BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Application for a rate increase for Orange-Osceola Utilities, Inc. in Osceola County, and in Bradford, Brevard, Charlotte, Citrus, Clay, Collier, Duval, Highlands, Lake, Lee, Marion, Martin, Nassau, Orange, Osceola, Pasco, Putnam, Seminole, St. Johns, St. Lucie, Volusia, and Washington Counties by Southern States Utilities, Inc.	)	Docket No. 950495-WS Filed: February 12, 1996

DIRECT TESTIMONY

OF

DAVID E. DISMUKES, PH.D.

On Behalf of the Citizens of The State of Florida

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BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

DOCKET NUMBER 950495-WS

DIRECT TESTIMONY OF DAVID E. DISMUKES, PH.D.

ON BEHALF OF THE CITIZENS OF THE STATE OF FLORIDA

Q. State your name and business address.

A. My name is David E. Dismukes. My business address is the Louisiana State University, Center for Energy Studies, One East Fraternity Circle, Baton, Rouge, Louisiana 70803-0301.

Q. What is your current occupation?

A. I am an assistant professor at the Louisiana State University.

Q. Have you prepared an appendix outlining your qualifications?

A. Yes, Appendix I was prepared for this purpose.

Q. What is the purpose of your testimony?

A. I have been retained by the Office of Public Counsel (OPC), on behalf of the Citizens of the State of Florida (the Citizens), to review the repression, or price elasticity, adjustments made by Southern States Utilities, Inc. (SSU or the Company).

Q. How is your testimony organized?

A. My testimony is organized into three parts. In the first section of my testimony I discuss the relationship between repression and the price elasticity of demand. In the second section of my testimony I present a number of standards which I believe to be important in evaluating statistical models used in regulatory proceedings. In the third section of my testimony, I present my primary and alternative recommendations.

Q. Have you prepared any exhibits?

A. Yes, I have prepared one composite exhibit, Exhibit__(DED-1), consisting of 6 schedules.

Q. Would you summarize your primary recommendations?

A. Yes. I would like to recommend that the Commission not accept the repression adjustment proposed by the Company because the statistical studies upon which these adjustments rest do not meet adequate standards for regulatory use. These standards include: (1) the applicability of the statistical model to the service territory in question: (2) the parsimony, simplicity, and sensitivity of the statistical model to its specification and alternative specifications; and (3) the explanatory power of the statistical model.

Q. Do you have any alternative recommendations?

A. Yes. The impact of the repression issue in this proceeding depends, in part, upon the Commission's decision regarding the adoption of the Company's proposed weather normalization clause (WNC). I have presented two alternative recommendations for the Commission's consideration, both of which are dependent upon the decision made concerning the WNC.

My first alternative recommendation assumes that the Commission accepts some version of the WNC. Under this scenario, I recommend that the Commission split the Company's short-run price elasticity on a 50-50 basis between ratepayers and the Company. I have summarized the results from this recommendation on Schedule 6.

My second alternative recommendation assumes that the Commission rejects the WNC. Under this scenario, I recommend that the Commission split the Company's long-run price elasticity estimate on a 50-50 basis between ratepayers and the Company.

Repression Adjustments and the Price Elasticity of Demand

Q. Would you please explain how price elasticities can be used to determine repression?

A. Yes. Elasticity estimates can be used to determine the degree of repression (or stimulation) that may arise from a change in the price of a particular service in question. Repression refers to the decreases in quantity demanded which arise from a proposed rate increase, while stimulation refers to the increases in quantity demanded that result from a proposed rate decrease. The price elasticities used in determining repression or stimulation are simply the empirical observations which measure the magnitude with which consumers change their consumption levels given a change in price. The stronger the elasticity estimate -- the stronger the reaction.

As a hypothetical example, consider a -0.25 price elasticity estimate for residential water demand. This elasticity estimate would entail that a one percent increase in the price of water service would result in a 0.25 percent decrease in the quantity demanded. Given this example, one can see that, under a proposed rate increase, the larger the elasticity estimate (in absolute terms) the greater the repression estimate. The extent to which an elasticity has been over or under estimated will determine the degree to which repression has been over or under estimated.

In the past, the Commission has accepted the use of price elasticity estimates derived from statistical models as a basis for determining repression or stimulation in the telecommunications industry. The Commission has also noted the importance of making such adjustments in the ratemaking process.

> The inclusion of repression and stimulation can significantly influence the estimate of the quantities demanded for a particular service, which, in turn, can markedly affect the revenue effect of a proposed price change. With rate of return regulation, repression and stimulation can materially affect the magnitude of rate changes needed in other services to attain the revenue requirement. [Order No. PSC-93-0108-FOF-TL]

Although the Commission has recognized the effects of repression in the telecommunications industry, it has not done so with respect to the water industry.

Q. Would you please explain how the Company has made its repression adjustment?

A. Yes. The Company has estimated repression through the use of the Waterate software program created by Dr. Whitcomb. The software uses estimates of the price elasticity of demand from a water demand study conducted by Brown & Caldwell for the Southwest Florida Water Management District (SWFWMD). These elasticity estimates are used to predict the adjustment in water demand that will result from a change in the Company's proposed price structure. In effect, the Company is using price elasticities generated from a different area of the state to estimate changes in demand which may arise in its own service territory.

Proposed Standards for Evaluating Statistical Models in a Regulatory Filing

Q. What are the appropriate standards for judging a statistical model for regulatory use?

A. There are three primary standards which should be used to evaluate a statistical model for regulatory use. First, a statistical model should strive to use Company-specific data whenever possible. It is my opinion that this standard increases proportionately with the issue in question. For instance, if the adjustment in question is a significant part of a

particular regulatory filing, then a regulated utility should take all necessary steps to produce a model which reflects the specific conditions of its own service territory. In this case, the revenues associated with repression amount to over $2 million. Thus, its would seem reasonable to expect the Company to produce a model with as much service territory specific information as possible.

Second, the statistical models should be parsimonious. This entails that the model is intuitive, straightforward, and based upon a tried and true methodology. Regulatory proceedings are no place for experimentation with novel statistical approaches of questionable reliability.

Third, statistical models used in a regulatory proceeding should meet relatively high standards of predictability and accuracy. Models with very low statistical explanatory power do not serve regulatory purposes well and place unnecessary risk upon ratepayers.

Q. How does the residential SWFWMD Price Elasticity Study compare with your first standard for evaluating a statistical model for regulatory use?

A. I believe the model is not an accurate representation of SSU's service territory. The Company has not attempted to reconcile the demographic and usage characteristics between the SSU service territory with that of SWFWMD. [Response to OPC Production of Documents Request No. 232.] This is troubling because a significant difference between the two service areas rests with how water service is priced. For instance, SSU has uniform per unit rates in most of its service territory. Here, uniform price means that the same per unit charge is applied to all customers for every unit of consumption. This differs from "blocked" rates in the sense that per unit rates increase (decrease) with increases

(decreases) in consumption.

Most of the utilities in the SWFWMD Price Elasticity study have either increasing or decreasing block rates as evidenced in Figure 2-1 [Exhibit_JBW-3, p. 26.] Other things equal, the customers faced with these different pricing structures will face different demand curves (and different price elasticities of demand). In their study, Brown & Caldwell are correct in drawing the following example:

> ...assume two identical customers facing the same marginal water price but different rate structures. The first customer faces a uniform rate where all water is charged at P_2 and where the resulting water quantity demanded is Q_2 as shown on Figure 2-3. The second customer, facing an increasing two-block rate structure, pays the lower P_1 for water up to Q_1 and price P_2 for water above that amount. Both customers pay the same marginal price. The second customer's water bill, however, is lower by $(P_2 - P_1)*Q_1$ because of the lower priced first block. ***This creates a relative increase in disposable income which can be used to buy more goods.*** If water and income are positively related, the second customer will buy more water moving out to Q_3. ***Thus, given identical customers facing the same marginal price, differences in rate structures can cause different demands for water.*** [Exhibit_(JBW-3), p. 27, emphasis added.]

I have provided a copy of this figure as Schedule 1. The important sentence to note in this example is the last: *given identical customers facing the same marginal price, differences in rate structures can cause different demands for water.* This is the particular reason why I do not believe the price elasticities generated in the SWFWMD residential

water demand study should be applied in this proceeding. SSU customers probably exhibit different demand curve than the residential customers in the SWFWMD Price Elasticity Study given the differences in the two area's price structures. Despite this acknowledged difference, Dr. Whitcomb's repression estimates are based upon an assumption that the demand curves for the two areas are the same.

Q. Are there any additional problems, in your opinion, with regards to the types of prices modeled in the SWFWMD study and those which actually exist in the SSU service territory?

A. Yes. There is an additional problem with applying the results from the SWFWMD Price Elasticity Study to SSU's service territory. This problem is related to the residential study's use of what is known as a "ramped" price. Brown & Caldwell define ramped prices as "a combination of block prices." [Exhibit_JBW-3, p. 25.]

> As a customer moves towards a block threshold, the price in the first block becomes less important and the price in the second block becomes more important. When a customer is at the threshold, prices from both blocks are given equal weight. Finally, as a customer goes beyond the threshold, the influence of the first block price progressively diminishes to zero. [Ibid.]

In effect, "ramped" prices average prices between two blocks over a particular range. The closer a customer gets to a particular block, the more likely he or she is to use the next block's rate in determining his or her consumption. Over some range -- in this study 2,000 gallons -- the customer reacts to an average of the two block's price rather than the marginal price of either block.

There are a number of important points to note about the use of ramped prices. First, SSU

does not price on a ramped basis -- this is an empirical artifact constructed on Brown & Caldwell's part to indicate that customers react to a combination of marginal and average prices. It would appear that the notion of "ramped prices" is nothing more than an empirical devise to force some kind of continuity in prices, rather than modeling prices in discrete blocks. Two, there is no theoretic justification to support the notion that customers react to both average and marginal prices in their demand for a particular service. Most of the literature in this area focuses on either set of prices (marginal or average) -- not some version of both.

While the notion of ramped versus marginal versus average price may seem like an exercise in academic acrobatics -- there is an applicable criticism here. The SWFWMD Price Elasticity study uses -- for better or worse -- ramped prices. Even if such a construction were correct -- they would not be applicable to SSU's customers because they do not face increasing (or decreasing) block rates. There is nothing there for them to "ramp." Thus, price elasticities used from such a model are inapplicable for use in this proceeding.

Q. Would you please discuss your second standard for evaluating statistical models in a regulatory proceeding?

A. Yes. A model used in a regulatory proceeding should be parsimonious. That is to say, it should be intuitive and relatively straightforward. Regulatory proceedings are no place to experiment with untried and questionable methods. In addition, the specification of the model should not be especially sensitive to minor changes such as relaxing a particular constraint. Unfortunately, the results from the SWFWMD residential water demand study are sensitive to its underlying empirical constraints.

For instance, Dr. Whitcomb presented the study included in Exhibit_(JBW-3) for academic publication in *Water Resources Research.* The paper was entitled "New Directions in Mapping Water Demand Curves." Upon the advice of peer reviewers, Dr. Whitcomb relaxed the constraint which forces the price elasticity to zero at the highest system price in the study ($7.05 per thousand gallons). Dr. Whitcomb explains that the relaxation of this constraint results in a more "flexible" demand specification. [Response to OPC Request for Production of Documents No. 230.] The relaxation of this constraint, however, presents some rather disturbing results.

First, consider the changes in basic water use. In the model filed in this proceeding, basic water use is estimated to be 105 gallons per day. In the alternative specification submitted for publication by Dr. Whitcomb, basic water use is estimated to be 451 gallons per day per household -- or four times as large. In the model filed in this proceeding, usage per occupant is estimated to be 23 gallons per day. In the alternative specification, usage per occupant is estimated to 71 gallons per day -- or three times as large. The specification presented in this proceeding estimates usage per inch of Net Irrigation Requirement (NIR) per thousand square feet of lot space to be 0.69 gallons per day, while the alternative specification presents an estimate of 2.3 gallons per day. The large deviations in these basic statistical results of the model raises serious questions about its stability and usefulness in a regulatory proceeding.

An additional downfall is the large difference in the implied price elasticities of demand. For instance, at a price of $2.10 per thousand gallons, the (composite) price elasticity from the study presented in this proceeding is -0.29, while the price elasticity using the alternative

specification was -0.63 -- over double the estimate filed in this proceeding. The relaxed (alternative) specification produces elasticities which range from a low of -0.26 to a high of -0.68. The specification filed in this proceeding (the one in which the Waterate elasticity defaults are based) produces elasticities which range from a low of 0 and an high of -0.55. [Response to OPC Request for Production of Documents Numbers 234 and 23.] This raises serious questions about the accuracy of the SWFWMD residential demand model presented in this filing. The potential for huge variation in price elasticities reinforces my recommendation that the methods used here are too inaccurate for regulatory use. Schedule 2 presents a graph comparing the price elasticity estimates from the two specifications over a range of different prices.

The biggest problem with relaxing the zero price elasticity constraint (at $7.05 per thousand gallons) is the implied shape of the demand curve when prices are allowed to increase above $7.05 per thousand gallon level. The alternative demand specification produces an "upwards" sloping demand curve at prices greater than $8.34 per thousand gallons. A graph of this upwards sloping demand curve has been presented in Schedule 3. *An upwards sloping demand curve entails positive (not negative) price elasticities of demand -- a contradiction of economic theory.* The positive price elasticities generated from relaxing this constraint can be seen on the graph presented in Schedule 2 for prices higher than $8.34 per thousand gallons.

An upwards sloping demand curve violates the first law of demand which states that there is an inverse relationship between price and quantity demanded. This law creates the familiar downwards sloping demand curve that is taught in most introductory economics

courses. The relaxation of the zero price elasticity constraint at $7.05 per thousand gallons produces a result contrary to this law. The result entails that if the utilities in the SWFWMD study increased their price above $8.34 per thousand gallons, customers would actually buy more (not less) water. This is a significant error and any empirical model which produces such a result should be unquestionably dismissed.

The results from the alternative specification have particular importance to the model upon which the repression estimates proposed by the Company are based. The model presented in this filing prevents such a positive demand curve from arising by arbitrarily forcing the price elasticity to zero at a price of $7.05 per thousand gallons. While potentially close to zero, there is no *a priori* reason to assume that the price elasticity is actually zero at that price level. Relaxing this arbitrary constraint is not unreasonable -- yet it produces results which are counter to economic theory. Thus, the entire empirical relationship -- and the results generated from such a relationship -- should be called into question.

Q. Have you reviewed all of the peer review comments generated from the work Dr. Whitcomb has submitted in this proceeding?

A. No. The Citizens received only the second set of peer review comments generated in the academic review of the work Dr. Whitcomb has submitted in this proceeding. When asked about the first (and other) sets of peer review comments, Dr. Whitcomb indicated that he had thrown these comments out about eight (8) months prior to his deposition. The Citizens subsequently asked Dr. Whitcomb to sign a release form authorizing the academic journal, *Water Resources Research*, to release any and all peer review comments generated during the review of his work. The Citizens submitted this request form to SSU on November 15, 1995. SSU indicated, over one month later (December 28, 1995), that it

had forwarded the release to Dr. Whitcomb for his signature. Dr. Whitcomb signed the release form on January 10, 1996. The Citizens received the release form approximately one week later. At this time, we have submitted the release to the journal asking for all peer review comments generated in the review of the demand model submitted in this filing. We have not received these comments to date. Given this delay, the Citizens may need to file supplemental testimony once we have had the opportunity to review the new evidence presented in these peer review comments.

Q. Please discuss your third standard for evaluating a statistical model for use in a regulatory proceeding?

A. A statistical model should have a significant degree of explanatory power if it is to be used in a regulatory proceeding. Typically, we look at a summary statistic known as the R^2 to measure a statistical model's fit. While I would not expect a cross sectional model to exhibit very high R^2 values, the residential water demand model presented in this proceeding has a rather low R^2 of only 0.59. This entails that some 41 percent of the variation in water consumption is not explained by the model.

A low R^2 alone is not as bothersome as the fact that two of the parameter estimates used in calculating the price elasticity for low and medium property values are significant only at the 90 percent level in a one-tailed test. A one-tailed test, in this instance, means that the result is statistically significant from zero in one direction -- negative. This is a very low statistical significance level particularly given the sample size. At minimum, I would expect both of these terms to be significant at least at the 95 percent level -- which they are not. The weakness of this result can be highlighted by the fact that, while the one-tailed test is appropriate, if a two-tailed test were used on the result, the two parameter estimates

would be significant at only the 80 percent level. It is the combination of a low R^2 and marginally significant parameter estimates that leads me (in addition to the comments presented earlier) to recommend that the Commission not accept the price elasticity estimates proposed by SSU in this proceeding.

Q. What about the commercial models?

A. These models suffer from a lack of statistically powerful results. In particular, all of the R^2 values are all critically low -- entailing that the overall explanatory power of the models are also very low. For instance, the demand analysis for the car wash usage is only 0.17 -- entailing that some 81 percent in the variation of their consumption is unexplained by the model. The model for hospital water use recorded an R^2 of only .04 -- or that some 96 percent in the variation in usage is unexplained by the model. The model for laundromats exhibits an R^2 of only 0.06 -- meaning that some 94 percent of the variation in their use is unexplained by the model. The model for nursing homes presents an R^2 of 0.54 -- or that some 46 percent of the variation in this usage is unexplained by the model. The model for office buildings exhibits an R^2 of 0.29 -- entailing that some 71 percent of the variation in consumption is unexplained by the model. The model for restaurants shows an R^2 of 0.19, or that some 81 percent of the variation in their usage is unexplained by the model. The model for schools has an R^2 of 0.32 -- or that some 68 percent of the variation is unexplained by the model. A summary of these results have been presented in Schedule 4 of my exhibit.

Q. How is repression altered by a change from statewide average rates to stand-alone or modified stand-alone rates?

A. That is unclear. The Company's existing repression estimates do not take into account the repression -- or net repression -- associated with a change from the existing

statewide average rates to stand alone -- or modified stand alone rates. The shift to modified stand alone rates may entail that some customers will be getting rate decreases, while others may be getting rate increases. If the repression associated with those systems getting rate increases is greater in magnitude than the stimulation associated with those systems getting price decreases -- net repression (Company-wide) will occur.

In his deposition, Dr. Whitcomb indicated that SSU is preparing to present an alternative repression estimate for the Commission. This repression estimate will take into account the impacts of shifting from state-wide average rates to modified stand-alone rates. I have not had the opportunity to review these adjustments, since they have not been filed to date. Since these adjustments will presumably use the Waterate software and the SWFWMD defaults, I would expect that many of the criticisms I have presented in this testimony to be applicable to the Company's revised repression analysis.

However, any final recommendations I may make on the overall repression issue are conditioned by what the Company may present at some later date. I am particularly concerned about the version of the Waterate software the Company may employ to conduct its revised repression analysis. If the Company chooses to use the updated version of the Waterate software, a number of additional questions may arise since many of the software's defaults have the potential to change.

Q. Do you have any other comments regarding the Company's repression adjustments in this filing?

A. Yes. Three of the systems in this filing are actually getting rate decreases under the Company's proposals. These systems include: Lehigh, Enterprise Utility Corp., and Deep

Creek. Typically, we associate price decreases with an increase in quantity demanded. Therefore, stimulation, rather than repression, would be the appropriate adjustment. Under a stimulation adjustment, a positive -- rather than a negative -- factor would be applied to test year billing units. However, inspection of Schedule E1-2, lines 314 (Deep Creek), 327 (Enterprise Utility Corp.), and 340 (Lehigh) all show projected billing units decreasing by a factor of -11.7 percent. The Company has failed to explain why it would be appropriate to reduce billing units for systems receiving price decreases. In the absence of some rational explanation, these systems should be stimulated not repressed. As such, Schedule E1-2 and the entire repression calculation -- is in error.

Recommendations

Q. What is your primary recommendation?

A. I recommend that the Commission not accept the repression adjustment proposed by SSU because it is based upon a statistical model which does not meet adequate standards for regulatory use. The study of water demand, while close to thirty years old, still presents results which vary from one extreme to another. The volatility of these results are highlighted by the relaxation of the zero price elasticity constraint which produces completely different empirical results. Such variation certainly places the Commission in a difficult position in determining the appropriate level of repression to include in this proceeding.

I believe that Dr. Whitcomb presents as accurate statement of the dilemma for the Commission when he notes that:

> A lack of consensus on price elasticity has left policy makers with a range of plausible price elasticities that is so wide as to offer little direction. For

> a utility changing its rate structure, the difference between assuming elasticity [of] -0.2 and -0.6 can have dramatic impacts on both rate revenues and capital improvement decisions. Price elasticity uncertainty has tended to discourage the use of price as a management tool. [Response to OPC Request for Production of Documents 27.]

The models presented in this filing (both residential and commercial) do nothing to allay the concerns noted by Dr. Whitcomb. Thus, the Commission should not accept the repression estimate proposed by the Company in this filing. A revised version of Schedule E1-4, which excludes the repression adjustment and presents a revised rate calculation using the Company's requested rate increase, has been included in Schedule 5 of my exhibit.

Q. Do you have any alternative recommendations?

A. Yes. If the Commission agrees that the results from the SWFWMD Price Elasticity Study are inappropriate for use in a regulatory proceeding, but still feels the need to make some type of repression adjustment, I would offer the following alternative recommendation. First, if the Commission chooses to accept the Company's weather normalization clause (WNC) there will be an ongoing opportunity for the Company to recover lost revenues associated with repression. Thus, I would recommend that the Commission split the short run elasticity estimate used by the Company on a 50-50 basis with ratepayers. These percentages merely share the risk associated with repression equally between Company and ratepayers. Long-run impacts of repression will be picked up in the WNC since, by its nature, it will collect the difference between actual and projected revenues. Some part of that difference may be associated with repression.

My alternative recommendation is based upon a short-run price elasticity which differs somewhat from the one used by the Company in this filing. I believe that the appropriate short run elasticity to be used is that recommended by Dr. Whitcomb in his Waterate software, and not the one facilitated by the Company in constructing its E schedules. Dr. Whitcomb, in the Waterate software price elasticity default notes:

> Based on review of previous studies, we assume a short-run half life [for the price elasticity of demand] of one year. In other words, 50, 25, 12.5, and 6.25 percent of the long-run price impact occurs in the first, second, third, and fourth years after the price change. [Response to OPC Production of Documents Request No. 23.]

The Company has opted to use a much higher short-run impact of 75 percent, against Dr. Whitcomb's default recommendation.

In addition to adjusting the first-year (short-run) price elasticity level, I have also adjusted the property value distributions of 33/34/33 (low, medium, and high income) to coincide with the property value percentages found in the 1990 Census for the ranges identified in the Waterate defaults ($0-55,000; $55,000-81,300; and $81,300 and above). These percentages are 40, 36, and 24 percent for low, medium, and high income property values, respectively. The final results from my first alternative recommendation have been included in Schedule 6.

My second alternative recommendation is conditioned on the Commission's decision to reject the Company's proposed WNC. If the Commission rejects the Company's proposed WNC, then the opportunity to recover lost revenues from repression over the long run will

not exist. In this case, I would recommend that the Commission split the difference in the long-run price elasticity between ratepayers and the Company on a 50/50 basis. I have included the results from my second alternative recommendation in Schedule 6.

As an additional point of clarification I would like to add that under both my alternative recommendations, the price elastic effect associated with changes in short-run costs (e.g., price elastic changes in the short-run revenue requirement) would also be adjusted consistent with the Commission's decision concerning the Company's proposed WNC.

Q. Do you have any additional comments regarding your repression recommendations?

A. Yes. OPC, on behalf of the Citizens, has recommended a revenue decrease in this proceeding. If the Commission accepts this recommendation, then adjustments regarding stimulation should be considered. If the Commission accepts OPC's recommendation, my primary recommendation would remain the same: no stimulation adjustment should be made given the existing shortcomings in the SWFWMD Price Elasticity Study. If the Commission believes that it is appropriate to make a stimulation adjustment, I would recommend using the formula outlined in my alternative repression recommendation for determining the appropriate level of stimulation. That is, if the WNC is approved, the Commission should split the difference in the short-run price elasticity between ratepayers and the Company on a 50/50 basis. If the WNC is not approved, then the Commission should split the difference between the long-run price elasticity between the Company and ratepayers on a 50/50 basis.

Q. Does this conclude your testimony?

A. Yes.

Appendix I

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Education

A.A., Liberal Arts, Pensacola Junior College, 1985.
B.A., History, University of West Florida, 1987.
M.S., International Affairs, Florida State University, 1988.
M.S., Economics, Florida State University, 1992.
Ph.D. , Economics, Florida State University, 1995.

Master's Thesis: ***Nuclear Power Project Disallowances: A Discrete Choice Model of Regulatory Decisions***

Ph.D. Dissertation: ***An Empirical Examination of Environmental Externalities and the Least-Cost Selection of Electric Generation Facilities***

Field Interests: Energy Economics, Regulatory Economics, Econometrics, Economic Development, International Economics, History of Economic Thought.

Academic Appointments

Louisiana State University, Baton Rouge, Louisiana
Center for Energy Studies

1995- Assistant Professor

Florida State University, Tallahassee, Florida
Department of Economics

1995 Instructor

Professional History

Florida Public Service Commission
Division of Communications, Policy Analysis Section

1995 Planning & Research Economist

Division of Auditing & Financial Analysis, Forecasting Section

1993 Planning & Research Economist
1992-1993 Economist

Project for an Energy Efficient Florida &
Florida Solar Energy Industries Association

1994 Energy Economist

Ben Johnson Associates, Inc.

1991-1992	Research Associate
1989-1991	Senior Research Analyst
1988-1989	Research Analyst

Research Experience in Energy Economics

Issues analyzed include: fuel price movements; electric generating plant retirements; capacity factors; interconnection transmission projects; analysis of the federal integrated resource planning (IRP) standard outlined in the Energy Policy Act of 1992. Conducted extensive research on the nuclear power industry including issues related to: prudence; cost and schedule estimates; economic impacts of NRC regulations on plant costs and schedule estimates; and intra-industry statistical comparisons. Specific nuclear projects researched include: South Texas Projects 1 & 2; Palo Verde 3; and Washington Nuclear Project 2 (WNP-2).

Analyzed issues in energy efficiency and conservation includes: economic analysis of cost effectiveness test standards for conservation programs; review of market barriers to the implementation of conservation programs; analysis of issues related to revenue neutrality and revenue decoupling; and alternative regulatory incentive structures for utility implementation of conservation programs.

Analyzed issues related to renewable energy includes: a review of solar energy use in Florida, a review of existing utility programs for solar energy; estimation of employment impacts and emission credits resulting from utility solar energy programs; review of legislative and regulatory policies for solar energy; and the estimation of numeric solar energy goals for Florida.

Research Experience in Regulatory Economics

Analysis of electric rate design issues such as: class revenue distribution; street lighting rates; declining block rates; government rates; small commercial rates; general service rates; residential rates; space heating riders; time-of-use rates; industrial rates; and seasonal rate differentials. Analysis in telecommunications industry includes: numerous rate design issues; interLATA and intraLATA toll competition; empirical estimates of market power in telecommunications markets; measures of productivity in the telecommunications industry; price cap/alternative regulation; and telecommunications infrastructure investments. Telephone cost studies include estimation of average and marginal: toll switching costs; fiber optic transport costs; and interexchange carrier local transport cost differentials.

Research Experience in Econometrics & Forecasting

Analyzed a variety of econometric and forecasting demand models for the electric utility industry which include: end-use models; essential usage models; short and long run demand models; and time-of-use block usage models. Telecommunications modeling includes: local access demand models; interLATA and intraLATA long distance demand models; and directory assistance demand models. Experience also includes the application of several econometric and quantitative techniques which includes: linear regression; simultaneous equations models; limited dependent variable models; and time series models. Extensive experience with SAS, SPSS, and LIMDEP statistical packages

Expert Witness Testimony

Docket 920188-TL, On the Behalf of the Florida Public Service Commission Staff. Company analyzed: GTE-Florida. Issues: Telephone Demand Forecasts and Empirical Estimates of the Price Elasticity of Demand for Telecommunication Services.

Docket 920260-TL, On the Behalf of the Florida Public Service Commission Staff. Company analyzed: BellSouth Communications, Inc. Issues: Telephone Demand Forecasts and Empirical Estimates of the Price Elasticity of Demand for Telecommunication Services.

Docket 940448-EG -- 940551-EG, On the Behalf of the Legal Environmental Assistance Foundation. Companies analyzed: Florida Power & Light Company; Florida Power Corporation; Tampa Electric Company; and Gulf Power Company. Issues: Comparison of Forecasted Cost-Effective Conservation Potentials for Florida.

Academic Research

Publications

"Comparing the Safety and Environmental Records of Firms Operating Offshore Platforms in the Gulf of Mexico" (1996). With Allan Pulsipher, Omowumi Iledare, Dimitry Mesyanzhinov, William Daniel, and Bob Baumann. *Offshore and Arctic Operations 1996: Proceedings of the American Society of Mechanical Engineers.*

"Electric Utility Mergers and Acquisitions: A Regulator's Guide" (1996). With Kimberly H. Dismukes. *Public Utilities Fortnightly.* January 1, 1996.

Publications Under Review

"Comparing the Safety and Environmental Performance of Offshore Oil and Gas Operators" (1995). With Allan Pulsipher, Omowumi Iledare, and Dimitry Mesyanzhinov. *Journal of Environmental Economics and Management.*

"A Route-Specific Analysis of IntraLATA Toll Demand." (1995). *Studies in Economics and Finance.*

Conference Presentations

"A Cross-Sectional Model of IntraLATA MTS Demand" (1995). Southern Economic Association Annual Conference, New Orleans, Louisiana.

"Empirical Determinants of Nuclear Power Plant Disallowances" (1995). Southern Economic Association Annual Conference, New Orleans, Louisiana.

"Comparing the Safety and Environmental Performance of Offshore Oil and Gas Operators." (1995). With Allan Pulsipher, Omowumi Iledare, and Dimitry Mesyanzhinov. U.S. Minerals Management Service, 15th Annual Information Transfer Meeting, New Orleans, Louisiana.

"A Micro-Analytic Model of Petroleum Exploration and Extraction Process for Policy Analysis." (1996). With Omowumi Iledare and Allan Pulsipher. Institute of Gas Technology Annual Conference on Energy Modelling. Clearwater, Florida. *(forthcoming)*

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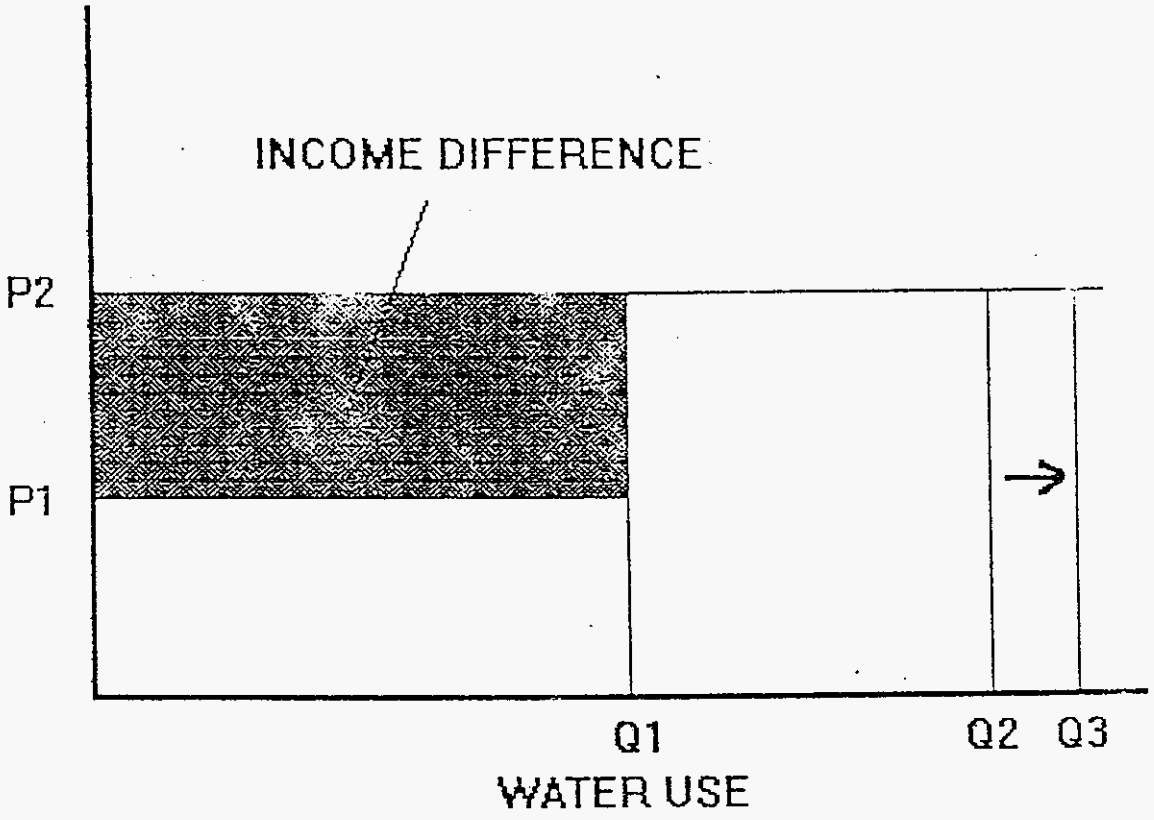
BILL DIFFERENCE ILLUSTRATION



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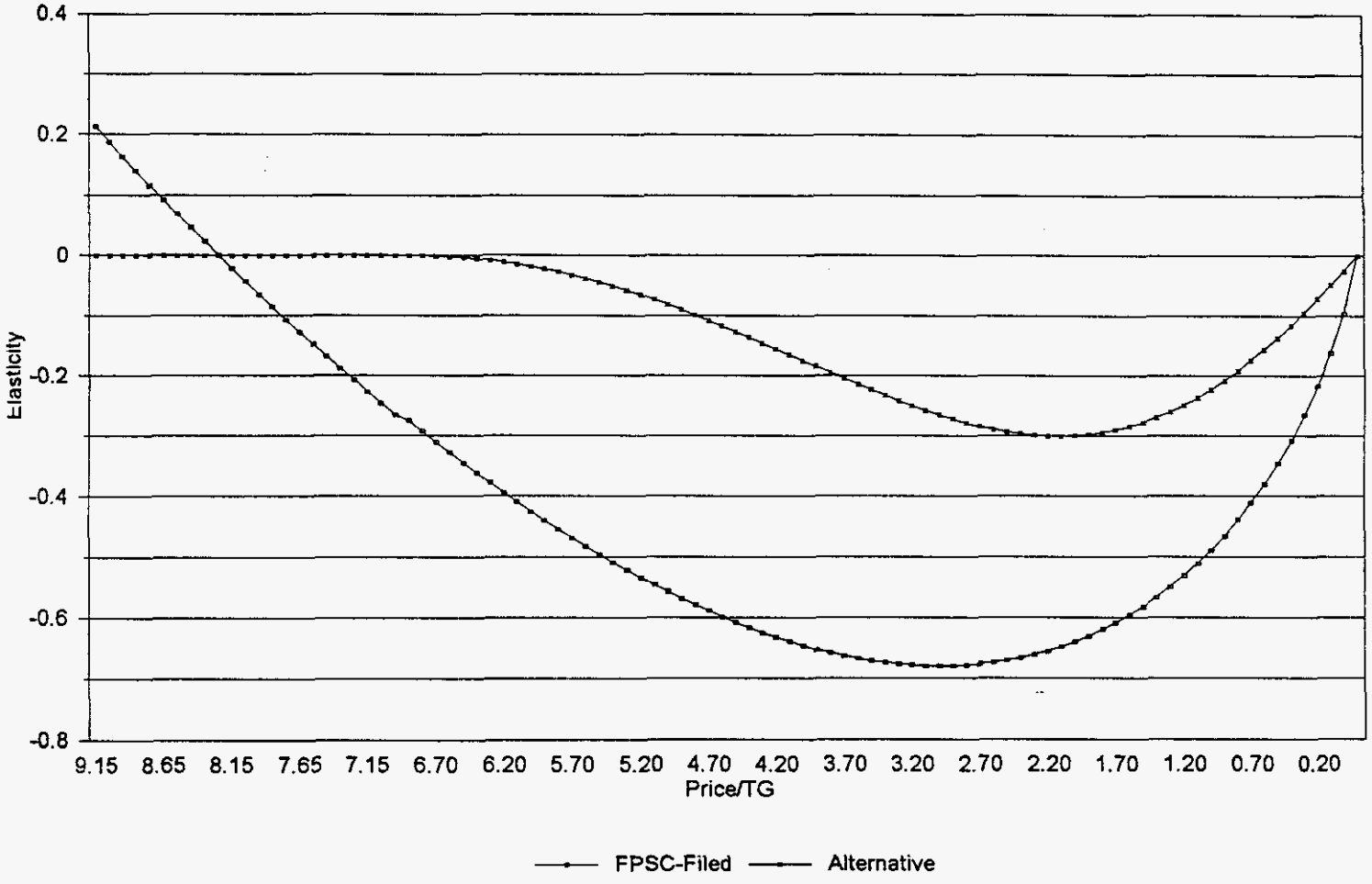
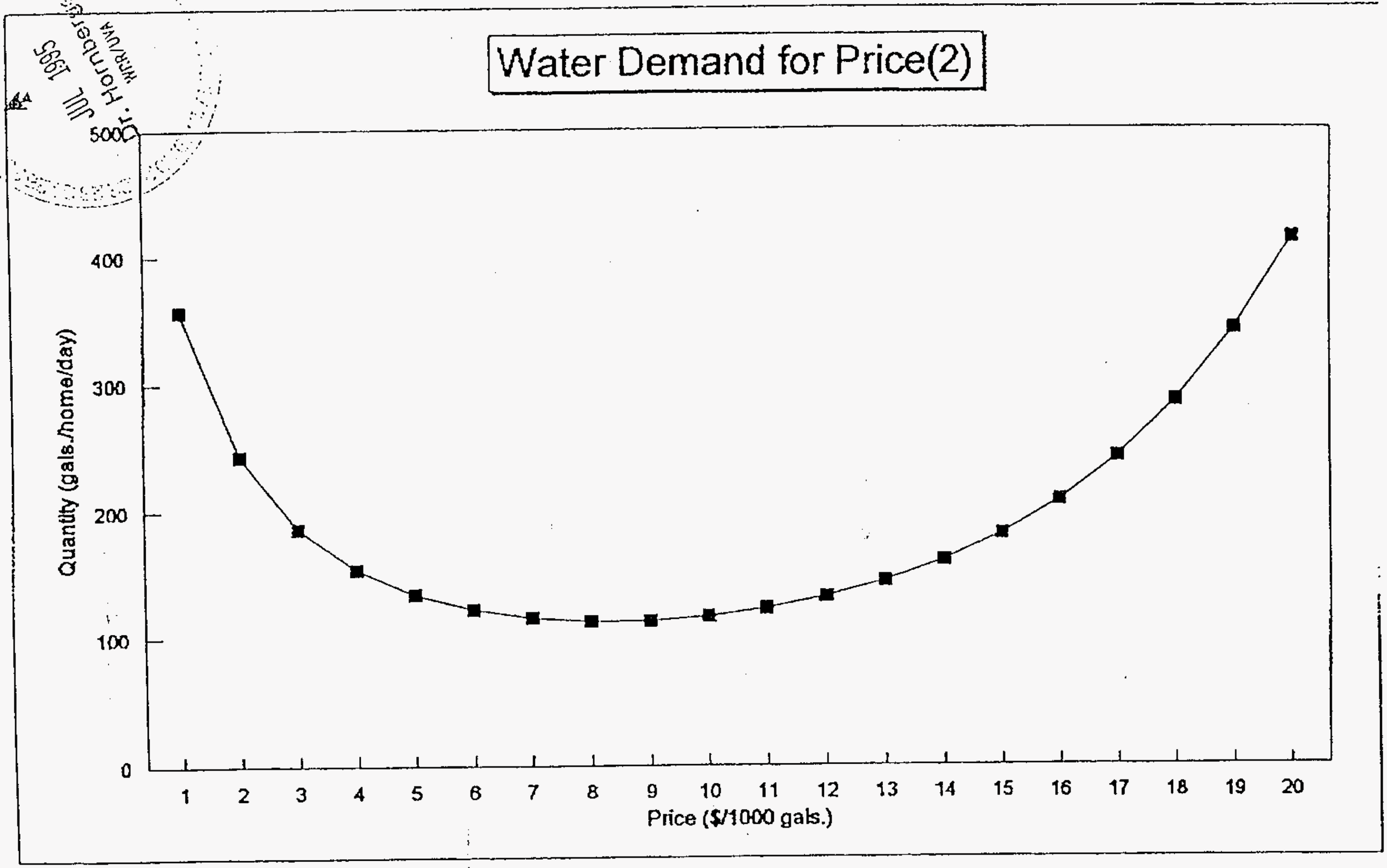
Comparison of Price Elasticities from Alternative Specifications





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Schedule 4

Summary of Results from Commercial Models

Model/Class	Percent Explained by Model	Percent Unexplained by Model	Price Elasticity
Car Wash	17.0%	83.0%	-0.70
Hopitals	4.0%	96.0%	0.00
Hotels/Motels	43.0%	57.0%	-0.48
Laundromats	6.0%	94.0%	-0.14
Nursing Homes	54.0%	46.0%	0.00
Office Buildings	29.0%	71.0%	-0.33
Restaurants	19.0%	81.0%	-0.28
Schools	32.0%	68.0%	-0.25
Universities	0.1%	99.9%	Indeterminate
Average	22.7%	77.3%	-0.2725

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Schedule 5

Primary Recommendation

	Revenues		*Conventional Treatment*	*Reverse Osmosis*
1	***Original Revenue Req. Less Direct Short Run Exp.***		$22,831,166	$10,458,202
2	Direct Short Run Expenses		3,201,573	1,218,241
3	Total Original Revenue Requirement		26,032,739	11,676,443
4	Direct Short-Run RR Price Elastic Change		0	0
5	Adjusted Revenue Requirement	L3-L4	26,032,739	11,676,443
6				
7	BFC Revenues	0.4 *L5 5/	10,413,096	4,670,577
8	Gallonage Revenue	0.6 *L5 5/	15,619,643	7,005,866
9	Total Revenues to be Collected from Rates		26,032,739	11,676,443
10				
11	***Billing Determinants***			
12	Projected Monthly ERCs		93,866	16,324
13	Projected Consumption TG		8,040,449	2,183,794
14				
15	Projected Residential Consumption TG		7,074,030	1,101,846
16	Projected Multi-Family Consumption TG		81,741	282,106
17	Projected Other Consumption TG		884,678	799,843
18	Total Projected Consumption TG	L15+L16+L17	8,040,449	2,183,795
19				
20	***Price Elasticity Adjustments***			
21	Residential Price Elasticity Change TG		0	0
22	Multi-Family Price Elasticity Change TG		0	0
23	Other Price Elasticity Change TG		0	0
24	Total Price Elasticity Change	L21+L22+L23	0	0
25				
26	Adjusted Projected Consumption TG	L18+L24	8,040,449	2,183,795
27				
28	Residential Price Elasticity Change Percentage	L21/L15	0.0%	0.0%
29	Multi-Family Price Elasticity Change Percentage	L22/L16	0.0%	0.0%
30	Other Price Elasticity Change Percentage	L23/L17	0.0%	0.0%
31	Overall Price Elasticity Change Percentage	L24/L18	0.0%	0.0%
32				
33	***Preliminary Rate Calculations***			
34	BFC Rate	(L7/L12)/12	9.24	23.84
35	Gallonage Charge	L8/L26	1.94	3.21

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Alternative Recommendation
Assuming Adoption of WNC

	Revenues		*Conventional Treatment*	*Reverse Osmosis*
1	***Original Revenue Req. Less Direct Short Run Exp.***		$22,831,166	$10,458,202
2	Direct Short Run Expenses		3,201,573	1,218,241
3	Total Original Revenue Requirement		26,032,739	11,676,443
4	Direct Short-Run RR Price Elastic Change		(71,418)	(10,297)
5	Adjusted Revenue Requirement	L3-L4	25,961,321	11,666,146
6				
7	BFC Revenues	0.4 *L5 5/	10,384,528	4,666,458
8	Gallonage Revenue	0.6 *L5 5/	15,576,793	6,999,688
9	Total Revenues to be Collected from Rates		25,961,321	11,666,146
10				
11	***Billing Determinants***			
12	Projected Monthly ERCs		93,866	16,324
13	Projected Consumption TG		8,040,449	2,183,794
14				
15	Projected Residential Consumption TG		7,074,030	1,101,846
16	Projected Multi-Family Consumption TG		81,741	282,106
17	Projected Other Consumption TG		884,678	799,843
18	Total Projected Consumption TG	L15+L16+L17	8,040,449	2,183,795
19				
20	***Price Elasticity Adjustments***			
21	Residential Price Elasticity Change TG		(241,286)	(6,863)
22	Multi-Family Price Elasticity Change TG		0	0
23	Other Price Elasticity Change TG		(16,876)	(11,136)
24	Total Price Elasticity Change	L21+L22+L23	(258,162)	(17,999)
25				
26	Adjusted Projected Consumption TG	L18+L24	7,782,287	2,165,796
27				
28	Residential Price Elasticity Change Percentage	L21/L15	-3.4%	-0.6%
29	Multi-Family Price Elasticity Change Percentage	L22/L16	0.0%	0.0%
30	Other Price Elasticity Change Percentage	L23/L17	-1.9%	-1.4%
31	Overall Price Elasticity Change Percentage	L24/L18	-3.2%	-0.8%
32				
33	***Preliminary Rate Calculations***			
34	BFC Rate	(L7/L12)/12	9.22	23.82
35	Gallonage Charge	L8/L26	2.00	3.23

Alternative Recommendation
Assuming No Adoption of WNC

	Revenues		*Conventional Treatment*	*Reverse Osmosis*
1	*Original Revenue Req. Less Direct Short Run Exp.*		$22,831,166	$10,458,202
2	Direct Short Run Expenses		3,201,573	1,218,241
3	Total Original Revenue Requirement		26,032,739	11,676,443
4	Direct Short-Run RR Price Elastic Change		(156,642)	(21,457)
5	Adjusted Revenue Requirement	L3-L4	25,876,097	11,654,986
6				
7	BFC Revenues	0.4 *L5 5/	10,350,439	4,661,994
8	Gallonage Revenue	0.6 *L5 5/	15,525,658	6,992,992
9	Total Revenues to be Collected from Rates		25,876,097	11,654,986
10				
11	*Billing Determinants*			
12	Projected Monthly ERCs		93,866	16,324
13	Projected Consumption TG		8,040,449	2,183,794
14				
15	Projected Residential Consumption TG		7,074,030	1,101,846
16	Projected Multi-Family Consumption TG		81,741	282,106
17	Projected Other Consumption TG		884,678	799,843
18	Total Projected Consumption TG	L15+L16+L17	8,040,449	2,183,795
19				
20	*Price Elasticity Adjustments*			
21	Residential Price Elasticity Change TG		(514,006)	(15,491)
22	Multi-Family Price Elasticity Change TG		0	0
23	Other Price Elasticity Change TG		(33,388)	(22,092)
24	Total Price Elasticity Change	L21+L22+L23	(547,394)	(37,583)
25				
26	Adjusted Projected Consumption TG	L18+L24	7,493,055	2,146,212
27				
28	Residential Price Elasticity Change Percentage	L21/L15	-7.3%	-1.4%
29	Multi-Family Price Elasticity Change Percentage	L22/L16	0.0%	0.0%
30	Other Price Elasticity Change Percentage	L23/L17	-3.8%	-2.8%
31	Overall Price Elasticity Change Percentage	L24/L18	-6.8%	-1.7%
32				
33	*Preliminary Rate Calculations*			
34	BFC Rate	(L7/L12)/12	9.19	23.80
35	Gallonage Charge	L8/L26	2.07	3.26