE

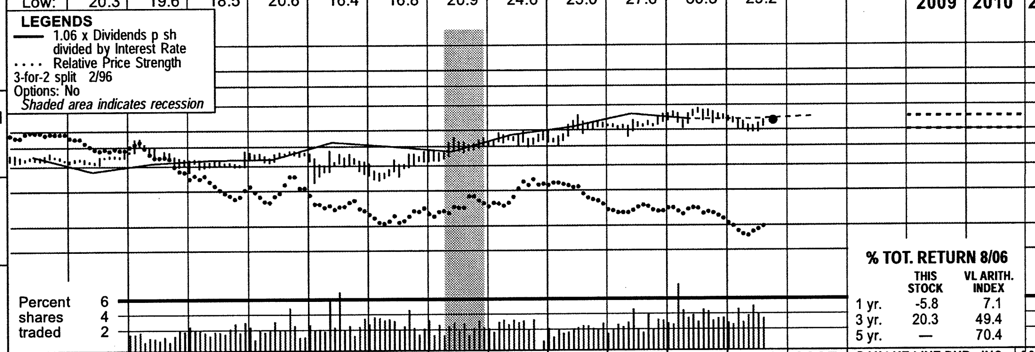
RECENT PRICE 33.39 | P/E RATIO 17.8 (Trailing: 18.5 / Median: 16.0) | RELATIVE P/E RATIO 1.01 | DIV'D YLD 4.2% | VALUE LINE

TIMELINESS 3 Raised 8/25/06
SAFETY 1 New 1/3/03
TECHNICAL 3 Raised 7/21/06
BETA .75 (1.00 = Market)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
High:	23.3	27.5	23.8	23.8	23.9	23.7	27.8	30.1	35.8	36.4	38.8	35.2
Low:	20.3	19.6	18.5	20.6	16.4	16.8	20.9	24.6	25.0	27.6	30.5	29.2

Target Price Range 2009 | 2010 | 2011

LEGENDS
— 1.06 x Dividends p sh divided by Interest Rate
.... Relative Price Strength
3-for-2 split 2/96
Options: No
Shaded area indicates recession



2009-11 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	35	(+5%)	6%
Low	30	(-10%)	2%

Insider Decisions

	N	D	J	F	M	A	M	J	J
to Buy	0	0	0	0	0	0	0	0	0
Options	0	0	0	0	0	0	0	0	0
to Sell	0	0	0	0	0	0	0	0	0

Institutional Decisions

	4Q2005	1Q2006	2Q2006
to Buy	32	24	36
to Sell	26	36	28
Hld's(000)	4863	5224	5521

Percent shares traded 6 4 2

% TOT. RETURN 8/06

	THIS STOCK	VL ARITH. INDEX
1 yr.	-5.8	7.1
3 yr.	20.3	49.4
5 yr.	—	70.4

1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	© VALUE LINE PUB., INC.	09-11
13.77	14.47	14.21	15.18	15.23	15.46	15.75	16.46	15.53	16.96	19.50	19.55	19.75	21.89	20.84	25.11	**25.00**	**25.75**	Revenues per sh	**27.20**
2.96	2.83	2.79	2.86	2.92	3.03	2.41	3.26	3.59	3.81	3.89	3.78	3.33	2.94	2.88	3.00	**2.95**	**3.30**	"Cash Flow" per sh	**4.00**
1.36	1.52	1.45	1.51	1.53	1.49	.82	1.40	1.38	1.48	1.67	1.62	1.69	1.71	1.77	1.57	**1.80**	**2.00**	Earnings per sh A	**2.45**
1.15	1.17	1.19	1.19	1.25	1.26	1.28	1.29	1.30	1.31	1.32	1.33	1.34	1.35	1.36	1.37	**1.39**	**1.40**	Div'd Decl'd per sh B ■	**1.44**
1.43	1.24	.77	1.47	1.64	1.19	1.36	1.35	1.92	3.16	4.44	2.47	4.45	4.52	4.70	4.19	**3.95**	**4.00**	Cap'l Spending per sh	**4.00**
10.62	10.98	11.24	11.51	11.78	12.01	11.14	11.25	11.34	11.49	12.05	12.67	12.94	14.34	16.59	16.82	**17.00**	**17.45**	Book Value per sh	**18.95**
16.02	16.05	16.05	16.08	16.08	16.08	16.08	16.08	16.08	16.16	16.62	17.07	17.57	18.34	20.39	20.45	**20.60**	**20.60**	Common Shs Outst'g C	**20.60**
10.8	11.3	14.3	15.2	14.3	14.5	28.1	14.5	16.2	14.0	11.7	14.8	16.0	17.5	18.0	22.4	Bold figures are Value Line estimates		Avg Ann'l P/E Ratio	**13.5**
.80	.72	.87	.90	.94	.97	1.76	.84	.84	.80	.76	.76	.87	1.00	.95	1.18			Relative P/E Ratio	**.95**
7.8%	6.8%	5.7%	5.2%	5.7%	5.8%	5.5%	6.3%	5.8%	6.3%	6.7%	5.5%	5.0%	4.5%	4.3%	3.9%			Avg Ann'l Div'd Yield	**4.6%**

CAPITAL STRUCTURE as of 6/30/06
Total Debt $290.8 mill. **Due in 5 Yrs** $65.0 mill.
LT Debt $222.3 mill. **LT Interest** $12.0 mill.
(LT interest earned: 4.3x)

Leases, Uncapitalized Annual rentals $1.4 mill.
Pension Assets-12/05 $116.7 mill.
Obligation $173.5 mill.

Pfd Stock None

Common Stock 20,557,016 shs.
as of 7/31/06
MARKET CAP: $675 million (Small Cap)

1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007		09-11
253.3	264.7	249.8	274.0	324.1	333.7	347.1	401.5	424.9	513.4	**515**	**530**	Revenues ($mill)	**560**
13.2	22.5	22.2	23.8	27.4	27.2	29.2	30.6	33.8	32.1	**37.0**	**41.0**	Net Profit ($mill)	**47.0**
55.1%	37.5%	37.1%	36.9%	36.5%	36.9%	39.1%	39.4%	37.9%	38.2%	**38.0%**	**38.0%**	Income Tax Rate	**38.0%**
--	.2%	.9%	1.9%	1.9%	2.2%	--	--	2.2%	1.7%	**1.7%**	**1.8%**	AFUDC % to Net Profit	**2.0%**
41.9%	41.8%	46.7%	44.5%	47.8%	42.2%	45.8%	43.5%	37.4%	39.3%	**39.5%**	**39.5%**	Long-Term Debt Ratio	**39.0%**
58.1%	58.2%	53.3%	55.5%	52.2%	57.8%	54.2%	56.5%	62.6%	60.7%	**60.5%**	**60.5%**	Common Equity Ratio	**61.0%**
308.0	310.8	342.0	334.3	383.7	373.9	419.5	465.3	540.5	566.2	**580**	**595**	Total Capital ($mill)	**640**
312.2	284.7	258.6	260.1	342.8	401.2	451.5	537.5	607.4	667.7	**675**	**680**	Net Plant ($mill)	**700**
5.9%	8.8%	8.0%	8.8%	8.8%	9.0%	8.1%	7.8%	7.1%	7.5%	**8.0%**	**8.5%**	Return on Total Cap'l	**8.5%**
7.4%	12.4%	12.2%	12.8%	13.7%	12.6%	12.8%	11.6%	10.0%	9.3%	**10.5%**	**11.5%**	Return on Shr. Equity	**12.0%**
7.4%	12.4%	12.2%	12.8%	13.7%	12.6%	12.8%	11.6%	10.0%	9.3%	**10.5%**	**11.5%**	Return on Com Equity D	**12.0%**
NMF	1.0%	.7%	1.5%	2.9%	2.3%	2.6%	2.5%	2.3%	2.5%	**2.5%**	**3.5%**	Retained to Com Eq	**4.5%**
NMF	92%	94%	89%	79%	82%	79%	79%	77%	87%	**76%**	**70%**	All Div'ds to Net Prof	**63%**

ELECTRIC OPERATING STATISTICS

	2003	2004	2005
% Change Retail Sales (KWH)	-1.6	+5.5	-0.7
Avg. Indust. Use (MWH)	4629	4624	4293
Avg. Indust. Revs. per KWH (¢)	4.11	4.40	4.37
Capacity at Peak (Mw)	768	763	812
Peak Load, Summer (Mw)	664	714	690
Annual Load Factor (%)	48.1	59.1	48.1
% Change Customers (avg.)	+.5	+1.0	+1.6
Fixed Charge Cov. (%)	352	388	352

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '03-'05 to '09-'11
Revenues	3.5%	5.0%	.5%
"Cash Flow"	0.5%	-3.0%	.5%
Earnings	1.5%	4.0%	6.0%
Dividends	1.0%	1.0%	.5%
Book Value	2.5%	5.0%	7.0%

Cal-endar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	128.5	82.6	87.9	102.5	401.5
2004	135.4	85.4	86.8	117.3	424.9
2005	138.9	100.5	114.4	159.6	513.4
2006	158.6	99.7	*120*	*136.7*	*515*
2007	*160*	*112*	*117*	*141*	*530*

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	.53	.33	.56	.29	1.71
2004	.74	.30	.48	.25	1.77
2005	.40	.27	.48	.42	1.57
2006	.56	.34	*.56*	*.34*	*1.80*
2007	*.64*	*.38*	*.60*	*.38*	*2.00*

Cal-endar	QUARTERLY DIVIDENDS PAID B ■ Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2002	.333	.333	.336	.336	1.34
2003	.336	.336	.338	.338	1.35
2004	.338	.338	.342	.342	1.36
2005	.342	.342	.345	.345	1.37
2006	.345	.345	.348		

BUSINESS: MGE Energy Inc. is a holding company for Madison Gas and Electric, which provides electric service to nearly 132,000 customers in a 250-square-mile area of Dane County and gas service to 129,000 customers in 1,375 square miles in seven counties in Wisconsin. Electric revenue breakdown, '05: residential, 33%; commercial, 48%; industrial, 6%; public authorities, 7%; other, 6%. Generating sources, '05: fossil-fueled steam, 62%; purchased power, 37%; other, 1%. Fuel costs: 43% of revenues. '05 reported depreciation rate: electric, 3.4%; gas, 3.3%. Has 750 employees. Chairman, President & CEO: Gary J. Wolter. Inc.: Wisconsin. Address: 133 South Blair St., P.O. Box 1231, Madison, WI 53701-1231. Telephone: 608-252-7000. Internet: www.mge.com.

MGE Energy posted share earnings of $0.34 in the June quarter. Results were 26% above last year's $0.27 tally and in line with our estimate. Importantly, both MGE's gas and electric utility operations benefited from lower natural gas prices. The cost of fuel for power generation alone declined 36%, year over year, to $9.1 million. Factoring in recent rate reductions, we look for MGE's earnings to increase 15%, to $1.80 a share, this year.

Power demand should increase at a decent clip out to 2009-2011, largely reflecting favorable demographics within MGE's south central Wisconsin service area. Commercial and industrial projects in Dane county totaled more than $500 million in 2005, setting a record for the second straight year. The city of Madison, in particular, should continue to be a hub for residential and economic development, as it is home to a major state university campus. The 150-megawatt, natural gas-fired West Campus Cogeneration Facility should help MGE meet increasing power demand. The Oak Creek Power Plant, meanwhile, is scheduled to be on line by 2011.

MGE and the International Brotherhood of Electrical Workers (IBEW) recently reached a tentative agreement on a three-year labor deal. Their previous collective bargaining accord expired in mid-May, but was extended until August 23rd. Roughly one-third of MGE's 750 or so employees are represented by the IBEW. On a separate note, all non-union new hires will now be enrolled in a defined contribution pension plan versus a defined benefit plan previously. The switch should save MGE money.

MGE shares are once again trading within our three- to five-year Target Price Range, having rallied 13% since our June report. As a result, we think that total shareholder returns will be fairly modest out to 2009-2011, driven by an expanded dividend payout. The current dividend yield, at 4.2%, is relatively attractive. What's more, the prospect for future, albeit modest, dividend increases is good, as MGE has hiked its annual payout in each of the last 31 years. That said, these shares are probably best suited for income-oriented investors.

Nils C. Van Liew *September 29, 2006*

(A) Excl. nonrecurring loss: '96, 42¢. Next earnings report due late Oct. (B) Dividends historically paid in mid-March, June, September, December. ■ Dvd. reinvestment plan available. (C) In millions, adjusted for stock split. (D) Rate allowed on common equity in '02: 12.9%; earned on average common equity, '02: 13.0%. Regulatory Climate: Above Average.

Company's Financial Strength	A
Stock's Price Stability	95
Price Growth Persistence	60
Earnings Predictability	80

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NSTAR NYSE-NST

RECENT PRICE	32.05	P/E RATIO	15.9 (Trailing: 16.7) (Median: 13.0)	RELATIVE P/E RATIO	0.95	DIV'D YLD	3.9%	VALUE LINE

TIMELINESS 3 Raised 8/4/06

SAFETY 1 Raised 6/11/99

TECHNICAL 2 Raised 8/25/06

BETA .80 (1.00 = Market)

2009-11 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	35	(+10%)	*6%*
Low	30	(-5%)	*3%*

Insider Decisions

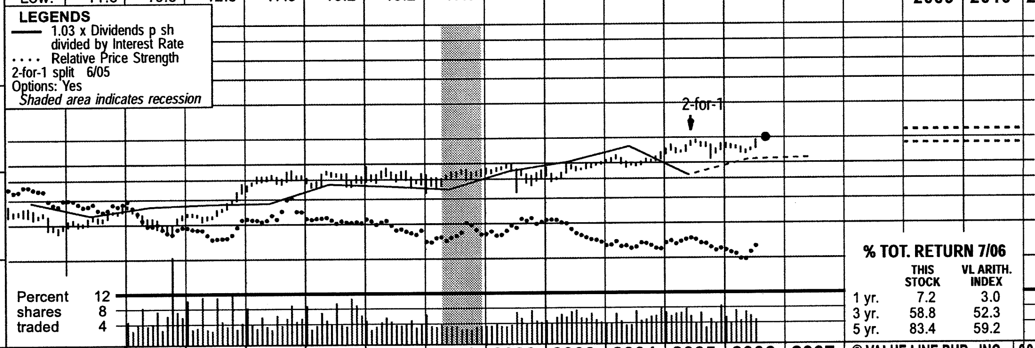
	O	N	D	J	F	M	A	M	J
to Buy	0	0	0	0	0	0	0	0	0
Options	0	0	0	0	0	0	0	0	0
to Sell	0	0	0	0	0	0	0	0	0

Institutional Decisions

	3Q2005	4Q2005	1Q2006
to Buy	102	98	91
to Sell	74	90	80
Hld's(000)	45335	46387	45046

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
High:	14.8	15.1	19.2	22.5	22.3	23.5	22.6	24.1	24.5	27.2	31.5	32.6
Low:	11.6	10.9	12.3	17.5	18.2	18.2	17.0	17.0	19.3	22.7	24.9	26.5

Target Price Range
2009 | 2010 | 2011



% TOT. RETURN 7/06

	THIS STOCK	VL ARITH. INDEX
1 yr.	7.2	3.0
3 yr.	58.8	52.3
5 yr.	83.4	59.2

1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	© VALUE LINE PUB., INC.	09-11
16.14	15.69	15.77	16.42	17.00	16.96	17.17	18.31	17.19	15.94	25.45	30.09	25.64	27.48	27.73	30.36	*34.65*	*36.50*	Revenues per sh	*41.25*
2.93	2.87	2.94	2.98	3.35	3.11	3.65	3.66	3.84	3.04	3.78	3.81	3.95	3.98	4.09	5.00	*5.60*	*5.85*	"Cash Flow" per sh	*6.50*
.80	.98	1.05	1.14	1.21	1.04	1.31	1.36	1.38	1.39	1.60	1.64	1.69	1.74	1.76	1.83	*1.95*	*2.10*	Earnings per sh A	*2.50*
.77	.80	.83	.86	.89	.92	.94	.94	.95	.98	1.01	1.04	1.07	1.09	1.13	.87	*1.21*	*1.28*	Div'd Decl'd per sh B ■	*1.55*
3.28	2.55	2.58	2.81	2.42	2.08	2.13	1.23	1.57	1.53	1.78	2.22	3.50	2.94	2.95	3.63	*3.80*	*3.10*	Cap'l Spending per sh	*2.75*
8.61	8.96	9.39	9.71	10.06	10.31	10.54	10.98	11.14	13.29	12.65	11.90	12.25	12.84	13.52	14.37	*15.15*	*16.00*	Book Value per sh C	*19.00*
78.00	84.09	89.53	90.26	91.07	96.01	97.02	97.03	94.37	116.12	106.07	106.07	106.07	106.07	106.55	106.81	*106.81*	*106.81*	Common Shs Outst'g D	*106.81*
11.6	10.6	11.9	13.1	10.7	12.3	9.7	10.6	14.6	14.6	12.9	12.7	12.7	12.7	13.8	15.5	*Bold figures are Value Line estimates*		Avg Ann'l P/E Ratio	*13.0*
.86	.68	.72	.77	.70	.82	.61	.61	.76	.83	.84	.65	.69	.72	.73	.83			Relative P/E Ratio	*.85*
8.3%	7.7%	6.6%	5.8%	6.9%	7.2%	7.4%	6.5%	4.7%	4.8%	4.9%	5.0%	4.9%	4.9%	4.6%	3.1%			Avg Ann'l Div'd Yield	*4.7%*

CAPITAL STRUCTURE as of 6/30/06
Total Debt $2971.4 mill. **Due in 5 Yrs** $1704.8 mill.
LT Debt $2514.6 mill. **LT Interest** $155.9 mill.
Incl. $711.4 mill. securitized bonds.
(LT interest earned: 2.9x)
Leases, Uncapitalized Annual rentals $19.6 mill.
Pension Assets-12/05 $964.6 mill. **Oblig.** $1.04 bill.
Pfd Stock $43.0 mill. **Pfd Div'd** $2.0 mill.
430,000 shs. 4.25%-4.78%, cum., redeemable at $102.80-$103.625.
Common Stock 106,808,376 shs.
as of 7/28/06
MARKET CAP: $3.4 billion (Mid Cap)

1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007		09-11
1666.3	1776.2	1622.5	1851.4	2699.5	3191.8	2719.1	2914.1	2954.3	3243.1	*3700*	*3900*	Revenues ($mill)	*4400*
141.5	144.6	141.0	146.5	181.0	179.1	181.3	188.0	190.4	198.1	*215*	*230*	Net Profit ($mill)	*280*
38.3%	36.3%	34.3%	29.1%	41.6%	41.4%	35.8%	37.5%	38.5%	35.6%	*40.0%*	*40.0%*	Income Tax Rate	*40.0%*
1.6%	.8%	1.2%	1.5%	2.5%	2.8%	1.6%	2.4%	.5%	1.9%	*2.0%*	*1.0%*	AFUDC % to Net Profit	*1.0%*
46.1%	46.1%	45.5%	50.0%	59.4%	59.2%	60.9%	58.5%	58.6%	60.4%	*60.0%*	*57.0%*	Long-Term Debt Ratio	*47.5%*
44.5%	46.5%	50.1%	47.2%	39.4%	39.5%	37.8%	40.2%	40.2%	38.6%	*39.0%*	*42.0%*	Common Equity Ratio	*51.5%*
2296.5	2291.6	2099.5	3269.3	3409.8	3197.4	3433.7	3387.1	3585.3	3980.4	*4140*	*4060*	Total Capital ($mill)	*3925*
2956.6	2854.1	2270.7	2550.6	2523.6	2625.4	2847.6	3216.1	3425.0	3701.8	*3875*	*3960*	Net Plant ($mill)	*4100*
8.2%	8.3%	8.7%	6.1%	7.6%	8.1%	7.5%	7.8%	7.4%	7.1%	*7.0%*	*7.5%*	Return on Total Cap'l	*8.5%*
11.4%	11.7%	12.3%	9.0%	13.1%	13.7%	13.5%	13.4%	12.8%	12.6%	*13.0%*	*13.0%*	Return on Shr. Equity	*13.5%*
12.3%	12.3%	12.6%	9.1%	13.0%	13.7%	13.8%	13.7%	13.1%	12.8%	*13.0%*	*13.5%*	Return on Com Equity E	*13.5%*
3.5%	3.7%	3.9%	2.4%	4.8%	5.0%	5.2%	5.2%	4.9%	4.7%	*5.0%*	*5.5%*	Retained to Com Eq	*5.5%*
75%	73%	71%	74%	64%	65%	63%	62%	63%	63%	*62%*	*60%*	All Div'ds to Net Prof	*60%*

ELECTRIC OPERATING STATISTICS

	2003	2004	2005
% Change Retail Sales (KWH)	+3.0	+1.5	+2.5
Avg. Indust. Use (MWH)	1018	1027	1022
Avg. Indust. Revs. per KWH (¢)	8.20	7.90	8.20
Capacity at Peak (Mw)	NMF	NMF	NMF
Peak Load, Summer (Mw)	4299	4254	4682
Annual Load Factor (%)	NMF	NMF	NMF
% Change Customers (avg.)	+1.1	+.4	+.7
Fixed Charge Cov. (%)	270	287	266

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '03-'05 to '09-'11
Revenues	5.5%	8.0%	*6.5%*
"Cash Flow"	3.5%	4.0%	*7.0%*
Earnings	4.5%	4.0%	*6.0%*
Dividends	1.5%	1.0%	*7.0%*
Book Value	3.0%	2.0%	*6.0%*

Cal-endar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	763.5	647.9	817.8	684.9	2914.1
2004	809.9	649.8	781.5	713.1	2954.3
2005	880.0	692.0	858.5	812.6	3243.1
2006	1034.8	785.6	*1014.6*	*865*	*3700*
2007	*1100*	*800*	*1075*	*925*	*3900*

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	.40	.37	.60	.37	1.74
2004	.46	.35	.59	.35	1.76
2005	.43	.31	.72	.36	1.83
2006	.41	.43	*.69*	*.42*	*1.95*
2007	*.48*	*.45*	*.73*	*.44*	*2.10*

Cal-endar	QUARTERLY DIVIDENDS PAID B ■ Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2002	.265	.265	.265	.265	1.06
2003	.27	.27	.27	.27	1.08
2004	.278	.278	.278	.278	1.11
2005	.29	.29	.29	.29	1.16
2006	.303	.303	.303		

BUSINESS: NSTAR is a holding company for Boston Edison Company, which supplies electricity to an area of approx. 590 sq. mi. in eastern Massachusetts, encompassing Boston and 39 surrounding towns and cities, and Commonwealth Energy (acq'd 8/99), which provides electric and gas service in eastern MA. Serves 1.1 million electric, 300,000 gas customers. Electric revenue breakdown, '05: residential, 39%; commercial, 54%; industrial, 6%; other, 1%. Sold fossil plants in '98, nuclear plant in '99. Fuel costs: 56% of revs. '04 reported deprec. rate: 3.0%. Has 3,050 employees. Chairman, President & CEO: Thomas J. May. Inc.: Massachusetts. Address: 800 Boylston St., Boston, Massachusetts 02199-8003. Tel.: 617-424-2000. Internet: www.nstaronline.com.

NSTAR's earnings growth is likely to accelerate. We have raised our 2006 share-earnings estimate from $1.90 to $1.95 because second-quarter earnings were better than we expected. Our revised figure is consistent with management's expectation that earnings this year are likely to wind up toward the high end of its guidance of $1.90-$1.96. Moreover, NSTAR has raised its long-term targeted range for annual earnings growth from 4%-6% to 6%-8%. That's due to the expected benefits from its seven-year regulatory agreement, lower growth in expenses, and increased spending on transmission (about $30 million a year over the previous budget in 2007 and 2008, on which the utility will earn a return once it's placed in the rate base). NSTAR also intends to raise its dividend in line with earnings growth. We have raised our 2007 earnings estimate by a nickel a share, to $2.10, and have increased our forecast for dividend growth.

NSTAR awaits an order from the Federal Energy Regulatory Commission (FERC) on its transmission rates. The company is asking FERC to raise its allowed return on equity from the current 11.5%. NSTAR just placed a $220 million transmission line in rates, and plans to spend an additional $110 million-$120 million on transmission in 2007 and 2008.

Finances are sound. Although the long-term debt ratio appears high, nearly 30% of NSTAR's long-term debt consists of securitized bonds that the rating agencies exclude from their calculations when evaluating the company's creditworthiness. "Cash Flow" exceeds the sum of capital spending and dividends. And the fixed-charge coverage is good. NSTAR merits a Financial Strength rating of A, and its stock is top-ranked for Safety.

This equity is up more than 15% since our last report, three months ago. Some of the rise is due to the favorable market reaction to NSTAR's higher earnings- and dividend-growth prospects. But we believe some of it is due to takeover speculation. The stock is trading within our 2009-2011 Target Price Range, and total-return potential over that time is unimpressive. **We advise investors not to purchase this stock based on the hope of a takeover.**

Paul E. Debbas, CFA *September 1, 2006*

(A) Diluted EPS. Excl. nonrecurring gain (losses): '90, 20¢; '01, ($1.66) net; '02, (17¢); '03, (4¢). '04 & '05 EPS don't add to full-year total due to rounding. Next earnings report due late Oct. (B) Div'ds historically paid in early Feb., May, Aug., and Nov. Only 3 div'd declarations in '05. ■ Div'd reinvestment plan available. (C) Incl. intangibles. In '05: $2.7 bill., $25.21/sh. (D) In mill., adj. for split. (E) Rate base: Net original cost. Rate allowed on com. eq. in '06: 10.5%; earned on avg. com. eq., '05: 13.2%. Regulatory Climate: Above Average.

Company's Financial Strength	A
Stock's Price Stability	100
Price Growth Persistence	80
Earnings Predictability	95

Staff/1402
Morgan/11

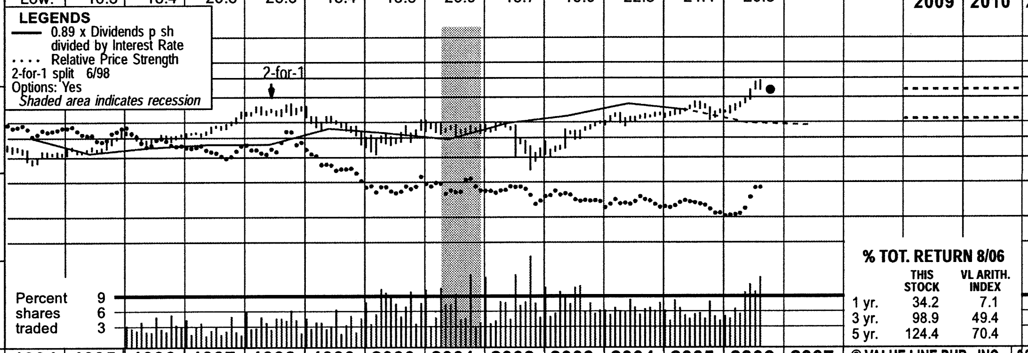
OGE ENERGY CORP. NYSE-OGE

RECENT PRICE 34.85 | P/E RATIO 14.6 (Trailing: 15.3 Median: 13.0) | RELATIVE P/E RATIO 0.83 | DIV'D YLD 3.9% | VALUE LINE

TIMELINESS 3 Raised 5/12/06
SAFETY 2 Raised 7/1/05
TECHNICAL 2 Lowered 9/15/06
BETA .75 (1.00 = Market)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
High:	21.8	21.8	27.4	30.0	29.1	24.8	24.7	24.2	24.3	27.0	30.6	39.2
Low:	16.3	18.4	20.3	25.6	18.4	16.5	20.0	13.7	16.0	22.8	24.4	26.3

LEGENDS
— 0.89 x Dividends p sh divided by Interest Rate
.... Relative Price Strength
2-for-1 split 6/98
Options: Yes
Shaded area indicates recession



Target Price Range
2009 | 2010 | 2011

2009-11 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	35	(Nil)	*4%*
Low	25	(-30%)	*-3%*

Insider Decisions

	N	D	J	F	M	A	M	J	J
to Buy	0	0	0	0	0	0	1	0	0
Options	0	0	0	0	3	0	7	0	0
to Sell	0	0	0	0	3	0	6	0	0

Institutional Decisions

	4Q2005	1Q2006	2Q2006
to Buy	96	107	147
to Sell	83	73	70
Hld's(000)	35479	35374	40917

Percent shares traded 9 6 3

% TOT. RETURN 8/06

	THIS STOCK	VL ARITH. INDEX
1 yr.	34.2	7.1
3 yr.	98.9	49.4
5 yr.	124.4	70.4

1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	© VALUE LINE PUB., INC.	09-11
15.27	16.31	16.30	17.94	16.79	16.13	17.18	18.23	20.02	27.90	42.33	40.80	38.52	43.24	54.74	65.65	*49.35*	*51.75*	Revenues per sh	*57.25*
2.99	2.97	2.58	2.87	3.07	3.16	3.31	3.38	3.90	4.06	4.15	3.61	3.75	3.65	3.74	3.89	*4.45*	*4.45*	"Cash Flow" per sh	*4.50*
1.69	1.64	1.21	1.39	1.51	1.52	1.62	1.61	2.04	1.94	1.89	1.29	1.43	1.73	1.78	1.83	*2.40*	*2.30*	Earnings per sh A	*2.25*
1.26	1.30	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	*1.33*	*1.36*	Div'd Decl'd per sh B ■ †	*1.50*
1.45	1.43	1.76	1.58	1.87	1.75	2.00	2.03	1.86	2.33	2.30	2.89	2.99	2.07	3.02	3.30	*5.55*	*1.80*	Cap'l Spending per sh	*1.75*
10.96	11.30	11.18	11.24	11.41	11.61	11.91	12.19	12.91	13.09	13.66	13.34	12.53	13.75	14.28	15.19	*16.75*	*17.75*	Book Value per sh C	*20.25*
80.60	80.60	80.66	80.69	80.71	80.75	80.76	80.77	80.80	77.86	77.92	77.99	78.50	87.40	90.00	90.60	*91.20*	*91.80*	Common Shs Outst'g D	*93.50*
10.6	12.0	14.7	12.8	11.1	11.9	12.3	14.0	13.3	12.1	10.6	17.4	14.1	11.8	14.1	14.9	*Bold figures are*		Avg Ann'l P/E Ratio	*14.0*
.79	.77	.89	.76	.73	.80	.77	.81	.69	.69	.69	.89	.77	.67	.74	.79	*Value Line*		Relative P/E Ratio	*.95*
7.0%	6.6%	7.5%	7.5%	8.0%	7.4%	6.7%	5.9%	4.9%	5.7%	6.6%	5.9%	6.6%	6.5%	5.3%	4.9%	*estimates*		Avg Ann'l Div'd Yield	*4.8%*

CAPITAL STRUCTURE as of 6/30/06
Total Debt $1407.9 mill. **Due in 5 Yrs** $462.2 mill.
LT Debt $1346.7 mill. **LT Interest** $86.2 mill.
(LT interest earned: 4.6x)
Leases, Uncapitalized Annual rentals $7.6 mill.

Pension Assets-12/05 $439.4 mill. **Oblig.** $594.0 mill.
Pfd Stock None

Common Stock 90,972,169 shs.

MARKET CAP: $3.2 billion (Mid Cap)

1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007		09-11
1387.4	1472.3	1617.7	2172.4	3298.7	3182.4	3023.9	3779.0	4926.6	5948.2	*4500*	*4750*	Revenues ($mill)	*5350*
133.3	132.6	165.9	151.3	147.0	100.6	111.7	141.8	157.8	166.1	*220*	*210*	Net Profit ($mill)	*210*
36.8%	36.6%	39.6%	37.3%	34.2%	34.3%	36.4%	35.4%	34.5%	30.2%	*36.0%*	*36.5%*	Income Tax Rate	*36.5%*
.5%	.5%	.6%	.5%	1.5%	.7%	.8%	.4%	1.1%	1.3%	*3.0%*	*Nil*	AFUDC % to Net Profit	*Nil*
45.1%	44.9%	47.3%	52.8%	60.8%	59.5%	60.4%	54.4%	52.6%	49.5%	*50.5%*	*49.0%*	Long-Term Debt Ratio	*45.0%*
52.3%	52.5%	52.7%	47.2%	39.2%	40.5%	39.6%	45.6%	47.4%	50.5%	*49.5%*	*51.0%*	Common Equity Ratio	*55.0%*
1840.3	1876.2	1979.0	2159.9	2712.8	2566.9	2485.8	2637.7	2709.7	2726.6	*3090*	*3195*	Total Capital ($mill)	*3475*
2346.1	2353.9	2526.6	3242.0	3219.5	3263.7	3204.3	3309.5	3581.0	3567.4	*3885*	*3855*	Net Plant ($mill)	*3725*
8.9%	8.7%	9.9%	8.8%	7.6%	6.2%	6.6%	7.1%	7.4%	7.6%	*8.5%*	*8.0%*	Return on Total Cap'l	*7.5%*
13.2%	12.8%	15.9%	14.8%	13.8%	9.7%	11.4%	11.8%	12.3%	12.1%	*14.5%*	*13.0%*	Return on Shr. Equity	*11.0%*
13.6%	13.2%	15.8%	14.8%	13.8%	9.7%	11.4%	11.8%	12.3%	12.1%	*14.5%*	*13.0%*	Return on Com Equity E	*11.0%*
2.5%	2.3%	5.5%	4.7%	4.1%	NMF	1.2%	3.6%	3.4%	3.4%	*6.5%*	*5.5%*	Retained to Com Eq	*3.5%*
82%	83%	65%	68%	70%	103%	89%	70%	73%	72%	*55%*	*59%*	All Div'ds to Net Prof	*67%*

ELECTRIC OPERATING STATISTICS

	2003	2004	2005
% Change Retail Sales (KWH)	+1.6	-.8	+5.3
Avg. Indust. Use (MWH)	763	761	762
Avg. Indust. Revs. per KWH (¢)	4.31	4.67	4.94
Capacity at Peak (Mw)	6400	6691	6739
Peak Load, Summer (Mw)	5997	5823	6145
Annual Load Factor (%)	47.9	48.4	47.6
% Change Customers (yr-end)	+1.0	+1.3	+1.4
Fixed Charge Cov. (%)	322	333	357

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '03-'05 to '09-'11
Revenues	12.5%	12.5%	*1.0%*
"Cash Flow"	2.0%	-1.5%	*3.0%*
Earnings	2.0%	-2.0%	*4.0%*
Dividends	--	--	*2.0%*
Book Value	2.5%	1.5%	*6.0%*

Cal-endar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	1050.2	852.6	1060.0	816.2	3779.0
2004	1041.7	1155.4	1324.7	1404.8	4926.6
2005	1274.5	1339.1	1681.5	1653.1	5948.2
2006	1109.8	934.3	*1300*	*1155.9*	*4500*
2007	*1150*	*1000*	*1400*	*1200*	*4750*

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	.05	.41	1.22	.03	1.73
2004	.11	.44	1.13	.10	1.78
2005	.05	.40	1.18	.20	1.83
2006	.27	.63	*1.30*	*.20*	*2.40*
2007	*.25*	*.55*	*1.30*	*.20*	*2.30*

Cal-endar	QUARTERLY DIVIDENDS PAID B ■ † Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2002	.333	.333	.333	.333	1.33
2003	.333	.333	.333	.333	1.33
2004	.333	.333	.333	.333	1.33
2005	.333	.333	.333	.333	1.33
2006	.333	.333	.333		

BUSINESS: OGE Energy Corp. is a holding company for Oklahoma Gas and Electric Company (OG&E), which supplies electricity to 750,000 customers in Oklahoma (87% of electric revenues) & western Arkansas (9%); wholesale (4%). Owns Enogex pipeline subsidiary. Acquired Transok 6/99. Electric revenue breakdown, '05: residential, 38%; commercial, 24%; industrial, 21%; other, 17%. Generating sources, '05: coal, 62%; gas, 26%; purchased, 12%. Fuel costs: 83% of revenues. '05 reported deprec. rate: 3.0%. Has 3,000 employees. Chairman, President & CEO: Steven E. Moore. Incorporated: Oklahoma. Address: 321 North Harvey, P.O. Box 321, Oklahoma City, Oklahoma 73101-0321. Telephone: 405-553-3000. Internet: www.oge.com.

OGE Energy is benefiting from high prices of natural gas liquids. The prices of NGLs, which typically track oil prices, have enabled fractionation spreads (the difference between the BTU values of natural gas and the NGLs that are produced) to exceed $6.00 per million BTUs, at times, this year. By contrast, frac spreads averaged $2.55 in 2005. As a result, OGE's Enogex pipeline subsidiary is having a terrific year. The company expects Enogex to have net income of $77 million-$86 million in 2006, compared with $44.9 million last year. OGE has raised its share-earnings target for 2006 from $2.05-$2.25 to $2.25-$2.40. We have raised our estimate by $0.15 a share, to $2.40.

We expect earnings to decline in 2007, but remain well above historical levels. We forecast continued high prices of oil, which suggests that NGL prices will remain elevated as well. But, frac spreads won't necessarily be as lofty as in 2006 if natural gas prices are higher as well. Also, Oklahoma Gas and Electric has benefited from favorable weather conditions so far in 2006, and we assume normal weather in 2007. Even if earnings decline from the 2006 tally, we think that the payout ratio will still be low enough for OGE's board of directors to declare the first dividend increase since the early 1990s.

The utility is building a wind project, and it might be a partner in a coal-fired plant. The $200 million, 120-megawatt wind project is scheduled to be on line by the start of 2007. OG&E will recover the cost through a rider on customers' bills until the facility is placed into the rate base after the utility has its next rate case in Oklahoma. OG&E is also proposing to take a 42% stake in a 950-mw coal-fired plant. Its share of the cost would be $750 million, and the plant would come on line in the second quarter of 2011.

OG&E has filed a rate case in Arkansas. The utility hasn't had a general rate increase there in 23 years. It is seeking a tariff hike of $13.5 million (7.6%) based on an 11.75% return on equity. An order is expected in 2007.

We don't recommend this stock. The sharp rise in its price this year has brought the quotation near the upper level of our 2009-2011 Target Price Range.

Paul E. Debbas, CFA September 29, 2006

(A) Diluted EPS. Excl. nonrec. losses: '02, 39¢; '03, 14¢; '04, 6¢; gains on disc. ops.: '02, 12¢; '04, 1¢; '05, 8¢; '05, 49¢; '06, 40¢. '03 EPS don't add due to change in shares. Next earnings report due early Nov. (B) Div'ds historically paid in late Jan., Apr., July, and Oct. ■ Div'd reinvest. plan avail. † Shareholder invest. plan avail. (C) Incl. deferred charges. In '05: $1.96/sh. (D) In mill., adj. for split. (E) Rate base: Net orig. cost. Rate allowed on com. eq. in '06: OK, 10.75%; in '87: AR, 13.0%; earned on avg. com. eq., '05: 12.6%. Reg. Clim.: Avg.

Company's Financial Strength	A
Stock's Price Stability	95
Price Growth Persistence	75
Earnings Predictability	80

Staff/1402
Morgan/12

PROGRESS ENERGY NYSE-PGN

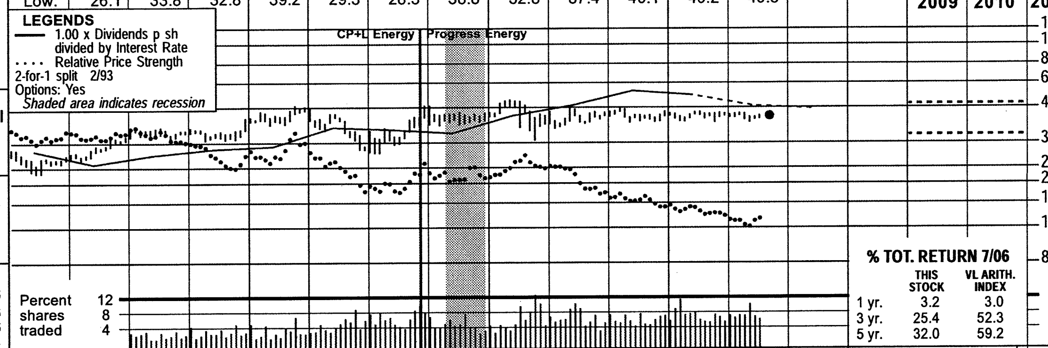
RECENT PRICE 43.57 | P/E RATIO 17.0 (Trailing: 13.2 Median: 14.0) | RELATIVE P/E RATIO 1.01 | DIV'D YLD 5.6% | VALUE LINE

TIMELINESS 3 Raised 12/17/04
SAFETY 2 Lowered 6/7/02
TECHNICAL 3 Raised 7/21/06
BETA .85 (1.00 = Market)

High:	34.6	38.8	42.7	49.6	47.9	49.4	49.3	52.7	48.0	47.9	46.0	45.3
Low:	26.1	33.8	32.8	39.2	29.3	28.3	38.8	32.8	37.4	40.1	40.2	40.3

Target Price Range
2009 | 2010 | 2011

LEGENDS
— 1.00 x Dividends p sh divided by Interest Rate
.... Relative Price Strength
2-for-1 split 2/93
Options: Yes
Shaded area indicates recession



% TOT. RETURN 7/06

	THIS STOCK	VL ARITH. INDEX
1 yr.	3.2	3.0
3 yr.	25.4	52.3
5 yr.	32.0	59.2

2009-11 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	50	(+15%)	*8%*
Low	35	(-20%)	*1%*

Insider Decisions

	O	N	D	J	F	M	A	M	J
to Buy	0	1	0	0	2	0	0	0	0
Options	0	0	0	0	0	0	15	0	0
to Sell	3	1	0	0	0	9	1	2	0

Institutional Decisions

	3Q2005	4Q2005	1Q2006
to Buy	194	188	178
to Sell	141	165	176
Hld's(000)	145391	150908	154983

Progress Energy was formed on November 30, 2000 through the merger of CP&L Energy and Florida Progress. Florida Progress common shareholders exchanged each share held for $54 in cash and/or CP&L common stock. They also received one Contingent Value Obligation for each share of Florida Progress stock, entitling them to payments in the event that four synthetic fuel plants achieve certain economic levels from 2001 to 2007. Data prior to merger are for CP&L only and are not comparable with Progress Energy data.

1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	© VALUE LINE PUB., INC.	09-11
19.78	19.98	20.68	21.04	19.99	38.69	34.18	35.54	39.56	40.11	*43.05*	*43.85*	Revenues per sh	*46.50*
5.47	6.26	6.44	6.06	5.37	8.14	7.02	7.54	7.40	6.53	*6.65*	*7.15*	"Cash Flow" per sh	*8.45*
2.66	2.66	2.75	2.55	2.34	3.43	3.84	3.41	3.10	2.94	*2.55*	*2.65*	Earnings per sh A	*2.90*
1.84	1.90	1.96	2.02	2.08	2.14	2.18	2.26	2.32	2.38	*2.44*	*2.46*	Div'd Decl'd per sh B†■	*2.52*
2.44	2.57	2.80	4.32	4.61	5.56	5.05	4.14	4.04	4.29	*6.95*	*6.75*	Cap'l Spending per sh	*6.50*
17.77	18.63	19.49	21.38	26.32	27.45	28.73	30.26	30.90	31.90	*32.15*	*32.50*	Book Value per sh C	*33.95*
151.42	151.34	151.34	159.60	206.09	218.73	232.43	246.00	247.00	252.00	*254.00*	*256.00*	Common Shs Outst'g E	*261.00*
13.6	13.6	15.9	15.2	15.3	12.4	11.9	12.4	14.1	14.8	*Bold figures are*		Avg Ann'l P/E Ratio	*15.0*
.85	.78	.83	.87	.99	.64	.65	.71	.74	.79	*Value Line*		Relative P/E Ratio	*1.00*
5.1%	5.3%	4.5%	5.2%	5.8%	5.0%	4.8%	5.3%	5.3%	5.5%	*estimates*		Avg Ann'l Div'd Yield	*5.9%*
2995.7	3024.1	3130.1	3357.6	4118.9	8461.5	7945.0	8743.0	9772.0	10108	*10930*	*11230*	Revenues ($mill)	*12130*
391.3	388.3	399.2	382.3	369.9	695.1	815.2	818.1	763.5	727.0	*650*	*680*	Net Profit ($mill)	*760*
39.5%	37.6%	39.2%	40.3%	35.4%	--	--	--	13.1%	13.0%	*20.0%*	*35.0%*	Income Tax Rate	*35.0%*
1.6%	1.3%	1.7%	3.0%	5.6%	2.6%	1.0%	3.4%	.8%	1.8%	*2.0%*	*2.0%*	AFUDC % to Net Profit	*2.0%*
47.1%	45.6%	46.5%	46.6%	51.6%	60.9%	59.0%	56.1%	55.2%	56.2%	*54.0%*	*52.0%*	Long-Term Debt Ratio	*50.5%*
50.2%	53.2%	52.4%	52.5%	47.6%	38.5%	40.4%	43.4%	44.3%	43.3%	*45.5%*	*47.5%*	Common Equity Ratio	*49.0%*
5359.9	5293.8	5623.1	6500.6	11407	15580	16517	17162	17247	18577	*17965*	*17515*	Total Capital ($mill)	*18060*
6399.9	6293.5	6299.5	6764.8	10437	10915	10656	14434	14363	14442	*15160*	*15740*	Net Plant ($mill)	*16990*
8.9%	8.9%	8.6%	7.3%	4.3%	6.4%	6.8%	6.5%	6.2%	5.6%	*5.0%*	*5.5%*	Return on Total Cap'l	*5.5%*
13.8%	13.5%	13.3%	11.0%	6.7%	11.4%	12.0%	10.9%	9.9%	8.9%	*8.0%*	*8.0%*	Return on Shr. Equity	*8.4%*
14.2%	13.6%	13.4%	11.1%	6.7%	11.5%	12.1%	10.9%	9.9%	9.0%	*8.0%*	*8.0%*	Return on Com Equity D	*8.5%*
4.5%	3.9%	4.0%	2.5%	NMF	4.3%	5.0%	3.7%	2.6%	1.7%	*.5%*	*.5%*	Retained to Com Eq	*1.0%*
69%	72%	71%	78%	101%	63%	59%	67%	74%	81%	*95%*	*93%*	All Div'ds to Net Prof	*87%*

CAPITAL STRUCTURE as of 3/31/06
Total Debt $10557 mill. **Due in 5 Yrs** $2817 mill.
LT Debt $10448 mill. **LT Interest** $622 mill.
(LT interest earned: 2.1x)
Pension Assets-12/05 $1.77 bill. **Oblig.** $2.16 bill.
Pfd Stock $92.8 mill. **Pfd Div'd** $4.5 mill.
921,814 shs. $4.00 to $5.44 cum. no par. callable from $101 to $110 per sh. Sinking funds began in 1984 and 1986, respectively.
Common Stock 252,970,295 shs. **as of 4/30/06**
MARKET CAP: $11.0 billion (Large Cap)

ELECTRIC OPERATING STATISTICS

	2003	2004	2005
% Change Retail Sales (KWH)	+1.4	+.5	1.4
Avg. Indust. Use (MWH)	2814	2394	2399
Avg. Indust. Revs. per KWH (¢)	4.98	4.84	5.74
Capacity at Peak (Mw)	23786	23878	24500
Peak Load, Summer (Mw)	19876	19711	21983
Annual Load Factor (%)	58.5	61.3	55.0
% Change Customers (yr-end)	+2.1	+2.2	+3.1
Fixed Charge Cov. (%)	210	227	198

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '03-'05 to '09-'11
Revenues	7.5%	13.5%	*3.0%*
"Cash Flow"	3.5%	3.5%	*3.0%*
Earnings	3.5%	4.5%	*-1.5%*
Dividends	3.0%	3.0%	*1.5%*
Book Value	6.5%	6.5%	*1.5%*

Cal-endar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	2187	2050	2458	2048	8743
2004	2245	2408	2761	2358	9772
2005	2168	2295	3067	2578	10108
2006	2433	2499	*3250*	*2748*	*10930*
2007	*2500*	*2575*	*3325*	*2830*	*11230*

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	.89	.65	1.40	.47	3.41
2004	.45	.63	1.24	.78	3.10
2005	.43	.03	1.85	.63	2.94
2006	.51	.43	*1.25*	*.36*	*2.55*
2007	*.52*	*.45*	*1.30*	*.38*	*2.65*

Cal-endar	QUARTERLY DIVIDENDS PAID ■B† Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2002	.545	.545	.545	.545	2.18
2003	.56	.56	.56	.56	2.24
2004	.575	.575	.575	.575	2.30
2005	.59	.59	.59	.59	2.36
2006	.605	.605	.605		

BUSINESS: Progress Energy, parent of CP&L Energy and Florida Progress, supplies electricity to portions of North Carolina, South Carolina, and Florida. Other operations include synthetic fuels, coal mining, wholesale generation, and financial services. Electric revenues: residential, 45%; commercial, 30%; industrial, 22%; other, 3%. Power costs: 43% of revs; labor costs: 14%. Fuel sources: gas/oil/coal, 65%; nuclear, 34%; hydro, 1%. Has 11,600 employees. '05 depreciation rate: 2.5%. Est'd plant age: 8 years. Chairman & Chief Executive Officer: Robert B. McGehee. President: William Johnson. Incorporated: North Carolina. Address: 411 Fayetteville Street, Raleigh, North Carolina 27602. Telep.: 1-800-662-7232. Internet: www.progress-energy.com.

Progress Energy continues selling assets to strengthen the balance sheet. Earlier this year, it sold nonregulated businesses for a total of $1.7 billion. Since then, it agreed to sell its 320-megawatt (mw) DeSoto and its 925-mw Rowan plants for $405 million in cash. Both transactions are subject to state and federal regulatory approvals. Progress has also contracted to sell its Winchester Energy subsidiary and associated natural gas businesses for $1.2 billion in cash. These sales will help provide funds to cover over $2 billion in long-term debt that matures between 2007 and 2011, as well as $300 million in callable quarterly income preferred securities. They will also make capital available for investments in new utility generation and the transmission and distribution system.

Last May, the company halted production of synthetic fuel. It owns four coal plants that produce synthetic fuel and qualify for federal tax credits. From 1998 through 2005, these facilities earned tax credits of $1.25 billion. But since federal law began phasing out the credits when oil prices rose above a specified level, PGN idled the mines, and restoration of their operation is unlikely. In any event, the law granting these credits expires at the end of 2007 and will probably not be renewed. That will have a substantial negative impact on future profits.

Earnings are headed lower in 2006. On the plus side, the unregulated Progress Ventures subsidiary will benefit from new contracts and the late 2005 in-service date of the Hines gas- and -oil-fired facility. Too, payroll costs will be lower, and retail energy sales should rise 2%-3%. But these gains will be more than offset by the phasing out of tax credits on synthetic fuel operations and the loss of earnings from the sale of Winchester Energy. On balance, we estimate 2006 earnings will fall 13%, to $2.55 a share. A full year of lower interest expense should boost results next year.

The yield is almost two percentage points above the industry norm. That reflects a probable slowdown in earnings growth and the likelihood that dividend hikes will be smaller than they have been. All told, we rate the stock an average utility investment.

Arthur H. Medalie *September 1, 2006*

(A) EPS diluted. Next egs. report due late Oct. Excl. nonrecur.: '00, 69¢; '01, (75¢); '02, ($1.32); '03, (3¢); '05, (39¢). (B) Div'ds historically paid in early Feb., May, Aug, and Nov. ■ Div'd reinvestment plan available. † Shareholder investment plan avail. (C) Incl. def. charges in '05: $18.15/sh. (D) Rate Base: orig. cost. Rate allowed on common equity. In '88 in N.C.: 12.75%; in '88 in S.C.: 12.75%; in '02 in Fla.: rev. sharing incentive plan; earn. on '05 avg. com. eq.: 9.3%. Regul. Clim.: Avg. (E) In millions, adjusted for split.

Company's Financial Strength	B++
Stock's Price Stability	90
Price Growth Persistence	5
Earnings Predictability	75

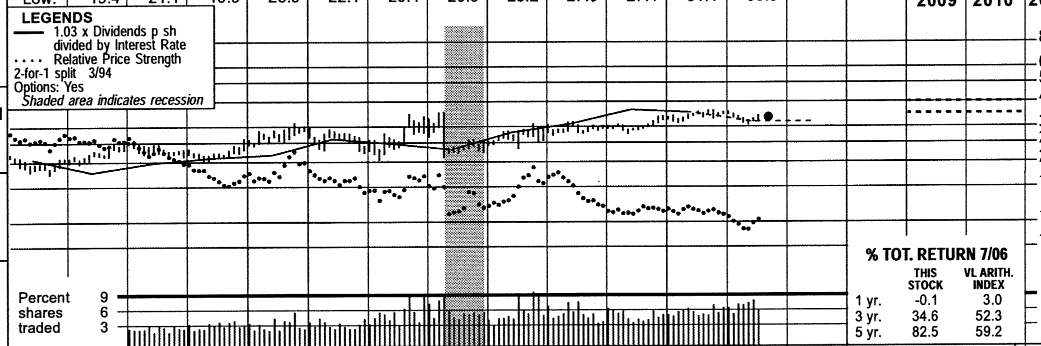
SOUTHERN CO. NYSE-SO

RECENT PRICE 33.50 | P/E RATIO 15.9 (Trailing: 16.3; Median: 15.0) | RELATIVE P/E RATIO 0.95 | DIV'D YLD 4.7% | VALUE LINE

TIMELINESS 3 Raised 8/4/06
SAFETY 1 Raised 6/3/05
TECHNICAL 3 Raised 8/4/06
BETA .65 (1.00 = Market)

High:	25.0	25.9	26.3	31.6	29.6	35.0	35.7	31.1	32.0	34.0	36.5	35.9
Low:	19.4	21.1	19.9	23.9	22.1	20.4	20.9	23.2	27.0	27.4	31.1	30.5

Target Price Range 2009 | 2010 | 2011



2009-11 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	40	(+20%)	9%
Low	35	(+5%)	6%

Insider Decisions

	O	N	D	J	F	M	A	M	J
to Buy	0	0	0	1	0	0	0	0	0
Options	0	0	0	0	0	0	0	0	0
to Sell	0	0	0	0	0	0	0	0	0

Institutional Decisions

	3Q2005	4Q2005	1Q2006
to Buy	251	236	234
to Sell	239	254	288
Hld's(000)	299339	305448	302478

% TOT. RETURN 7/06

	THIS STOCK	VL ARITH. INDEX
1 yr.	-0.1	3.0
3 yr.	34.6	52.3
5 yr.	82.5	59.2

In September, 2000, Southern spun off its independent power marketing and trading subsidiary, called Mirant. Issuing 66.7 million shares, the company and Mirant shared $1.8 billion in gross proceeds. In April, 2001, management spun off the remaining 80.3% stake in Mirant to Southern investors; 0.4 of a common share in the subsidiary was distributed for each common share in the parent held. Mirant filed for Chapter 11 bankruptcy protection in July, 2003 and emerged from bankruptcy in January, 2006.

1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	© VALUE LINE PUB., INC.	09-11
15.30	18.41	16.32	17.39	14.76	14.53	14.71	15.31	16.04	18.28	*19.70*	*20.50*	Revenues per sh	*23.25*
3.64	3.90	4.25	4.17	3.89	3.54	3.45	3.53	3.65	4.03	*3.95*	*4.10*	"Cash Flow" per sh	*4.50*
1.68	1.58	1.73	1.83	2.01	1.61	1.85	1.97	2.06	2.13	*2.05*	*2.15*	Earnings per sh A	*2.50*
1.26	1.30	1.34	1.34	1.34	1.34	1.36	1.39	1.42	1.48	*1.54*	*1.60*	Div'd Decl'd per sh B ■ †	*1.80*
1.82	2.71	2.87	3.84	3.26	3.74	3.79	2.72	2.84	3.20	*4.15*	*4.65*	Cap'l Spending per sh	*3.75*
13.61	14.08	14.02	13.82	15.67	11.42	12.15	13.13	13.86	14.41	*15.05*	*15.70*	Book Value per sh C	*17.75*
677.00	685.00	698.63	666.00	682.00	699.00	716.90	734.80	741.80	741.60	*747.00*	*753.00*	Common Shs Outst'g D	*770.00*
13.8	14.0	15.7	14.3	13.2	14.6	14.6	14.8	14.7	15.9	*Bold figures are*		Avg Ann'l P/E Ratio	*15.0*
.86	.81	.82	.82	.86	.75	.80	.84	.78	.85	*Value Line*		Relative P/E Ratio	*1.00*
5.5%	5.9%	4.9%	5.1%	5.0%	5.7%	5.0%	4.7%	4.7%	4.4%	*estimates*		Avg Ann'l Div'd Yield	*4.8%*
10358	12611	11403	11585	10066	10155	10549	11251	11902	13554	*14700*	*15450*	Revenues ($mill)	*17900*
1234.0	1245.0	1372.0	1457.0	1501.0	1306.0	1510.0	1602.1	1589.0	1621.0	*1560*	*1650*	Net Profit ($mill)	*1950*
37.8%	36.9%	24.1%	25.6%	31.0%	29.9%	25.9%	27.0%	27.0%	26.9%	*35.0%*	*35.0%*	Income Tax Rate	*35.0%*
1.9%	1.6%	1.8%	1.9%	4.7%	5.1%	5.4%	4.6%	5.2%	4.4%	*4.0%*	*3.0%*	AFUDC % to Net Profit	*2.0%*
42.8%	46.4%	45.9%	48.2%	37.1%	43.8%	43.1%	45.9%	53.5%	53.2%	*54.0%*	*54.5%*	Long-Term Debt Ratio	*55.0%*
49.7%	43.5%	42.9%	37.8%	50.6%	42.2%	43.4%	43.6%	44.1%	44.3%	*44.0%*	*43.5%*	Common Equity Ratio	*43.5%*
18553	22158	22817	24372	21147	18925	20086	22135	23288	24131	*25700*	*27275*	Total Capital ($mill)	*31800*
23269	23652	24124	24544	21622	23084	24642	27534	28361	29480	*31150*	*33175*	Net Plant ($mill)	*37600*
8.1%	7.1%	7.6%	7.8%	8.5%	8.2%	8.6%	8.4%	8.1%	8.2%	*7.5%*	*7.5%*	Return on Total Cap'l	*7.5%*
11.6%	10.5%	11.1%	11.5%	11.3%	12.3%	13.2%	13.4%	14.7%	14.4%	*13.0%*	*13.5%*	Return on Shr. Equity	*13.5%*
12.2%	11.2%	12.2%	13.6%	12.3%	14.0%	15.1%	14.8%	14.9%	14.9%	*13.5%*	*13.5%*	Return on Com Equity E	*14.0%*
3.0%	2.0%	2.7%	3.6%	4.1%	2.5%	4.1%	4.4%	4.7%	4.6%	*3.5%*	*3.5%*	Retained to Com Eq	*4.0%*
77%	84%	81%	77%	71%	85%	76%	73%	69%	70%	*75%*	*74%*	All Div'ds to Net Prof	*73%*

CAPITAL STRUCTURE as of 6/30/06
Total Debt $16035 mill. **Due in 5 Yrs** $5790 mill.
LT Debt $13190 mill. **LT Interest** $692.0 mill.
(LT interest earned: 3.8x)
Pension Assets-12/05 $6.1 bill. **Oblig.** $5.6 bill.
Pfd Stock $595.6 mill. **Pfd Div'd** $32.0 mill.
Incl. 1 mill. shs. 4.20%-5.44%, cum. sub. pfd. ($100 par); 12 mill. shs. 4.95%-5.83%, cum. sub. pfd. ($1 par); 2 mill. shs. 6.0%, noncum. sub. pfd. ($25 par); 1 mill. shs. 6.0% noncum. sub. pfd. ($100 par).
Common Stock 742,286,154 shs.
MARKET CAP: $25 billion (Large Cap)

ELECTRIC OPERATING STATISTICS

	2003	2004	2005
% Change Retail Sales (KWH)	--	+3.6	+1.2
Avg. Indust. Use (MWH)	3887	4029	3676
Avg. Indust. Revs. per KWH (¢)	3.94	4.34	5.05
Capacity at Yearend (Mw)	38679	38622	40502
Peak Load, Summer (Mw)	32949	34414	35050
Annual Load Factor (%)	62.0	61.4	60.2
% Change Customers (yr-end)	+1.7	+1.5	+1.2
Fixed Charge Cov. (%)	332	375	367

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '03-'05 to '09-'11
Revenues	2.5%	.5%	*6.0%*
"Cash Flow"	1.5%	-2.0%	*3.0%*
Earnings	2.5%	2.0%	*3.5%*
Dividends	2.0%	1.0%	*4.0%*
Book Value	1.0%	-1.0%	*4.5%*

Cal-endar	QUARTERLY REVENUES (mill.) Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	2548	2845	3318	2540	11251
2004	2732	3009	3441	2720	11902
2005	2787	3120	4358	3289	13554
2006	3063	3592	*4575*	*3470*	*14700*
2007	*3250*	*3750*	*4800*	*3650*	*15450*

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	.41	.49	.85	.22	1.97
2004	.45	.48	.87	.26	2.06
2005	.43	.52	.97	.21	2.13
2006	.35	.52	*.94*	*.24*	*2.05*
2007	*.41*	*.51*	*.97*	*.26*	*2.15*

Cal-endar	QUARTERLY DIVIDENDS PAID B ■ † Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2002	.335	.335	.343	.343	1.36
2003	.343	.343	.35	.35	1.39
2004	.35	.35	.358	.358	1.42
2005	.358	.373	.373	.373	1.48
2006	.373	.388			

BUSINESS: The Southern Company's four operating subsidiaries supply electricity to 4.3 million customers in about 120,000 square miles of Georgia, Alabama, Florida, and Mississippi (79% of net inc.). Revenue breakdown, '05: residential, 34%; commercial, 30%; industrial, 22%; other, 14%. Retail revenues by state: GA, 52%; AL, 34%; FL, 8%; MS, 6%. Also has competitive generation business (17% of net inc.). Other (4%). Generating sources, '05: coal, 67%; nuclear, 14%; oil & gas, 11%; hydro, 3%; purchased, 5%. Fuel costs: 39% of revenues. '05 reported deprec. rate: 2.9%. Has 25,600 employees. Chairman, President, and CEO: David M. Ratcliffe. Inc.: DE. Address: 30 Ivan Allen Jr. Blvd., N.W., Atlanta, GA 30308. Tel.: 404-506-5000. Internet: www.southernco.com.

Earnings will probably decline in 2006 due to the expected absence of income from Southern Company's synthetic fuel investments. In 2005, synfuel investments contributed $0.11 a share to the bottom line. Southern will probably record virtually no synfuel income this year—perhaps just one cent a share—because the high price of oil has resulted in a phaseout of the tax credits that are associated with synfuel production. Accordingly, we have lowered our 2006 earnings estimate from $2.15 a share to $2.05. The revised figure is within Southern's guidance of $2.03-$2.08.

We expect the company to attain its annual earnings-growth goal of 4%-6% in 2007. The service area's economy is in good shape, producing average annual demand growth of around 2%. The utilities are allowed healthy returns on equity (with a blended average of 13.5%) and are earning them. In addition, Southern's wholesale business is expanding. The company agreed to pay $405 million for two dual-fueled (gas or oil) plants. One is a 320-megawatt facility in Florida, the other a 925-mw plant in North Carolina. (The purchase of the latter facility won't close until later this month.) Southern's strategy involves signing long-term contracts (with creditworthy counterparties) that allow Southern to pass on changes in fuel costs. This minimizes the risk to the company. Its current focus is on its home territory of the Southeast, but Southern doesn't rule out entering new regions.

Finances are sound. The fixed-charge coverage is well above the industry average. The capitalization ratios are solid, and returns on capital are high. Although Southern will have to finance some of its heavy capital spending needs through 2008 (much of which is driven by environmental upgrades), its balance sheet should remain strong.

We think this high-quality stock is suitable for conservative, income-oriented investors. The yield is well above the utility average. Dividend-growth potential through 2009-2011 is superior to that of most utility equities as well. This, along with respectable earnings growth, should produce a good risk-adjusted total return over that time.

Paul E. Debbas, CFA *September 1, 2006*

(A) Diluted earnings. Incl. Mirant earnings of 49¢ in '00. Excl. nonrecurring gain: '03, 6¢ net. Next earnings report due late October. (B) Div'ds historically paid in early Mar., June, Sept., and Dec. ■ Div'd reinvestment plan avail. † Shareholder investment plan avail. (C) Incl. deferred charges. In '05: $1.26/sh. (D) In mill., adj. for split. (E) Rate base: AL, MS, fair value; FL, GA, original cost. Allowed return on com. eq. (blended): 13.5%. Earned on avg. com. eq., '05: 15.2%. Regulatory Climate: AL, FL: Above Average; GA, MS: Average.

Company's Financial Strength	A
Stock's Price Stability	100
Price Growth Persistence	25
Earnings Predictability	90

Staff/1402
Morgan/14

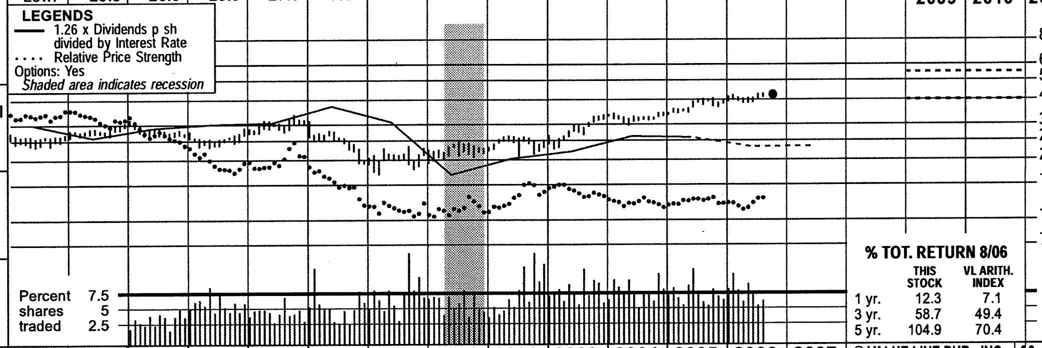
WISCONSIN ENERGY NYSE-WEC

RECENT PRICE 42.30 | P/E RATIO 16.8 (Trailing: 15.6 / Median: 15.0) | RELATIVE P/E RATIO 0.95 | DIV'D YLD 2.2% | VALUE LINE

TIMELINESS 4 Lowered 9/29/06
SAFETY 2 Lowered 7/11/97
TECHNICAL 3 Raised 5/26/06
BETA .80 (1.00 = Market)

High:	30.9	32.0	29.1	34.0	31.6	23.6	24.6	26.5	33.7	34.6	40.8	43.2	
Low:	25.8	26.0	23.0	27.0	19.1	16.8	19.1	20.2	22.6	29.5	33.3	38.2	

Target Price Range
2009 | 2010 | 2011



2009-11 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	55	(+30%)	9%
Low	40	(-5%)	1%

Insider Decisions

	N	D	J	F	M	A	M	J	J
to Buy	0	0	0	0	0	0	0	0	0
Options	0	0	0	3	0	0	1	0	0
to Sell	0	0	0	3	0	0	1	0	1

Institutional Decisions

	4Q2005	1Q2006	2Q2006
to Buy	114	123	107
to Sell	112	109	130
Hld's(000)	72297	73804	72366

% TOT. RETURN 8/06

	THIS STOCK	VL ARITH. INDEX
1 yr.	12.3	7.1
3 yr.	58.7	49.4
5 yr.	104.9	70.4

1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	© VALUE LINE PUB., INC.	09-11
14.28	15.23	15.05	15.61	15.99	15.98	15.88	15.86	17.13	19.11	28.28	34.04	32.20	34.24	29.33	32.62	**35.05**	**36.95**	Revenues per sh	**43.25**
3.28	3.33	3.22	3.84	3.81	4.28	4.25	2.96	4.13	4.53	4.48	5.44	5.68	5.71	5.16	5.78	**5.85**	**6.10**	"Cash Flow" per sh	**7.25**
1.85	1.87	1.67	1.81	1.67	2.13	1.97	.54	1.65	1.88	1.08	1.84	2.32	2.26	1.85	2.56	**2.55**	**2.65**	Earnings per sh A	**3.25**
1.16	1.23	1.29	1.34	1.40	1.46	1.51	1.54	1.56	1.56	1.37	.80	.80	.80	.83	.88	**.92**	**.96**	Div'd Decl'd per sh B ■ †	**1.10**
2.09	2.40	3.11	3.43	2.76	2.50	3.53	3.13	3.52	4.44	5.29	6.03	5.07	5.89	5.70	6.79	**8.70**	**9.60**	Cap'l Spending per sh	**8.50**
13.70	14.35	14.97	15.67	16.01	16.89	17.42	16.51	16.46	16.89	17.00	17.81	18.44	19.92	21.31	22.91	**24.25**	**25.60**	Book Value per sh C	**30.25**
101.04	101.04	103.09	105.32	108.94	110.82	111.68	112.87	115.61	118.90	118.65	115.42	116.03	118.43	116.99	116.98	**117.00**	**117.00**	Common Shs Outst'g D	**117.00**
10.6	12.1	15.6	15.2	15.2	13.1	14.3	47.3	18.0	13.3	18.7	12.1	10.5	12.4	17.5	14.5	*Bold figures are*	*Value Line estimates*	Avg Ann'l P/E Ratio	**14.0**
.79	.77	.95	.90	1.00	.88	.90	2.73	.94	.76	1.22	.62	.57	.71	.92	.78			Relative P/E Ratio	**.95**
6.0%	5.4%	5.0%	4.9%	5.5%	5.2%	5.4%	6.0%	5.2%	6.3%	6.8%	3.6%	3.3%	2.8%	2.6%	2.4%			Avg Ann'l Div'd Yield	**2.4%**

1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007		09-11
1773.8	1789.6	1980.0	2272.6	3354.7	3928.5	3736.2	4054.3	3431.1	3815.5	**4100**	**4325**	Revenues ($mill)	**5050**
219.3	61.9	189.3	231.5	132.0	218.8	270.8	269.2	221.2	304.8	**305**	**315**	Net Profit ($mill)	**385**
36.4%	33.4%	32.7%	33.8%	43.7%	40.9%	37.4%	35.5%	37.5%	32.9%	**38.0%**	**38.0%**	Income Tax Rate	**38.0%**
3.9%	16.7%	5.7%	5.8%	12.3%	6.9%	4.1%	6.9%	10.0%	12.5%	**16.0%**	**18.0%**	AFUDC % to Net Profit	**13.0%**
41.7%	44.7%	47.5%	48.8%	58.9%	62.2%	59.8%	59.9%	56.2%	52.8%	**55.5%**	**52.5%**	Long-Term Debt Ratio	**51.0%**
57.4%	54.4%	51.7%	45.9%	40.5%	37.2%	39.6%	39.6%	43.3%	46.7%	**44.0%**	**47.0%**	Common Equity Ratio	**48.5%**
3391.9	3425.8	3682.6	4372.8	4979.9	5523.8	5400.3	5963.3	5762.3	5741.5	**6445**	**6355**	Total Capital ($mill)	**7300**
3057.9	3185.0	3238.4	3846.6	4152.4	4188.0	4398.8	5926.1	5903.1	6362.9	**7005**	**7730**	Net Plant ($mill)	**9375**
8.0%	3.4%	6.6%	6.7%	4.7%	5.8%	7.1%	6.3%	5.6%	7.0%	**6.0%**	**6.5%**	Return on Total Cap'l	**7.0%**
11.1%	3.3%	9.8%	10.3%	6.4%	10.5%	12.5%	11.3%	8.8%	11.2%	**10.5%**	**10.5%**	Return on Shr. Equity	**11.0%**
11.2%	3.3%	9.9%	10.9%	6.5%	10.6%	12.6%	11.4%	8.8%	11.3%	**10.5%**	**10.5%**	Return on Com Equity E	**11.0%**
2.6%	NMF	.6%	1.9%	NMF	6.0%	8.3%	7.4%	4.9%	7.5%	**7.0%**	**6.5%**	Retained to Com Eq	**7.0%**
77%	NMF	94%	84%	NMF	43%	35%	35%	45%	34%	**36%**	**36%**	All Div'ds to Net Prof	**34%**

CAPITAL STRUCTURE as of 6/30/06
Total Debt $3807.6 mill. **Due in 5 Yrs** $1511.7 mill.
LT Debt $3025.4 mill. **LT Interest** $174.0 mill.
Incl. $203.0 mill. capitalized leases.
(LT interest earned: 3.3x)
Leases, Uncapitalized Annual rentals $51.1 mill.

Pension Assets-12/05 $976.9 mill. **Oblig.** $1.3 bill.
Pfd Stock $30.4 mill. **Pfd Div'd** $1.2 mill.
260,000 shs. 3.60%, $100 par, callable at $101;
44,498 shs. 6%, $100 par.
Common Stock 116,978,883 shs.

MARKET CAP: $4.9 billion (Mid Cap)

ELECTRIC OPERATING STATISTICS

	2003	2004	2005
% Change Retail Sales (KWH)	+.8	+1.7	+3.8
Avg. Indust. Use (MWH)	16127	16482	16578
Avg. Indust. Revs. per KWH (¢)	4.55	4.71	5.15
Capacity at Peak (Mw)	NA	NA	NA
Peak Load, Summer (Mw)	6376	5789	6344
Annual Load Factor (%)	NA	NA	NA
% Change Customers (yr-end)	+1.1	+1.3	+1.0
Fixed Charge Cov. (%)	256	248	277

ANNUAL RATES of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '03-'05 to '09-'11
Revenues	7.5%	8.5%	5.0%
"Cash Flow"	3.5%	5.0%	4.5%
Earnings	1.5%	7.5%	6.5%
Dividends	-5.0%	-11.0%	4.5%
Book Value	3.0%	5.0%	6.0%

Cal-endar	QUARTERLY REVENUES ($ mill.) Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	1229.2	914.3	878.5	1032.3	4054.3
2004	1065.9	716.4	696.6	952.2	3431.1
2005	1094.7	788.5	797.3	1135.0	3815.5
2006	1247.0	814.4	**850**	**1188.6**	**4100**
2007	**1375**	**850**	**875**	**1225**	**4325**

Cal-endar	EARNINGS PER SHARE A Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	.79	.37	.47	.64	2.26
2004	.69	.17	.26	.73	1.85
2005	.76	.48	.56	.77	2.56
2006	.88	.50	**.57**	**.60**	**2.55**
2007	**.85**	**.41**	**.60**	**.79**	**2.65**

Cal-endar	QUARTERLY DIVIDENDS PAID B ■ † Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2002	.20	.20	.20	.20	.80
2003	.20	.20	.20	.20	.80
2004	.20	.21	.21	.21	.83
2005	.22	.22	.22	.22	.88
2006	.23	.23	.23		

BUSINESS: Wisconsin Energy Corporation (WEC) is a holding company for We Energies, which provides electric, gas & steam service in WI & upper MI. Customers: 1.1 mill. elec., 1 mill. gas. Acq'd Edison Sault Electric 5/98; WICOR 4/00. Discontinued pump-manufacturing ops. in '04. Electric rev. breakdown, '05: residential, 35%; small commercial & industrial, 32%; large commercial & industrial, 26%; other, 7%. Generating sources, '05: coal, 57%; nuclear, 20%; gas, 3%; hydro, 2%; purchased, 18%. Fuel costs: 48% of revs. '05 reported deprec. rate (utility): 3.9%. Has 5,400 employees. Chairman, President & CEO: Gale E. Klappa. Inc.: WI. Address: 231 W. Michigan St., P.O. Box 2949, Milwaukee, WI 53201. Tel.: 414-221-2345. Internet: www.wisconsinenergy.com.

Wisconsin Energy is building a coal-fired unit and a gas-fired unit, and its utility subsidiary is planning to build a wind project. Under the company's Power the Future program, Wisconsin Energy a gas-fired unit started up last year, and a similar facility is under way for a 2008 in-service date. Power the Future also calls for the addition of two coal-fired units in 2009 and 2010, and construction of the first facility is under way. We Energies, the company's utility subsidiary, is leasing these plants from We Power, a nonregulated sibling, under an agreement that is designed to provide a return on equity of 12.7% for Wisconsin Energy. We Energies intends to add a wind project in 2008 or 2009. Unlike the plants under Power the Future, the wind project would be a traditionally regulated utility asset.

The company is evaluating options for its Point Beach nuclear station. Prospective buyers have been visiting the two-unit site so that Wisconsin Energy can gauge interest. We think that a plant sale is the most likely outcome, considering that the value of nuclear assets is rising because they don't have the fuel-cost and environmental concerns that are associated with gas and coal. Other alternatives include maintaining the status quo, under which a management entity is operating Point Beach and some other nuclear units; bringing in another operator; or returning the plant to management under We Energies (which we think is the least likely outcome). A decision is expected in the fourth quarter.

We estimate earnings improvement in 2007 after a flattish tally in 2006. Comparisons were favorable in the first half, due in part to overrecovery of fuel costs, but this situation will be reversed in the second half of 2006. A refueling outage for one of the Point Beach units will also hurt the year-to-year comparison in the fourth quarter. We expect modest growth in electric and gas sales to drive earnings improvement in 2007.

This untimely stock has one of the lowest yields of any dividend-paying utility equity. Although we project solid earnings and dividend growth through the decade's end, total-return potential over that time is unimpressive.

Paul E. Debbas, CFA *September 29, 2006*

(A) Diluted EPS. Excl. nonrec. gains (losses): '99, (9¢); '00, 19¢ net; '01, 1¢ net; '02, (88¢); '03, (20¢) net; '04, (81¢); gains on disc. ops.: '04, $1.54; '05, 4¢; '06, 4¢. '03 & '05 egs. don't add due to rounding. Next egs. report due late Oct. (B) Div'ds historically paid in early Mar., June, Sept., Dec. ■ Div'd reinvest. plan avail. † Shareholder invest. plan avail. (C) Incl. intang. In '05: $12.54/sh. (D) In mill., adj. for split. (E) Rate base: Net orig. cost. Rate allowed on com. eq. in '06: 11.2%; earned on avg. com. eq., '05: 11.6%. Regulat. Climate: Above Avg.

Company's Financial Strength	B++
Stock's Price Stability	100
Price Growth Persistence	60
Earnings Predictability	65

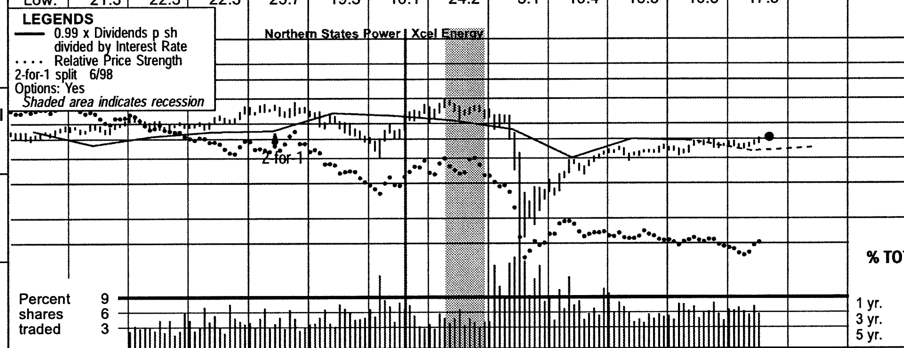
XCEL ENERGY NYSE-XEL

RECENT PRICE	P/E RATIO	(Trailing: 15.6 / Median: 15.0)	RELATIVE P/E RATIO	DIV'D YLD	VALUE LINE
20.45	15.1	Trailing: 15.6; Median: 15.0	0.87	4.4%	

TIMELINESS 2 Raised 6/30/06
SAFETY 2 Raised 5/14/04
TECHNICAL 3 Raised 5/19/06
BETA .90 (1.00 = Market)

High:	24.8	26.7	29.4	30.8	27.9	30.0	31.8	28.5	17.4	18.8	20.2	20.6
Low:	21.3	22.3	22.3	25.7	19.3	16.1	24.2	5.1	10.4	15.5	16.5	17.8

Target Price Range
2009 | 2010 | 2011



2009-11 PROJECTIONS

	Price	Gain	Ann'l Total Return
High	25	(+20%)	10%
Low	18	(-10%)	3%

Insider Decisions

	S	O	N	D	J	F	M	A	M
to Buy	0	0	0	0	0	0	0	0	0
Options	0	0	0	0	0	0	0	0	0
to Sell	0	0	0	0	0	1	0	0	0

Institutional Decisions

	3Q2005	4Q2005	1Q2006
to Buy	137	150	146
to Sell	132	132	145
Hld's(000)	225382	230561	241124

% TOT. RETURN 7/06

	THIS STOCK	VL ARITH. INDEX
1 yr.	8.1	3.0
3 yr.	58.9	52.3
5 yr.	-3.0	59.2

Xcel Energy was formed through the merger of Northern States Power and New Century Energies on August 21, 2000. NSP stockholders received one share of Xcel for every NSP share, and NCE stockholders received 1.55 shares of Xcel for each NCE share. Data prior to 2000 reflect NSP on a stand-alone basis and are not comparable with Xcel data.

1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	© VALUE LINE PUB., INC.	09-11
19.22	18.32	18.46	18.42	34.11	43.56	23.89	19.90	20.84	23.86	**25.10**	**24.80**	Revenues per sh	**27.50**
4.33	3.92	4.30	4.13	4.12	5.09	3.14	3.35	3.27	3.28	**3.80**	**3.75**	"Cash Flow" per sh	**4.25**
1.91	1.61	1.84	1.43	1.60	2.27	.42	1.23	1.27	1.20	**1.35**	**1.40**	Earnings per sh A	**1.75**
1.37	1.40	1.43	1.45	1.48	1.50	1.13	.75	.81	.85	**.88**	**.93**	Div'd Decl'd per sh B ■	**1.10**
2.99	2.90	2.99	13.87	3.63	7.40	6.04	2.49	3.19	3.25	**3.90**	**3.70**	Cap'l Spending per sh	**2.50**
15.46	15.89	16.25	16.42	16.37	17.95	11.70	12.95	12.99	13.37	**13.95**	**14.40**	Book Value per sh C	**16.00**
138.13	149.24	152.70	155.73	339.79	345.02	398.71	398.96	400.46	403.39	**406.00**	**427.00**	Common Shs Outst'g D	**435.00**
12.5	15.5	15.2	16.6	14.3	12.4	40.8	11.6	13.6	15.4	*Bold figures are*		Avg Ann'l P/E Ratio	**12.5**
.78	.89	.79	.95	.93	.64	2.23	.66	.72	.82	*Value Line*		Relative P/E Ratio	**.85**
5.7%	5.6%	5.1%	6.1%	6.4%	5.3%	6.6%	5.2%	4.7%	4.6%	*estimates*		Avg Ann'l Div'd Yield	**5.1%**
2654.2	2733.7	2819.2	2869.0	11592	15028	9524.4	7937.5	8345.3	9625.5	**10200**	**10600**	Revenues ($mill)	**12000**
274.5	251.8	298.1	240.1	545.8	784.7	177.6	510.0	526.9	499.0	**580**	**605**	Net Profit ($mill)	**740**
34.8%	27.8%	26.0%	21.6%	35.8%	28.2%	32.7%	23.7%	23.2%	25.8%	**25.0%**	**28.5%**	Income Tax Rate	**30.0%**
6.9%	6.6%	5.3%	2.5%	4.4%	7.1%	46.7%	8.9%	10.9%	8.5%	**10.0%**	**9.0%**	AFUDC % to Net Profit	**5.0%**
40.1%	40.4%	39.9%	54.7%	58.8%	66.7%	59.6%	55.3%	55.0%	51.7%	**53.5%**	**50.0%**	Long-Term Debt Ratio	**47.0%**
53.8%	51.0%	53.5%	40.5%	40.5%	32.8%	39.5%	43.8%	44.1%	47.3%	**46.0%**	**49.0%**	Common Equity Ratio	**52.0%**
3968.9	4650.9	4637.7	6316.2	13745	18911	11815	11790	11801	11398	**12375**	**12550**	Total Capital ($mill)	**13300**
4337.9	4361.3	4395.2	4451.5	15273	21165	18816	13667	14096	14696	**15325**	**15875**	Net Plant ($mill)	**16200**
8.4%	6.9%	8.1%	5.4%	6.0%	6.0%	5.4%	6.1%	6.2%	6.2%	**6.5%**	**6.5%**	Return on Total Cap'l	**7.0%**
11.6%	9.1%	10.7%	8.4%	9.6%	12.5%	3.7%	9.7%	9.9%	9.1%	**10.0%**	**9.5%**	Return on Shr. Equity	**10.5%**
12.3%	9.5%	11.2%	8.6%	9.7%	12.6%	3.7%	9.8%	10.0%	9.2%	**10.0%**	**9.5%**	Return on Com Equity E	**10.5%**
3.6%	1.2%	2.5%	NMF	.9%	4.3%	NMF	3.9%	3.9%	2.9%	**4.0%**	**3.5%**	Retained to Com Eq	**3.5%**
72%	88%	79%	100%	91%	66%	NMF	60%	62%	69%	**62%**	**65%**	All Div'ds to Net Prof	**65%**

CAPITAL STRUCTURE as of 3/31/06
Total Debt $7130.1 mill. **Due in 5 Yrs** $4045.9 mill.
LT Debt $5544.9 mill. **LT Interest** $360.4 mill.
Incl. 8,000,000 shares 7.875% tax-deductible Trust Originated Preferred Securities, liquidation value $25/share; 7,760,000 shares 7.60%, cumulative, $25 par; $100 mill. 7.85% tax-deductible Trust Preferred Securities.
(LT interest earned: 2.5x)
Leases, Uncapitalized Annual rentals $41.0 mill.
Pension Assets-12/05 $3.09 bill. **Oblig.** $2.80 bill.
Pfd Stock $105.0 mill. **Pfd Div'd** $4.2 mill.
1,049,800 shares $3.60 to $4.56, cumulative, $100 par, callable $102.00 to $103.75.
Common Stock 405,483,743 shs. **as of 4/24/06**
MARKET CAP: $8.3 billion (Large Cap)

ELECTRIC OPERATING STATISTICS

	2003	2004	2005
% Change Retail Sales (KWH)	+.7	+.3	+3.6
Avg. C & I Use (MWH)	146	145	150
Avg. C & I Revs. per KWH (¢)	5.28	5.51	6.22
Capacity at Peak (Mw)	NA	NA	NA
Peak Load, Summer (Mw)	19948	19827	20854
Annual Load Factor (%)	NA	NA	NA
% Change Customers (yr-end)	+1.7	+1.0	-.4
Fixed Charge Cov. (%)	226	230	232

ANNUAL RATES

of change (per sh)	Past 10 Yrs.	Past 5 Yrs.	Est'd '03-'05 to '09-'11
Revenues	1.5%	-2.0%	4.0%
"Cash Flow"	-2.0%	-4.5%	4.5%
Earnings	-3.5%	-5.5%	6.0%
Dividends	-5.0%	-11.0%	5.5%
Book Value	-1.0%	-4.5%	3.5%

QUARTERLY REVENUES ($ mill.)

Cal-endar	Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	2086	1722	2020	2110	7937.5
2004	2280	1797	2009	2259	8345.3
2005	2381	2074	2289	2882	9625.5
2006	2888	2074	**2425**	**2813**	**10200**
2007	**3000**	**2200**	**2500**	**2900**	**10600**

EARNINGS PER SHARE A

Cal-endar	Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2003	.31	.14	.43	.36	1.23
2004	.36	.21	.40	.31	1.27
2005	.31	.18	.47	.24	1.20
2006	.36	.24	**.49**	**.26**	**1.35**
2007	**.39**	**.23**	**.50**	**.28**	**1.40**

QUARTERLY DIVIDENDS PAID B ■

Cal-endar	Mar.31	Jun.30	Sep.30	Dec.31	Full Year
2002	.375	.375	.375	.188	1.31
2003	.188	.188	.188	.188	.75
2004	.188	.188	.208	.208	.79
2005	.208	.208	.215	.215	.85
2006	.215	.215	.223		

BUSINESS: Xcel Energy Inc. is the parent of Northern States Power, which supplies power to MN, WI, ND, SD, MI, & gas to MN, WI, ND, MI & AZ; P.S. of Colorado, which supplies power & gas to CO; & Southwestern P.S., which supplies power to TX, OK, NM, & KS. Customers: 3.3 mill. electric, 1.8 mill. gas. Electric revenue breakdown, '05: residential, 28%; commercial & industrial, 52%; other, 20%. Generating sources, '05: coal, 48%; nuclear, 11%; gas & oil, 10%; other, 1%; purchased, 30%. Fuel costs: 54% of revs. '05 reported deprec. rate: 3.2%. Has 9,800 employees, 300,000 common stockholders. Chairman, President & CEO: Richard C. Kelly. Inc.: MN. Address: 414 Nicollet Mall, Minneapolis, MN 55401. Tel.: 612-330-5500. Internet: www.xcelenergy.com.

Xcel Energy has electric rate cases pending in three states. In Minnesota, the utility is requesting an increase of $156 million based on an 11% return on a 51.7% common-equity ratio. Xcel is now collecting interim rates, and a final order is due in early September. If the recommendation of an administrative law judge is an indication, the final decision should be reasonable. In Colorado, the utility is seeking a hike of $210 million based on an 11% return on a 59.9% common-equity ratio. An order is expected in late 2006. In Texas, Xcel has filed for a boost of $48 million based on a return of 11.6% on a common-equity ratio of 51.1%. An order is expected in the fourth quarter.

More rate applications are probable. Xcel plans to file gas rate requests in Colorado and Minnesota later this year, and electric requests in North Dakota, New Mexico, and South Dakota are possible. Much of the regulatory activity is prompted by investments Xcel is making to increase generating capacity and reduce emissions of pollutants.

Rate relief should help produce higher earnings in 2006 and 2007. Besides the interim order that Xcel received in Minnesota, the utility is benefiting from electric and gas tariff hikes in Wisconsin and a gas increase in Colorado. Our 2006 estimate is the upper level of the company's target of $1.25-$1.35 a share. Our 2007 forecast is based on reasonable regulatory treatment in Colorado and Texas.

A dispute with the IRS is ongoing. The government is challenging the deductibility of Xcel's company-owned life insurance expense. Unless a settlement is reached, the case will likely go to trial in 2007. Appeals could take an additional year or two. If the company loses, its annual earning power would be hurt by $0.10 a share, and it would have to take a charge (based on year-end 2005 information) of $428 million.

We believe this timely stock has appeal for income-oriented investors. With the uncertainty of the IRS dispute more than adequately reflected in the share price, the yield is above the utility average. That's unusual for the stock of a utility with good earnings- and dividend-growth potential and sound finances.

Paul E. Debbas, CFA *August 11, 2006*

(A) Diluted EPS. Excl. nonrec. gain (loss): '01, 3¢; '02, ($6.27); gains (loss) on discont. ops.: '03, 27¢; '04, (30¢); '05, 3¢. '03 & '04 EPS don't add due to rounding. Next earnings report due late Oct. (B) Div'ds historically paid in mid-Jan., Apr., July, and Oct. ■ Div'd reinv. plan avail. (C) Incl. intang. In '05: $4.08/sh. (D) In mill., adj. for split. (E) Rate base: Varies. Rate all'd on com. eq.: MN '93, 11.47%; WI '05, 11.0%; CO '03 (elec.), 10.75%; CO '05 (gas) 10.5%; TX '86, 15.05%; earned on avg. com. eq., '05: 9.4%. Regulatory Climate: Average.

Company's Financial Strength	B++
Stock's Price Stability	35
Price Growth Persistence	5
Earnings Predictability	40

S&P UTILITY FINANCIAL RATIO BENCHMARKS

ADJ. FFO INTEREST COVERAGE								
Business Profile	AA		A		BBB		BB	
1	3.0	2.5	2.5	1.5	1.5	1.0	< 1.0	
2	4.0	3.0	3.0	2.0	2.0	1.0	< 1.0	
3	4.5	3.5	3.5	2.5	2.5	1.5	1.5	1.0
4	5.0	4.2	4.2	3.5	3.5	2.5	2.5	1.5
5	5.5	4.5	4.5	3.8	3.8	2.8	2.8	1.8
6	6.0	5.2	5.2	4.2	4.2	3.0	3.0	2.0
7	8.0	6.5	6.5	4.5	4.5	3.2	3.2	2.2
8	10.0	7.5	7.5	5.5	5.5	3.5	3.5	2.5
9	-	-	10.0	7.0	7.0	4.0	4.0	2.8
10	-	-	11.0	8.0	8.0	5.0	5.0	3.0

ADJ. FFO / AVG. TOTAL DEBT								
Business Profile	AA		A		BBB		BB	
1	20.0	15.0	15.0	10.0	10.0	5.0	< 5.0	
2	25.0	20.0	20.0	12.0	12.0	8.0	< 8.0	
3	30.0	25.0	25.0	15.0	15.0	10.0	10.0	5.0
4	35.0	28.0	28.0	20.0	20.0	12.0	12.0	8.0
5	40.0	30.0	30.0	22.0	22.0	15.0	15.0	10.0
6	45.0	35.0	35.0	28.0	28.0	18.0	18.0	12.0
7	55.0	45.0	45.0	30.0	30.0	20.0	20.0	15.0
8	70.0	55.0	55.0	40.0	40.0	25.0	25.0	15.0
9	-	-	65.0	45.0	45.0	30.0	30.0	20.0
10	-	-	70.0	55.0	55.0	40.0	40.0	25.0

ADJ. TOTAL DEBT / TOTAL CAPITAL								
Business Profile	AA		A		BBB		BB	
1	48.0	55.0	55.0	60.0	60.0	70.0	> 70.0	
2	45.0	52.0	52.0	58.0	58.0	68.0	> 68.0	
3	42.0	50.0	50.0	55.0	55.0	65.0	65.0	70.0
4	38.0	45.0	45.0	52.0	52.0	62.0	62.0	68.0
5	35.0	42.0	42.0	50.0	50.0	60.0	60.0	65.0
6	32.0	40.0	40.0	48.0	48.0	58.0	58.0	62.0
7	30.0	38.0	38.0	45.0	45.0	55.0	55.0	60.0
8	25.0	35.0	35.0	42.0	42.0	52.0	52.0	58.0
9	-	-	32.0	40.0	40.0	50.0	50.0	55.0
10	-	-	25.0	35.0	35.0	48.0	48.0	52.0

Updated June 2, 2004

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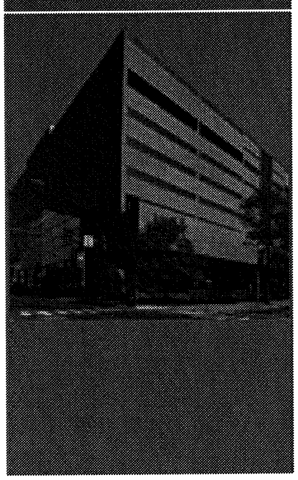

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Economic Research

Survey of Professional Forecasters

Release Date: February 13, 2006

A complete writeup of this survey, including all tables, is available here in .pdf format.

First Quarter 2006

Release Date: February 13, 2006

A Rebound Is Expected in the First Quarter
The U.S. economy will grow strongly in the first quarter, following unexpectedly slow growth in last year's fourth quarter, according to 53 forecasters surveyed by the Federal Reserve Bank of Philadelphia. The forecasters now project first-quarter growth at an annual rate of 4.4 percent, marking an upward revision from their previous estimate of 3.7 percent in the survey of three months ago. Second-quarter growth is seen at an annual rate of 3.4 percent, up 0.1 percentage point from the previous estimate. On an annual basis, the forecasters project steady year-over-year growth at 3.2 percent in each of the next two years. Interestingly, these rates are the same as the forecasters' new estimate of average annual growth over the next 10 years, suggesting that they see little in the way of transitional dynamics in the U.S. economy over the medium and long run.

With their call for relatively steady growth, the forecasters see pretty steady performance in the labor market. The unemployment rate is seen holding constant at 4.8 percent over the four quarters of this year and rising just a bit, to 4.9 percent, in 2007. Previously, the forecasters expected unemployment to average 4.9 percent in 2006. On the jobs front, the forecasters see nonfarm payroll employment increasing at a rate of 188,000 jobs per month this quarter, down marginally from their previous estimate of 199,000. For the year, the forecasters see payrolls increasing at a rate of 165,000 per month, virtually unchanged from their previous estimate of 172,000. Job gains in 2007 are seen averaging 149,000 per month, as the table below shows.

Little Risk of Rising Inflation
Beyond the very short term, the forecasters see little threat of accelerating inflation. They predict CPI inflation at an annual rate of 2.0 percent in the current quarter and 2.5 percent in each of the following two quarters. On a fourth-quarter over fourth-quarter basis, CPI inflation is forecast at 2.4 percent in 2006 and 2.3 percent in 2007. Over the longer run, the forecasters see inflation averaging 2.5 percent over the next 10 years, the same rate they have been expecting since the surveys conducted in the late 1990s.

In recent surveys, we have been asking the forecasters for additional details on their expectations for inflation, in an attempt to see if there is any horizon over which the forecasters are worried about inflation. In answer to these special questions, the forecasters report that they expect inflation in 2008 to average 2.3 percent, the same rate they expect in 2007. Over the next five years, inflation will average 2.5 percent, the same rate the forecasters expect over the 10-year horizon, suggesting that no

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acceleration is seen over the second five-year period of the 10-year horizon. These forecasts, summarized in the table below, suggest that beyond a short-term transitional period, the forecasters are not worried about accelerating inflation.

Forecasters Trim Estimates for Long-Run Growth in Output and Productivity
In first-quarter surveys, we ask the forecasters for their long-run projections for an expanded set of variables, including growth in output and productivity, as well as returns on financial assets. As the table below shows, the forecasters have trimmed the long-run outlook for real GDP growth and growth in productivity, but only by a very small amount. Over the next 10 years, the forecasters think real GDP will grow at an annual rate of 3.20 percent. Part of that growth comes from a more productive labor force. The forecasters see labor productivity growing over the next 10 years at an annual rate of 2.44 percent. Over the next 10 years, equities (as measured by the S&P 500 index) will return 7 percent per year and 10-year Treasury bonds will return 5 percent, estimates that are unchanged from the survey conducted last year. Three-month Treasury bills will, in contrast, return a bit more than the forecasters previously thought. They now think bills will return 4.25 percent per year over the next 10 years, up from their previous estimate of 3.70 percent.

The Federal Reserve Bank of Philadelphia thanks the following forecasters for their participation in our surveys:

Joseph T. Abate, Lehman Brothers; **Scott Anderson,** Wells Fargo and Company; **Robert J. Barbera,** ITG; **David W. Berson**, Fannie Mae; **George Brinton**, Brinton Economics, Inc.; **Joseph Carson,** Alliance Capital Management; **Gary Ciminero, CFA**, Independent Economic Advisory; **Richard DeKaser**, National City Corporation; **Rajeev Dhawan**, Georgia State University; **Doug Duncan,** Mortgage Bankers Association; **Michael R. Englund**, Action Economics, LLC; **Gerard F. Fuda**, Independent Economist; **Stephen Gallagher,** Societe Generale; **James Glassman**, JP Morgan Chase & Co.; **Global Insight**; **Keith Hembre,** First American Funds; **David Huether,** National Association of Manufacturers; **William B. Hummer**, Wayne Hummer Investments; **Saul Hymans**, **Joan Crary**, and **Janet Wolfe**, RSQE, The University of Michigan; **Fred Joutz**, Benchmark Forecasts and Research Program on Forecasting, George Washington University; **Kurt Karl**, Swiss Re; **Dr. Irwin Kellner**, Hofstra University/MarketWatch/North Fork Bank; **Thomas Lam,** UOB Group; **L. Douglas Lee,** Economics from Washington; **Joseph Liro**, Stone & McCarthy Research Associates; **John Lonski**, Moody's Investors Service; **Dean Maki,** Barclays Capital; **Edward F. McKelvey**, Goldman Sachs; **Jim Meil**, Eaton Corporation; **Anthony Metz,** Pareto Optimal Economics; **Michael Moran,** Daiwa Securities America; **Joel L. Naroff**, Naroff Economic Advisors; **Mark Nielson, Ph.D.**, MacroEcon Global Advisors; **Michael P. Niemira**, International Council of Shopping Centers; **Martin A. Regalia**, U.S. Chamber of Commerce; **David Resler**, Nomura Securities International, Inc.; **David Rosenberg**, Merrill Lynch; **John Ryding,** Bear, Stearns, and Company, Inc.; **David F. Seiders**, National Association of Home Builders; **Xiaobing Shuai, Ph.D.,** Chmura Economics & Analytics; **Sean M. Snaith, Ph.D.,** University of the Pacific; **Constantine G. Soras, Ph.D.**, Verizon Communications; **Neal Soss,** Credit Suisse First Boston; **Stephen Stanley,** RBS Greenwich Capital; **Susan M. Sterne**, Economic Analysis Associates, Inc.; **Thomas Kevin Swift**, American Chemistry Council; **David Teolis,** General Motors Corporation; **Lea Tyler**, Oxford Economics USA, Inc.; **Albert M. Wojnilower**; **Richard Yamarone**, Argus Research Group; **Mark Zandi**, Economy.com; **Ellen Beeson Zentner**, Bank of Tokyo-Mitsubishi UFJ, Ltd.

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For further information about the Survey of Professional Forecasters, contact:

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To subscribe to the survey, go to www.philadelphiafed.org/forms/orderform.htm. This three-page writeup contains partial results of the survey. More detailed tables are available. These tables can be accessed on the Internet at: http://www.philadelphiafed.org/econ/spf/index.html.

NEXT SURVEY RELEASE (2006 Q2): May 15, 2006

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Release Date: February 13, 2006

FIRST QUARTER 2006

A Rebound Is Expected in the First Quarter

The U.S. economy will grow strongly in the first quarter, following unexpectedly slow growth in last year's fourth quarter, according to 53 forecasters surveyed by the Federal Reserve Bank of Philadelphia. The forecasters now project first-quarter growth at an annual rate of 4.4 percent, marking an upward revision from their previous estimate of 3.7 percent in the survey of three months ago. Second-quarter growth is seen at an annual rate of 3.4 percent, up 0.1 percentage point from the previous estimate. On an annual basis, the forecasters project steady year-over-year growth at 3.2 percent in each of the next two years. Interestingly, these rates are the same as the forecasters' new estimate of average annual growth over the next 10 years, suggesting that they see little in the way of transitional dynamics in the U.S. economy over the medium and long run.

With their call for relatively steady growth, the forecasters see pretty steady performance in the labor market. The unemployment rate is seen holding constant at 4.8 percent over the four quarters of this year and rising just a bit, to 4.9 percent, in 2007. Previously, the forecasters expected unemployment to average 4.9 percent in 2006. On the jobs front, the forecasters see nonfarm payroll employment increasing at a rate of 188,000 jobs per month this quarter, down marginally from their previous estimate of 199,000. For the year, the forecasters see payrolls increasing at a rate of 165,000 per month, virtually unchanged from their previous estimate of 172,000. Job gains in 2007 are seen averaging 149,000 per month, as the table below shows.

The following table compares forecasts for selected variables from the current survey with those from three months ago.

	Real GDP (%)		*Unemployment Rate (%)*		*Change in Payrolls (000s/month)*	
	Previous	*New*	*Previous*	*New*	*Previous*	*New*
Quarterly data:						
2006: Q1	3.7	4.4	5.0	4.8	199.0	187.7
Q2	3.3	3.4	4.9	4.8	184.0	178.7
Q3	3.2	3.0	4.9	4.8	182.7	157.8
Q4	3.2	3.2	5.0	4.8	147.3	140.8
2007: Q1	N.A.	3.3	N.A.	4.9	N.A.	151.3
Annual average data:						
2006	3.4	3.2	4.9	4.8	172.1	165.4
2007	N.A.	3.2	N.A.	4.9	N.A.	149.0

Little Risk of Rising Inflation

Beyond the very short term, the forecasters see little threat of accelerating inflation. They predict CPI inflation at an annual rate of 2.0 percent in the current quarter and 2.5 percent in each of the following two quarters. On a fourth-quarter over fourth-quarter basis, CPI inflation is forecast at 2.4 percent in 2006 and 2.3 percent in 2007. Over the longer run, the forecasters see inflation averaging 2.5 percent over the next 10 years, the same rate they have been expecting since the surveys conducted in the late 1990s.

In recent surveys, we have been asking the forecasters for additional details on their expectations for inflation, in an attempt to see if there is any horizon over which the forecasters are worried about inflation. In answer to these special questions, the forecasters report that they expect inflation in 2008 to average 2.3 percent, the same rate they expect in 2007. Over the next five years, inflation will average 2.5 percent, the same rate the forecasters expect over the 10-year horizon, suggesting that no acceleration is seen over the second five-year period of the 10-year horizon. These forecasts, summarized in the table below, suggest that beyond a short-term transitional period, the forecasters are not worried about accelerating inflation.

Median Forecasts for the Trajectory of CPI Inflation Over the Next 10 Years (%)
First Quarter 2006 Survey

Quarterly data:	
2006:Q1	2.0
Q2	2.5
Q3	2.5
Q4	2.4
2007:Q1	2.3
Annual average data:	
2006	2.4
2007	2.3
2008	2.3
Long-Term (Annual Average):	
2006-2010	2.50
2011-2015	2.50
2006-2015	2.50

Forecasters Trim Estimates for Long-Run Growth in Output and Productivity

In first-quarter surveys, we ask the forecasters for their long-run projections for an expanded set of variables, including growth in output and productivity, as well as returns on financial assets. As the table below shows, the forecasters have trimmed the long-run outlook for real GDP growth and growth in productivity, but only by a very small amount. Over the next 10 years, the forecasters think real GDP will grow at an annual rate of 3.20 percent. Part of that growth comes from a more productive labor force. The forecasters see labor productivity growing over the next 10 years at an annual rate of 2.44 percent. Over the next 10 years, equities (as measured by the S&P 500 index) will return 7 percent per year and 10-year Treasury bonds will return 5 percent, estimates that are unchanged from the survey conducted last year. Three-month Treasury bills will, in contrast, return a bit more than the forecasters previously thought. They now think bills will return 4.25 percent per year over the next 10 years, up from their previous estimate of 3.70 percent.

Long-Term (10-year) Forecasts (%)

	First Quarter 2005	*Current Survey*
Real GDP Growth	3.30	3.20
Productivity Growth	2.50	2.44
Stock Returns (S&P 500)	7.00	7.00
Bond Returns (10-year)	5.00	5.00
Bill Returns (3-month)	3.70	4.25

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For further information about the Survey of Professional Forecasters, contact:

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Philadelphia, PA 19106 e-mail: PHIL.SPF@phil.frb.org.

To subscribe to the survey, go to www.philadelphiafed.org/forms/orderform.htm. This three-page writeup contains partial results of the survey. More detailed tables are available. These tables can be accessed on the Internet at: http://www.philadelphiafed.org/econ/spf/index.html.

NEXT SURVEY RELEASE (2006Q2): May 15, 2006

SURVEY OF PROFESSIONAL FORECASTERS
MAJOR MACROECONOMIC INDICATORS, 2006-2007

	2006 Q1	Q2	Q3	Q4	2007 Q1	ANNUAL AVERAGE 2006	2007
PERCENT GROWTH AT ANNUAL RATES							
1. REAL GDP (BILLIONS, CHAIN WEIGHTED)	4.4	3.4	3.0	3.2	3.3	3.2	3.2
2. GDP PRICE INDEX (2000=100)	2.5	2.1	2.2	2.0	2.4	2.6	2.2
3. GROSS DOMESTIC PRODUCT (GDP) ($ BILLIONS)	6.8	5.9	5.3	5.2	5.4	5.9	5.4
4. CONSUMER PRICE INDEX (CPI-U) (ANNUAL RATE)	2.0	2.5	2.5	2.4	2.3	2.4	2.3
VARIABLES IN LEVELS							
5. UNEMPLOYMENT RATE (PERCENT)	4.8	4.8	4.8	4.8	4.9	4.8	4.9
6. 3-MONTH TREASURY BILL RATE (PERCENT)	4.4	4.6	4.7	4.7	4.6	4.5	4.6
7. 10-YEAR TREASURY BOND YIELD (PERCENT)	4.6	4.8	4.8	4.9	5.0	4.8	5.0

NOTES: THE FIGURES ON EACH LINE ARE MEDIANS OF 53 INDIVIDUAL FORECASTS.
N.A. = NOT APPLICABLE.

SURVEY OF PROFESSIONAL FORECASTERS

First Quarter 2006

Tables

Note: Data in these tables listed as "actual" are the data that were available to the forecasters when they were sent the survey questionnaire on January 27; the tables do not reflect subsequent revisions to the data. All forecasts were received on or before February 8, 2006. **Note on forecasts for corporate profits:** This is the first survey to incorporate forecasts for corporate profits after tax *with* inventory valuation adjustment (IVA) and capital consumption adjustment (CCAdj). Previous surveys used the after-tax measure without these adjustments.

TABLE ONE

MAJOR MACROECONOMIC INDICATORS, 2006-2007
MEDIANS OF FORECASTER PREDICTIONS
QUARTERLY DATA

		ACTUAL	FORECASTS				
		2005	2006				2007
	NO.	Q4	Q1	Q2	Q3	Q4	Q1
1. GROSS DOMESTIC PRODUCT (GDP) ($ BILLIONS)	50	12735.3	12946.1	13133.6	13305.6	13475.7	13654.3
2. GDP PRICE INDEX (2000=100)	52	113.41	114.10	114.71	115.33	115.91	116.60
3. CORPORATE PROFITS AFTER TAXES ($ BILLIONS)	36	N.A.	1064.3	1080.0	1095.0	1104.4	1114.5
4. UNEMPLOYMENT RATE (PERCENT)	53	4.9	4.8	4.8	4.8	4.8	4.9
5. INDUSTRIAL PRODUCTION (2002=100)	49	109.0	110.3	111.3	112.2	113.1	113.8
6. NEW PRIVATE HOUSING STARTS (ANNUAL RATE, MILLIONS)	49	2.04	1.98	1.94	1.91	1.88	1.85
7. CONSUMER PRICE INDEX (CPI-U) (ANNUAL RATE)	51	3.2	2.0	2.5	2.5	2.4	2.3
8. 3-MONTH TREASURY BILL RATE (PERCENT)	47	3.83	4.36	4.60	4.65	4.65	4.64
9. AAA CORPORATE BOND YIELD (PERCENT)	43	5.38	5.50	5.87	5.95	5.95	6.07
10. 10-YEAR TREASURY BOND YIELD (PERCENT)	51	4.49	4.60	4.80	4.85	4.90	5.00
11. REAL GDP (BILLIONS, CHAIN WEIGHTED)	53	11233.5	11355.0	11449.0	11533.9	11626.3	11720.6
12. TOTAL CONSUMPTION EXPENDITURES (BILLIONS, CHAIN WEIGHTED)	51	7930.2	8004.6	8061.3	8124.0	8186.4	8243.8
13. NONRESIDENTIAL FIXED INVESTMENT (BILLIONS, CHAIN WEIGHTED)	50	1314.2	1345.0	1372.0	1396.9	1421.6	1442.3
14. RESIDENTIAL FIXED INVESTMENT (BILLIONS, CHAIN WEIGHTED)	50	615.2	612.9	608.5	603.0	596.1	592.5
15. FEDERAL GOVERNMENT C & I (BILLIONS, CHAIN WEIGHTED)	48	736.1	747.3	754.2	757.6	761.2	764.7
16. STATE AND LOCAL GOVT C & I (BILLIONS, CHAIN WEIGHTED)	48	1249.8	1255.9	1262.2	1269.7	1276.4	1282.4
17. CHANGE IN PRIVATE INVENTORIES (BILLIONS, CHAIN WEIGHTED)	51	25.7	28.2	32.1	36.0	36.0	40.0
18. NET EXPORTS (BILLIONS, CHAIN WEIGHTED)	51	-650.3	-653.7	-656.0	-653.9	-652.0	-645.7

NOTE: THE COLUMN HEADED NO. SHOWS THE NUMBER OF FORECASTERS RESPONDING.

TABLE ONE CONTINUED

MAJOR MACROECONOMIC INDICATORS, 2006-2007
MEDIANS OF FORECASTER PREDICTIONS
ANNUAL DATA

	NUMBER OF FORE-CASTERS	ACTUAL 2005	FORECAST 2006	FORECAST 2007
1. GROSS DOMESTIC PRODUCT (GDP) ($ BILLIONS)	50	12479.5	13215.9	13929.0
2. GDP PRICE INDEX (2000=100)	52	112.14	115.02	117.54
3. CORPORATE PROFITS AFTER TAXES ($ BILLIONS)	36	N.A.	1071.6	1131.6
4. UNEMPLOYMENT RATE (PERCENT)	53	5.1	4.8	4.9
5. INDUSTRIAL PRODUCTION (2002=100)	49	108.0	111.8	115.5
6. NEW PRIVATE HOUSING STARTS (ANNUAL RATE, MILLIONS)	49	2.07	1.92	1.82
7. CONSUMER PRICE INDEX (CPI-U) (ANNUAL RATE)	51	3.7	2.4	2.3
8. 3-MONTH TREASURY BILL RATE (PERCENT)	47	3.15	4.54	4.60
9. AAA CORPORATE BOND YIELD (PERCENT)	43	5.24	5.83	6.10
10. 10-YEAR TREASURY BOND YIELD (PERCENT)	51	4.29	4.80	4.99
11. REAL GDP (BILLIONS, CHAIN WEIGHTED)	53	11131.1	11487.3	11850.5
12. TOTAL CONSUMPTION EXPENDITURES (BILLIONS, CHAIN WEIGHTED)	51	7858.1	8097.6	8329.5
13. NONRESIDENTIAL FIXED INVESTMENT (BILLIONS, CHAIN WEIGHTED)	50	1287.7	1384.4	1470.3
14. RESIDENTIAL FIXED INVESTMENT (BILLIONS, CHAIN WEIGHTED)	50	602.2	604.2	595.1
15. FEDERAL GOVERNMENT C & I (BILLIONS, CHAIN WEIGHTED)	48	738.4	755.1	767.3
16. STATE AND LOCAL GOVT C & I (BILLIONS, CHAIN WEIGHTED)	48	1246.5	1266.3	1289.8
17. CHANGE IN PRIVATE INVENTORIES (BILLIONS, CHAIN WEIGHTED)	51	17.2	33.9	40.0
18. NET EXPORTS (BILLIONS, CHAIN WEIGHTED)	51	-631.9	-654.7	-636.8

TABLE TWO

MAJOR MACROECONOMIC INDICATORS, 2006-2007
PERCENTAGE CHANGES AT ANNUAL RATES

	Q4 2005 TO Q1 2006	Q1 2006 TO Q2 2006	Q2 2006 TO Q3 2006	Q3 2006 TO Q4 2006	Q4 2006 TO Q1 2007	2005 TO 2006	2006 TO 2007
1. GROSS DOMESTIC PRODUCT (GDP) ($ BILLIONS)	6.8	5.9	5.3	5.2	5.4	5.9	5.4
2. GDP PRICE INDEX (2000=100)	2.5	2.1	2.2	2.0	2.4	2.6	2.2
3. CORPORATE PROFITS AFTER TAXES ($ BILLIONS)	13.5	6.0	5.7	3.5	3.7	11.0	5.6
4. UNEMPLOYMENT RATE (PERCENT)	-0.1	0.0	0.0	0.0	0.1	-0.3	0.1
5. INDUSTRIAL PRODUCTION (2002=100)	4.9	3.5	3.3	3.4	2.6	3.5	3.3
6. NEW PRIVATE HOUSING STARTS (ANNUAL RATE, MILLIONS)	-10.4	-8.5	-4.5	-6.9	-6.2	-7.0	-5.2
7. CONSUMER PRICE INDEX (CPI-U) (ANNUAL RATE)	-1.2	0.5	0.0	-0.1	-0.1	-1.3	-0.1
8. 3-MONTH TREASURY BILL RATE (PERCENT)	0.53	0.24	0.05	0.00	-0.01	1.39	0.06
9. AAA CORPORATE BOND YIELD (PERCENT)	0.12	0.37	0.08	0.00	0.12	0.59	0.27
10. 10-YEAR TREASURY BOND YIELD (PERCENT)	0.11	0.20	0.05	0.05	0.10	0.51	0.19
11. REAL GDP (BILLIONS, CHAIN WEIGHTED)	4.4	3.4	3.0	3.2	3.3	3.2	3.2
12. TOTAL CONSUMPTION EXPENDITURES (BILLIONS, CHAIN WEIGHTED)	3.8	2.9	3.1	3.1	2.8	3.0	2.9
13. NONRESIDENTIAL FIXED INVESTMENT (BILLIONS, CHAIN WEIGHTED)	9.7	8.2	7.5	7.3	6.0	7.5	6.2
14. RESIDENTIAL FIXED INVESTMENT (BILLIONS, CHAIN WEIGHTED)	-1.5	-2.9	-3.6	-4.5	-2.4	0.3	-1.5
15. FEDERAL GOVERNMENT C & I (BILLIONS, CHAIN WEIGHTED)	6.2	3.8	1.8	1.9	1.9	2.3	1.6
16. STATE AND LOCAL GOVT C & I (BILLIONS, CHAIN WEIGHTED)	2.0	2.0	2.4	2.1	1.9	1.6	1.9
17. CHANGE IN PRIVATE INVENTORIES (BILLIONS, CHAIN WEIGHTED)	2.5	3.9	3.9	0.0	4.0	16.7	6.1
18. NET EXPORTS (BILLIONS, CHAIN WEIGHTED)	-3.4	-2.3	2.1	1.9	6.3	-22.8	17.8

NOTE: FIGURES FOR UNEMPLOYMENT RATE, PERCENT CHANGE IN CONSUMER PRICE INDEX, TREASURY BILL RATE, AAA CORPORATE BOND YIELD, AND 10-YEAR TREASURY BOND YIELD ARE CHANGES IN THESE RATES, IN PERCENTAGE POINTS.
ALL OTHERS ARE PERCENTAGE CHANGES AT ANNUAL RATES.
FIGURES FOR CHANGE IN PRIVATE INVENTORIES AND NET EXPORTS ARE CHANGES IN BILLIONS OF CHAIN-WEIGHTED DOLLARS.

TABLE THREE

ESTIMATED PROBABILITY OF DECLINE IN REAL GDP

ESTIMATED PROBABILITY (CHANCES IN 100)	Q4 2005 TO Q1 2006	Q1 2006 TO Q2 2006	Q2 2006 TO Q3 2006	Q3 2006 TO Q4 2006	Q4 2006 TO Q1 2007
	NUMBER OF FORECASTERS				
10 OR LESS	48	39	34	26	16
11 TO 20	1	10	13	18	21
21 TO 30	1	1	1	4	10
31 TO 40	0	0	2	1	0
41 TO 50	0	0	0	0	2
51 TO 60	0	0	0	1	0
61 TO 70	0	0	0	0	0
71 TO 80	0	0	0	0	0
81 TO 90	0	0	0	0	0
91 AND OVER	0	0	0	0	0
NOT REPORTING	3	3	3	3	4
MEDIAN PROBABILITY	1	5	10	10	15
MEAN PROBABILITY	3	7	11	14	17

NOTE: TOTAL NUMBER OF FORECASTERS REPORTING IS 50.

TABLE FOUR

MEAN PROBABILITY OF CHANGES IN GDP AND PRICES 2005-2006 AND 2006-2007

MEAN PROBABILITY ATTACHED TO POSSIBLE PERCENT CHANGES IN REAL GDP:

	2005-2006	2006-2007
6.0 OR MORE	0.21	0.20
5.0 TO 5.9	1.54	1.35
4.0 TO 4.9	12.15	10.01
3.0 TO 3.9	49.91	39.22
2.0 TO 2.9	25.85	30.69
1.0 TO 1.9	7.03	11.25
0.0 TO 0.9	2.03	4.42
-1.0 TO -0.1	0.74	1.76
-2.0 TO -1.1	0.36	0.72
LESS THAN -2.0	0.18	0.38

MEAN PROBABILITY ATTACHED TO POSSIBLE PERCENT CHANGES IN GDP PRICE INDEX:

	2005-2006	2006-2007
8.0 OR MORE	0.14	0.10
7.0 TO 7.9	0.24	0.25
6.0 TO 6.9	0.58	0.50
5.0 TO 5.9	1.68	1.50
4.0 TO 4.9	5.46	5.51
3.0 TO 3.9	25.04	20.73
2.0 TO 2.9	52.16	46.40
1.0 TO 1.9	12.38	21.19
0.0 TO 0.9	2.10	3.64
WILL DECLINE	0.22	0.19

NOTE: TOTAL NUMBER OF FORECASTERS REPORTING IS 50.

TABLE FIVE

LONG-TERM (10 YEAR) FORECASTS

SERIES: CPI INFLATION RATE

STATISTIC	
MINIMUM	1.750
LOWER QUARTILE	2.300
MEDIAN	2.500
UPPER QUARTILE	2.725
MAXIMUM	3.700
MEAN	2.512
STD. DEV.	0.354
N	49
MISSING	4

SERIES: REAL GDP GROWTH RATE

STATISTIC	
MINIMUM	2.500
LOWER QUARTILE	3.000
MEDIAN	3.200
UPPER QUARTILE	3.400
MAXIMUM	4.250
MEAN	3.189
STD. DEV.	0.301
N	49
MISSING	4

SERIES: PRODUCTIVITY GROWTH

STATISTIC	
MINIMUM	1.600
LOWER QUARTILE	2.175
MEDIAN	2.437
UPPER QUARTILE	2.600
MAXIMUM	3.500
MEAN	2.404
STD. DEV.	0.355
N	46
MISSING	7

SERIES: STOCK RETURNS (S&P 500)

STATISTIC	
MINIMUM	5.000
LOWER QUARTILE	6.000
MEDIAN	7.000
UPPER QUARTILE	8.000
MAXIMUM	15.000
MEAN	7.340
STD. DEV.	1.800
N	41
MISSING	12

SERIES: BOND RETURNS (10-YEAR)

STATISTIC	
MINIMUM	4.000
LOWER QUARTILE	4.842
MEDIAN	5.000
UPPER QUARTILE	5.500
MAXIMUM	7.200
MEAN	5.146
STD. DEV.	0.579
N	44
MISSING	9

SERIES: BILL RETURNS (3-MONTH)

STATISTIC	
MINIMUM	2.800
LOWER QUARTILE	3.985
MEDIAN	4.250
UPPER QUARTILE	4.575
MAXIMUM	5.500
MEAN	4.200
STD. DEV.	0.631
N	44
MISSING	9

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ELECTRICPERSPECTIVES

September/October 2003

The Dividend Advantage

By Paul Donahue

Paul Donahue is managing director in the global markets capital group at Morgan Stanley in New York.

The utility industry generally attracts investors who have a dividend focus. Retail investors own utility stocks for the dividend income, and institutional investors own them in income portfolios. Every investor group in this sector considers dividend income when evaluating the investment merits of a particular stock.

In the last few years, however, power companies as a group began paying out a smaller portion of their earnings. Instead, they allocated capital to growth opportunities and strategic activity—they expected diversified activities to create more shareholder value. Many shareholders have been quick to point out that capital for strategic activity outside the regulated business has not historically been a shareholder value-creating practice. A well known industry analyst for a large mutual fund complex has summed it up best: "In general, nonutility investments have earned very low returns on capital...and reinvestment opportunities in the utility ratebase are not that significant."

But dividend programs have regained sway, helped in part by the Jobs and Growth Tax Relief Reconciliation Act signed last May. In fact, the Act has profound implications for the power industry. It cut the tax rate for both dividends and capital gains received by an investor. If he holds a stock at least 60 days, the tax rate on his dividends will be 15 percent rather than the highest ordinary rate (formerly 38.6 percent; now 35.0 percent). The Act also reduced the 20-percent tax on net long-term capital gains to 15 percent.

In essence, this change eliminated the historical tax bias toward the creation of capital gains at the expense of current income. This change will also affect how shareholders value equities, which in turn will have implications for the cost of equity capital.
It is clear that investors are paying increased attention to dividends. It is also clear that investors have returned to traditional valuation models. What is less obvious is the impact of dividend tax relief on these models. For the power industry, this is likely to be significant, and that's why companies need to reevaluate dividend policy today in the context of current shareholder views, rating agency concerns, and long-term value creation.

From Dividends to Buybacks

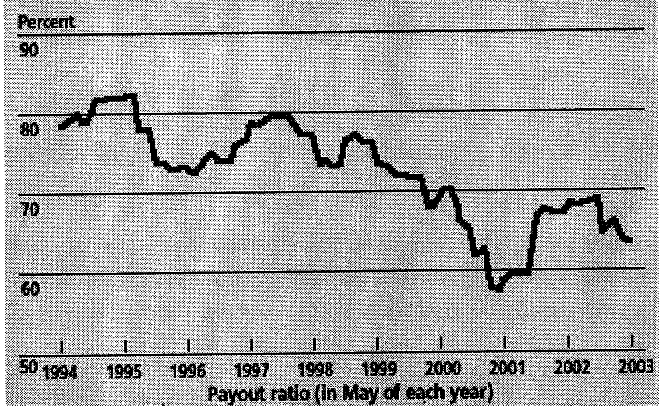
During much of the last century, tax policy gave most companies meaningful incentives to create shareholder value through capital gains rather than by distributing earnings directly to shareholders. Still, at least until the 1990s, power companies had few opportunities to redeploy earnings into businesses with strong growth prospects. As a result, those companies paid out a large percentage of their earnings in the form of dividends. As earnings grew, so did dividends.

Another reason for those high-dividend policies was the relative unattractiveness of stock buybacks. Since regulated utilities (unlike most companies in other industries) earn returns based on their equity base, shrinking that base through stock buybacks has negative implications. In essence, utilities did not have the same opportunity as other industries to convert earnings into the more tax-efficient capital gains.

But by the mid 1990s, the American economy was strong, companies in many sectors were growing rapidly, and perceived high-growth businesses (trading, merchant generation, etc.) proliferated. For the first time the market viewed power companies as having a new use for earnings: growth. Dividend payout ratios began to decline as earnings were redeployed to create more shareholder value. (See Figure 1.) Power stocks suddenly were more than simple income investments: They were growth stories as well.

FIGURE 1

DIVIDEND PAYOUT RATIOS SINCE 1994



Source: Morgan Stanley

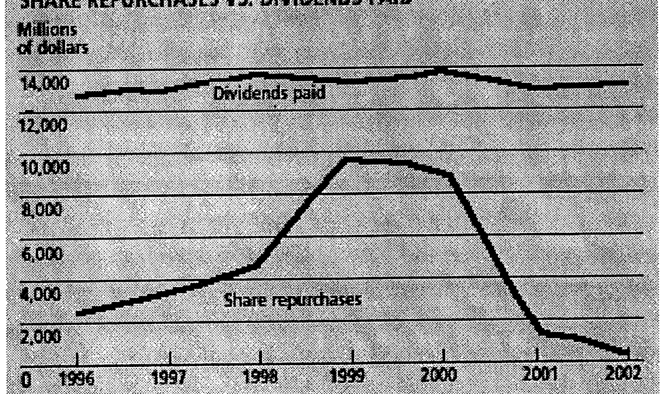
With declining payout ratios and greater prospects for growth, some management teams felt their companies were creating more value than what their stocks reflected. Companies across the board recognized the potent combination of flexibility and tax efficiency unique to stock buyback programs. In fact, this trend became so pronounced that the dollar volume of announced and completed buybacks actually equaled the amount of dividends paid in 1999 for the market overall. (See Figure 2.) Indeed, even the utility sector saw share repurchases begin to approach dividends that year.

The Buyback Rationale

When ordinary income was taxed at rates far exceeding that of capital gains, the debate of buybacks versus dividends was a one-sided argument. The Tax Relief Act has now balanced the debate. But there are still several differences between the two options that may make one or the other more attractive to power companies.

FIGURE 2

SHARE REPURCHASES VS. DIVIDENDS PAID



Source: EEI and Compustat

Before the Act, the primary rationale for companies to pursue buybacks over dividends was that the former represented a more tax-efficient way of returning capital to shareholders. Although this advantage no longer exists, there are several other benefits of stock buybacks that continue to be equally (or even more) important for companies to consider.

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Flexibility is a key benefit. A company can announce a buyback, execute it slowly (open market) or quickly (tender), and change terms and timing as it sees fit. Also, it can then choose what portion, if any, of the buyback to execute (though shareholder displeasure for not completing an announced buyback can be severe). This nearly unlimited flexibility can distort clear corporate finance thinking. Instead of using buybacks to distribute value to shareholders, under- performing companies often use the programs to support their stock price. Although you can argue that this is a form of value creation, the investment community sometimes perceives it simply as corporate (and management) preservation. Nonetheless, when it comes to distributing capital to shareholders, flexibility remains an important rationale in selecting a stock buyback over a dividend increase.

Buybacks also allow shareholder self-selection. In other words, a shareholder can choose how to accept the distribution of value. By selling stock into a buyback, a shareholder theoretically receives a higher price for the stock than he would have otherwise. By not selling, he effectively reinvests in the company since his post-buyback pro rata ownership of it is greater.

Companies also like buybacks because they help manage the impact of new equity issuances, particularly those arising from the exercise of stock options. In the last decade, stock buyback programs were a good response to rising equity values and corporate America's increased use of options as employee incentives.

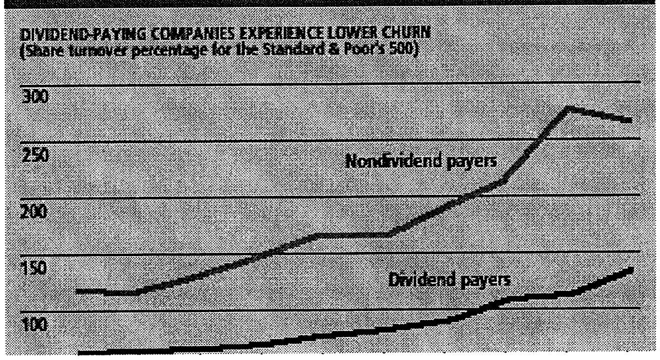
Dividends and the Clientele Effect

Still, returning capital to shareholders through a recurring dividend has always had advantages over buybacks. And now that the primary argument against dividends has been resolved (the inequity of the tax on ordinary income versus capital gains), the benefits of dividends have become even clearer.

Those benefits derive from the "clientele effect," that is, the buying or selling of equities that occurs when a company policy—e.g., on dividends or governance—changes. In the case of dividends, there are actually two effects. The first is shareholder signaling—dividend increases traditionally signal management confidence in future cash flows. Stock buybacks, on the other hand, tend to signal management's belief that the stock is undervalued. This is a subtle yet important distinction for power companies.

The clientele effect's second component relates to shareholder-base expansion. There is very little capital that can invest only in nondividend-paying stocks. On the other hand, there is a large pool of capital specifically chartered to invest in those that pay dividends. Thus, even a modest dividend can significantly expand the universe of potential investors. This may explain why dividend-paying companies experience significantly less turnover in the market than their nondividend-paying peers. (See Figure 3.)

FIGURE 3

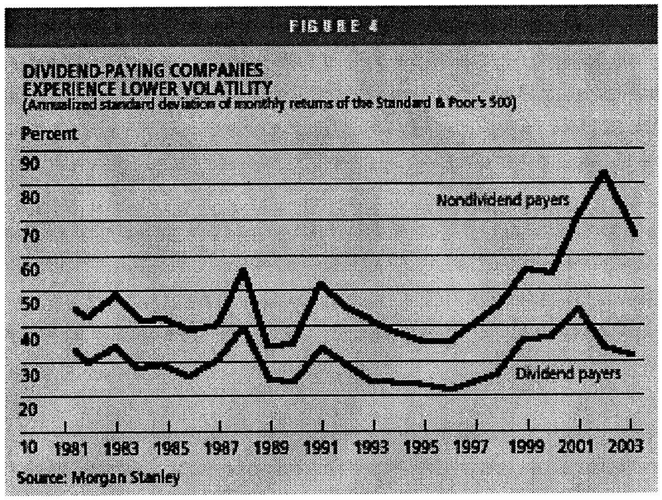


That reduction in churn is another benefit of dividends: The lower turnover of shareholders leads to lower stock price volatility. (See Figure 4.) This has important implications for a company's cost of capital.

The Rating Agency View

Now that the tax inefficiency of

dividends is no longer an issue, the view of dividends by rating agencies takes center stage. Indeed, with 279 corporate downgrades in the electric utility sector since January 2001 and $30 billion of equity capital raised in the same period (most of which went to improve the industry balance sheet), the ratings agencies seem to be single-handedly driving the industry's finance decisions, including dividend policy.



The primary agency concern regarding dividends is the extent to which they are a cash commitment: The dividend, although not factored into coverage or balance sheet ratios, might detract from cash flows that could be used to cover interest expense or reduce overall debt levels. By increasing the payout ratio to return more cash to shareholders, companies may be limiting their fiscal flexibility.

"We don't think of dividends as a fixed charge," says John Whitlock, a director with Standard and Poor's (S&P). "We think about them in terms of a company's overall financial flexibility and financial policy. There is no formal model or way in which we model dividends in viewing a credit. Our ratings committee views each company on a case-by-case basis."

Dan Gates of Moody's has a similar view: "One of the key measures of financial flexibility is cash flow after capital expenditures and dividends."

Yet ratings agencies do have some concerns about power companies increasing their payout ratios. "It is too simplistic to say that the combination of low payouts and tax relief on dividends means that power companies should increase their payout ratios," says Whitlock. "In our industry, it is paramount to focus on flexibility. A dividend increase in one year that is subsequently reduced may result in diminished access to capital markets." At the same time, both S&P and Moody's worry that power company management teams consider dividends sacred and are reluctant to reduce them in times of duress. "We consider a dividend as being unlikely to be cut by management unless under extreme pressure," says Moody's Gates. "There is a long history of investors being focused on dividends [in the utility sector] and management teams keeping them intact during times of diminished financial flexibility."

The Investor's Measures

Investors seem to be encouraging power companies to increase payout ratios. In part, this is a function of investors wanting current return in a low-return world. However, the burst of the internet bubble in the equity markets has also led to significant changes in investor thinking. These changes are not simply reactionary: They represent a return to the approaches that existed prior to the bubble. As such, they should remain steadfast even in the event of another phase of dramatic power industry growth.

Investor irrationality during the height of internet mania is well known. Cash was not king, and seemingly all companies, including power companies, reported financials based on earnings that derived from generally accepted accounting principles (GAAP). Investors signaled Wall Street that they wanted to focus on quarter-to-quarter growth in earnings, and management teams had incentives (through stock options) to deliver on earnings growth targets. And who could blame them? The market was valuing equities based on perceived earnings growth. As recently as May 2001, Mirant (the spin-off from Southern Company) actually had a higher market value of equity than did its former parent primarily because of perceived growth rates. Further, companies financed acquisitions with leverage, choosing to ignore (or at least postpone addressing) potential balance-sheet implications. After all, equity values were only going higher, so why worry about capital structure?

The market has obviously returned to some of its sensibilities—in many ways, in fact, it has improved on them. Driven by investors, corporations today focus on transparency. Acknowledging the shortcomings of GAAP earnings, many companies now use "free cash flow" and "return on invested capital" (ROIC) as their primary metrics. (See "A Metric Glossary.) Those companies are proactive and preemptive in thinking about their liquidity needs—they keep a tight rein on their commitments. The days of driving the capital allocation process to achieve quarterly projections are gone. Many companies now only provide annual targets to buyside and sellside analysts; these same analysts are returning to time-tested valuation tools with which to assess stocks.

A METRIC GLOSSARY

Discounted cash flow Net present value of a firm as calculated by discounting the unievered free cash flows of a company and an assumed terminal value

Dividend discount model Valuation model that estimates the current value of all future dividend payments

Free cash flow Earnings accounting for capital spending in the year it occurs, not in terms of depreciation.

Intrinsic value Value of a firm as calculated by a discounted cash flow analysis

Levered beta Beta is a measure of risk relative to portfolio of securities or an index. Levered beta is the relative risk of a stock accounting for the debt (leverage) of the company's capital structure

Price-to-earnings ratio Price of a company's stock divided by the earnings per share. A measure of the valuation of a company relative to a unit of earnings

Return on equity Net income divided by the book value equity

Return on invested capital Net income after taxes divided by (total assets minus cash and noninterest-bearing liabilities)

Sharpe ratio A ratio to estimate risk-adjusted return. Calculated using standard deviation ad excess return to determine reward per unit of risk. The higher a Sharpe Ratio, the better the risk-adjusted return

Terminal value The remaining future value of a firm at the end of a time period. encompassing remaining value of cash flows plus scrap value and /or perpetual growth

Unievered free cash flow Net income, depreciation, amortization, deferred taxes, working capital, and writedowns, minus capital expenditures and after-tax interest expense

Weighted average cost of capital Cost of a company's capital, calculated by adding the company's cost of debt and the company's cost of equity in proportion to their respective percentage of the overall capital structure

Instead of earnings growth, investors and companies in the power sector are using ROIC, intrinsic value (that is, discounted cash flow—DCF), and dividend discount (DD) models (along with price-to-earnings ratios—P/Es) more frequently to value companies. In other words, the market has returned to incorporating risk when assessing returns. Although it was rare to hear of common concepts that measure risk (for instance, Sharpe ratios, levered betas, etc.) during the internet bubble, one certainly does now. One portfolio manager of a large utility fund said his group relies almost solely on a multi-stage DD model when assessing relative value among utility stocks. Others still adhere to P/E-based relative value calculations.

But many savvy portfolio managers use a range of techniques in assessing relative value while giving a nod to the recent emphasis on dividends. "We use many measures," says Evan Silverstein of Silcap. "Most recently, we have been focusing on both dividend discount and total return models to try and compare segments of the industry. Determining what is important to investors at different points of time is always a challenge."

Taking a WAAC

DFC models used by many analysts and investors are almost always pre-tax relative to personal tax. In the model, corporate tax rates apply to cash flows, but not personal tax rates. Few CEOs and chief financial officers (and fewer buyside investors) would allocate capital based on a DCF model, which adjusts for taxes at the individual shareholder level. Even DD models rarely incorporate personal tax rates when discounting future dividends paid to investors.

So where does the change in dividend tax rates manifest itself in these tried-and-true valuation tools? The answer lies in the discount rate.

Whether using a DCF or DD model, you have to make an assumption with respect to the cost of equity. The cost of equity, in turn, is a key component in arriving at the weighted average cost of capital (WAAC) that many power companies use as the discount rate in a DCF model. Even in a DD model, the cost of equity is a key driver.

To arrive at the cost of equity, you must determine the equity risk premium for the investment or market. The tax assumption on dividends can materially alter the calculation of equity risk premium. Conceptually, the analysis is straightforward: If an equity investor demands a certain after-tax equity risk premium above a risk-free rate, allowing that investor to keep a more current return (by lowering the dividend tax rate), then he requires less growth, all else being equal. Tax relief on dividends ensures that the investor keeps more current income and therefore is willing to accept lower returns (through growth) to achieve the required after-task equity return. In Table 1, you can see that ABC Power Company has a pre-tax risk premium of 4.81 percent under the old tax rules. Based on the new tax rules (and other assumptions being equal) the pre-tax risk premium falls to 3.29 percent

TABLE 1

ABC POWER COMPANY'S PRE-TAX RISK PREMIUM
(in percent)

Assumptions	**Prior tax rule**	**New tax rule**
Personal tax rate on ordinary income	35.00	15.00
Personal tax rate on capital gains	20.00	15.00

Risk-free rate (30-year Treasury bond yield)	6.00	6.00
Equity risk premium	4.00	4.00
Dividend yield on utility stock	5.00	5.00
1. Compute the after-tax return on the risk free rate:		
Risk-free rate times (1 minus the personal tax rate on ordinary income)	3.90	5.10
2. Compute the required after-tax return on the equity:		
After-tax return on the risk-free rate	3.90	5.10
Plus the equity risk premium	4.00	4.00
Equals the after-tax return needed for the equity	7.90	9.10
3. Determine the components of the equity return:		
Dividend yield on utility stock	5.00	5.00
Adjust for personal tax rate on ordinary income	35.00	15.00
Equals after-tax dividend yield	3.25	4.25
After-tax return needed for the equity (assume this does not change)	7.90	7.90
Minus the after-tax dividend yield	3.25	4.25
Equals the required price appreciation	4.65	3.65
Adjust for personal tax rate on capital gains	20.00	15.00
Equals the pre-tax price appreciation needed	5.81	4.29
4. Calculate the pre-tax risk premium:		
Dividend yield	5.00	5.00
Plus pre-tax price appreciation	5.81	4.29
Equals pre-tax return on equities	10.81	9.29
Minus the risk free rate	6.00	6.00
Equals the pre-tax risk premium	**4.81**	**3.29**

In its most simple form, ABC Power Company has seen its WAAC decline. How? If the pre-tax equity risk premium falls, then so does the cost of equity. If the cost of equity declines, so too must WAAC (all things being equal). Companies that pay large dividends will see the new tax law's greatest impact on WAAC.

"Dividend tax relief lowers the cost of equity," says an analyst at a large dedicated utility hedge fund, echoing the belief of many investors. "Whether you use the capital asset pricing model or DD to measure the cost of equity, in theory, the required pre-tax return has decreased," yet investors still demand the same after-tax return. Silcap's Silverstein agrees: "I do believe the cost of equity has been reduced, reflective of the fact the total return to investors has gone up on an after-tax basis."

But some caution that this could be a fleeting benefit. "[Dividend tax relief] may lower a utility's cost of capital in the near term, but that could impact a regulator's view," said Bill Tilles of Jemmco Capital. "If the regulators see this as an opportunity to pass on a benefit to the ratepayer classes, then there is no long-term benefit" to utilities resulting from tax relief.

What does this mean for companies? It means that just as investors have differing views on the benefits of a dividend increase, companies must realize that there is no universal answer. Instead, each company must carefully assess the strategic, financial, and regulatory implications of dividend policy in light of the company's own situation.

The Core of the Issue
Ultimately, there is a cost to increasing the payout ratio for power companies, and it is not theoretical. A dollar of free cash flow that is paid out as a dividend is unavailable to be reinvested to earn returns for shareholders in the future or to pay down debt and improve the balance sheet. As such, the dividend debate is really not about dividends versus buybacks. Nor is it simply about appealing to the current buyside "flavor of the month" (a trend likely to reappear because, after all, at some point investors will focus on growth again). And whether a rating agency might frown on a payout increase should not be a primary decision driver, either. The dividend debate should simply be viewed as a capital allocation and return of capital decision.

According to finance theory, non-dividend paying companies can be expected to grow at a level equal to their earnings, multiplied by their return on equity (ROE, as a proxy for the reinvestment rate). XYZ Technology Company, with $1 of per-share earnings and an ROE of 10 percent, should grow at 10 percent (assuming it reinvests all its earnings and does not pay any dividends). On the other hand, ABC Power Company, with its aforementioned 4-percent dividend yield, would grow at a slower rate than XYZ, even with the same ROE characteristics. If you assume that the 4-percent dividend represented a 40-percent payout ratio, then ABC Power only has $0.60 for each $1 of per share earnings to reinvest at its ROE—and thus have a 6-percent growth rate.

Does this imply that ABC Power will have a relatively worse valuation in the public market than XYZ Technology? Of course not. But it also does not mean that each company will have identical valuations. As the power industry knows well, many factors can explain equity valuations—and not all the explanations are necessarily rational. The timing of cash flows, the riskiness of flows created by operating or financial leverage, and so forth, all factor in "real world" equity valuations. Since the Act effectively increases the post-tax dividend component of total returns to investors, thereby decreasing the required return from capital gains, it can change the way companies evaluate their opportunities: Now, they can provide the same total return despite lower-growth, lower-risk investments.

Will investors give management the benefit of the doubt in selecting where to reinvest those earnings? The effects of over-extending into nonregulated businesses have taken their toll on analysts' perceptions. "Over the past several cycles, utility managements have generally not shown a consistent ability to generate nonutility returns commensurate with the incremental risks undertaken," says Jemmco's Tilles. Another portfolio manager agrees: "As a rule, we do feel that utilities should increase their payout ratios. The underlying reason is related to rate-base regulation and the industry's poor record of diversification/investments outside the regulated base."

But in environments where marginal returns on reinvested capital exceeds WAAC, companies can create value by deploying retained earnings back in the business. Leslie Rich, senior industry analyst at Banc of America Capital Management, sums it up well: "With returns on investments (such as new gas-fired plants) not earning their cost of capital, it should make companies more receptive to distributing dividends as a means of increasing shareholder value."

A Logical Catalyst
Understanding the primary and secondary implications of dividend tax relief is more important for power companies than those in nearly any other sector, since they pay out a large part of their earnings as dividends. But the Jobs and Growth Tax Relief Reconciliation Act has done more than simply change the tax rate for dividends and capital gains. It has direct implications for how power companies compute their cost of equity and thus make

capital allocation decisions.

These issues, in turn, affect other decisions ranging from capital structure to project evaluation to investor relations. Tax relief on dividends is a logical catalyst for industry participants to review dividend policy thoroughly, and thereby re-evaluate their strategic direction.

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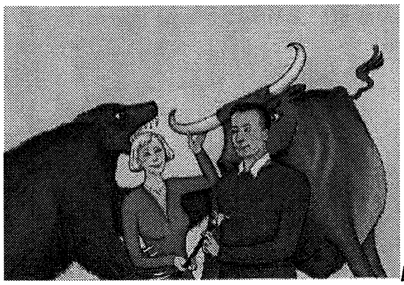

Daily Speculations

The Web Site of Victor Niederhoffer & Laurel Kenner

Dedicated to the scientific method, free markets, deflating ballyhoo, creating value, and laughter; a forum for us to use our meager abilities to make the world of specinvestments a better place.

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Write to us at: Specs@Mantrade.com (address is not clickable)

Long-Term Returns

By Victor Niederhoffer and Alex Castaldo (April 2004)

Traders as well as investors need to know the distinct personality of every available market. The equity markets' chief characteristic has been a relentless long term upward bias in prices: a random selection of U.S. stocks returned a million and a half percent over the twentieth century. The implications are monumental. This guarantees that a large short position in equities held over a sufficiently long time will ruin the wealthiest person. When trading equities we recommend shorting only for brief periods and with positions that are one quarter or one eighth of the size of long positions. For investors a fairly steady accumulation of equities over time is a sound policy.

How academics and investors came to these views about long run returns is an interesting story in and of itself.

Early Studies

The first credible attempt to estimate the long run return on stocks empirically was made by Edgar Lawrence Smith in his 1926 book <Common Stocks as Long Term Investments>. Collecting data by hand for the most popular (i.e. most actively traded) stocks from 1901 to 1922, he showed that, assuming no market timing or stock selection ability whatsoever but simply holding on to stocks, an investor could have earned a satisfactory rate of return and in fact outperformed a bond investor over this period. This result was at variance with traditional opinion, which regarded stock investing as a treacherous field where only the well informed, well connected or lucky make money from in and out trading at the expense of those less fortunate. Serious long term investors preferred bonds. Mr. Smith said stocks would do better. Three years after publication, the bottom fell out of the market and Mr. Smith lost favor. None other than Benjamin Graham blamed Smith's book for inspiring an orgy of uncontrolled speculation that led directly to the market crash. But on the fundamental point of long run stock and bond returns there is no doubt who was right. We know now that from 1926 to 2001 stocks returned 10.9% a year while bonds returned 5.8% (Ibbotson Associates). Warren Buffett still holds that Smith's book was a dangerous one;

knowledge of investing is best left to the experts and should be hidden from ordinary people.

Mr Smith did a good job for an amateur, but as Will Goetzmann of Yale reminded us in a recent Email, "the most carefully crafted empirical study of the long term performance of the stock market was by Alfred Cowles III, called Common Stock Indices, published in 1938. Cowles collected individual stock prices (actually monthly highs and lows by stock) and dividends from 1872 to 1937 for the NYSE, allowing the analysis of total return to equity investing." Total return means the sum of price changes and dividends, and is now the accepted way of reckoning returns. (Mr. Smith's book used price change only, which makes his figures difficult to compare to later studies). Cowles documented a dramatically positive long term equity performance.

The next step forward took place in 1964 when Fisher and Lorie published their article "Rates of Return on Investments in Common Stock" in the Journal of Business. It was based on the first computerized database of stock prices recently completed at the University of Chicago's Center for Research In Security Prices (CRSP).

The history of science is full of examples of monumental collections of data that sparked revolutions in knowledge. Tycho Brahe's careful and extensive measurements of planetary positions, based on observations made with his innovative astronomical instruments, led to the development of Johann Kepler's Laws on the motion of the planets. The data on plants collected by Carl Linnaeus in the early 18th century laid a base for Charles Darwin's discoveries and groupings. Painstakingly exact and detailed measurements by Henry Cavendish and Antoine Lavoisier on the various chemical elements led to Dimitri Mendeleyev's discovery of the periodic table. The CRSP (pronounced "crisp") data base brought the field of security analysis into the modern era. Hypotheses on portfolio analysis, market efficiency, behavioral finance or price reactions to events could now be tested empirically. The resulting discoveries are chronicled in any standard college finance text and have been rewarded with numerous Nobel prizes.

Fisher and Lorie showed that the total return from a random investment in NYSE stocks from 1926 to 1964 was 9.1% a year. Again there was some surprise the figure could be so high. Stock analysts felt a conspiracy was afoot to downplay the value of their advice; they derided the idea of investing "randomly". Once again academic findings had a way of coming down the pike at exactly the wrong time for investors. Four years after publication, when everyone was familiar with Fisher and Lorie's study and the Ford Foundation had used it to urge an increase in endowment funds' exposure to stocks, the market peaked. Once again disgruntled investors focused their ire on Fisher and Lorie, for promising that stocks would always go up 9.1% each year, although they had never said such a thing.

Prof. Goetzmann again: "It is also worth mentioning the 1976 Ibbotson Brinson studies published in Journal of Business. They made a very bullish forecast with confidence intervals for the next 20 years. It was an early application of the simulation approach to forecasting the market - and it turned out to be right on, depsite the nay-saying tone of equity investors in the mid-1970's. While Fisher and Lorie published an important academic book, Ibbotson really popularized the equity premium among investment managers. By the way the Dimson data is available via Ibbotson software for your readers". Ibbotson also publish an annually updated study "Stocks, Bonds and Inflation 1926 to Present". "In my view, the Ibbotson annual study has done more to convince money managers that the equity premium is large and economically important than any other publication. Also by putting the data on the desktops of thousands of investment managers around the world, they have encouraged the use of the equity premium in asset allocation."

To further refine our estimates of stock returns, we would need large amounts (decades) of fresh data. Unfortunately such data is hard to come by. For the United States, the Cowles Index goes back to 1872. Special research efforts have been needed to go back further in time. Goetzmann, Roger Ibbotson and Liang Peng collected U.S. stock market data by hand from 1816 when the official list of the NYSE became available. "This gives us an index that is not based on the chained, previously-known indices. Our study "A New Historical Database for the NYSE 1815 to 1871: Performance and Predictability" in The Journal of Financial Markets (2001) documents a substantial equity premium for the U.S. over history. The analysis is based, for the first time on hand-collected individual security price data and hand-collected dividend data. This data - even down to the individual prices - is available for your readers at the web site www.icf.yale.edu. It took ten years to collect."

Using data available to him for the United States Siegel came to the conclusion that the long term rate of return on stocks was 6.75% after inflation or 8.75 to 9.75% if we assume two to three percent inflation (Siegel: Stocks for the Long Run, 1994, 2002).

Consider how much uncertainty is associated with this number. With 167 years of data, and assuming an annual standard deviation of 20%, the standard error of the mean is 1.5%. To quote a 95% confidence band around Siegel's estimate we would have to say "the real long term rate of return on US stocks is 3.75% to 9.75%". That is quite a large range.

To refine our estimate we have to look at markets outside the U.S. Jorion and Goetzmann pioneered this so called cross-sectional approach in their article "Global Stock Markets in the Twentieth Century" (1999). They studied a large number of markets around the world beginning in 1921. They came to three conclusions: "First, the U.S. was the leading performer over this period, as measured by real stock price appreciation. Second, a large number of markets did very poorly over the period -- particularly South American and Central European exchanges. Third, a GDP-weighted index of the world's markets performed nearly as well as that of the U.S., suggesting that, while, due to survivorship, the U.S. experience gives us a rosy picture of equity market performance, the world equity market portfolio yielded a significant equity premium (as measured over inflation) as well."

Our favorite book on global stock market performance is Triumph of the Optimists by Dimson, Marsh and Staunton, published in 2002. It studies 16 markets from 1900 to 2000. Once again the experience of the long term stock investor is found to be quite satisfactory, with rates of return similar to those in the United States; the US did perhaps a little better than the others, but three markets did even better than the US.

Elroy Dimson, Paul Marsh and Mike Staunton of the University of London Business School worked together on this massive project. Within Triumph's pages, an investor may find definitive information on inflation adjusted returns for stocks, bonds and treasury bills, real dividends, correlation between markets worldwide, and the relative performance of value

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and growth stocks.

Unlike most books written by academics, Triumph avoids hasty generalizations and biased sampling procedures. The authors rightly fault earlier investment studies for arbitrary selection of starting and stopping points, the tendency to include the good and exclude the bad, and a parochial focusing on a small slice of the global picture. Their work epitomizes outstanding investment research.

Great works can be created in humble circumstances. Shakespeare was an actor and entrepreneur who reworked old plots so that his theatre company could make a buck. Cervantes wrote a parody of the fashionable knight errantry books to repay his debts. Dimson told us that he and his colleagues thought of Triumph as "a labor of love, just a small contribution that could lead to a paperback meant for light reading on planes". He added, "Our families would be less kind about our fixation." Staunton, who collected the data, prefers to gather statistics by himself from original sources at specialized libraries instead of delegating the work.

The main conclusion of Triumph is that a random selection of US stocks returned 1,500,000 percent in the twentieth century. Yes, big losses occurred at times, such as the back-to-back losses of -28 percent and -44 percent in 1930 and 1931, or the 10 years from 1970 to 1979 when stocks hardly budged while the dollar lost 28 percent of its purchasing power.

But overall, adjusted for inflation, the return on US stocks amounted to 6.3% a year, better than any other class of securities.

Current Studies

Unless intelligent life is discovered on another planet and a stock market is found to have been operating there for some centuries, it is unlikely that much new data can be brought to bear on the problem of long run stock returns. Therefore Triumph of the Optimists may well be the last word on the subject for some time to come. Nevertheless we try to keep in touch with the literature and have recently reviewed 5 published papers. We begin with the latest from the authors of Triumph of the optimists.

Elroy Dimson, Paul Marsh, and Mike Staunton, Irrational Optimism, Financial Analysts Journal, January/February 2004.

The article is addressed to Pension Plan managers and individual investors. The authors feel that the estimates of long term return they are using are too high. They claim pension plan sponsors are assuming 12.5% nominal, 10% real return on stocks, and that many individual investors assume even higher returns. "In this article, we show that, historically, annualized long-run equity returns have not been as high as 10 percent in real terms anywhere in the world. Over the past 103 years, a more typical figure has been 4-6 percent. Furthermore, a careful analysis of historical returns indicates that future risk premiums are likely to be lower than in the past."

The authors also argue against the idea sometimes seen in popular investment books that "stocks are safe if held for 20 years". That is you can never lose money if you hold onto your investment for 20 years. This idea originated in Siegel's book and has been repeated widely ever since.

The authors feel that the US record is exceptional, that the US has in some sense been a unique country and therefore they prefer to work with a sample of 16 countries, also over the last 103 years. This is the most countries for which they could find data, although they admit that "Our sample [] omits such countries as Russia, China, and Argentina, whose stock and bond markets have performed poorly and have been highly volatile."

For the World Index, composed of 16 countries weighted by GDP, the geometric mean real return was 5.4%, the arithmetic mean 6.8%, the standard deviation 17.2%.

The authors point out that some countries have experienced bad returns over a 20 year interval. For example in Japan 22% of all (overlapping) 20 year intervals have negative real returns. In fact a negative 20 year return exists for 11 of the countries in the sample, contrary to the myth that you can never lose money over 20 years.

Now the authors are ready to make their forecast.

They agree with Arnott and Bernstein (2003) [see below] that exceptional factors pushed the performance up in the 20th century. Specifically there was "an uplift in equity valuations" measured in terms of dividends or earnings that is unlikely to be repeated. They state "We project real equity returns of 5% a year". This is 0.4% below the observed 5.4 mean of the 16 countries. If we add a 2-3% estimate of inflation we come up with 7% to 8% nominal equity returns.

The authors point out that 5% real return is quite good. In fact over 20 years, even "achieving a mean return of 4% would mean that real wealth had increased by a factor of 2.2".

Conclusion: "when investors look back a century from now, equities should prove to have been the best performing asset class in the 21st century. Nevertheless, the real return on stocks will turn out to be lower than it was in the 20th century."

Also, the authors feel they have shown the idea that <stocks are safe if held for 20 years> is wrong.

Ibbotson, Roger, and Peng Chen, Long-Run Stock Returns: Participating in the Real Economy. Financial Analysts Journal, January/February 2003;

Starts with an interesting classification of previous studies:

1. Historical studies (what have returns been in the past)
2. Studies that ask what kind of returns corporations can supply. These use fundamental

information such as earnings, dividends and overall economic productivity. The present study is in this category.

3. Studies that ask what return investors demand. This is the approach we favor. Assuming that there will be plenty of opportunities for investment (if nothing else new technology should provide such opportunities), the question is what payoff will people demand for bearing risk. And this does not change much over time.
4. Survey studies that use "opinions of investors and financial professionals garnered from broad surveys"

The details of the paper are complex. The authors consider 6 methods of analyzing fundamental data about US corporations and their growth rates by decomposing it in various ways. To give a simple example the growth rate of GDP could be decomposed into the growth rate of GDP per capita times the growth rate of population. One can then plug in historical or subjective growth rates to come up with a forecast. The authors narrow the choice down to two models they call Model 3F (based on earnings) and model 4F (based on dividends).

Model 3F gives an expected stock return of 9.37%. Model 4F gives 5.44%. What are the reasons for this discrepancy and which forecast is best?

Using earnings (3F) is preferable because "the growth in corporate earnings has been in line with the growth of overall economic productivity." Whereas "despite the record earnings growth in the 1990s, the dividend yield and the payout ratio declined sharply, which renders dividends alone a poor measure for corporate profitability and future earnings growth."

Also Model 4F is inconsistent with the Modigliani-Miller theorem of modern finance. If this disrepancy is remedied one ends up with the same results as model 3F. Another reason for sticking with that model.

In summary the predicted rate of return is 9.37% nominal or 6.09% in real terms, that is after inflation. Provided one believes in Modigliani-Miller.

The authors point out that this is less than the 10.70% historical figure from Ibbotson, but higher than figures put forth by other authors such as Shiller and Campbell. The latter are assuming that current high P/E's signal an overvaluation, this paper assumes current valuations are correct and the P/E's reflect a favorable investing environment (i.e. low interest rates and high future growth).

Arnott, Robert, and Peter Bernstein, What Risk Premium is Normal'? Financial Analysts Journal, March/April, 2002;

This article is quite pessimistic. The world is not about to end, but "real stock returns will probably be roughly 2-4 percent, similar to bond returns."

Their approach is based on economic growth and dividends. They make much of the fact that the latter is always less than the former:

"Can't shareholders expect to participate in the growth of the economy? No. Shareholders can expect to participate only in the growth of the enterprises they are investing in. An important engine for economic growth is the creation of new enterprises. The investor in today's enterprises does not own tomorrow's new enterprises not without making a separate investment in those new enterprises with new investment capital."

"More than half of the capitalization of the Russell 3000 today consists of enterprises that did not exist 30 years ago."

They condider that "The earnings yield is a better estimate of future real stock returns than any extrapolation of the past. And the dividend yield plus a small premium for real dividend growth is even better, because [...] the earnings yield systematically overstates future real stock returns."

"long-term dividend growth should be equal to long-term economic growth minus a haircut for dilution or entrepreneurial capitalism (the share of economic growth that is tied to new enterprises not yet available in the stock market) plus a premium for hidden dividends, such as stock buybacks."

We must caution against this dividend based approach, since dividends are under the control of the corporation and practices in dividend policy have changed a lot over time as Ibbotson and Chen pointed out.

Conclusions. "The observed real stock returns and the excess return for stocks relative to bonds in the past 75 years have been extraordinary, largely as a result of important nonrecurring developments."

"The current risk premium is approximately zero, and a sensible expectation for the future real return for both stocks and bonds is 2 4 percent". When their expected inflation rate of 1.2% is added in we get an estimate of long run stock returns of 3.2% to 5.2%.

Ivo Welch: The Equity Premium Consensus Forecast Revisited, September 2001,COWLES FOUNDATION DISCUSSION PAPER NO. 1325

This is an example of the survey method. "This paper presents the results of a survey of 510 finance and economics professors." "The consensus 30-year stock market geometric mean forecast is 9.1% with an inter-quartile range of 8 to 10.5%. The forecasts are considerably lower than those taken just 3 years ago."

The rate of return on bonds is estimated to be about 5%. The consensus forecast for the 30-year equity premium (arithmetic) is about 5% to 5.5%

Estimating the Real Rate of Return on Stocks Over the Long Term
Papers by John Y. Campbell, Peter A. Diamond, John B. Shoven
Presented to the Social Security Advisory Board

August 2001

Three prominent academics present their forecasts:

Campbell: "a geometric average equity return of 5% to 5.5% or an arithmetic average return of 6.5% to 7%" in real terms.

Diamond: "projection values around 6.0% or 6.5% seem to me appropriate for projection purposes" in real terms

Shoven: no single forecast given, argues in various ways that a forecast of 7% in real terms would be too high.

Our conclusion

The survey results are interesting only in that they illustrate the error that people make of expecting too much after several years of good results and cutting back sharply after a bad year. We recommend fighting that tendency and keeping to a very steady estimate of long run returns.

The proposition that stock's premium over bonds could now be zero, as Messrs. Arnott and Bernstein believe, we find hard to swallow. It would contradict economic rationality as well as all past experience. The best working hypothesis is that stock returns have nothing to do with reported dividend growth and payouts, but have everything to do with the requirements of entrepreneurs for risk capital, the return they can make on investments, and the requirements of investors who invest at risk. The best working hypothesis for the next 100 years is that investors will achieve what they require a priori for their risky investments.

Like a motorcycle rider who still prefers his old and worn leather jacket to the brand new one given to him by his girlfriend, we still retain a great affection for Fisher and Lorie's estimate of 9.1% nominal return on stocks. It has served us well in many years of stock market riding and has never been refuted by later studies. Nevertheless, the current academic practice of quoting inflation-adjusted figures is preferable, and Triumph's use of a 100 year window makes it superior to that path breaking study. Hence our estimate of US stock returns is about 6.3% real. And it would not surprise us if the actual outcome is one or two percentage points above that.

We appreciate Prof. Goetzmann's inputs for this article.

A short version of this article appears in *Active Trader* <www.activetradermagazine.com>

Go to more scholarly reviews

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 608

Request:

What is the long-term return to the stock market, overall, expected to be going forward? Please provide any information known to Dr. Zepp.

Response:

Dr. Zepp did not propose an estimate of the future long-term return for the stock market in this case. He is aware, however, that a range of such estimates can be determined from data he provided in PGE Exhibits 2108 and 2109 as follows:

Risk-Free Rate	Market Risk Premium	Expected Market Return
5.35%	7.0%	12.35%
5.35%	9.1%	14.45%

Dr. Zepp is also aware the Ibbotson Associates' 2006 long-horizon estimate of the Market Risk Premium is 7.1%. If investors expected that Market Risk Premium in the future, the indicated market return is 12.45% (5.35% + 7.1%).

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 609

Request:

Does Dr. Zepp believe that PGE is as risky as the "market, overall"? If not, does Dr. Zepp believe that PGE is more risky than the "market, overall?" Does Dr. Zepp believe that PGE is less risk than the "market, overall?" Similarly, please explain whether PGE believes that PGE is as risky as the market, overall, or whether PGE believes it is less risky, or whether it is more risky.

Response:

Based on equity cost estimates Dr. Zepp presented in PGE Exhibit 2100, equity cost estimates determined by PGE, and the range of expected market returns in PGE Response to OPUC Data Request No. 608, PGE requires a lower ROE than an average risk stock in the overall market.

Dr. Zepp's forecast for the long-term return on the stock market is between 12.35% and 14.45%. Mr. Hager and Mr. Valach's range for PGE's RROE is 9.25% to 11.30%. Given these estimates, we would agree with Dr. Zepp.

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 607

Request:

Does Dr. Zepp recommend a different company sample than he used in his DCF model? If yes, what is the sample that Dr. Zepp feels should be used in his analysis and why did he not use it?

Response:

Please see PGE's Response to OPUC Data Request No. 606.

Dr. Zepp is aware that PGE has explained why the samples they rely upon provide superior sets of guideline companies. But, Dr. Zepp used the Staff sample in his analysis to focus on critical assumptions in the DCF analysis and to show different models based on data for Staff's sample support higher guideline ROEs.

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 604

Request:

What is the growth rate in earnings per share, book value per share, and dividends per share, that Dr. Zepp feels is reasonable for the regulated utility industry, over the next 10-year period?

Response:

Dr. Zepp did not prepare the analysis requested. His analysis in PGE Exhibits 2105 and 2106 were limited to showing the Commission that if investors expected past earnings per share growth to occur in the future, and the investors expected 12.5% ROE in Stage 2, the internal rate of return would be 10.5% and 10.31%, respectively. This demonstration shows the range of equity costs produced by the DCF model and assumptions Mr. Morgan says should be considered, and results in an ROE very close to the ROE requested by PGE.

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 605

Request:

What are the growth rates that are implicit in Dr. Zepp's DCF analysis?

Response:

The growth rates can be computed by referring to the columns marked "total cash flow" in PGE Exhibits 2105 and 2106.

If T_i = total cash flow in year i, the percent growth for any year can be computed with the following formula:

$$(T_{i+1}/T_i) - 1,$$

except for the final year. In the final year, the capital gain stated as an average earned growth rate is:

$$(P_{40}/P_0)^{\wedge(1/40)} - 1.$$

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 606

Request:

Does Dr. Zepp agree with all the other Staff assumptions that he uses in his DCF model?

Response:

No. Dr. Zepp did not evaluate the reasonableness of the other Staff assumptions or the appropriateness of the Staff sample. He adopted the Staff sample and other Staff assumptions to focus his response to Staff on a minimal number of changes.

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September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 588

Request:

Since January 1, 2006, has PGE provided any information to any credit rating agency or analyst that indicates its long-term goal for its capitalization structure? If yes, please provide a copy of all reports or other information addressing PGE's long-term capitalization policy.

Response:

Yes. In March 2006, PGE sponsored several "Investor Roadshow Presentations" for analysts. In the presentation, PGE indicates a long-term Debt/Capitalization ratio of 50%. However, this figure is a long-term ratio and assumes the implementation of the AMI project and Biglow Canyon wind project coming on line in 2007.

Attachment 588-A is the relevant page from the Roadshow.

This page is confidential.

You must have signed the protective order in this docket in order to view this page.

Analysis of Equity Costs and Risk Premiums Based on DCF Analyses of the Value Line Industrial Composite: 1986 to 2006

	Study Date	Dividend Yield	Expected Growth-b/	DCF Equity Cost	Long-term Treasury Lag 1 Mnth	Risk Premium	Line BR (Published)	to FERC br
1	1/86	3.80%	8.85%	12.65%	9.54%	3.11%	8.50%	8.8%
2	2/87	3.00%	9.39%	12.39%	7.39%	5.00%	9.00%	9.39%
3	2/88	3.10%	9.93%	13.03%	8.83%	4.20%	9.50%	9.93%
4	7/88	3.50%	7.77%	11.27%	9.00%	2.27%	7.50%	7.77%
5	2/89	3.50%	7.77%	11.27%	8.93%	2.34%	7.50%	7.77%
6	2/90	3.20%	7.77%	10.97%	8.26%	2.71%	7.50%	7.77%
7	1/91	3.70%	9.93%	13.63%	8.24%	5.39%	9.50%	9.93%
8	2/92	2.80%	9.39%	12.19%	7.58%	4.61%	9.00%	9.39%
9	2/93	2.90%	8.31%	11.21%	7.34%	3.87%	8.00%	8.31%
10	2/94	3.00%	8.31%	11.31%	6.39%	4.92%	8.00%	8.31%
11	2/95	2.70%	9.93%	12.63%	7.97%	4.66%	9.50%	9.93%
12	3/96	2.70%	10.48%	13.18%	6.03%	7.15%	10.00%	10.48%
13	2/97	2.40%	12.13%	14.53%	6.91%	7.62%	11.50%	12.13%
14	1/98	1.50%	14.92%	16.42%	6.07%	10.35%	14.00%	14.92%
15	1/99	1.30%	16.05%	17.35%	5.36%	11.99%	15.00%	16.05%
16	2/00	0.80%	16.05%	16.85%	6.86%	9.99%	15.00%	16.05%
17	7/00	1.00%	14.92%	15.92%	6.28%	9.64%	14.00%	14.92%
18	2/01	1.20%	13.79%	14.99%	5.65%	9.34%	13.00%	13.79%
19	7/01	1.20%	12.13%	13.33%	5.82%	7.51%	11.50%	12.13%
20	1/02	1.20%	12.13%	13.33%	5.76%	7.57%	11.50%	12.13%
21	8/02	1.60%	12.68%	14.28%	5.51%	8.77%	12.00%	12.68%
22	1/03	1.60%	12.13%	13.73%	5.01%	8.72%	11.50%	12.13%
23	7/03	1.50%	11.57%	13.07%	4.34%	8.73%	11.00%	11.57%
24	3/04	1.60%	12.13%	13.73%	4.94%	8.79%	11.50%	12.13%
25	10/04	1.80%	11.57%	13.37%	4.89%	8.48%	11.00%	11.57%
26	4/05	1.90%	11.57%	13.47%	4.89%	8.58%	11.00%	11.57%
27	11/05	2.10%	12.68%	14.78%	4.74%	10.04%	12.00%	12.68%
28	5/06	2.10%	12.68%	14.78%	5.22%	9.56%	12.00%	12.7%

Averages for:	AVERAGE	AVERAGE	AVERAGE	AVERAGE	AVERAGE
All years (1986-2006)	13.6%	6.6%	7.0%	10.8%	11.3%
Last 15 years (1992-2006)	14.0%	5.9%	8.1%	11.5%	12.2%
Last 10 years (1997-2006)	14.6%	5.5%	9.1%	12.3%	13.1%

Notes and Sources:

a/ Data obtained from *Value Line's* studies of the Industrial Composite.

b/ Projected growth from retained earnings restated with FERC formula.

ORIGINAL EXHIBIT

UE 180 - UE 181 - UE 184 / PGE Exhibit / 2108 Zepp / 1

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 575

Request:

Is it PGE's position that S&P requires an adjustment to a company's capitalization ratios due to imputed debt? Please provide reports or other documentation showing S&P explicitly required additional equity to be sold to alter a company's balance sheet.

Response:

No. S&P is a credit rating agency and for its credit rating purposes, it imputes debt. The imputed debt ratio, not necessarily the actual debt ratio, is used. Thus, if a company's imputed debt ratio is too high, S&P may change its rating. To prevent this, a company could issue more common equity or keep the equity component of its capital structure higher than otherwise.

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 577

Request:

Does PGE understand Staff's capitalization ratios to be explicit recommendations for PGE to maintain a balance sheet within Staff's parameters? If yes, please identify the specific portions of testimony on which PGE bases its belief.

Response:

Yes. Please refer to Staff/1000/ Morgan/ 5 lines 3-12, Morgan/28 lines 6-10, and Staff1100 Conway/1. Staff identifies a capital structure and "recommended" cost of equity and cost of debt.

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 578

Request:

Is PGE aware of any company or companies with "total debt including the effect of imputed debt" in the range PGE identified that it would have in 2007, if the Commission adopts Staff's recommended capital structure and ROE (See page 29)? What are the S&P, Moody's and Fitch credit ratings of these companies?

Response:

PGE has not performed this analysis.

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 580

Request:

Please identify the benchmark financial metrics from S&P that reflect "BBB-". Additionally, please identify the specific ranges for "BBB+" and for "BBB".

Response:

Please see PGE Exhibit 2000, page 29, Table 5 for the relevant S&P financial benchmarks for "BBB."

S&P does not publish standards for "BBB+" or "BBB-," however; PGE has been advised by S&P that, as a guide, the financial metrics ranges for "BBB" can be divided by 1/3 to approximate the metrics for "BBB+," "BBB," and "BBB-." For an example, please see PGE Response to ICNU Data Request No. 203, Attachment A.

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 581

Request:

Does PGE have control over the amount of energy costs that it incurs? Does its "46 percent" reflect its long-term, permanent expectations? Please provide all data available indicating PGE's expected long-term energy costs.

Response:

PGE objects to this request on the basis that it is vague. PGE does not use the number "46" in PGE Exhibit 2000. In addition, the phrase "long-term, permanent expectations" is undefined. Nevertheless, without waiving objection, PGE responds as follows:

PGE's latest long-term power forecast and plan were presented in OPUC docket LC 33 and acknowledged in Order 04-375.

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 582

Request:

Please identify all regulatory Commissions that rely on the DCF model and provide all the evidence PGE relied upon for its statement that "it would appear that other regulatory commissions have placed less emphasis on the DCF results." (See page 36, lines 12-13)

Response:

PGE objects to this request on the basis that it is unduly burdensome. PGE does not know what "all regulatory Commissions" use or rely upon, except as reported in our informal survey. Nevertheless, without waiving objection, PGE replies as follows:

Please refer to PGE Exhibits 2005 and 2011 and work papers, pages 199-216.

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 585

Request:

Has PGE completed any analysis to determine whether it has control over the "short capacity position" and the risks it believes cause an increased cost of capital?

Response:

PGE objects to this question because it is vague and does not supply any citation for the location of the quote. Notwithstanding this objection, PGE responds as follows:

PGE assumes that Staff is referring to PGE Exhibit 2010/7, which is a report from S&P. All statements in the position belong to S&P and do not necessarily reflect the position of PGE.

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 586

Request:

Does PGE believe that it can control its current "short capacity position" and the risks it believes cause an increased cost of capital?

Response:

PGE objects to the request on the basis of vagueness and innuendo. Staff is taking the words of S&P out of context and attributing them to PGE. Notwithstanding this objection, PGE responds as follows:

Please refer to Docket LC 33 and Order 04-375 for a discussion of how PGE expects to manage it energy and capacity positions.

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 587

Request:

Please provide data showing to PGE's capacity position, by month, since 1990.

Response:

PGE objects to this request of the basis of relevance and vagueness. PGE cannot ascertain whether the question refers to a true capacity position or an energy position. Based on the quote in OPUC Data Response No. 585, the question appears to refer to energy. PGE files this information annually with the OPUC. Information is also available in the Action Plan approved in Order 04-375.

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 589

Request:

Does PGE assert that the capital structure it proposes in this docket is expected to be the same capital structure it expects over the period from 2007-2010? Please provide any information or data relative to PGE's formal expectations.

Response:

No. PGE summarizes the reasons we need to maintain our proposed capital structure in PGE Exhibit 2000, pages 30-31. PGE has also indicated that we expect in the long run to manage our capital structure towards 50% long-term debt and 50% equity. PGE's actual capital structure during this period will depend on a number of factors, including those on pages 30-31 as well as the timing of the expected capital expenditures, earnings deviations from expected due to low hydro, unexpected plant outages, or other power related events.

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 590

Request:

Please provide the data, in the format at Exhibit 2010 Hager-Valach / 9, for PGE since 2001, and for all companies PGE uses in its cost of equity sample groups from 1997 through 2005.

Response:

PGE objects to this request on the basis that it is unduly burdensome; PGE has not performed this study or gathered such information in this format on its sample companies. Notwithstanding its objection, PGE responds as follows:

PGE is unaware of an updated S&P report such as the one in PGE Exhibit 2010, page 9 providing the detail Staff is requesting. PGE has not reviewed or similar S&P reports for other electric utilities.

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 594

Request:

Is the "allowed and earned ROE" of the companies reported on Exhibit 2103 the same figures that investors would actually expect to earn on investments in a company's stock? How do the "allowed and earned ROEs for companies differ from the "required return" for an investor? Please explain.

Response:

Please see PGE Exhibit 1100, pages 21-24 for a discussion on how authorized and earned ROEs for companies factor into the required return for companies.

The required return on equity is the return that the investor must receive in order to hold an investment, such as PGE's common stock or long-term debt. In making a purchase or sale decision, an investor derives his or her required return on equity for a security over an investment horizon based on a number of factors, including investment risk of the security and expected returns on other (alternative) investments. The authorized ROE effectively establishes investor expectations on the potential return on equity that the company can provide them on their investment in the security. The expected return for a utility is dependent on the utility's authorized rate of return and regulatory regime.

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 595

Request:

From where did the 12.50% ROE figure that is stated at Exhibit 2100 Zepp/18, line 20 come? Please provide supporting documentations.

Response:

The 12.5% figure is reported in Staff Exhibit 1003. Please also see PGE Exhibit 2100, page 22, lines 19-23.

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 597

Request:

Please show on Staff Exhibit 1000, page 13, where Mr. Morgan indicated that a 12.5 percent ROE should be considered? Specifically, on which line was this located?

Response:

Staff Exhibit 1000, page 13 refers to Mr. Morgan's use of *Value Line's* estimates of future earned ROEs. Staff Exhibit 1003, pages 96-98, which are *Value Line* reports, states its estimates of future earned ROEs is 12.5%.

See also PGE Exhibit 2100, page 23, lines 1-3, in reference to Mr. Morgan's testimony.

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 598

Request:

Does Dr. Zepp believe that the Commission should use the "FERC" formula, which is referenced at Exhibit 2100 Zepp/16, line 7?

Response:

Yes, as discussed in PGE Exhibit 2100, page 16. See also PGE's Response to OPUC Data Request No. 600.

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September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 602

Request:

Please detail the exact inputs that were used to adjust Mr. Morgan's models to rely on "past growth in EPS", as reflected on Exhibit 2100 Zepp/23, line 12. Was this adjustment based on Dr. Zepp's belief that investors will expect identical year-over-year results from the past period he relies upon?

Response:

Please see PGE Exhibit 2105.

Dr. Zepp's analysis does not rely upon Dr. Zepp's "beliefs." His analysis presents a scenario about future growth that investors might expect. Mr. Morgan states this scenario should be considered by the Commission, but does not incorporate it into the ROE numbers he computed with his DCF approaches.

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 603

Request:

Does Dr. Zepp believe that the utility industry will evolve to a 54.5 percent retention ratio over the ensuing 10 years, as reflected on Exhibit 2100 Zepp /23, at line 24?

Response:

Dr. Zepp did not rely upon his "beliefs" to conduct the analysis presented in PGE Exhibit 2105. Dr. Zepp presents a scenario in PGE Exhibit 2105 based on potential investor expectations Mr. Morgan said should be considered, but that Mr. Morgan did not include in his actual ROE estimates. The potential investor expectations Dr. Zepp relied upon assumes that investors expect dividend per share growth in the first stage that was assumed by Mr. Morgan, and then shows the retention ratio would increase to 54.5% if investors assume past earnings per share growth will occur in the future.

September 27, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 574

Request:

Please provide, in electronic and hardcopy format, the analysis that supports the Company's position that Staff's recommendations would "push PGE closer to non-investment grade". (UE 180 – UE 181 – UE 184 / PGE /2000 Hager – Valach / 27) Please provide such analysis for the ensuing five-year period, in the formats that will be provided to rating agencies. Have these forecasts been provided to rating agencies?

Response:

The Excel spreadsheets supporting Exhibit 2015-C are confidential and provided electronically (CD) under separate cover as Attachment 574-A. This information is subject to Protective Order No. 06-111.

PGE has not provided the forecasts to the credit rating agencies, although the agencies can, and have in the past, performed their own analyses.

April 19, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated March 30, 2006
Question No. 110

Request:

Please provide historic and current data, in electronic spreadsheet format, of the Company's complete financial statements (i.e., balance sheet, income statement, cash flow statement) from 2000 through the present that include:

a. **Return on equity for all property**
b. **Return on equity for OPUC-regulated property**
c. **FFO / Total debt**
d. **FFO interest coverage**
e. **Pretax interest coverage**
f. **Total debt / total capital**
g. **Net cash flow to utility capital expenditures**

Response:

Historic and current data in electronic spreadsheet format of PGE's complete financial statement from 2000 through the present can be found on portlandgeneral.com at the following URL: http://investors.portlandgeneral.com/fin-info.cfm and click on SEC filings. The requested ratios can either be calculated from the information on the website or found in the full document.

CASE: UE 180/UE 181/UE 184
WITNESS: Thomas D. Morgan

PUBLIC UTILITY COMMISSION
OF
OREGON

STAFF EXHIBIT 1403

Confidential Exhibits in Support
Of Surrebuttal Testimony

October 6, 2006

STAFF EXHIBIT 1403

IS CONFIDENTIAL AND SUBJECT TO PROTECTIVE ORDER NO. 06-111. YOU MUST HAVE SIGNED APPENDIX B OF THE PROTECTIVE ORDER IN DOCKET UE 180 TO RECEIVE THE CONFIDENTIAL VERSION OF THIS EXHIBIT.

CASE: UE 180/UE 181/UE 184
WITNESS: Maury Galbraith

PUBLIC UTILITY COMMISSION
OF
OREGON

STAFF EXHIBIT 1500

Surrebuttal Testimony

October 6, 2006

Q. PLEASE STATE YOUR NAME AND POSITION.

A. My name is Maury Galbraith. The Public Utility Commission of Oregon (OPUC) employs me as a Senior Economist.

Q. DID YOU PREVIOUSLY FILE TESTIMONY IN THESE PROCEEDINGS?

A. Yes. I sponsored Staff/100 and Staff/800 in consolidated Docket Nos. UE 180, UE 181 and UE 184. My witness qualifications were provided as Staff/101.

Introduction and Summary

Q. WHAT IS THE PURPOSE OF YOUR REBUTTAL TESTIMONY?

A. I address three separate issues in this testimony. The first issue is Portland General Electric's (PGE's) proposed power cost framework. The second issue concerns the appropriate forced outage rates to use to normalize the generation of the Boardman and Colstrip units in the test period. The third issue is the prudence of PGE's decision to build the Port Westward generating facility.

Q. HOW IS YOUR TESTIMONY ORGANIZED?

A. First, I address PGE's proposed power cost framework. Next, I discuss the Boardman and Colstrip forced outage rates. Lastly, I address the prudence of PGE's decision to build Port Westward.

PGE's Power Cost Framework

Q. PLEASE SUMMARIZE STAFF'S PRIOR RECOMMENDATIONS REGARDING PGE'S POWER COST FRAMEWORK.

A. Staff made the following recommendations in its direct testimony:

- The Commission should use the design criteria for power cost adjustment mechanisms identified in Order 05-1261 to evaluate PGE's proposed power cost framework.
- The Commission should reject PGE's Annual Power Cost Variance (Annual Variance) mechanism. The Annual Variance mechanism lacks a power cost deadband and as a result does not satisfy the unusual event standard. The mechanism also lacks an earnings test deadband and therefore fails to prevent recovery if overall earnings are reasonable.
- The Commission should reject PGE's Annual Power Cost Update (Annual Update) mechanism. It is unclear if the benefits of a prospective automatic adjustment clause outweigh its regulatory burdens.
- The Commission should adopt Staff's proposed long-term power cost adjustment (PCA) mechanism. Staff's proposed PCA mechanism satisfies the unusual event and reasonable recovery standards. It also does not incent direct-access eligible customers on their choice to go direct access or remain with the company.

Q. PGE WITNESS MS. LESH ASSERTS THAT STAFF HAS FAILED TO ARTICULATE OR EXPLAIN THE NATURE OF THE RISK THAT PGE'S PROPOSED POWER COST FRAMEWORK SHIFTS TO CUSTOMERS. *SEE* PGE/1800, LESH/7. IS THIS ASSERTION ACCURATE?

A. No. Staff has presented its position on power cost risk in testimony in four separate dockets and has expressed its position directly to PGE in numerous workshops on this issue in recent years. I believe Staff's position on the risk PGE's proposal would shift to customers is clear. Staff is unsure as to the basis of PGE's continued misunderstanding.

Q. PLEASE SUMMARIZE STAFF'S POSITION ON POWER COST RISK.

A. Staff first articulated its position on power cost risk in Docket No. UE 137:

> It is Staff's position that the primary purpose of a PCA is to protect the utility from major increases in net variable power costs (NVPC). Historically, major increases in NVPC have been associated with poor hydro conditions or large plant outages. Recent history has shown that major increases in NVPC can result from instability in wholesale power markets. Recent history has also shown that these events can be interrelated. A PCA also protects customers from paying too much when large decreases in power costs occur. However, large decreases in NVPC are less likely than large increases in NVPC. *It is Staff's position that a PCA should be designed to give the utility insurance against major increases in NVPC.*

UE 137, Staff/100, Galbraith/1 (emphasis in original).

Staff's position on the allocation of power cost risk has remained largely unchanged since Docket UE 137. In direct testimony in Docket Nos. UE 180, UE 181, and UE 184, Staff explained that its position on power cost risk was a precursor to the Commission's unusual event standard, established in Order 05-1261, for hydro-related PCA mechanisms:

> Staff has consistently argued in recent cases that PCA mechanisms should be used to protect the company from extreme fluctuations in NVPC. Staff has recommended using a deadband to exclude a reasonable range of normal variation from triggering the PCA mechanism. *See* Staff Testimony in Docket No. UE 137, Staff Closing Comments in Docket No. UM 1071, Staff Testimony in Docket No. UE 165, and Staff Testimony in Docket No. UE 173.
>
> In Order 05-1261, the Commission indicated that the long-term operation of a PCA mechanism allows offsetting events to be reflected in customer rates and, therefore, provides an opportunity to use a more inclusive recovery standard (i.e., a narrower deadband) in a PCA mechanism than it would allow

> with a one-time deferral mechanism. *See* Order 05-1261 at 9-10. The Commission concluded that a hydro-only PCA mechanism should be used to protect the company from unusual variation in hydro-related power costs.

UE 180, UE 181, UE 184, Staff/800, Galbraith/8-9.

In this proceeding, Staff has proposed a retrospective PCA mechanism, with a deadband equivalent to 150 basis points of return on equity (ROE). The deadband limits supplemental recovery to unusual events and would require PGE to absorb that amount of excess power costs. Staff believes this deadband satisfies the Commission's unusual event standard.

Q. WHAT DO YOU BELIEVE IS THE MOST RELEVANT RISK FOR THE COMMISSION TO CONSIDER WHEN EVALUATING PGE'S PROPOSED POWER COST FRAMEWORK?

A. The most relevant risk is extreme increases in net variable power costs (NVPC). Staff assigns priority to the consideration of extreme increases in NVPC for three reasons. First, the impact of increases in NVPC on shareholder earnings, or customer rates, is qualitatively different from the impact of decreases in NVPC on shareholder earnings, or customer rates. Increases in NVPC are bad outcomes. Decreases in NVPC are good outcomes. Second, the severity, or magnitude of the increases in NVPC makes a difference. Trivial or modest increases in NVPC are qualitatively different from extreme increases in NVPC. Finally, Staff believes that increases in NVPC are more likely than decreases in NVPC.[1]

Q. PLEASE ELABORATE ON POWER COST RISK FROM THE SHAREHOLDER PERSPECTIVE?

A. The following decision matrix illustrates the relevant risk from the shareholder perspective.

Table 1. Shareholder PCA Mechanism Decision Matrix
Base case: No PCA Mechanism, Actual COS = Forecasted COS

	$55 M Decrease in NVPC	**$55 M Increase in NVPC**
Without PCA	Increased earnings (+$55 M)	Decreased earnings (-$55 M)
With PCA (90-10 Sharing)	Increased earnings after refund to customers (+$5.5 M)	Decreased earnings after recovery from customers (-$5.5 M)

The base case for this analysis is regulation without a retrospective PCA mechanism where the utility's actual cost-of-service is equal to its forecasted cost-of-service. *See* UE 180, UE 181, UE 184, PGE/1800, Lesh/15, lines 17-20. The analysis compares monetary outcomes under two regulatory regimes and two power cost outcomes. The two regulatory regimes are regulation without a PCA mechanism and regulation with PGE's proposed PCA mechanism. Assume the two possible power cost outcomes are a $55 million decrease in NVPC, which occurs with a probability of q, and a $55 million increase in NVPC, which occurs with a probability of 1-q.

---

[1] Staff's focus on both the likelihood and magnitude of bad outcomes is not uncommon. *See* Northwest Power and Conservation Council, The Fifth Northwest Electric Power and Conservation Plan, May 2005 (Chapter 6: Risk Management & Assessment); and Rescher, Nicholas, Risk: A Philosophical Introduction to the Theory of Risk Evaluation and Management, University Press of America, 1983 (Chapter 3: Negativity Evaluation and Comparison).

Without a PCA mechanism, a decrease in NVPC of $55 million results in increased earnings of $55 million before taxes, all other things the same. On the other hand, a $55 million increase in NVPC results in decreased earnings of $55 million. If there were an equal probability of a $55 million decrease and a $55 million increase in NVPC (i.e., q = .5) then the expected change in shareholder earnings without a PCA mechanism would be zero.

With PGE's proposed retrospective automatic adjustment clause, a decrease in NVPC of $55 million results in increased earnings of $5.5 million after refund to customers. Conversely, a $55 million increase in NVPC results in decreased earnings of $5.5 million. Again, with equal probabilities the expected change in shareholder earnings would be zero.

Q. WHAT IS THE RATIONALE FOR PGE TO PREFER REGULATION WITH A PCA MECHANISM TO REGULATION WITHOUT A PCA MECHANISM?

A. The fact that PGE is requesting a retrospective PCA mechanism is an indication that it is willing to forego increased earnings associated with decreases in NVPC in order to avoid reduced earnings associated with increases in NVPC. In other words, PGE either believes the probability of power cost increases is greater than the probability of power cost decreases (i.e., q < .5) and/or is risk averse and would rather avoid power cost increases than enjoy power cost decreases. This is simply another way of saying that PGE considers exposure to increases in NVPC to be the bad outcome.

Q. PLEASE ELABORATE ON POWER COST RISK FROM THE CUSTOMER PERSPECTIVE?

A. The following decision matrix illustrates the relevant risk from the customer perspective.

Table 2. Customer PCA Mechanism Decision Matrix
Base case: No PCA Mechanism, Actual COS = Forecasted COS

	$55 M Decrease in NVPC	**$55 M Increase in NVPC**
Without PCA	No opportunity	No exposure
With PCA (90-10 Sharing)	Rate decrease (+$49.5 M)	Rate increase (-$49.5 M)

Without a PCA mechanism, customers have no exposure to increases in NVPC and no opportunity to enjoy decreases in NVPC. The expected change in rates is zero.

With PGE's proposed retrospective automatic adjustment clause, a decrease in NVPC of $55 million results in rate credits totaling $49.5 million. On the other hand, a $55 million increase in NVPC results in a rate increase of $49.5 million. Again, with equal probabilities the expected change in rates would be zero.

Q. IS IT STAFF'S POSITION THAT CUSTOMERS ARE BETTER OFF WITHOUT A RETROSPECTIVE PCA MECHANISM?

A. Yes. As I mentioned earlier, Staff believes rate increase are qualitatively different from rate decreases. Given recent history in energy prices, I believe customers likely assign more weight to the avoidance of large rate increases than they do to the pursuit of rate decreases. In addition, Staff believes that increases in NVPC are more likely than decreases in NVPC.[2] Customers should be willing to forego the potential rate decreases associated with PCA regulation in exchange for the avoidance of rate increases due to increases in NVPC. Again, exposure to large increases in NVPC is the bad outcome.

Q. MS. LESH ARGUES THAT PGE CANNOT BEAR CUSTOMERS' RISK THAT ACTUAL COST-OF-SERVICE WILL BE LOWER THAN FORECASTED COST-OF-SERVICE AND THAT THE STAFF POSITION CONTRADICTS THIS CONCLUSION. *SEE* UE 180, UE 181, UE 184, PGE/1800, LESH/15-16. IS THIS ACCURATE?

A. No. Any contradiction, or confusion, is properly attributed to Ms. Lesh's logic and not to Staff's position. The confusion is resolved once one recognizes that shareholders and customers do not value decreases in NVPC (i.e., upside potential) and increases in NVPC (i.e., downside risk) equally. Ms. Lesh seems to question why Staff pays more attention to increases in NVPC than to decreases in NVPC. The answer is simple: large increases in NVPC are bad outcomes. Ms. Lesh seems to believe that all gaps between actual NVPC and forecasted NVPC are equally bad outcomes, regardless of their sign and magnitude. If PGE, on behalf of its shareholders, is willing to exchange upside potential for the avoidance of downside risk, then why is it a contradiction for customers to pursue the same objective? The company appears unable to grasp the fact that both shareholders and customers want to avoid the same thing: exposure to large increases in NVPC.

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[2] PGE also believes this general principle. See PGE/1900, Tinker – Schue – Drennan/53, lines 7-8 and footnote 4.

Q. MS. LESH ARGUES THAT A RETROSPECTIVE AUTOMATIC ADJUSTMENT CLAUSE REDUCES RISK. *SEE* PGE/1800, LESH/11. IS THIS A VALID ARGUMENT?

A. No. A retrospective PCA mechanism shifts risk to customers. The central comparison is between regulation without a retrospective automatic adjustment clause and regulation with an automatic adjustment clause. In the earlier example, under regulation without a PCA mechanism shareholders absorb the full $55 million in increased NVPC. With PGE's proposed PCA mechanism, customers bear $49.5 million (90 percent) and shareholders $5.5 million (10 percent) of the increased NVPC. PGE's proposed change in regulatory regime shifts nearly all power cost risk from shareholders to customers.

Q. MS. LESH ARGUES THAT THE COMMISSION ALLOCATES COST-OF-SERVICE RISK WHEN IT SETS THE BASELINE NVPC FOR A GIVEN TEST PERIOD. *SEE* PGE/1800, LESH/12-13. IS THIS A VALID ARGUMENT?

A. Yes, in a very limited sense. Ms. Lesh argues that the Commission allocates cost-of-service risk when it chooses a forecast of baseline NVPC. The example offered in support of this claim is a case where the Commission arbitrarily reduces PGE's forecasted NVPC by $20 million and thereby allocates more risk to the utility. According to this logic, in order for the Commission to allocate less risk to the utility it would have to arbitrarily increase the forecast of baseline NVPC. Staff, on the other hand, assumes that when the Commission chooses a forecast of baseline NVPC that it does so based on the evidence presented in the record. In other words, the Commission chooses the best forecast. PGE's risk allocation logic only makes sense in the case where the Commission chooses to use a lower or higher number than its best forecast. In other words, the argument makes sense if the Commission opts to authorize rates that are either "cost-of-service plus" or "cost-of-service minus." As Staff's earlier example shows, the most relevant risk is exposure to large increases in NVPC and the Commission's ability to allocate this risk is much greater than PGE is willing to admit.

Q. MS. LESH ALSO ARGUES THAT THE COMMISSION CAN RE-ALLOCATE COST-OF-SERVICE RISK BY BRINGING ACTUAL COSTS INTO THE RATEMAKING PROCESS IN AN UNEVEN MANNER. *SEE* PGE/1800, LESH/12-13. DOES THIS ARGUMENT MAKE SENSE?

A. Yes, in a very limited sense. Ms. Lesh indicates that one-time deferrals of excess power costs and one-sided PCA mechanisms are examples where the Commission re-allocates cost-of-service risk. This is true. However, the Commission has indicated a preference for a permanent PCA mechanism as a means to overcome reliance on one-time deferred accounting and has indicated that PCA mechanisms should be designed to be revenue neutral. The objective should be to avoid allocating cost-of-service risk between shareholders and customers in an uneven manner and to achieve a permanent and fair allocation of power cost risk between shareholders and customers.

Q. ARE PGE'S VIEWS ON RISK ALLOCATION LIMITED BY ITS SOLE FOCUS ON COST-OF-SERVICE RISK?

A. Yes. PGE's examples of risk allocation are counterintuitive because they presume that the only relevant risk is cost-of-service risk. As I indicated earlier, the most relevant risk is exposure to large increases in NVPC. Both shareholders and customers want to avoid this bad outcome and are willing to trade upside potential to achieve the goal.

Q. PLEASE RECAP HOW THESE CONSIDERATIONS HAVE INFLUENCED STAFF'S RECOMMENDATIONS ON PCA MECHANISMS IN THIS AND OTHER RECENT DOCKETS.

A. Staff believes that the primary purpose of a PCA mechanism is to protect utility shareholders from large increases in NVPC. Staff supports the use of a retrospective PCA mechanism as a means to reduce shareholder NVPC-related earnings risk. However, Staff does not believe it is appropriate to shift all of the risk to customers. The fundamental issue is the amount of risk reduction, or earnings stability, to achieve with a PCA mechanism. Staff has recommended using a deadband to prevent normal variation in NVPC from triggering the PCA mechanism. Staff believes a deadband is the best way to protect shareholders from extreme increases in NVPC without shifting too much risk to customers. A large deadband serves two other purposes. First, it keeps PGE focused on managing power cost risk. Not only can the company take actions to reduce the risk, investors in PGE can hedge the risk through diversifying their portfolios. It is likely more efficient to leave power cost risk with the company than to shift this risk to customers where diversification is problematic. Second, a large deadband prevents the PCA mechanism from supplanting normalized test year ratemaking.

Q. PROTECTION FROM BAD MONETARY OUTCOMES SOUNDS LIKE INSURANCE. IS THIS AN APPROPRIATE ANALOGY?

A. Yes. A PCA mechanism is like insurance; it does not prevent the bad events from happening, it only cushions their economic impact. A PCA mechanism does not reduce the potential for extreme increases in NVPC; it simply limits shareholders' monetary loss. The purpose of a PCA mechanism is to transform a hazard that poses an unacceptable risk to shareholders into one for which risk is shared by both shareholders and customers.

Q. MS. LESH SUGGESTS THAT SOME PARTIES MAY VIEW COST-OF-SERVICE ELECTRICITY AS A "NO TRUE UP" PRODUCT. *SEE* PGE/1800, LESH/18-22. DOES STAFF HOLD THIS VIEW?

A. No. However, Staff also does not hold the view implicit in much of Ms. Lesh's argument that cost-of-service pricing requires a frequent and full true-up to actual costs.

Q. MS. LESH REBUTS YOUR STATEMENTS ABOUT THE DEGREE OF COMPANY CONTROL OVER NET POWER COSTS. *SEE* PGE/1800, LESH/26. DID YOU FIND THIS REBUTAL PERSUASIVE?

A. No.

Q. PLEASE EXPLAIN.

A. While I agree with Ms. Lesh that the amount of control a utility can exercise over an element of cost-of-service affects the size, or amount, of risk associated with that cost element, my point is that the question of the appropriate sharing of power cost risk presupposes a significant lack of control. *See* UE 180, UE 181, UE 184, Staff/800, Galbraith/11-12. Lack of control is not a reason that justifies shifting nearly all power cost risk to customers, it is simply one reason for the existence of the risk in the first place.

Q. PGE ARGUES THAT REDUCING COST-OF-SERVICE RISK BENEFITS CUSTOMERS. *SEE* PGE/1800, LESH/30-31. CAN YOU SUMMARIZE THESE ARGUMENTS?

A. Yes. PGE's first argument is that its required ROE is higher without the company's proposed power cost framework and, therefore, if the Commission fails to adopt its power cost framework then the fixed costs of new investments will be higher. Ms. Lesh next asserts that incurring higher fixed costs to avoid periodic bad NVPC outcomes is a poor bargain. *See* UE 180, UE 181, UE 184, PGE/1800, Lesh/30-31. The argument, in a nutshell, is that lower investment costs will more than offset customers' exposure to power cost risk and result in net customer benefits.

PGE's second argument is that its proposed power cost framework will provide improved price signals and that this benefits customers by enabling better consumption decisions. *See* UE 180, UE 181, UE 184, PGE/1800, Lesh/31.

The final argument for customer benefits is that reducing cost-of-service risk improves inter-generational equity among customers. *See* UE 180, UE 181, UE 184, PGE/1800, Lesh/31.

Q. IS PGE'S FIRST ARGUMENT FOR CUSTOMER BENEFITS PERSUASIVE?

A. No. Ms. Lesh chides other parties for failing to demonstrate that not reducing cost-of-service risk benefits customers. *See* UE 180, UE 181, UE 184, PGE/1800, Lesh/31, lines 13-16. PGE has not demonstrated, or attempted to demonstrate, that lower investment costs will offset customers' exposure to power cost risk.

Q. IS PGE'S SECOND ARGUMENT FOR CUSTOMER BENEFITS PERSUASIVE?

A. No. When it comes to sending accurate price signals, PCA mechanisms are very blunt instruments. The price signal can reach the customer more than a year after the fact. There are better ways of enabling better consumption decisions.

Q. IS PGE'S THIRD ARGUMENT FOR CUSTOMER BENEFITS PERSUASIVE?

A. No. While improving inter-generational equity among customers is a good thing, improving intra-generational equity between customers and shareholders should be the primary concern.

Q. PGE CRITICIZES STAFF'S DEADBAND FOR HAVING NOTHING TO DO WITH THE DISTRIBUTION OF NVPC OUTCOMES. *SEE* PGE/1800, LESH/41. CAN YOU ADDRESS THIS CRITICISM?

A. Yes. Staff has approximated the distribution of PGE's NVPC developed by PA Consulting using Monte Carlo simulation and the statistical parameters provided at PGE/1803, Lesh/43. PGE does not have the model developed by PA Consulting or the prototype histogram of NVPC outcomes. *See* Staff/1501, Galbraith/1. Staff made 10,000 random draws from each of four different distributions that bracket the statistical parameters provided by PA Consulting. Staff then combined the draws and constructed alternative deadbands based on the simulated distribution.

Q. HOW DOES STAFF'S PROPOSED 150 BASIS POINT DEADBAND COMPARE TO ALTERNATIVE DEADBANDS BASED ON THE SIMULATED DISTRIBUTION OF PGE'S NVPC?

A. The analysis shows that Staff's proposed deadband falls between an alternative deadband set at the 60th percentile of the NVPC distribution and an alternative deadband set at the 70th percentile of the NVPC distribution. *See* Staff/1502, Galbraith/1-3. The following table shows this comparison:

Table 3. Comparison of Staff PCA Mechanism to Alternative PCA Mechanisms Based on Percentile Deadbands.

	60th & 40th Percentile Deadband w/ 90-10 Sharing	70th & 30th Percentile Deadband w/ 90-10 Sharing		Staff's Proposed PCA Mechanism
Upper Deadband	$14	$30		$21
Lower Deadband	-$13	-$27		-$21
Increases in NVPC				
Average Increase in NVPC (in millions)	$49	$49		$49
Average PGE Share (in millions)	$16	$26		$21
Average Customer Share (in millions)	$32	$22		$28
Overall Percentage Borne by PGE	33%	54%		43%
Overall Percentage Borne by Customers	67%	46%		57%
	100%	100%		100%
Increases Above Upper Deadband				
Average Increase in NVPC (in millions)	$59	$71		$64
Average PGE Share (in millions)	$18	$34		$25
Average Customer Share (in millions)	$40	$37		$39
Overall Percentage Borne by PGE	31%	48%		39%
Overall Percentage Borne by Customers	69%	52%		61%
	100%	100%		100%

Staff's proposed PCA mechanism, with a deadband of 150 basis points of ROE and 90-10 sharing beyond the deadband, would allocate 57 percent of PGE's power cost risk to customers if the prototype distribution is accurate. Under Staff's proposal customers would bear 61 percent of the increased cost of events exceeding the deadband. Staff's proposed PCA mechanism could be expected to result in recovery/refund in at least 7 out of 10 years.

In comparison, an alternative PCA mechanism, with a deadband set at the 70th and 30th percentiles of the prototype distribution (equivalent to plus $30 million and minus $27 million) and 90-10 sharing beyond the deadband, would allocate 46 percent of PGE's power cost risk to customers if the prototype distribution is accurate. This alternative PCA mechanism could be expected to trigger in 6 out of 10 years.

Q. THE PROTOTYPE DISTRIBUTION OF PGE'S NVPC DEVELOPED BY PA CONSULTING LIKELY UNDERSTATES THE VARIABILITY IN PGE'S POWER COSTS. *SEE* UE 180, UE 181, UE 184, PGE/1803, LESH/43-44. HOW DOES THIS IMPACT STAFF'S COMPARATIVE DEADBAND ANALYSIS?

A. Staff believes that its comparative deadband analysis likely overstates the allocations of increased NVPC to PGE and understates the allocations of increased NVPC to customers.

Q. HAS PGE'S REBUTTAL OF STAFF'S TESTIMONY REGARDING THE COMPANY'S PROPOSED POWER COST FRAMEWORK PERSUADED STAFF TO MODIFY ANY OF ITS PRIOR RECOMMENDATIONS?

A. No.

Q. DOES THIS CONCLUDED YOUR TESTIMONY ON PGE'S PROPOSED POWER COST FRAMEWORK?

A. Yes.

PGE'S Boardman and Colstrip Forced Outage Rates

Q. WHAT CONCERN DID YOU IDENTIFY WITH PGE'S PROPOSED FORCED OUTAGES RATES FOR BOARDMAN AND COLSTRIP?

A. I identified a flaw in the traditional four-year rolling average calculation of a unit's 'normal' forced outage rate. I indicated that it is inappropriate to include extreme outage events in the four-year average because doing so assigns too much weight to the extreme event. See UE 180, UE 181, UE 184, Staff/100, Galbraith/6. I indicated that PGE's proposed 'normal' forced outage rate for Boardman reflected an extreme outage rate from 2005. *See* UE 180, UE 181, UE 184, Staff/100, Galbraith/6. I also indicated that the proposed Colstrip rate inappropriately reflected an extreme forced outage rate from 2002. *See* UE 180, UE 181, UE 184, Staff/100, Galbraith/13.

Q. PLEASE SUMMARIZE STAFF'S RECOMMENDATION REGARDING PGE'S FORCED OUTAGES RATES FOR BOARDMAN AND COLSTRIP.

A. Staff recommended that the Commission use adjusted North American Electric Reliability Council (NERC) peer group equivalent forced outage rates as the 'normal' test period rates for Boardman and Colstrip. The recommended rates were 7.67 percent for Boardman and 7.69 percent for Colstrip. Staff estimated that the proposed adjustments would lower PGE's test period NVPC by $12.847 million.

Q. DID PGE ADDRESS YOUR CONCERN WITH THE TRADITIONAL FOUR-YEAR AVERAGE METHODOLOGY IN ITS REBUTTAL TESTIMONY?

A. No. PGE argued that Staff failed to demonstrate that using NERC peer group averages would be less volatile than using the four-year average methodology. *See* UE 180, UE 181, UE 184, PGE/1900, Tinker – Schue – Drennan/41. Staff did not identify volatility of the four-year average as a concern. Staff identified the inappropriate weighting of extreme outage events as a flaw in the four-year average approach to determining ‘normal’ forced outage rates. PGE failed to address this concern.

Q. PGE ARGUES THAT THE HIGHER FORCED OUTAGE RATES AT THESE PLANTS ARE OFFSET BY LOWER PLANNED OUTAGE RATES. SEE UE 180, UE 181, UE 184, PGE/1900, TINKER – SCHUE – DRENNAN/38-39. DID YOU FIND THIS REBUTTAL PERSUASIVE?

A. No. This rebuttal is unpersuasive. First, the identified offset is not a good economic tradeoff. Forced outages are likely to be more expensive than planned outages. Planned outages are scheduled for periods of the year when wholesale power prices are expected to be at their lowest levels. A utility can purchase replacement power for these scheduled outages in the forward markets. On the other hand, forced outages occur randomly. Some of these random outages will occur during high price periods of the year and will force the utility to acquire replacement power in the real-time and day-ahead wholesale markets. Second, although it is clear that the actual forced outage rates are reflected in PGE’s retail rates through the use of the four-year average methodology, PGE failed to demonstrate that that the offset, lower than average planned outage rates, are also reflected in its retail rates.

Q. DOES THE FOUR-YEAR AVERAGE METHODOLOGY PROVIDE INCENTIVE FOR A UTILITY TO HAVE HIGHER THAN AVERAGE FORCED OUTAGE RATES AND LOWER THAN AVERAGE PLANNED OUTAGES?

A. This is certainly an additional concern that I now have with the 4-year average calculation of ‘normal’ forced outage rates.

Q. PGE CRITICIZES STAFF FOR FAILING TO IDENTIFY THE COLSTRIP ADJUSTMENT IN PRIOR RATE PROCEEDINGS. *SEE* UE 180, UE 181, UE 184, PGE/1900, TINKER – SCHUE – DRENNAN/40. HOW DO YOU EXPLAIN THIS INCONSISTENCY?

A. The October 23, 2005 outage at the Boardman facility was the impetus for taking a harder look at the four-year average methodology. Staff now believes that using NERC peer group averages is a better method of normalizing forced outages.

Q. PGE POINTS OUT THAT NERC HAS BEEN CRITICAL OF ITS STANDARD PEER GROUPS, WHICH ARE BASED ONLY ON FUEL TYPE AND UNIT SIZE. *SEE* UE 180, UE 181, UE 184, PGE/1900, TINKER – SCHUE – DRENNAN/42-43. PLEASE RESPOND TO THIS TESTIMONY.

A. NERC indicates that a standard peer group may not be the optimal peer group for a particular unit. NERC offers benchmarking services that can lead to the selection of an optimal, or custom, peer group for a particular unit. The material describing these benchmarking services does not indicate the sign or magnitude of the potential bias. *See* UE 180, UE 181, UE 184, PGE/1912, Tinker – Schue – Drennan/1-6. In other words, the optimal peer group for the Boardman unit may have a lower forced outage rate than the standard peer group based on fuel type and capacity.

Q. PGE ARGUES THAT NERC DATA ARE FINE FOR GENERAL COMPARISON PURPOSES BUT ARE NOT APPROPRIATE FOR RATEMAKING PURPOSES. *SEE* UE 180, UE 181, UE 184, PGE/1900, TINKER – SCHUE – DRENNAN/44, LINES 12-13. PLEASE RESPOND TO THIS TESTIMONY.

A. I disagree with PGE’s statement. The NERC data are verifiable and objective. The use of verifiable and objective data improves the chances that the

Commission will accept normalized forced outage rates. *See* UE 180, UE 181, UE 184, PGE/1912, Tinker – Schue – Drennan/1.

Q. HAS PGE'S REBUTTAL OF STAFF'S TESTIMONY REGARDING THE BOARDMAN AND COLSTRIP FORCED OUTAGE RATES PERSUADED STAFF TO MODIFY ANY OF ITS PRIOR RECOMMENDATIONS?

A. No.

Q. DOES THIS CONCLUDED YOUR TESTIMONY ON PGE'S BOARDMAN AND COLSTRIP FORCED OUTAGE RATES?

A. Yes.

PGE's Port Westward Decision

Q. WHAT CONCERNS HAVE BEEN RAISED REGARDING THE PRUDENCE OF PGE'S DECISION TO BUILD PORT WESTWARD?

A. The Citizens' Utility Board (CUB) raises the issue of the prudence of Port Westward in relation to the whole 2002 Integrated Resource Plan (IRP) Final Action Plan. CUB argues that when the Commission acknowledged PGE's ten-part action plan it did so as an integrated whole. Therefore, according to CUB, when evaluating the prudence of Port Westward, it is important to review Port Westward's place in the whole action plan, as well as the company's progress towards achieving all of the action items. *See* UE 180, UE 181, UE 184, CUB/200, Jenks – Brown/25-26.

Q. IS CUB'S CONCERN VALID?

A. Yes. Evaluating PGE's actions in relation to the entire 2002 IRP action plan is an important consideration in evaluating the prudence of Port Westward. As CUB correctly indicates, an action plan is acknowledged, in large part, because it creates a good balance between cost and risk. However, as a general matter, a utility's failure to complete an individual action item does not necessarily mean that the company's decisions regarding the other action plan items should be challenged. Individual resource decisions can still be prudent even though the utility's implementation of its entire action plan has been less than perfect.

Q. DID PGE ADDRESS CUB'S CONCERN IN ITS REBUTTAL TESTIMONY?

A. Yes. PGE included in it rebuttal testimony a copy of its Final Action Plan Update dated March 23, 2006. *See* UE 180, UE 181, UE 184, PGE/1915, Tinker – Schue – Drennan/1-44. PGE argues that as of March 23, 2006, the only item remaining to be completed from its 2002 IRP action plan was the acquisition of 38 average megawatts (MWa) of wind resources. PGE further argues that it is in the process of developing the first phase of the Biglow Canyon Wind Farm and that it now considers this action item completed. *See* UE 180, UE 181, UE 184, PGE/1900, Tinker – Schue – Drennan/57.

Q. IS PGE'S REBUTTAL OF CUB'S CONCERN PERSUASIVE?

A. Yes, in large part. However, one remaining issue might turn on whether it is appropriate to consider the wind resource action item completed, when PGE is admittedly only in the process of developing the Biglow Canyon Wind Farm. It is Staff's understanding that CUB intends to further pursue this issue in this current round of rebuttal testimony.

Q. DOES STAFF HAVE A FINAL RECOMMENDATION REGARDING THE PRUDENCE OF PGE'S DECISION TO BUILD PORT WESTWARD?

A. No, not at this time. Staff intends to review CUB's rebuttal testimony and make a final recommendation to the Commission in its opening brief.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

CASE: UE 180/UE 181/UE 184
WITNESS: Maury Galbraith

PUBLIC UTILITY COMMISSION
OF
OREGON

STAFF EXHIBIT 1501

Exhibits in Support
Of Surrebuttal Testimony

October 6, 2006

September 26, 2006

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 180
PGE Response to OPUC Data Request
Dated September 20, 2006
Question No. 618

Request:

Please provide on an electronic EXCEL worksheet the 1000 net variable power cost (M$) simulation results referenced in PGE Exhibit 1803, Lesh/43.

Response:

PGE does not have this information, nor does PGE have the model developed by PA Consulting.

CASE: UE 180/UE 181/UE 184
WITNESS: Maury Galbraith

PUBLIC UTILITY COMMISSION OF OREGON

STAFF EXHIBIT 1502

Exhibits in Support Of Surrebuttal Testimony

October 6, 2006

Comparison of Staff PCA Mechanism to Alternative PCA Mechanisms Based on Percentile Deadbands

	60th & 40th Percentile Deadband w/ 90-10 Sharing	70th & 30th Percentile Deadband w/ 90-10 Sharing	75th & 25th Percentile Deadband w/ 90-10 Sharing	80th & 20th Percentile Deadband w/ 90-10 Sharing	90th & 10th Percentile Deadband w/ 90-10 Sharing	Staff's Proposed PCA Mechanism
Upper Deadband	$14	$30	$39	$49	$78	$21
Lower Deadband	-$13	-$27	-$34	-$42	-$60	-$21
Increases in NVPC Beyond the Deadband						
Number of Draws	16,057	11,982	9,925	8,004	3,983	14,180
Average Percentage Borne by PGE per Year	42%	57%	62%	67%	76%	49%
Average Percentage Borne by Customers per Yea	58%	43%	38%	33%	24%	51%
	100%	100%	100%	100%	100%	100%
Average Increase in NVPC (in millions)	$59	$71	$79	$88	$113	$64
Average PGE Share (in millions)	$18	$34	$43	$53	$82	$25
Average Customer Share (in millions)	$40	$37	$36	$35	$32	$39
Overall Percentage Borne by PGE	31%	48%	54%	60%	72%	39%
Overall Percentage Borne by Customers	69%	52%	46%	40%	28%	61%
	100%	100%	100%	100%	100%	100%
Increases in NVPC Within the Deadband						
Number of Draws	3,943	8,018	10,075	11,996	16,017	5,820
Average Percentage Borne by PGE per Year	100%	100%	100%	100%	100%	100%
Average Percentage Borne by Customers per Year	0%	0%	0%	0%	0%	0%
	100%	100%	100%	100%	100%	100%
Average Increase in NVPC (in millions)	$7	$14	$18	$23	$32	$10
Average PGE Share (in millions)	$7	$14	$18	$23	$32	$10
Average Customer Share (in millions)	$0	$0	$0	$0	$0	$0
Overall Percentage Borne by PGE	100%	100%	100%	100%	100%	100%
Overall Percentage Borne by Customers	0%	0%	0%	0%	0%	0%
	100%	100%	100%	100%	100%	100%
All Increases in NVPC						
Number of Draws	20,000	20,000	20,000	20,000	20,000	20,000
Average Percentage Borne by PGE per Year	53%	74%	81%	87%	95%	64%
Average Percentage Borne by Customers per Year	47%	26%	19%	13%	5%	36%
	100%	100%	100%	100%	100%	100%
Average Increase in NVPC (in millions)	$49	$49	$49	$49	$49	$49
Average PGE Share (in millions)	$16	$26	$31	$35	$42	$21
Average Customer Share (in millions)	$32	$22	$18	$14	$6	$28
Overall Percentage Borne by PGE	33%	54%	63%	71%	87%	43%
Overall Percentage Borne by Customers	67%	46%	37%	29%	13%	57%
	100%	100%	100%	100%	100%	100%

	60th & 40th Percentile Deadband w/ 90-10 Sharing	70th & 30th Percentile Deadband w/ 90-10 Sharing	75th & 25th Percentile Deadband w/ 90-10 Sharing	80th & 20th Percentile Deadband w/ 90-10 Sharing	90th & 10th Percentile Deadband w/ 90-10 Sharing	Staff's Proposed PCA Mechanism
Decreases in NVPC Within the Deadband						
Number of Draws	3,922	7,965	9,899	11,982	15,932	6,287
Average Percentage Borne by PGE per Year	100%	100%	100%	100%	100%	100%
Average Percentage Borne by Customers per Year	0%	0%	0%	0%	0%	0%
	100%	100%	100%	100%	100%	100%
Average Increase in NVPC (in millions)	-$7	-$13	-$17	-$20	-$28	-$10
Average PGE Share (in millions)	-$7	-$13	-$17	-$20	-$28	-$10
Average Customer Share (in millions)	$0	$0	$0	$0	$0	$0
Overall Percentage Borne by PGE	100%	100%	100%	100%	100%	100%
Overall Percentage Borne by Customers	0%	0%	0%	0%	0%	0%
	100%	100%	100%	100%	100%	100%
Decreases in NVPC Beyond the Deadband						
Number of Draws	16,078	12,035	10,101	8,018	4,068	13,713
Average Percentage Borne by PGE per Year	44%	61%	67%	73%	82%	54%
Average Percentage Borne by Customers per Year	56%	39%	33%	27%	18%	46%
	100%	100%	100%	100%	100%	100%
Average Increase in NVPC (in millions)	-$45	-$54	-$59	-$64	-$77	-$50
Average PGE Share (in millions)	-$16	-$30	-$36	-$44	-$62	-$24
Average Customer Share (in millions)	-$29	-$24	-$22	-$20	-$15	-$26
Overall Percentage Borne by PGE	36%	55%	62%	69%	80%	48%
Overall Percentage Borne by Customers	64%	45%	38%	31%	20%	52%
	100%	100%	100%	100%	100%	100%
All Decreases in NVPC						
Number of Draws	20,000	20,000	20,000	20,000	20,000	20,000
Average Percentage Borne by PGE per Year	55%	76%	83%	89%	96%	69%
Average Percentage Borne by Customers per Year	45%	24%	17%	11%	4%	31%
	100%	100%	100%	100%	100%	100%
Average Increase in NVPC (in millions)	-$38	-$38	-$38	-$38	-$38	-$38
Average PGE Share (in millions)	-$14	-$23	-$27	-$30	-$35	-$20
Average Customer Share (in millions)	-$23	-$15	-$11	-$8	-$3	-$18
Overall Percentage Borne by PGE	38%	61%	71%	79%	92%	52%
Overall Percentage Borne by Customers	62%	39%	29%	21%	8%	48%
	100%	100%	100%	100%	100%	100%

	60th & 40th Percentile Deadband w/ 90-10 Sharing	70th & 30th Percentile Deadband w/ 90-10 Sharing	75th & 25th Percentile Deadband w/ 90-10 Sharing	80th & 20th Percentile Deadband w/ 90-10 Sharing	90th & 10th Percentile Deadband w/ 90-10 Sharing	Staff's Proposed PCA Mechanism
All Variation in NVPC						
Number of Draws	40,000	40,000	40,000	40,000	40,000	40,000
Average Percentage Borne by PGE per Year	54%	75%	82%	88%	96%	66%
Average Percentage Borne by Customers per Year	46%	25%	18%	12%	4%	34%
	100%	100%	100%	100%	100%	100%
Average Increase in NVPC (in millions)	$5	$5	$5	$5	$5	$5
Average PGE Share (in millions)	$1	$2	$2	$2	$4	$1
Average Customer Share (in millions)	$4	$4	$3	$3	$2	$5
Overall Percentage Borne by PGE	17%	28%	37%	44%	70%	12%
Overall Percentage Borne by Customers	83%	72%	63%	56%	30%	88%
	100%	100%	100%	100%	100%	100%
Number of Deadband Result in 10 Years	2	4	5	6	8	3

CASE: UE 180/UE 181/UE 184
WITNESS: Bill Wordley

PUBLIC UTILITY COMMISSION
OF
OREGON

STAFF EXHIBIT 1600

Surrebuttal Testimony

REDACTED VERSION
October 6, 2006

CERTAIN INFORMATION CONTAINED IN STAFF EXHIBIT 1600

IS CONFIDENTIAL AND SUBJECT TO PROTECTIVE

ORDER NO. 06-111. YOU MUST HAVE SIGNED

APPENDIX B OF THE PROTECTIVE ORDER IN

DOCKET UE 180 TO RECEIVE THE

CONFIDENTIAL VERSION

OF THIS EXHIBIT.

Q. PLEASE STATE YOUR NAME AND POSITION.

A. My name is Bill Wordley. I am employed by the Public Utility Commission of Oregon (OPUC) as a Senior Economist.

Q. DID YOU PREVIOUSLY FILE TESTIMONY IN THESE PROCEEDINGS?

A. Yes. I sponsored Staff/200-204 in consolidated Docket Nos. UE 180, UE 181, and UE 184.

Introduction and Summary

Q. WHAT IS THE PURPOSE OF YOUR SURREBUTTAL TESTIMONY?

A. The purpose of this testimony is to rebut PGE's rebuttal testimony concerning two adjustments I proposed in direct testimony, one for ancillary services revenue and the second for the extrinsic value of PGE's power resources.

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. First, staff continues to recommend a reduction in allowed costs for revenues from ancillary services that PGE provides to other entities. The amount of the proposed adjustment is now [redacted] (confidential) compared to $1,647,855 in staff's direct testimony.

Second, staff continues to recommend a reduction of $12,352,530 to account for the extrinsic value associated with PGE's flexible purchase power contracts and gas-fired generating resources. PGE has failed to demonstrate why staff's proposed adjustment, based on the company's own estimate of extrinsic value, is not reasonable. This adjustment is required to ensure that customers receive all of the benefits from resources for which they are paying all of the costs.

Ancillary Services Revenue

Q. WHAT IS PGE'S ARGUMENT REGARDING THE ANCILLARY SERVICES REVENUE THE COMPANY IS RECEIVING, BUT DID NOT INCLUDE IN THE COMPANY'S CASE?

A. PGE says, "there is considerable risk around making a revenue projection for the test year". (PGE/1900, Tinker-Schue-Drennan/46)

Q. WHAT IS STAFF'S ASSESSMENT OF THE COMPANY'S ARGUMENT?

A. According to updated information provided by the company, PGE has been selling ancillary services for 15 months and counting (June 2005-August 2006). PGE has not indicated that the company expects these sales to not continue for the foreseeable future. Staff sees no reason to assume the sales will not continue. Consequently, staff recommends an adjustment to reduce allowed costs for revenues from ancillary services that PGE provides to other entities. The proposed adjustment of [redacted] (confidential) is based on the actual revenues for September 2005-August 2006, the most recent twelve-month period of data available. See Staff/1601, Wordley/1 (confidential), which is the company's response to staff DR 619.

Extrinsic Value

Q. WHAT IS EXTRINSIC VALUE?

A. Extrinsic value is the dollar value produced by the flexibility of a power resource to operate profitably in a wholesale power market characterized by volatile and correlated gas and electricity prices. (Staff/200, Wordley/9)

Q. DID PGE INCLUDE THE EXTRINSIC VALUE OF THE COMPANY'S POWER RESOUCES IN ITS CASE?

A. No. The company includes only the "intrinsic" or deterministic value of resources in its case. (PGE/1900, Tinker-Schue-Drennan/18) PGE does not include the extrinsic value of its resources, produced by the company's flexible power resources operating in the uncertain wholesale energy markets.

Q. WHAT IS THE COMPANY'S ARGUMENT FOR NOT INCLUDING EXTRINSIC VALUE IN ITS CASE?

A. PGE said staff "failed to consider all the necessary factors" in developing its proposed extrinsic value adjustment. (PGE/1900, Tinker-Schue-Drennan/1900)

Q. IS THIS CORRECT?

A. No. Staff's estimate of extrinsic value is based directly on the company's own estimate of extrinsic value developed and used in its capacity resource acquisition evaluation process. This estimate appropriately considered the volatility and correlation of natural gas and electricity prices, and the flexibility of the resources to capture margins.

Q. IS THE COMPANY CONFUSING EXTRINSIC VALUE WITH THE STOCHASTIC MODELING OF POWER COSTS?

A. Yes. Staff has encouraged PGE to pursue stochastic power cost modeling in UE 165 as well as in this docket. As indicated in staff's direct testimony, stochastic modeling involves consideration of the uncertainty of several modeling inputs. (Staff/200, Wordley/3-9) However, to be fair and consistent to the company and customers, in this case staff only considered the extrinsic value-related factors/variables that the company analyzed when choosing resources.

Q. TO JUSTIFY ITS USE OF ELEMENTS OF STOCHASTIC MODELING IN THE IRP PROCESS AND FOR RESOURCE ACQUISITION EVALUATION, BUT NOT FOR RATEMAKING, THE COMPANY SUGGESTS THAT RATE MAKING REQUIRES "PROHIBITIVE PRECISION", WHILE RESOURCE PLANNING DOES NOT. PLEASE COMMENT. (PGE/1900, TINKER-SCHUE-DRENNAN/18)

A. Staff's view is both the resource planning/acquisition and ratemaking processes require the best and most complete modeling possible. If one process were to be "more precise", it seems that the IRP/RFP process, yielding multi-million dollar, often 30-year investments in power resources, has the longer (i.e. more important) impacts on the company and customers.

In addition, if uncertainty can be addressed and evaluated in the 20-50 year IRP/RFP process, as PGE currently does, it certainly should be possible to deal with it in a one-year ratemaking test period. Why does the company consider uncertainty in the long-term, but not the short-term?

Q. PGE HAS ASSERTED THAT STAFF'S EXTRINSIC VALUE ADJUSTMENT IS BASED ON LESS THAN PRECISE MODELING AND THAT ANY MODELING USED FOR RATEMAKING "WOULD REQUIRE PROHIBITIVE PRECISION IN ALL OF THE PARAMETERS". WOULD STAFF CHARACTERIZE THE COMPANY'S MONET POWER COST MODEL, FOR EXAMPLE, USED IN THIS CASE AS HAVING PROHIBITIVE PRECISION?

A. No. In direct testimony staff identified flaws with PGE's power cost modeling. In addition, there is nothing precise about the modeling of power cost. PGE's power cost modeling is simply a point estimate, based on the best forecast information available at the time.

Q. PGE SUGGESTS CUSTOMERS WILL RECEIVE ANY EXTRINSIC VALUE THAT EXISTS IF THE COMMISSION APPROVES THE COMPANY'S PROPOSED ANNUAL UPDATE TARIFF AND VARIANCE TARIFF, SUBJECT TO THE 90-10 SHARING FORMULA. PLEASE COMMENT.

A. This is true. However, staff is recommending that the Commission reject the company's proposed Annual Update Tariff, and that the Commission also reject the company's proposed Variance Tariff. Staff is recommending that the Commission approve a power cost adjustment (PCA) mechanism with a significant deadband. If the Commission approves a PCA with a deadband, or does not approve a PCA of any kind, then staff's proposed extrinsic value adjustment is required for customers to receive the full value of the power resources for which they are paying the full cost.

Q. DOES PGE IDENTIFY PROBLEMS WITH ITS OWN POWER COST MODELING?

A. Yes. In addressing its power cost modeling of net variable power costs (NVPC) the company admits that; (1) regarding extrinsic value, "Our NVPC forecast does not reflect this because it models only a point electric power market and gas market price"; (2) "retail customers' demand for power will rise significantly above forecast" in MONET; (3) "any one or more of PGE's resources can experience difficulties at any time" that is not modeled in MONET; and (4) regarding capacity resources, "They are available for events that we anticipate but cannot precisely model". (PGE/1900, Tinker-Schue-Drennan/22-23)

Ironically, while PGE points out these several problems with its own power cost modeling, however the company does not offer or commit to fixing the flaws. Nonetheless, PGE criticizes staff's recommended improvements to the company's modeling, which would correct not only the problems PGE identified above, but the additional limitations to the company's power cost modeling that staff identified in its direct testimony. (See Staff/200, Wordley/3-5)

Q. PGE DOES NOT DENY THAT IT CAN OPERATE ITS RESOURCES MORE FREQUENTLY THAN MONET INDICATES, BUT ASSERTS

THAT THE MARGINS (I.E. EXTRINSIC VALUE) SHOULD NOT GO TO CUSTOMERS. PLEASE COMMENT.

A. PGE says that the extrinsic value adjustment is based on “selling this capacity to the market”, that is the undispatched or unused resource capacity in MONET. “If it is sold to the market, it is not available to serve retail load”. (PGE/1900, Tinker-Schue-Drennan/23) This is a misleading statement, since in actual operation of the system PGE does not base resource dispatch on the level of retail load. PGE uses its resources whenever it is economic; staff described “economic dispatch” in its direct testimony. (Staff/200, Wordley/10) All the value expected from the company’s power resources should go to customers, since customers are paying all of the cost of these resources in rates.

Q. PLEASE COMMENT ON PGE’S “SIMPLE EXAMPLE” OF THE NET IMPACT OF EVALUATING THE EXTRINSIC VALUE OF THE COMPANY’S UNUSED RESOURCE CAPACITY.

A. PGE provides an example where its Beaver gas-powered plant appears to operate and produce margins, but with the assumptions in the example, the company actually losses money. However, when viewed through the wide “lens” that PGE suggests, varying only one of the company’s assumptions in its example can produce a variety of results. By assuming the “weather event” in the company’s example had a 200 MWa load impact, instead of the company’s assumed 500 MWa impact, the net result is a positive $91,000 instead of the negative impact in the company’s example. (see Staff/1602, Wordley/1)

Instead of a weather event, if a supply interruption is assumed to be the cause of the spot electricity and gas prices in PGE's example, the net extrinsic value when looking through the company's wide lens, is a positive $720,000. (See Staff/1603, Wordley/1)

Clearly, any number of reasonable examples can be created using the company's "more complete view", the results of which are totally assumption driven. These positive and negative results will demonstrate nothing except that varying assumptions will produce varying results. Staff has recommended that the company pursue stochastic modeling, which would provide the company the more complete or wide lens that the company seems to be supporting in its rebuttal testimony. (See PGE/1900, Tinker-Schue-Drennan/26)

Q. PLEASE COMMENT ON PGE'S ANALYSIS OF STAFF'S CALCULATION OF ITS EXTRINSIC VALUE ADJUSTMENT.

A. First, it is significant that while PGE does not dispute the existence of extrinsic value, the company does not offer its own estimate in this docket. In its effort to discredit staff's estimate, PGE ironically attacks its own estimate of extrinsic value on which the company based multi-million dollar resources acquisition decisions. As staff explained in its direct testimony, PGE's estimate of extrinsic value used to evaluate capacity resource options was the only estimate available to staff and consequently was used by staff to develop its proposed extrinsic value adjustment. (see Staff/200, Wordley/13)

Q. IS THERE ANY VALIDITY TO PGE'S CRITIQUE OF STAFF'S ESTIMATION OF ITS PROPOSED EXTRINSIC VALUE ADJUSTMENT?

A. No. While PGE criticizes almost every element of staff's extrinsic value adjustment calculation, the company makes no valid points. PGE's specific criticisms are addressed below: First, PGE maintains that the company's estimate of extrinsic value it used to make capacity resource acquisition decisions, which was the same estimate used by staff to develop its extrinsic value adjustment, "was not a forecast", so consequently the company says, it cannot be used for ratemaking. This again is the company's "prohibitive precision" argument discussed earlier in this testimony, as PGE tries to draw a distinction between an estimate and a forecast, where, for purposes of ratemaking, no difference exists. The forecast future test period revenue requirement that supports PGE's rate request in this docket is full of estimates.

Second, PGE uses one year of actual data to imply staff's extrinsic value estimate for PGE's Super-Peak contract is too high. One year of actual experience provides no useful evidence regarding staff's estimate, which is an expected value over time, not a prediction for each and every year. (PGE/1900, Tinker-Schue-Drennan/28)

Third, PGE criticizes staff for not indicating why 2001 actual generation levels were used as the basis for staff's recommended extrinsic value adjustments for the company's Beaver and Coyote Springs power plants. However, staff indicted in its direct testimony that its recommended adjustment was based on limiting the plant capacity utilization to what has been used in the past. (Staff/200, Wordley/13)

Fourth, PGE asserts that the primary extrinsic value estimate that staff used was from the company's evaluation of winter season capacity options, when extrinsic value is higher, and consequently is not appropriate for applying to Beaver and Coyote Springs which are available all year. First, the company's extrinsic value estimate that staff used was the only value available. In addition, when staff issued a discovery request asking the company to provide analysis or studies that support and demonstrate that extrinsic value is higher in the winter, the company could provide no convincing evidence.

Q. WHAT IS STAFF'S CONCLUSION REGARDING EXTRINSIC VALUE?

A. Staff's proposed extrinsic value adjustment is aimed at improving PGE's power cost estimation methodology. Staff continues to recommend that the company pursue stochastic power cost modeling, with the intent of using the resulting distribution of net variable power cost (NVPC) for ensuring a fair sharing of power cost risk between customers and the company, and potentially for the source of expected NVPC for use in rates. Until the company develops and implements stochastic power cost modeling, staff's recommended extrinsic value adjustment improves the company's current NVPC estimate by ensuring customers receive all the benefits from the company's flexible power resources for which they are paying all the cost in rates. In addition, the extrinsic value adjustment will improve the consistency between the company's IRP/RFP and ratemaking processes.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

CASE: UE 180/UE 181/UE 184
WITNESS: Bill Wordley

PUBLIC UTILITY COMMISSION
OF
OREGON

STAFF EXHIBIT 1601

Confidential Exhibits in Support
Of Surrebuttal Testimony

October 6, 2006

STAFF EXHIBIT 1601

IS CONFIDENTIAL AND SUBJECT TO PROTECTIVE ORDER NO. 06-111. YOU MUST HAVE SIGNED APPENDIX B OF THE PROTECTIVE ORDER IN DOCKET UE 180 TO RECEIVE THE CONFIDENTIAL VERSION OF THIS EXHIBIT.

CASE: UE 180/UE 181/UE 184
WITNESS: Bill Wordley

PUBLIC UTILITY COMMISSION
OF
OREGON

STAFF EXHIBIT 1602

Exhibits in Support
Of Surrebuttal Testimony

October 6, 2006

Extrinsic Value Example
200 MW Weather Event

Forecast NVPC	850,000	000s
Forecast Load	2,400	aMW
Average Price	40.4	mills/kwh
Other Rev Req	800,000	000s
Forecast Load	2,400	aMW
Average Price	38.1	mills/kwh
Total Retail Tariff	78.5	mills/kwh
Forecast January:		
Beaver Output	0	For example, as it was in Mar 15 Filing
Sumas Gas Price	9.80	$/mmbtu
Mid-C On Peak	77.00	$/MWh
Mid-C Off Peak	68.75	$/MWh
Retail Load - Month	2700	aMW
Weather Event:		
Length of Storm	48	hours
Average Load	2900	aMW
Load above expected	200	aMW (Equals 2,900 - 2,700 aMW)
Energy to be filed	9,600	MWh
Avg Sumas Price	12.00	$/mmbtu (Over 48 hours)
Avg Mid-C Price	144.00	$/MWh (Over 48 hours)
Approx Beaver HR	9.500	mmbtu/MWh
Approx Beaver Cap	500	MW
Sales to Market		
Value of Beaver Gen	2,074	Equals 300 MW * 48 hours * $144/MWh (in $000s)
Fuel Cost of Beaver	1,642	Equals 300 MW * 48 hours * 9.500 mmbtu / MWh * $12.00/mmbtu (in $000s)
Beaver Margin	432	Relative to Market ($000s)
"Sales" of Beaver to Retail		
Additional Retail Rev	753	Equals 9,600 MWh * $78.50/Mwh (in $000s)
Additional Fuel Costs	1,094	Equals 200 MW * 48 hours * 9.500 mmbtu / MWh * $12.00/mmbtu (in $000s)
PGE Gross Margin	(341)	Loss of $.85 million from Load Excursion (in $000s)
Financial Impact of Load Excursion:		
Beaver Margin	432	Relative to Market (in $000s)
PGE Gross Margin	(341)	Loss of $.85 million from Load Excursion (in $000s)
Net Impact	**91**	**Net Extrinsic Value (in $000s)**

CASE: UE 180/UE 181/UE 184
WITNESS: Bill Wordley

PUBLIC UTILITY COMMISSION
OF
OREGON

STAFF EXHIBIT 1603

Exhibits in Support
Of Surrebuttal Testimony

October 6, 2006

Extrinsic Value Example

Regional Supply Interruption (Loss of elecrtric transmission line or loss of gas pipeline or loss of power plants)

Forecast January:		
Beaver Output	0	For example, as it was in Mar 15 Filing
Sumas Gas Price	9.80	$/mmbtu
Mid-C On Peak	77.00	$/MWh
Mid-C Off Peak	68.75	$/MWh
Approx Beaver HR	9.500	mmbtu/MWh
Approx Beaver Cap	500	MW
Supply Interruption		
Avg Sumas Price	12.00	$/mmbtu (Over 48 hours)
Avg Mid-C Price	144.00	$/MWh (Over 48 hours)
Sales to Market		
Value of Beaver Gen	3,456	Equals 500 MW * 48 hours * $144/MWh (in 000s)
Fuel Cost of Beaver	2,736	Equals 500 MW * 48 hours * 9.500 mmbtu / MWh * $12.00/mmbtu (in 000s)
Beaver Margin	**720**	Relative to Market (in 000s)

CASE: UE 180/UE 181/UE 184
WITNESS: Lisa Schwartz

PUBLIC UTILITY COMMISSION
OF
OREGON

STAFF EXHIBIT 1700

Surrebuttal Testimony

October 6, 2006

Q. PLEASE STATE YOUR NAME.

A. My name is Lisa Schwartz.

Q. ARE YOU THE SAME LISA SCHWARTZ THAT FILED DIRECT TESTIMONY IN THIS PROCEEDING?

A. Yes.

Q. WHAT IS THE PURPOSE OF YOUR SURREBUTTAL TESTIMONY?

A. My testimony addresses the remaining issue in the case related to partial requirements service – Economic Replacement Power (Schedule 76R).

Q. DID YOU PREPARE AN EXHIBIT FOR YOUR SURREBUTTAL TESTIMONY?

A. No.

PARTIAL REQUIREMENTS SERVICE – SCHEDULE 76R

Q. PLEASE SUMMARIZE THE ISSUE.

A. The Industrial Customers of Northwest Utilities (ICNU) assert in direct testimony that under Schedule 76R, customers with on-site generation should have several choices for obtaining Economic Replacement Power from Portland General Electric (PGE) at market prices. These choices would replace current pricing for this service which is based on the hourly Mid-Columbia (Mid-C) price index. As ICNU points out, the hourly index is a real-time price that is not known until after the fact. *See* ICNU/200, Iverson-Wolverton/15.

Q. DO YOU AGREE WITH ICNU THAT "USE OF A REAL-TIME PRICE MAKES IT DIFFICULT FOR A PARTIAL REQUIREMENTS CUSTOMER TO DETERMINE WHETHER BUYING ECONOMIC REPLACEMENT ENERGY IS AN ECONOMIC OPTION" (ICNU/200, IVERSON-WOLVERTON/15)?

A. Yes. The point of Economic Replacement Power is to allow the customer-generator to reduce or shut down on-site generation when market prices are low and to buy power at market prices from the utility or, under Schedule 576R, an Electricity Service Supplier (ESS). If the customer does not know what the prices will be, the Economic Replacement Power option is far less attractive. Staff supported an Economic Replacement Power option in UE 158 (for PGE) and UE 170 (for PacifiCorp) in order to provide an interruptible option for partial requirements service that provides flexibility and maximizes economic use of the customer's generation, without harm to the utility or its customers.

Q. HOW IS REAL-TIME HOURLY PRICING APPLIED IN THE BASE PARTIAL REQUIREMENTS SCHEDULE?

A. Partial requirements customers that want to buy energy from PGE must take service under Schedule 75. They then have the option to meet some of their energy needs by buying Economic Replacement Power under Schedule 76R.

Under Schedule 75, real-time hourly pricing is the basis for *Unscheduled* Energy charges. Unscheduled Energy is any energy above the baseline usage level consumed within an hour that has not been scheduled for delivery by PGE. Essentially, it replaces the consumer's generation during forced outages.

Economic Replacement Power, on the other hand, is for *prescheduled* energy needs. Thus, it need not be priced on the same basis as Unscheduled Energy.

Q. WHAT ECONOMIC REPLACEMENT POWER OPTIONS DOES PACIFICORP OFFER PARTIAL REQUIREMENTS CUSTOMERS?

A. Instead of a real-time hourly indexed rate, PacifiCorp offers daily, monthly and quarterly pricing for Economic Replacement Power. *See* PacifiCorp Schedule 276R. Daily charges are based on the Dow Jones Mid-C on-peak and off-peak prices. Pricing for monthly and quarterly Economic Replacement Power is based on a price quote from a brokering house or trading platform that the company is using on a given day.

The customer must provide an Energy Needs Forecast specifying the total prescheduled amount of energy per hour that PacifiCorp is requested to serve over a daily, monthly or quarterly period. The company can accept the forecast in whole or in part, or reject the forecast.

Q. HOW IS PACIFICORP PROTECTED IN OFFERING THESE PRICING OPTIONS?

A. First, the price quote is specified in PacifiCorp's "Energy Replacement Power Agreement" with the customer, and the customer is obligated to pay for the quantities of power per hour specified in the agreement. Therefore, the company does not need to include Imbalance Charges, simplifying the process.

Second, PacifiCorp includes an adder of 0.14 cents per kWh to defray supply and price risks of these transactions. Also, non-standard blocks – those not in multiples of 25 megawatts (MW) – incur a 5 percent adder to recognize the additional costs of these "odd lots."

Third, the Energy Replacement Power Agreement addresses mitigation of damages if the customer is unable to take the power.

Q. HOW DOES PACIFICORP ADDRESS THE ADMINISTRATIVE COSTS ASSOCIATED WITH THESE PRICING OPTIONS?

A. To defray administrative costs, PacifiCorp charges a fee for each Energy Needs Forecast the customer submits, as well as a processing fee for each executed Energy Replacement Power Agreement.

Q. WHAT ECONOMIC REPLACEMENT POWER OPTIONS DOES ICNU PROPOSE PGE OFFER PARTIAL REQUIREMENTS CUSTOMERS?

A. First, ICNU proposes that PGE's Daily Price Option under Schedules 83/89 *substitute* for the hourly pricing currently required under Schedule 76R. ICNU proposes that "reasonable scheduling requirements would apply." *See* ICNU/200, Iverson-Wolverton/15.

Second, ICNU proposes that Schedule 76R allow partial requirements customers that are *not* receiving service from an ESS for energy usage up to their Baseline Demand nevertheless be allowed to buy Economic Replacement Power from an ESS. Baseline Demand is demand normally supplied by the company when the customer's generator is operating as planned.

Third, ICNU proposes that Schedule 76R allow customers to participate in Schedule 87, Experimental Real Time Pricing, for their load in excess of Baseline Demand. ICNU proposes to maintain the currently established limits in that tariff. To be eligible for Schedule 87, the customer must have a demand greater than 1 MW, and no more than six customers are eligible. Under Schedule 87, energy is priced based on *day-ahead*, hourly prices.

Q. DO YOU AGREE WITH ICNU'S RECOMMENDATIONS?

A. Generally, yes. I agree with ICNU that PGE's Daily Price Option should replace real-time hourly pricing as the default pricing for Economic Replacement Power. Such a change will encourage additional distributed generation, an objective of the Commission, while assisting already established distributed generation to remain economic. PacifiCorp offers a daily price option (as well as monthly and quarterly options) for Economic Replacement Power, instead of a real-time hourly rate. The provisions I describe above would protect PGE against the risks and administrative costs posed by offering a daily pricing option for Economic Replacement Power.

Staff is intrigued by ICNU's proposal to allow partial requirements customers to participate in Schedule 87, particularly because no *full* requirements customers have enrolled in the pilot program since it was first offered in January 2004. Under Schedule 87, hourly prices apply *only* to deviations from the customer's historic energy use in each hour. PGE develops a customer "baseline" that represents these historic levels.

An advantage of opening the schedule to partial requirements customers is that they already have established a Baseline Demand under Schedule 75. Thus, PGE would not have to separately establish such a demand level for the purpose of Schedule 87.

Under Schedule 87, participants receive hourly prices by 4 p.m. for the following day. Therefore, they have advance information on the hourly prices they would pay.

Staff does not find persuasive PGE's general arguments opposing use of Schedule 87 for Economic Replacement Power. *See* PGE/2200, Kuns-Cody/25-26. Staff does not understand why the process PGE set up in Schedule 87 for establishing day-ahead hourly prices poses a problem or risk when applying it to Schedule 76R customers. Staff's public meeting memo recommending Commission approval of Schedule 87 describes the process under the tariff whereby the company synthesizes day-ahead prices by shaping day-ahead Mid-C bilateral trades. *See* Staff Report for the Commission's November 13, 2003, public meeting.

Regarding ICNU's proposed split-service option, whereby PGE would supply power for the partial requirements customer up to its Baseline Demand and an ESS would supply Economic Replacement Power (above Baseline Demand), PGE should lay out in its reply on this issue the concerns the company sees with such an approach. Staff recognizes that a partial requirements customer that wants service from an ESS already has the option to do so, under a package comprised of both Schedules 575 and 576R. However, the split-service option ICNU proposes should be more fully explored as an alternative.

Q. DOES THIS CONCLUDE YOUR SURREBUTTAL TESTIMONY?

A. Yes.

CASE: UE 180/UE 181/UE 184
WITNESS: Carla Owings

PUBLIC UTILITY COMMISSION
OF
OREGON

STAFF EXHIBIT 1800

Surrebuttal Testimony

October 6, 2006

Q. PLEASE STATE YOUR NAME, OCCUPATION, AND BUSINESS ADDRESS.

A. My name is Carla Owings. I am a Senior Revenue Requirements analyst employed by the Public Utility Commission. I have provided Direct Testimony in this proceeding that can be found at Exhibit Staff/400/Owings. My Witness Qualification Statement is found in Exhibit Staff/401.

Q. DID YOU PREPARE AN EXHIBIT FOR THIS DOCKET?

A. Yes. I prepared Exhibit Staff/1801, consisting of 15 pages.

Q. COULD YOU PLEASE SUMMARIZE YOUR SURREBUTTAL TESTIMONY?

A. Yes. Part I of my Testimony provides the rationale underlying Staff's recommendation as it relates to PGE's proposed treatment of its 24.7 MW combustion turbine at its Beaver Generation Plant (Beaver 8) and the necessary adjustments to the revenue requirement model to support that recommendation.

Part II provides a final rate case summary with modifications to the revenue requirement model that was submitted in Staff's direct testimony that reflect the following adjustments:

- Staff Witness Thomas Morgan's surrebuttal testimony in which he recommends PGE's Cost of Equity be 9.4 percent and a Capital Structure of 50 percent debt and 50 percent equity (*See* Exhibit Staff/1400/Morgan).

- Staff Witness Bill Wordley's surrebuttal testimony in which he finalizes his recommendation to Staff Adjustment S-16, Ancillary Services, revising the adjustment from $1,648 million to $1,532 million based on new information received from the Company (*See* Exhibit Staff /1600/Wordley).
- Staff Adjustment S-17, which includes the adjustments necessary to return the Beaver 8 generating facility to the terms agreed upon in a Stipulated Agreement discussed in Part I of this Surrebuttal Testimony.

Part I:
BEAVER 8

Q. PLEASE SUMMARIZE THE COMPANY'S RATE REQUEST AND TESTIMONY AS IT PERTAINS TO THE BEAVER 8 GENERATING FACILITY.

A. In 2001, PGE, Citizens' Utility Board (CUB) and Staff (the Parties) entered into a Stipulated Agreement wherein the parties agreed on how the revenues and costs associated with Beaver 8 should be treated for regulatory purposes (*See* Commission Order Nos. 01-473 and 01-694). The Commission orders provided for a three-year renewable agreement directing the sharing between customers and PGE on the costs and revenues of the plant's output. In 2004, the parties reconvened to address the expiration of the three-year agreement ordered in 2001 resulting in a Stipulation issued in August of 2004 (*See* Commission Order No. 04-740).

In a Stipulation approved in Commission Order No. 04-740, the parties agreed to divide the approximately $14.2 million in costs associated with Beaver 8 capital costs into two parts. The parties agreed that $4 million represented the current market value of the turbine, plus site improvements and would be added to PGE's rate base as of August 1, 2004. The remaining $10.2 million would be accounted for as a regulatory asset accruing interest at PGE's cost of capital (9.083% in UE 115) and would be amortized over a five-year-period beginning January 1, 2005, subject to two provisions:

- Excluding the effect of interest, PGE would collect no more than 60 percent of the $10.2 million initial balance prior to January 1, 2007.
- If, prior to the effective date of a Commission order setting rates in PGE's next general rate case, the Commission issues an order allowing addition of new rate base assets on a cost basis, then beginning on the effective date of rates set in PGE's next general rate case, PGE will amortize the outstanding balance of the regulatory asset over the remaining projected useful life of Beaver 8. The test year rate base will include the average unamortized balance, and the test year revenue requirement will include associated amortization and prudently incurred operations and maintenance expenses.

In addition, the parties to the stipulation agreed that PGE would transfer existing accumulated deferred taxes related to Beaver 8 from non-regulated to regulated books and that although the $4 million component will go into ratebase and will be depreciated beginning August 1, 2004, it will not go into retail rates until the effective date of tariffs resulting from PGE's next general rate case (which is UE 180).

Q. WERE ALL PARTIES THAT DISCUSSED ISSUES SURROUNDING THE STIPULATED AGREEMENT IN COMMISSION ORDER 04-740 A PARTY TO THE STIPULATION?

A. No. The parties that met to discuss the issues resolved in the stipulated agreement approved in Commission Order 04-740 included PGE, CUB, Staff and the Industrial Customers of Northwest Utilities (ICNU). Only PGE, CUB and Staff were parties to the Stipulation. However, ICNU did not oppose the Stipulation.

Q. WHAT HAS OCCURRED SINCE AUGUST OF 2004 AS A RESULT OF THE STIPULATION?

A. Pursuant to the Stipulation, PGE added $4 million to its ratebase and began to depreciate the regulatory asset over the projected useful life of Beaver 8. Also, the Company began to amortize the regulatory asset ($10.2 million) as of January 1, 2005. Total collections through Schedule 105 as of December 31, 2006 are projected to be approximately $5.4 million (*See* PGE/200/Tooman-Tinker/21).

Q. HOW DID PGE TREAT BEAVER 8 IN ITS UE 180 FILING?

A. PGE left the balance of the $4 million representing market value in ratebase and continued to expense depreciation based on the useful life of the Beaver 8 plant. However, the unamortized portion of the $10.2 million ($6.7 million, including the effects of interest accruing at PGE's cost of capital in UE 115, or 9.083 percent) was added to ratebase in the UE 180 test year period with a corresponding adjustment to reflect depreciation for the regulatory asset (*See* Exhibit PGE/200/Tooman-Tinker/23). These adjustments were based on the provision issued in Commission Order No. 04-740 that the Commission *could* issue an order allowing new ratebase assets to be added on a cost basis (*See* Commission Docket No. UM 1066) prior to PGE's next general rate case, or prior to rates being set in this UE-180 proceeding.

Q. HAS THE COMMISSION ISSUED AN ORDER IN DOCKET NO. UM 1066 ALLOWING ASSETS TO BE ADDED ON A COST BASIS?

A. No.

Q. HAS PGE TESTIFIED AS TO THE TREATMENT IT PROPOSES DUE TO THE FACT THAT NO ORDER HAS BEEN ISSUED IN DOCKET NO. UM 1066?

A. Yes. PGE proposes to remove the $7 million adjustment from ratebase and to adjust for the corresponding depreciation for the test year revenue requirement (*See* Exhibit PGE/1900/Tinker-Schue-Drennan/59).

Q. DOES STAFF SUPPORT PGE'S PROPOSAL TO REMOVE $7 MILLION FROM TEST YEAR RATEBASE AND TO ADJUST DEPRECIATION FOR THE CORRESPONDING EXPENSE?

A. Yes. Removing the $7 million from ratebase and adjusting for the corresponding depreciation expense is consistent with the regulatory treatment ordered in Commission Order 04-740. Further, Staff believes that this treatment is appropriate given the fact that PGE has never filed for a waiver the administrative rule requiring assets be included in rates at market and requesting the Commission approve the addition of the entire $14.2 million to ratebase or alternatively, a Commission decision granting permission to do so in Docket No. UM 1066.

Q. HAS STAFF MADE ADJUSTMENTS TO ITS REVENUE REQUIREMENT MODEL REFLECTING THE CHANGE TO RATEBASE AND TO DEPRECIATION EXPENSE?

A. Yes. Staff has added adjustment S-17 showing an adjustment to Electric Plant in Service of $6.7 million and an adjustment to Depreciation Expense of $497,000.

Q. ARE THERE ANY OTHER ISSUES RELATED TO THESE ADJUSTMENTS NOT ALREADY DISCUSSED IN THIS TESTIMONY?

A. Yes. In order to fully return the treatment of the regulatory asset to the terms agreed upon in the Stipulation, the Company should continue to collect revenues on Schedule 105 to recover the $10.2 million established in August of 2004 as a regulatory asset and the associated interest at its cost of capital (currently 9.083 percent established in UE 115; to be reestablished in this proceeding). The balance of which, as of December of 2006, is projected to be $6.7 million.

Q. DOES STAFF SUPPORT THE AMORTIZATION OF THE BALANCE OF THE REGULATORY ASSET ON SCHEDULE 105?

A. Yes.

PART II:

RATE CASE SUMMARY

Q. PLEASE SUMMARIZE THE COMPANY'S RATE REQUEST AND STAFF'S FINDINGS REGARDING REVENUE REQUIREMENT.

A. The Company's overall request, including updates to its power costs and Port Westward, was approximately $143 million or 9.1 percent increase from current rates. Staff proposes the revenue requirement determined in this case be $14.9 million on an annual basis. This recommendation includes updated power costs, all Staff proposed adjustments discussed in this Surrebuttal Testimony and the Stipulated Agreement entered into by Staff, PGE, CUB and ICNU effective January 1, 2007, as well as a correction for a math error in Staff's proposed cost of debt and represents an overall increase of approximately 1.8 percent. For March 1, 2007, the expected commercial operation date for Port Westward, Staff proposes that the appropriate increase in revenues should be an additional $37.1 million on an annual basis, or an additional increase of 3.8 percent to rates. On a consolidated basis, this represents an overall revenue requirement increase of 5.6 percent to current rates.

Q. DO YOU HAVE ANYTHING FURTHER ON THESE ISSUES OR ANY OTHER ISSUES?

A. No.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

CASE: UE 180/UE 181/UE 184
WITNESS: Carla Owings

PUBLIC UTILITY COMMISSION OF OREGON

STAFF EXHIBIT 1801

Exhibits in Support Of Surrebuttal Testimony

October 6, 2006

Portland General Electric
UE 180
Case Summary
Twelve Months Ending December 31, 2007
(000)

	DESCRIPTION	PER APPLICATION Before PW (1)	STAFF PROPOSED Before PW (2)	PER APPLICATION After PW (3)	STAFF PROPOSED After PW (4)
1	**Rate of Return Under Present Rates**				
2	**Total Combined Rate Base**	1,745,972	1,728,742	1,921,100	2,008,637
3					
4	**Revenues**				
5	Sales Revenues	1,546,707	1,561,494	1,644,624	1,598,598
6	Other Operating Revenues	17,728	16,236	17,728	16,236
7	**Total Operating Revenues**	1,564,435	1,577,730	1,662,352	1,614,834
8					
9	**Operating Expenses**				
10	Operation & Maintenance Expenses	1,177,769	1,136,117	1,175,298	1,133,323
11	Depreciation Expense	154,384	153,887	165,050	162,565
12	Amortization Expense	18,848	18,848	18,848	18,848
13	Taxes other than Income	47,497	45,230	47,497	45,230
14	Income Taxes	30,757	51,340	61,894	59,720
15	Miscellaneous Revenue and Expense(Franch. Fees)	36,193	36,539	38,484	37,407
18	**Total Operating Expenses**	1,465,448	1,441,961	1,507,071	1,457,099
19					
20	**Operating Income**				
21	**Operating Income**	98,987	135,793	155,281	157,735
24	**Rate of Return at present rates**	5.67%	7.86%	8.08%	7.85%
25					
26	**Development of Revenue Requirement**				
27	Rate of Return @ Company's Requested ROE	8.967%	7.855%	8.967%	7.855%
28					
29	Return at claimed rate of return	156,740		181,769	
30	Earnings Deficiency	57,753		26,488	
31					
32	Net to Gross Multiplier	1.696		1.696	
33	**Additional Revenue Requirement**	**97,917**	**14,787**	**44,911**	**37,104**
34	Revenue at Request Rate of Return	1,662,352	1,592,517	1,707,263	1,651,937
36					
37	**Percent change from current rates**	**6.26%**	**1.80%**	**9.13%**	**5.59%**

STAFF NARRATIVE SUMMARY SHEET
ADJUSTMENTS BEFORE PORT WESTWARD
UE 180
Twelve Months Ending December 31, 2007
($000)

Item	Staff	Issue	Revenue Requirement Effect
		Revenue Requirement on the Company's Filed Results	**$97,917**
		Proposed Staff Adjustments	
S-ROR A	BC	**Rate of Return** Staff proposed Cost of Capital Impact before Port Westward Addition	**($33,036)**
S-1	CO	**All Other Taxes** Adjustment reflecting stipulated agreement	**($2,339)**
S-2	JJ	**FIT and SIT Deduction** Staff proposes to adjust interest calculation to Staff's weighted cost of Capital	**($3,698)**
S-3	MD	**Administrative & General and Operations & Maintenance Adjustment** Adjustment reflecting stipulated agreement	**($6,760)**
S-4	MG	**Net Varible Power Cost Adjustment** Staff proposes to adjust Monet Model to reflect 4-yr forced outage rate of 8.62%	**($13,255)**
S-5	CO	**Incentive Adjustment** Adjustment reflecting stipulated agreement	**($4,647)**
S-6	CO	**Wages & Salary** Adjustment reflecting stipulated agreement	**($3,762)**
S-7	ED	**Coal Loss Adjustment** Staff proposes to remove Company's adjustment for coal loss.	**($365)**

STAFF NARRATIVE SUMMARY SHEET
ADJUSTMENTS BEFORE PORT WESTWARD
UE 180
Twelve Months Ending December 31, 2007
($000)

S-8	PR	**Adjustment to Other Revenues** Adjustment reflecting stipulated agreement	**($41)**
S-9	CO	**Capital Expenditures Adjustment** Adjustment reflecting stipulated agreement	**($784)**
S-10	BW	**Extrinsic Value** Staff proposes to adjust for flexible power resources not dispatched by Monet Modeling	**($12,745)**
S-11	BW	**System Losses** Adjustment reflecting stipulated agreement	**$0**
S-12	PR	**Membership Adjustment** Adjustment reflecting stipulated agreement	**($85)**
S-13	CO	**Tenant Improvements** Adjustment reflecting stipulated agreement	**$0**
S-14	MD	**Weatherization Adjustment** Adjustment reflecting stipulated agreement	**($71)**
S-15	DG	**Customer Service & Information Expense Adjustment** Adjustment reflecting stipulated agreement	**($1,626)**
S-16	BW	**Ancillary Services** Staff proposes to add revenues not included in the Test Period for Ancillary Services	**$1,571**
S-17	CO	**Beaver 8 Generating Facility** Staff proposes to adjust rate base and depreciation pursuant to Commission Order 04-740	**($1,263)**
S*		Revenue Sensitive Costs	**($224)**
		Total Staff-Proposed Adjustments (Base Rates):	(83,130)
		Staff-Calculated Revenue Requirements Change (Base Rates):	**$14,787**

Portland General Electric
UE 180
Revenue Requirement Model
Twelve Months Ending December 31, 2007
($000)

	SUMMARY SHEET	2007 Per application Includes Power Costs (1)	Staff Proposed Adjustments (2)	2007 Adjusted (3)	Revenue Req without Port Westward 1/1/2007 (4)	Results at Reasonable Return Inc. Pwr Costs (5)
1	**Operating Revenues**					
2	Retail Sales	$1,546,707	$0	$1,546,707	$14,787	$1,561,494
3	Wholesale Sales	0	0	0	0	0
4	Other Revenues	17,728	(1,492)	16,236	0	16,236
5	**Total Operating Revenues**	$1,564,435	($1,492)	$1,562,943	$14,787	$1,577,730
6	**Operating Expenses**					
7	Net Variable Power Costs	$856,968	($25,199)	$831,769	$0	$831,769
8	Production	71,970	(354)	71,616	0	71,616
9	Other Power Supply (Trojan)	218	0	218	0	218
10	Transmission	10,279	(34)	10,245	0	10,245
11	Distribution	60,336	(1,623)	58,713	0	58,713
12	Customer Accounting	0	(69)	(69)	0	(69)
13	Customer Service & Info	60,015	(1,575)	58,440	0	58,440
14	Uncollectibles	8,198	0	8,198	78	8,276
15	Administrative and General	109,785	(12,876)	96,909	0	96,909
16	**Total Operation & Maintenance**	$1,177,769	($41,730)	$1,136,039	$78	$1,136,117
17	Depreciation	$154,384	($497)	$153,887	$0	$153,887
18	Amortization	18,848	0	18,848	0	18,848
19	Taxes Other than Income	47,497	(2,267)	45,230	0	45,230
20	Income Taxes	30,758	14,941	45,699	5,641	51,340
21	Miscellaneous Revenue and Expense(Franch. Fees)	36,193	0	36,193	346	36,539
22	**Total Operating Expenses**	$1,465,449	($29,553)	$1,435,896	$6,065	$1,441,961
23	**Net Operating Revenues**	$98,986	$28,061	$127,064	8,729	$135,793
24	**Average Rate Base**					
25	Electric Plant in Service	$4,316,780	($16,009)	$4,300,771	$0	$4,300,771
26	Less: Accumulated Depreciation & Amortization	(2,463,112)	0	(2,463,112)	0	(2,463,112)
27	Accumulated Deferred Income Taxes	(205,677)	0	(205,677)	0	(205,677)
28	Accumulated Deferred Inv. Tax Credit	(5,005)	0	(5,005)	0	(5,005)
29	**Net Utility Plant**	$1,642,986	($16,009)	$1,626,977	$0	$1,626,977
30	Plant Held for Future Use	$0	$0	$0	$0	$0
31	Acquisition Adjustments	0	0	0	0	0
32	Working Capital	76,203	(1,537)	74,666	315	74,982
33	Fuel Stock	0	0	0	0	0
34	Materials & Supplies	50,177	0	50,177	0	50,177
35	Customer Advances for Construction	0	0	0	0	0
36	Weatherization Loans	0	0	0	0	0
37	Misc Deferred Credits	(28,082)	0	(28,082)	0	(28,082)
38	Misc. Deferred Debits	4,689	0	4,689	0	4,689
39	Misc. Rate Base Additions/(Deductions)	0	0	0	0	0
40	**Total Average Rate Base**	$1,745,973	($17,546)	$1,728,427	$315	$1,728,742
41	**Rate of Return**	5.67%		7.35%		**7.86%**
42	**Implied Return on Equity**	4.86%		8.39%		9.40%

Portland General Electric
UE 180
Revenue Requirement Model
Twelve Months Ending December 31, 2007
($000)

	SUMMARY SHEET	Company's Change for Port Westward (6)	Results with Port Westward Change (7)	Adjustments Impacting only Port Westward (8)	Adjusted for Port Westward Change (9)	Revenue Req with Port Westward 3/31/2007 (10)	Results with Port Westward 3/1/2007 (11)
1	**Operating Revenues**						
2	Retail Sales	$0	$1,561,494	$0	$1,561,494	$37,104	$1,598,598
3	Wholesale Sales	0	0	0	$0	0	0
4	Other Revenues	0	16,236	0	$16,236	0	16,236
5	**Total Operating Revenues**	$0	$1,577,730	$0	$1,577,730	$37,104	$1,614,834
6	**Operating Expenses**						
7	Net Variable Power Costs	($11,746)	$820,023	$0	$820,023	$0	$820,023
8	Production	8,440	80,056	0	80,056	0	80,056
9	Other Power Supply (Trojan)	0	218	0	218	0	218
10	Transmission	0	10,245	0	10,245	0	10,245
11	Distribution	0	58,713	0	58,713	0	58,713
12	Customer Accounting	0	(69)	0	(69)	0	(69)
13	Customer Service & Info	0	58,440	0	58,440	0	58,440
14	Uncollectibles	0	8,276	0	8,276	197	8,473
15	Administrative and General	315	97,224	0	97,224	0	97,224
16	**Total Operation & Maintenance**	($2,991)	$1,133,126	$0	$1,133,126	$197	$1,133,323
17	Depreciation	$10,667	$164,553	($1,988)	$162,565	$0	$162,565
18	Amortization	0	18,848	0	18,848	0	18,848
19	Taxes Other than Income	0	45,230	0	45,230	0	45,230
20	Income Taxes	**(6,217)**	45,123	447	45,570	14,150	59,720
21	Miscellaneous Revenue and Expense(Franch. Fees)	0	36,539	0	36,539	868	37,407
22	**Total Operating Expenses**	$1,459	$1,443,425	($1,541)	$1,441,884	$15,215	$1,457,099
23	**Net Operating Revenues**	($1,459)	$134,334	$1,541	$135,875	$21,903	$157,778
24	**Average Rate Base**						
25	Electric Plant in Service	$285,205	$4,585,976	$994	$4,586,970	$0	$4,586,970
26	Less: Accumulated Depreciation & Amortization	(5,333)	(2,468,445)	0	(2,468,445)	0	(2,468,445)
27	Accumulated Deferred Income Taxes	(1,758)	(207,435)	0	(207,435)	0	(207,435)
28	Accumulated Deferred Inv. Tax Credit	0	(5,005)	0	(5,005)	0	(5,005)
29	**Net Utility Plant**	$278,114	$1,905,091	$994	$1,906,085	$0	$1,906,085
30	Plant Held for Future Use	$0	$0	$0	$0	$0	$0
31	Acquisition Adjustments	0	0	0	0	0	0
32	Working Capital	76	75,058	(80)	74,978	791	75,769
33	Fuel Stock	0	0	0	0	0	0
34	Materials & Supplies	0	50,177	0	50,177	0	50,177
35	Customer Advances for Construction	0	0	0	0	0	0
36	Weatherization Loans	0	0	0	0	0	0
37	Misc Deferred Credits	0	(28,082)	0	(28,082)	0	(28,082)
38	Misc. Deferred Debits	0	4,689	0	4,689	0	4,689
39	Misc. Rate Base Additions/(Deductions)	0	0	0	0	0	0
40	**Total Average Rate Base**	$278,190	$2,006,932	$914	$2,007,846	$791	$2,008,637
41	**Rate of Return**		7.86%		6.77%		**7.86%**
42	**Implied Return on Equity**		9.40%		7.22%		9.40%

Portland General Electric
UE 180
Income Tax Calculation On Revenue Requirement
Twelve Months Ending December 31, 2007
($000)

		Income Tax Calculations	2007 Per Company Filing (1)	Staff Proposed Adjustments (2)	2007 Adjusted (3)	Required Change for Reasonable Return (4)	Results at Reasonable Return (5)
1		Book Revenues	$1,564,435	($1,492)	$1,562,943	$14,787	$1,577,730
2		Book Expenses Other than Depreciation	1,280,307	(43,997)	1,236,310	424	1,236,734
3		State Tax Depreciation	154,384	(497)	153,887	0	153,887
4		Interest	51,097	4,981	56,078	10	56,088
5	Less:	Schedule M Differences	(38,410)	0	(38,410)	0	(38,410)
6		State Taxable Income	$117,057	$38,021	$155,078	$14,353	$169,431
7		Production Deduction	($4,017)	$0	($4,017)	$0	($4,017)
8		Total State Taxable Income	$113,040	$38,021	$151,061	$14,353	$165,414
9		State Income Tax @ 6.617%	$7,480	$2,516	$9,996	$950	$10,946
10		State Tax Credits	(166)	0	(166)	0	(166)
11		Net State Income Tax	$7,314	$2,516	$9,830	$950	$10,780
12		Additional Tax Depreciation	0	0	0	0	0
13	Plus:	Other Schedule M Differences	0	0	0	0	0
14		Federal Taxable Income	$105,726	$35,505	$141,231	$13,403	$154,634
15		Federal Tax @ 35%	$37,004	$12,425	$49,429	$4,691	$54,120
16		Federal Tax Credits	0	0	0	0	0
17		Current Federal Tax	$37,004	$12,425	$49,429	$4,691	$54,120
18		ITC Adjustment					
19		Deferral	0	0	0	0	0
20		Restoration	1,461	0	1,461	0	1,461
21		Total ITC Adjustment	($1,461)	$0	($1,461)	$0	($1,461)
22		Provision for Deferred Taxes	($12,099)	$0	($12,099)	$0	($12,099)
23		Total Income Tax	$30,758	$14,941	$45,699	$5,641	$51,340

Portland General Electric
UE 180
Income Tax Calculation On Revenue Requirement
Twelve Months Ending December 31, 2007
($000)

		Income Tax Calculations	Impact of Port Westward (6)	Results with Port Westward Change (7)	Adjustments Impacting Only Port Westward (8)	Adjusted for Port Westward Change (9)	Revenue Req with Port Westward 3/31/2007 (10)	Results at Reasonable Return (11)
1		Book Revenues	$0	$1,577,730	$0	$1,577,730	$37,104	$1,614,834
2		Book Expenses Other than Depreciation	7,676	1,244,410	0	1,244,410	1,065	$1,245,475
3		State Tax Depreciation	0	153,887	(1,988)	151,899		$151,899
4		Interest	8,141	64,229	852	65,081	25	$65,106
5	Less:	Schedule M Differences	8,947	(29,463)	0	(29,463)	0	($29,463)
6		State Taxable Income	($24,764)	$144,667	$1,136	$145,803	$36,006	$181,808
7		Production Deduction	$0	($4,017)	$0	($4,017)	$0	($4,017)
8		Total State Taxable Income	($24,764)	$140,650	$1,136	$141,786	$36,006	$177,791
9		State Income Tax @ 6.617%	($1,639)	$9,307	$76	$9,383	$2,382	$11,765
10		State Tax Credits	0	(166)	0	(166)	0	(166)
11		Net State Income Tax	($1,639)	$9,141	$76	$9,217	$2,382	$11,599
12		Additional Tax Depreciation	0	0	0	0	0	0
13	Plus:	Other Schedule M Differences	0	0	0	0	0	0
14		Federal Taxable Income	($23,125)	$131,509	$1,060	$132,569	$33,624	$166,192
15		Federal Tax @ 35%	($8,094)	$46,026	$371	$46,397	$11,768	$58,165
16		Federal Tax Credits	0	0	0	0	0	0
17		Current Federal Tax	($8,094)	$46,026	$371	$46,397	$11,768	$58,165
18		ITC Adjustment						
19		Deferral	0	0	0	0	0	0
20		Restoration	0	1,461	0	1,461	0	0
21		Total ITC Adjustment	$0	($1,461)	$0	($1,461)	$0	$0
22		Provision for Deferred Taxes	$3,516	($8,583)	$0	($8,583)	$0	$3,516
23		Total Income Tax	($6,217)	$45,123	$447	$45,570	$14,150	$59,720

Portland General Electric
UE 180
Adjustments Before Port Westward
Twelve Months Ending December 31, 2007
($000)

	Staff Adjustments	All Other Taxes (S-1)	FIT & SIT Adjustment (S-2)	A&G and O&M Adjustment (S-3)	Power Cost Adjustment (S-4)	Incentive Adjustment (S-5)	Wages & Salary Adjustment (S-6)	Coal Loss Adjustment (S-7)	Other Revenues Adjustment (S-8)	Capital Expenditures Adjustment (S-9)	Extrinsic Value Adjustment (S-10)	System Losses Adjustment (S-11)
1	**Operating Revenues**											
2	Retail Sales	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3	Wholesale Sales	0	0	0	0	0	0	0	0	0	0	0
4	Other Revenues	0	0	0	0	0	0	0	40	0	0	0
5	**Total Operating Revenues**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$40**	**$0**	**$0**	**$0**
6	**Operating Expenses**											
7	Net Variable Power Costs	$0	$0	$0	($12,847)	$0	$0	$0	$0	$0	($12,352)	0
8	Production	0	0	0	0	0	0	(354)	0	0	0	0
9	Other Power Supply (Trojan)	0	0	0	0	0	0	0	0	0	0	0
10	Transmission	0	0	(34)	0	0	0	0	0	0	0	0
11	Distribution	0	0	(1,623)	0	0	0	0	0	0	0	0
12	Customer Accounting	0	0	0	0	0	0	0	0	0	0	0
13	Customer Service & Info	0	0	0	0	0	0	0	0	0	0	0
14	Uncollectibles	0	0	0	0	0	0	0	0	0	0	0
15	Administrative and General	0	0	(4,894)	0	(4,366)	(3,534)	0	0	0	0	0
16	**Total Operation & Maintenance**	**$0**	**$0**	**($6,551)**	**($12,847)**	**($4,366)**	**($3,534)**	**($354)**	**$0**	**$0**	**($12,352)**	**$0**
17	Depreciation	0	0	0	0	0	0	0	0	0	0	0
18	Amortization	0	0	0	0	0	0	0	0	0	0	0
19	Taxes Other than Income	(2,267)	0	0	0	0	0	0	0	0	0	0
20	Income Taxes	892	(2,174)	2,577	5,054	1,733	1,403	139	16	87	4,859	0
21	Miscellaneous Revenue and Expense											
22	**Total Operating Expenses**	($1,375)	($2,174)	($3,974)	($7,793)	($2,633)	($2,131)	($215)	$16	$87	($7,493)	$0
23	**Net Operating Revenues**	**$1,375**	**$2,174**	**$3,974**	**$7,793**	**$2,633**	**$2,131**	**$215**	**$24**	**($87)**	**$7,493**	**$0**
24	**Average Rate Base**											
25	Electric Plant in Service	0	0	0	0	(1,271)	(1,029)	0	0	(7,000)	0	0
26	Accumulated Depreciation & Amortization	0	0	0	0	0	0	0	0	0	0	0
27	Accumulated Deferred Income Taxes	0	0	0	0	0	0	0	0	0	0	0
28	Accumulated Deferred Inv. Tax Credit	0	0	0	0	0	0	0	0	0	0	0
29	**Net Utility Plant**	$0	$0	$0	$0	($1,271)	($1,029)	$0	$0	($7,000)	$0	$0
30	Plant Held for Future Use	0	0	0	0	0	0	0	0	0	0	0
31	Acquisition Adjustments	0	0	0	0	0	0	0	0	0	0	0
32	Working Capital	(72)	(113)	(207)	(405)	(137)	(111)	(11)	1	5	(390)	0
33	Fuel Stock	0	0	0	0	0	0	0	0	0	0	0
34	Materials & Supplies	0	0	0	0	0	0	0	0	0	0	0
35	Customer Advances for Construction	0	0	0	0	0	0	0	0	0	0	0
36	Weatherization Loans	0	0	0	0	0	0	0	0	0	0	0
37	Prepayments	0	0	0	0	0	0	0	0	0	0	0
38	Misc. Deferred Debits	0	0	0	0	0	0	0	0	0	0	0
39	Misc. Rate Base Additions/(Deductions)	0	0	0	0	0	0	0	0	0	0	0
40	**Total Average Rate Base**	**($72)**	**($113)**	**($207)**	**($405)**	**($1,408)**	**($1,140)**	**($11)**	**$1**	**($6,995)**	**($390)**	**$0**
41	**Revenue Requirement Effect**	**($2,339)**	**($3,698)**	**($6,760)**	**($13,255)**	**($4,647)**	**($3,762)**	**($365)**	**($41)**	**($784)**	**($12,745)**	**$0**

Portland General Electric
UE 180
Adjustments Before Port Westward
Twelve Months Ending December 31, 2007
($000)

	Staff Adjustments	Membership Adjustment (S-12)	Tenant Improvements Adjustment (S-13)	Weatherization Services Adjustment (S-14)	Customer Info and Advertising Adjustment (S-15)	Ancillary Services Adjustment (S-16)	Beaver 8 Generating Facility (S-17)		Total Adjustments (Base Rates)
1	**Operating Revenues**								
2	Retail Sales	$0	$0	$0	$0	$0	$0		$0
3	Wholesale Sales	0	0	0	0	0	0		$0
4	Other Revenues	0	0	0	0	(1,532)	0		($1,492)
5	**Total Operating Revenues**	**$0**	**$0**	**$0**	**$0**	**($1,532)**	**$0**		**($1,492)**
6	**Operating Expenses**								
7	Net Variable Power Costs	$0	$0	$0	$0	$0	$0		($25,199)
8	Production	0	0	0	0	0	0		($354)
9	Other Power Supply (Trojan)	0	0	0	0	0	0		$0
10	Transmission	0	0	0	0	0	0		($34)
11	Distribution	0	0	0	0	0	0		($1,623)
12	Customer Accounting	0	0	(69)	0	0	0		($69)
13	Customer Service & Info	0	0	0	(1,575)	0	0		($1,575)
14	Uncollectibles	0	0	0	0	0	0		$0
15	Administrative and General	(82)	0	0	0	0	0		($12,876)
16	**Total Operation & Maintenance**	**($82)**	**$0**	**($69)**	**($1,575)**	**$0**	**$0**		**($41,730)**
17	Depreciation	0	0	0	0	0	(497)		($497)
18	Amortization	0	0	0	0	0	0		$0
19	Taxes Other than Income	0	0	0	0	0	0		($2,267)
20	Income Taxes	32	0	27	619	(602)	279		$14,941
21	Miscellaneous Revenue and Expense								$0
22	**Total Operating Expenses**	($50)	$0	($42)	($956)	($602)	($218)		($29,553)
23	**Net Operating Revenues**	**$50**	**$0**	**$42**	**$956**	**($930)**	**$218**		**$28,061**
24	**Average Rate Base**								
25	Electric Plant in Service	0		0	0	0	(6,709)		($16,009)
26	Accumulated Depreciation & Amortization	0	0	0	0	0	0		$0
27	Accumulated Deferred Income Taxes	0	0	0	0	0	0		$0
28	Accumulated Deferred Inv. Tax Credit	0	0	0	0	0	0		$0
29	**Net Utility Plant**	$0	$0	$0	$0	$0	($6,709)		($16,009)
30	Plant Held for Future Use	0	0	0	0	0	0		$0
31	Acquisition Adjustments	0	0	0	0	0	0		$0
32	Working Capital	(3)	0	(2)	(50)	(31)	(11)		($1,537)
33	Fuel Stock	0	0	0	0	0	0		$0
34	Materials & Supplies	0	0	0	0	0	0		$0
35	Customer Advances for Construction	0	0	0	0	0	0		$0
36	Weatherization Loans	0	0	0	0	0	0		$0
37	Prepayments	0	0	0	0	0	0		$0
38	Misc. Deferred Debits	0	0	0	0	0	0		$0
39	Misc. Rate Base Additions/(Deductions)	0	0	0		0	0		$0
40	**Total Average Rate Base**	**($3)**	**$0**	**($2)**	**($50)**	**($31)**	**($6,720)**		**($17,546)**
41	**Revenue Requirement Effect**	**($85)**	**$0**	**($71)**	**($1,626)**	**$1,571**	**($1,263)**		**($49,870)**

Portland General Electric
UE 180
Tax Calcualtions to Adjustments Before Port Westward
Twelve Months Ending December 31, 2007
($000)

	Income Tax Calculations	All Other Taxes (S-1)	FIT & SIT Adjustment (S-2)	A&G and O&M Adjustment (S-3)	Power Cost Adjustment (S-4)	Incentive Adjustment (S-5)	Wages & Salary Adjustment (S-6)	Coal Loss Adjustment (S-7)	Other Revenues Adjustment (S-8)	Capital Expenditures Adjustment (S-9)	Extrinsic Value Adjustment (S-10)
1	Book Revenues	$0	$0	$0	$0	$0	$0	$0	$40	$0	$0
2	Book Expenses Other than Depreciation	(2,267)	0	(6,551)	(12,847)	(4,366)	(3,534)	(354)	0	0	(12,352)
3	State Tax Depreciation	0	0	0	0	0	0	0	0	0	0
4	Interest	(2)	5,531	(7)	(13)	(44)	(36)	(0)	0	(221)	(12)
5	Schedule M Differences	0	0	0	0	0	0	0	0	0	0
6	State Taxable Income	$2,269	($5,531)	$6,558	$12,860	$4,410	$3,570	$354	$40	$221	$12,364
7	Add OR Depletion Adjustment-Net	0	0	0	0	0	0	0	0	0	0
8	Total State Taxable Income	$2,269	($5,531)	$6,558	$12,860	$4,410	$3,570	$354	$40	$221	$12,364
9	State Income Tax	$150	($366)	$434	$851	$292	$236	$23	$3	$15	$818
10	State Tax Credits	0	0	0	0	0	0	0	0	0	0
11	Net State Income Tax	$150	($366)	$434	$851	$292	$236	$23	$3	$15	$818
12	Additional Tax Depreciation	0	0	0	0	0	0	0	0	0	0
13	Other Schedule M Differences	0	0	0	0	0	0	0	0	0	0
14	Federal Taxable Income	$2,119	($5,165)	$6,124	$12,009	$4,118	$3,334	$331	$37	$206	$11,546
15	Federal Tax @ 35%	742	(1,808)	2,143	4,203	1,441	1,167	116	13	72	4,041
16	Federal Tax Credits	0	0	0	0	0	0	0	0	0	0
17	Current Federal Tax	$742	($1,808)	$2,143	$4,203	$1,441	$1,167	$116	$13	$72	$4,041
18	**ITC Adjustment**										
19	Deferral	0	0	0	0	0	0	0	0	0	0
20	Restoration	0	0	0	0	0	0	0	0	0	0
21	Total ITC Adjustment	0	0	0	0	0	0	0	0	0	0
22	Provision for Deferred Taxes	0	0	0	0	0	0	0	0	0	0
23	Total Income Tax	$892	($2,174)	$2,577	$5,054	$1,733	$1,403	$139	$16	$87	$4,859

REVENUE REQUIREMENTS EFFECTS OF ADJUSTMENTS

	All Other Taxes (S-1)	FIT & SIT Adjustment (S-2)	A&G and O&M Adjustment (S-3)	Power Cost Adjustment (S-4)	Incentive Adjustment (S-5)	Wages & Salary Adjustment (S-6)	Coal Loss Adjustment (S-7)	Other Revenues Adjustment (S-8)	Capital Expenditures Adjustment (S-9)	Extrinsic Value Adjustment (S-10)
Revenues and Expenses	($2,329)	($3,683)	($6,732)	($13,201)	($4,460)	($3,610)	($364)	($41)	$147	($12,693)
Rate Base	(10)	(15)	(28)	(54)	(187)	(152)	(1)	0	(931)	(52)
Total	($2,339)	($3,698)	($6,760)	($13,255)	($4,647)	($3,762)	($365)	($41)	($784)	($12,745)

Portland General Electric
UE 180
Tax Calcualtions to Adjustments Before Port Westward
Twelve Months Ending December 31, 2007
($000)

	Income Tax Calculations	System Losses Adjustment (S-11)	Membership Adjustment (S-12)	Tenant Improvements Adjustment (S-13)	Weatherization Services Adjustment (S-14)	Customer Info and Advertising Adjustment (S-15)	Ancillary Services Adjustment (S-16)	**Total Adjustments (Base Rates)**
1	Book Revenues	$0	$0	$0	$0	$0	($1,532)	($1,492)
2	Book Expenses Other than Depreciation	0	(82)	0	(69)	(1,575)	0	($43,997)
3	State Tax Depreciation	0	0	0	0	0	0	($497)
4	Interest	0	(0)	0	(0)	(2)	(1)	$4,981
5	Schedule M Differences	0	0	0	0	0	0	$0
6	State Taxable Income	$0	$82	$0	$69	$1,577	($1,531)	$38,021
7	Add OR Depletion Adjustment-Net	0	0	0	0	0	0	$0
8	Total State Taxable Income	$0	$82	$0	$69	$1,577	($1,531)	$38,021
9	State Income Tax	$0	$5	$0	$5	$104	($101)	$2,516
10	State Tax Credits	0	0	0	0	0	0	$0
11	Net State Income Tax	$0	$5	$0	$5	$104	($101)	$2,516
12	Additional Tax Depreciation	0	0	0	0	0	0	$0
13	Other Schedule M Differences	0	0	0	0	0	0	$0
14	Federal Taxable Income	$0	$77	$0	$64	$1,473	($1,430)	$35,505
15	Federal Tax @ 35%	0	27	0	22	515	(501)	$12,425
16	Federal Tax Credits	0	0	0	0	0	0	$0
17	Current Federal Tax	$0	$27	$0	$22	$515	($501)	$12,425
18	**ITC Adjustment**							
19	Deferral	0	0	0	0	0	0	$0
20	Restoration	0	0	0	0	0	0	$0
21	Total ITC Adjustment	0	0	0	0	0	0	$0
								$0
22	Provision for Deferred Taxes	0	0	0	0	0	0	$0
								$0
23	Total Income Tax	$0	$32	$0	$27	$619	($602)	$14,941

REVENUE REQUIREMENTS EFFECTS OF ADJUSTMENTS

	System Losses Adjustment (S-11)	Membership Adjustment (S-12)	Tenant Improvements Adjustment (S-13)	Weatherization Services Adjustment (S-14)	Customer Info and Advertising Adjustment (S-15)	Ancillary Services Adjustment (S-16)	Total Adjustments (Base Rates)
Revenues and Expenses	$0	($85)	$0	($71)	($1,619)	$1,575	($47,535)
Rate Base	0	0	0	0	(7)	(4)	($2,335)
Total	$0	($85)	$0	($71)	($1,626)	$1,571	($49,870)

Portland General Electrci
UE 180
Staff Narrative Summary After Port Westward
Beginning March 1, 2007

Item	Staff	Issue	Revenue Requirement Effect
		Revenue Requirement on the Company's Filed Results	$44,911
		Proposed Staff Adjustments	
S-ROR B	BC	Rate of Return Staff proposed Cost of Capital Impact after Port Westward Addition	(5,260)
S-PW-1	JJ	FIT and SIT Deduction to adjust interest calculation to Staff's weighted cost of debt.	**($569)**
S-PW-2	CO	Life Estimate Adjustment Adjustment to reflect change of life estimate for Port Westward from 28.5 years to 35 years	**($1,919)**
S*		Revenue Sensitive Costs	(59)
		Total Staff-Proposed Adjustments (Base Rates):	(7,807)
		Staff-Calculated Revenue Requirements Change (Base Rates):	**$37,104**

Portland General Electric
UE 180
Adjustments After Port Westward
Beginning March 1, 2007
($000)

	Staff Adjustments	FIT & SIT Adjustment (S-PW-1)	Life Estimate Adjustment (S-PW-2)	Total Adjustments (Base Rates)
1	**Operating Revenues**			
2	Retail Sales	$0	$0	$0
3	Wholesale Sales	0	0	$0
4	Other Revenues	0	0	$0
5	**Total Operating Revenues**	**$0**	**$0**	**$0**
6	**Operating Expenses**			
7	Net Variable Power Costs	$0	$0	$0
8	Production	0	0	$0
9	Other Power Supply (Trojan)	0	0	$0
10	Transmission	0	0	$0
11	Distribution	0	0	$0
12	Customer Accounting	0	0	$0
13	Customer Service & Info	0	0	$0
14	Collectibles	0	0	$0
15	Administrative and General	0	0	$0
16	**Total Operation & Maintenance**	**$0**	**$0**	**$0**
17	Depreciation	0	(1,988)	($1,988)
18	Amortization	0	0	$0
19	Taxes Other than Income	0	0	$0
20	Income Taxes	(335)	782	$447
21	Miscellaneous Revenue and Expense			$0
22	**Total Operating Expenses**	($335)	($1,206)	($1,541)
23	**Net Operating Revenues**	**$335**	**$1,206**	**$1,541**
24	**Average Rate Base**			
25	Electric Plant in Service	0	994	$994
26	Accumulated Depreciation & Amortization	0	0	$0
27	Accumulated Deferred Income Taxes	0	0	$0
28	Accumulated Deferred Inv. Tax Credit	0	0	$0
29	**Net Utility Plant**	$0	$994	$994
30	Plant Held for Future Use	0	0	$0
31	Acquisition Adjustments	0	0	$0
32	Working Capital	(17)	(63)	($80)
33	Fuel Stock	0	0	$0
34	Materials & Supplies	0	0	$0
35	Customer Advances for Construction	0	0	$0
36	Weatherization Loans	0	0	$0
37	Prepayments	0	0	$0
38	Misc. Deferred Debits	0	0	$0
39	Misc. Rate Base Additions/(Deductions)	0	0	$0
40	**Total Average Rate Base**	**($17)**	**$931**	**$914**
41	**Revenue Requirement Effect**	**($569)**	**($1,919)**	**($2,488)**

Portland General Electric
UE 180
Tax Adjustments After Port Westward
Beginning March 1, 2007
($000)

	Income Tax Calculations	FIT & SIT Adjustment (S-PW-1)	Life Estimate Adjustment (S-PW-2)				Total Adjustments (Base Rates)
1	Book Revenues	$0	$0				$0
2	Book Expenses Other than Depreciation	0	0				$0
3	State Tax Depreciation	0	(1,988)				($1,988)
4	Interest	852					$852
5	Schedule M Differences	0	0				$0
6	State Taxable Income	($852)	$1,988				$1,136
7	Add OR Depletion Adjustment-Net	0	0				$0
8	Total State Taxable Income	($852)	$1,988				$1,136
9	State Income Tax	($56)	$132				$76
10	State Tax Credits	0	0				$0
11	Net State Income Tax	($56)	$132				$76
12	Additional Tax Depreciation	0	0				$0
13	Other Schedule M Differences	0	0				$0
14	Federal Taxable Income	($796)	$1,856				$1,060
15	Federal Tax @ 35%	(279)	650				$371
16	Federal Tax Credits	0	0				$0
17	Current Federal Tax	($279)	$650				$371
18	**ITC Adjustment**						$0
19	Deferral	0	0				$0
20	Restoration	0	0				$0
21	Total ITC Adjustment	0	0				$0
							$0
22	Provision for Deferred Taxes	0	0				$0
							$0
23	Total Income Tax	($335)	$782				$447

REVENUE REQUIREMENTS EFFECTS OF ADJUSTMENTS

	FIT & SIT Adjustment (S-PW-1)	Life Estimate Adjustment (S-PW-2)				Total Adjustments (Base Rates)
Revenues and Expenses	($567)	($2,043)				($2,610)
Rate Base	(2)	124				$122
Total	($569)	($1,919)				($2,488)

Portland General Electric
UE 180
Cost of Capital and Revenue Sensitive Costs
Tweleve Months Ending December 31, 2007
($000)

REVENUE SENSITIVE COSTS	
Company's Case	
Revenues	1.00000
Operating Revenue Deductions	
Uncollectible Accounts	0.00530
Taxes Other - Franchise	0.02340
- Other	
- Resource supplier	
State Taxable Income	0.9713
State Income Tax	0.06427
Federal Taxable Income	0.90703
Federal Income Tax @ 35%	0.31746
ITC	
Current FIT	0.31746
Other	
Total Excise Taxes	0.38173
Total Revenue Sensitive Costs	0.41043
Utility Operating Income	0.58957
Net-to-Gross Factor	1.696155

COST OF CAPITAL - STAFF	% of CAPITAL	COST	WEIGHTED COST
Long Term Debt	50.00%	6.31%	3.16%
Preferred Stock	0.00%	0.00%	0.00%
Common Equity	50.00%	9.40%	4.70%
Total	100.00%		7.86%

CERTIFICATE OF SERVICE

UE 180/UE 181/UE 184

I certify that I have this day served the foregoing document 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 860-13-0070, to the following parties or attorneys of parties.

Dated at Salem, Oregon, this 6th day of October, 2006.

Stephanie S. Andrus
Assistant Attorney General
Of Attorneys for Public Utility Commission's Staff
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UE 180/UE 181/UE 184
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