Exhibit No.
Issue: Fuel And Purchased Power Expenses; Natural Gas Pricing and Risks; Fuel Adjustment Clause
Witness: Jill S. Tietjen
Type of Exhibit: Direct Testimony
Sponsoring Party: Empire District
Case No.
Date Testimony Prepared: April 23, 2004

Before the Public Service Commission
of the State of Missouri

Direct Testimony

Of

Jill S. Tietjen

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OF
JILL S. TIETJEN
ON BEHALF OF
THE EMPIRE DISTRICT ELECTRIC COMPANY
BEFORE THE
MISSOURI PUBLIC SERVICE COMMISSION

DIRECT TESTIMONY
OF
JILL S. TIETJEN
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CASE NO.

I. Introduction

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. Jill S. Tietjen. My business address is 7377 S. Hudson Way, Littleton, Colorado.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am self-employed as an engineering consultant.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL AND WORK BACKGROUND.

A. I graduated from the University of Virginia with a BS in Applied Mathematics (minor in Electrical Engineering) in 1976. I began my career with Duke Power Company and spent five years as a Planning Engineer in the System Planning Department (1976-1981). While at Duke Power Company, I earned my MBA from the University of North Carolina at Charlotte in 1979. I subsequently joined Mobil Oil Corporation's Mining and Coal Division where I worked from 1981-1984 as a planning analyst. I became a registered professional engineer in Colorado in 1982. I joined Stone & Webster Management Consultants in 1984 and by the time I left in 1992 had progressed to Assistant Vice President. I served as Principal and leader of the utility planning practice at Hagler Bailly Consulting during 1992-1995. In 1995, I rejoined Stone & Webster Management Consultants as an Assistant Vice President and office manager for the Denver office, a position that I served in through 1997. Since 1997, I have been on staff at the University of Colorado at Boulder and have also been self-employed as an engineering consultant. Also in 1997, I was elected as an outside director on the Board of Directors of Georgia Transmission Corporation and still serve in that capacity. I work on a part-time, as needed basis as a senior engineer for McNeil Technologies and as a senior management consultant for R. W. Beck. My resume, testimony listing, and a publications listing are shown as Schedule JST-0.

Q. HAVE YOU FILED TESTIMONY PREVIOUSLY BEFORE THE COMMISSION?

A. Yes. In 1995, I filed testimony on behalf of The Empire District Electric Company in Case No. EC-95-28 under my previous name, Jill S. Baylor. I filed rebuttal testimony on behalf of The Empire District Electric Company in Case No. ER-2002-424 in September 2002.

Q. COULD YOU BRIEFLY PROVIDE THE TOPICS AND JURISDICTIONS IN WHICH YOU HAVE PREVIOUSLY PRESENTED EXPERT TESTIMONY?

A. I have prepared testimony or filed affidavits for cases before the Federal Energy Regulatory Commission and before regulatory agencies in the states of Illinois, Kansas, Kentucky, Maine, Missouri, Ohio, South Dakota, and Wyoming. Topics have included fuel procurement practices, policies, and procedures; integrated resource planning; nonutility generation markets; economic dispatch practices; avoided costs; fuel and purchased power expenses; and electric system reliability. I am currently serving as a member of a team advising the Iowa Utilities Board on matters related to establishing a priori ratemaking principles prior to utility construction of power plants.

Q. WHAT IS THE PURPOSE OF THIS TESTIMONY?

A. My testimony describes the production cost model used for estimation of fuel and purchased power expenses. I then provide the rationale supporting the values used by The Empire District Electric Company (Empire) for gas prices (and associated policies) and purchased power prices and availability in the test year for this rate case. Further, my testimony argues in favor of the establishment of an interim energy charge (IEC) or a fuel adjustment clause (FAC) for Empire to assist the Missouri Public Service Commission in meeting its two goals: 1) ensuring safe, reliable, and economic service to Empire's ratepayers and 2) ensuring fair and equitable cost recovery to Empire and its stockholders. Finally, I discuss the output of the production cost model runs and the resulting levels of fuel and purchased power expense that should be considered for an FAC or IEC.

II. Production Cost Model

Q. DID EMPIRE USE A PRODUCTION COST MODEL TO DETERMINE THE LEVEL OF EXPENSE FOR FUEL AND PURCHASED POWER?

A. Yes, Empire used the PROSYM production cost model.

Q. BRIEFLY DESCRIBE THE PROSYM MODEL.

A. The PROSYM model is a chronological dispatch computer model that dispatches resources to meet demand requirements on an hourly basis. The model commits resources based on fuel costs, unit start-up costs, and variable operation and maintenance ("O&M") costs after accounting for operational characteristics of a utility system that may override economic dispatch. Electric production is modeled at the generation unit level while system loads are modeled on an hourly basis.

Q. IS THE PROSYM MODEL AN ACCEPTED PRODUCTION COST MODEL IN THE ENERGY INDUSTRY?

A. Yes. The PROSYM simulation engine is described by Henwood Energy, its developer, as providing the most accurate generation unit commitment logic in the world. This description is justified by the fact that PROSYM is employed by well over 100 energy organizations around the world in both control room dispatch environments as well as in market analytic groups. PROSYM serves as the power market simulation engine for the RISKSYM model, the model that Henwood Energy developed for risk analysis and planning.

Q. DESCRIBE EMPIRE'S EXPERIENCE WORKING WITH THE PROSYM MODEL.

A. Empire has been using chronological production costing models for projection purposes since 1991. Empire's three previous rate case filings in Missouri utilized the PROSYM model.

Q. HOW DOES EMPIRE VALIDATE THE OUTPUT OF PROSYM?

A. Empire compares the generation output of the model with actual historical generation for each unit. The dispatch of Empire's thermal units falls within a reasonable range of historical generation.

Q. PLEASE DESCRIBE THE EVOLUTION OF PRODUCTION COST MODELS IN THE ELECTRIC UTILITY INDUSTRY.

A. Production cost models have evolved as computer capability has evolved. Early models used load duration curves to simulate generation commitment and dispatch. At that time, hourly dispatch was desirable but computers were not yet capable of turning around analysis in a timely manner. As the computers became more capable, deterministic hourly dispatch models were used. All the input data for these models were deterministic – one load forecast, one set of fuel prices, one set of heat rate curves, one set of planned maintenance schedules. These models provide a snapshot of outcomes under a set of assumed input conditions. The most current models today use stochastic analysis to look at the risks associated with load forecasting, natural gas pricing, availability and cost of non-contract purchased power, and forced outages on units. The new models include RISKSYM, which was developed by Henwood Energy.

Q. WOULD IT BE YOUR OPINION THAT RISK ANALYSIS IS BECOMING THE STANDARD FOR INTEGRATED RESOURCE PLANNING PROCESSES AND THAT SINGLE CASE OUTCOMES ARE NO LONGER THE NORM FOR UTILITIES ACROSS THE COUNTRY?

A. Yes. Utilities and commissions across the country have realized for many years that any "base case" prepared by a utility for a rate case or an integrated resource plan was just one view of a future that had many uncertainties. Scenario analysis was often conducted to look at higher and lower load forecasts, higher and lower inflation, higher and lower natural gas prices, and so forth. Risk analysis takes into account the uncertainties associated with many of these key variables and provides the opportunity for a utility to undertake a strategic analysis. Risky, uncertain environments are one reason why an Interim Energy Charge or Fuel Adjustment Clause help Commissions to ensure safe, reliable, and economic electric service to customers while setting fair rates for electric utilities.

III. Modeling Parameters

Q. WHAT ARE THE VARIABLES THAT DRIVE THE ENERGY COSTS ON EMPIRE'S SYSTEM?

A. Key variables include transmission cost and availability, coal and natural gas prices, purchased power prices and capacity availability, planned and forced outages of

thermal units, weather, heat rates, and water availability for the Ozark Beach hydro units. Specific parameters for modeling the generating units are described in this section of the testimony.

Q. PLEASE PROVIDE AN OVERVIEW OF THE DATA USED FOR MODELING EMPIRE'S GENERATING UNITS.

A. Data for Empire's generating units are shown on Schedule JST-1. These data include each unit's rated capacity, maximum capacity, minimum capacity, heat rate curve information, ramp rate, normalized outage, forced outage rate information, mean repair time, minimum down time, minimum up time, fuel ratio, start-up fuel requirements and associated cost, and variable O&M.

Q. WHAT IS THE BASIS FOR THE HEAT RATES USED IN THE PRODUCTION COST MODEL?

A. Multi-step heat rates are input for each unit such that the final output heat rate for each unit is near the historical five-year average heat rate for the unit, or the average heat rate for those years that the unit has been operational if the unit has less than five years of operating history. Historical heat rates for Empire's units are attached as Schedule JST-2.

Q. HOW WERE THE FORCED OUTAGE RATES USED IN THE PRODUCTION COST MODEL DETERMINED?

A. Empire tracks historical forced outage rates for its units. These historical rates are attached to my testimony as Schedule JST-3. The historical forced outage rates served as a basis for the forced outage rate used in the model for all Empire units except for Energy Center Units 3 and 4. Because of their limited operational history, forced outage rates were used that are representative of similar units in the industry. The historical equivalent forced outages as compared to industry data (referred to as GADS data) are shown on Schedule JST-4.

Q. WHAT OPERATIONAL CONSTRAINTS WERE CONSIDERED WHEN DETERMINING THE FORCED OUTAGE RATES TO BE USED FOR THE COAL UNITS AND STATE LINE COMBINED CYCLE ("SLCC") IN THE MODELING?

A. Some of Empire's units, especially at Asbury, experience extended periods of operational derations due to opacity or other constraints. Such derations are captured in the calculation of the equivalent forced outage rate but not in the calculation of the standard forced outage rate. To accurately reflect the actual and expected operation of its units, Empire used the equivalent forced outage rate and not the forced outage rate in the production cost model.

Q. HOW WERE THE PLANNED OUTAGE SCHEDULES USED IN THE PRODUCTION COST MODEL DETERMINED?

A. The planned outage schedules are based on the average of the actual scheduled maintenance days from the past five (5) years (1999-2003). Those outages are shown on Schedule JST-5. Normalized scheduled outages are reflected on Schedule JST-6.

Q. WHAT COAL BLEND RATES ARE USED IN THE MODEL?

A. On a million British thermal unit ("MMBtu") basis, Asbury burns 91% western coal and 9% local coal, Riverton 7 burns 75% western coal and 25% local coal, and Iatan burns 87% western coal and 13% local coal. Coal prices used in the model that are based on 2004 rates are shown on Schedule JST-7.

Q. HOW WAS THE COMBINED CYCLE UNIT AT STATE LINE MODELED?

A. Empire owns 300 MW (60 percent) of the 500-MW combined cycle unit at State Line (SLCC). For this rate case filing, SLCC was modeled as two separate units, one being 250 MW and the other being 50 MW. Multi-step heat rates were input for each unit with the overall heat rate of the units comparing favorably to SLCC's average heat rate for 2003 of approximately 7,500 Btu/kWh.

Q. WHY WAS THE UNIT MODELED AS TWO SEPARATE UNITS WITH DIFFERENT CAPACITIES INSTEAD OF A SINGLE 300 MW UNIT?

A. SLCC is comprised of two combustion turbines that share a single steam turbine. The unit can operate as a single combustion turbine in conjunction with the steam turbine (1 x 1 mode) or as two combustion turbines in conjunction with the steam turbine (2 x 1 mode). Since the commercial operation of this unit, the norm has been for either Empire to solely be dispatching its share of the unit or for Empire and Westar to be dispatching their shares of the unit at the same time; rarely, if

ever, has Westar dispatched their share of the unit without Empire utilizing at least a portion of its share of the unit. Since the unit is most efficient when the combustion turbines are operating at or near their maximum output level, Empire often dispatches the unit in 1 x 1 mode at high output ranges rather than run the unit in 2 x 1 mode at minimum, less efficient load levels. This means that Empire is often only utilizing 250 of its 300 MW share of the unit. When Westar decides to dispatch its share of the unit, the unit will then be in 2 x 1 mode and Empire is capable of utilizing its additional 50 MW share of the unit in an efficient manner. This reflection of actual operating parameters explains why SLCC was modeled as two separate units.

Q. HOW WAS THE OZARK BEACH HYDRO UNIT MODELED?

A. Ozark Beach was modeled based on the average of the historical capacity factors over the past five (5) years. Hydro generation accounts for less than 1.5 percent of Net System Input (NSI). Historical data for Ozark Beach are shown as Schedule JST-8.

Q. ARE THERE ANY OPERATING CHARACTERISTICS FOR EMPIRE'S ASBURY UNITS THAT NEED SPECIAL CONSIDERATION?

A. Yes. Asbury is comprised of one boiler and two turbines. The Asbury Unit 1 turbine is rated at 193 MW and Asbury Unit 2 is rated at 17 MW. Asbury Unit 2 cannot operate while Asbury Unit 1 is off line. In addition, Asbury is not able to run on a continuous basis at 210 MW due to operational issues. Specifically, the upper convection passes in the furnace tend to plug with ash. This operational limitation combined with Unit 2 operating costs causes Empire to operate Unit 2 as a peaking unit that is normally used only during the summer months. These constraints have been taken into consideration in the PROSYM model.

Q. ARE THERE ANY OPERATING CHARACTERISTICS FOR EMPIRE'S RIVERTON UNITS THAT NEED SPECIAL CONSIDERATION?

A. Yes. Riverton Unit 7 can operate to approximately 26 MW out of its 38 MW of rated capacity on coal fuel alone. The remainder of the Riverton Unit 7 capacity can only be obtained by over-firing natural gas. Likewise, Riverton Unit 8 can operate to approximately 45 MW out of its 53 MW rated capacity on coal fuel alone

with the remainder of the capacity obtained by over-firing natural gas. These operational constraints were modeled in PROSYM.

Q. WHAT ARE THE BASES FOR THE COAL COSTS INCLUDED IN THE PRODUCTION COST MODEL?

A. All costs are based on current delivered initial and freight prices. Coal handling costs are added to the initial and freight costs to obtain the appropriate coal costs to include in the model for accurate dispatching. Costs for unit train operation are included as an Undistributed & Other cost, which were added after the model run and are attached as Schedule JST-9.

Q. HOW HAS THE GENERATION OF THE EMPIRE UNITS VARIED OVER TIME AND HOW DO THEY COMPARE WITH THE ESTIMATES DERIVED FOR THE BASE RUN IN THIS CASE?

A. A generation history for the Empire units is provided as Schedule JST-10. Comparing this history to the results from the Base Run (Run 1) for a normalized test year (attached as Schedule JST-11), one will notice that generation from all of the coal units is at or above the five-year average production levels. Conversely, generation from some of our older, less efficient combustion turbines (namely, Energy Center 1 and 2, and Riverton 9, 10, and 11) falls below the five-year average levels. This generation is displaced by more efficient gas turbines (Energy Center 3 and 4) and increased production from SLCC. SLCC production is above the historical average. This is due to SLCC's limited operational history (commercial operation as of June 2001) and because Empire was able to procure favorably priced purchased power through short-term contracts with American Electric Power (AEP) during 2002 and 2003, which offset some of the generation that would normally have come from SLCC had these short-term contracts not been in place. The five-year average level for non-contract purchased power is near 435,000 MWh. Non-contract purchased power from the Base Run totaled 358,000 MWh, well within the normal range.

IV. Gas Price Estimation

Q. PLEASE EXPLAIN WHAT LEVELS OF GAS PRICES EMPIRE USED IN THE PRODUCTION COST MODELING.

A. Empire used the gas prices that it expects to pay in calendar year 2005, the time frame in which new rates resulting from this rate proceeding would likely go into effect. These prices assume that 4,200,000 MMBtu is hedged and the rest will be purchased on the spot market at the prevailing spot market price. The monthly hedged and spot market values as used in the test year are shown in Schedule JST-12.

Q. YOU HAVE USED THE TERM "HEDGED." PLEASE EXPLAIN WHAT THE TERM "HEDGED" MEANS.

A. Hedging is a strategy used to offset investment or price risk, specifically to protect against upward price movements. Hedging can be used by individual investors as well as companies and financial institutions. Empire's Risk Management Policy, described in more detail in Brad Beecher's testimony, has been implemented to protect Empire's customers against adverse price movements in natural gas.

Q. WHAT DETERMINES HOW MUCH NATURAL GAS IS HEDGED BY EMPIRE AND WHEN SUCH NATURAL GAS IS HEDGED?

A. Empire originally enacted a Risk Management Policy (RMP) in 2001 that establishes the approach and internal rules that Empire will use to manage specifically its power and natural gas commodity risk. The policy is revised approximately annually to reflect lessons learned and changes in markets and financial instruments. The RMP targets for hedging of natural gas are:

A minimum of 10% of year four expected gas burn

A minimum of 20% of year three expected gas burn

A minimum of 40% of year two expected gas burn

A minimum of 60% of year one expected gas burn

Up to 80% of any year's expected requirement can be hedged if appropriate given the associated volume risk.

Q. HAS HEDGING BEEN A VALUABLE STRATEGY FOR EMPIRE TO USE IN THE PAST?

A. Yes. Empire's use of a hedging strategy has saved its customers and shareholders a significant amount of money. Just in 2003, Empire would have paid approximately $13.5 million more in natural gas prices had Empire not hedged its natural gas

purchases. As shown on schedule JST-13, Empire paid an average hedged price in 2003 of $3.02/MMBtu for natural gas. If that natural gas had not been hedged, the average price would have been a higher value of approximately $5.12/MMBtu based on NYMEX historical closing prices.

Q. WHAT ARE THE APPROPRIATE NATURAL GAS PRICES TO BE USED FOR PRODUCTION COST MODELING FOR THE TEST YEAR?

A. The answer to this question is that "it varies." If you have to pick a specific price and you are a member of the staff of a regulatory agency or consumer advocate, in my experience the answer usually is the lowest gas price forecast possible to assume. If you are a utility company employee, the answer is the highest gas price forecast that can be assumed. Natural gas spot market prices are extremely volatile and truthfully can not be known in advance. They are one of the two areas in which Empire and the Commission Staff have historically argued vehemently in each rate case (the other being purchased power prices and capacity availability). The volatility associated with natural gas spot market prices and the significant financial inequities that can result for Empire, its customers, and its shareholders if an inaccurate price is assumed for ratemaking purposes lead to the observation that fighting about future natural gas prices is not productive. An effective means of dealing with natural gas price volatility is the implementation of either an Interim Energy Charge (IEC) or a Fuel Adjustment Charge (FAC). Empire witness Brad Beecher describes these two possible rate making processes in more detail in his testimony.

V. Purchased Power

Q. HOW WAS THE COST OF THE JEFFREY ENERGY CENTER (JEC) CONTRACT PURCHASE ENERGY DETERMINED?

A. The JEC contract energy purchase price is based on the actual cost of the energy out of the three JEC coal units. The three JEC units were assigned planned outages based on NERC GADS data and unplanned outages are similar to those modeled for the Iatan plant, which is comparable in size and age. The average energy cost in the base run is $13.39/MWh.

Q. DOES EMPIRE PARTICIPATE IN THE NON-CONTRACT PURCHASE ENERGY MARKET?

A. Empire evaluates the non-contract energy purchase market on a daily and hourly basis. The Company will participate in such markets whenever it makes economic sense to do so. However, the Commission and the Staff should be aware that modeling the price and availability of non-contract purchased power is a difficult task with the ever evolving and uncertain price and availability of energy and transmission. This area, in addition to natural gas pricing, has been one of the biggest sources of contention between Empire and the Commission Staff in previous rate cases.

Q. WHY IS IT DIFFICULT FOR EMPIRE AND THE COMMISSION STAFF TO AGREE ON MODELING PARAMETERS FOR NON-CONTRACT PURCHASED POWER?

Like natural gas, neither Empire nor the Commission Staff can accurately predict future prices of purchased power nor the amount of purchased power that will be available during any given hour on any day in any year in the future. And, due to the structure of the market, the price of non-contract purchased power is becoming more and more closely tied with the price of natural gas. The price and capacity of purchased power are so uncertain because they depend on the situation not only at Empire at any given point in time, but also on the conditions at surrounding utilities including the weather, transmission availability, unit outages, natural gas prices, coal prices, water availability, and perceptions about what is transpiring in the market. The uncertainty associated with purchased power prices, like the risks associated with natural gas prices, leads to one conclusion – either an IEC or an FAC should be enacted or Empire should be allowed a higher return on equity recognizing the risks that it is shouldering for both natural gas price uncertainty and purchase power price and capacity fluctuations.

Q. WHAT PROCESS DID EMPIRE UNDERTAKE FOR THIS RATE CASE TO MODEL NON-CONTRACT PURCHASED POWER PRICES AND CAPACITY AVAILABILITY?

A. Empire determined that it should attempt to use the model normally utilized by Commission Staff to project non-contract purchased power prices and capacity availability during the test year which is summarized in a Commission Staff provided document entitled "A Methodology to Calculate Representative Prices for Purchased Energy in the Spot Market" dated March 18, 1996. During that process, Empire uncovered numerous instances of data anomalies that if provided to the Commission Staff could have caused them to mischaracterize other types of transactions as non-contract purchased power. Although Empire believes that the data that it will provide Commission Staff for the quantities and prices of non-contract purchased power for the test year will be significantly improved over past years, it does not negate the fact that neither Staff nor Empire can accurately forecast non-contract purchased power prices and capacity availability. In addition, when the gas price, and therefore the non-contract purchased power price is underestimated, the amount of generation projected for Empire's natural gas-fired units is also significantly underestimated.

Q. DID EMPIRE MAKE ANY MODIFICATIONS TO COMMISSION STAFF'S METHODOLOGY FOR SPOT MARKET PURCHASED POWER?

A. Yes. In the methodology presented by Commission Staff, Step 25 (found on page Appendix A-3) states "Calculate the 24 maximum hourly amount of MW's for each hour. Assign this amount of MW's for the hours in the month.". Empire and I believe this to be a flawed assumption. To say that the maximum amount of MW's purchased in an hour are available for all similar hours in that month, regardless of the price of that energy, is simply not realistic. Empire assumed that the average capacity of all similar hours in a month was a better representation of the amount of non-contract purchased power that may be available in that hour of the month. Again, Empire will not try to contend that they know for a certainty that this is the amount of non-contract purchased power that will be available on the market (it could be less or more), but they do believe it is more likely for the average to be available than the maximum on a daily basis.

Q. DID EMPIRE MODEL NON-CONTRACT PURCHASED POWER USING BOTH METHODS FOR ASCERTAINING THE AMOUNT OF CAPACITY AVAILABLE ON AN HOURLY BASIS?

A. Yes. Empire modeled non-contract purchased power capacity availability in PROSYM using the Step 25 method ("maximum availability") and a method that averages availability across hours of a month ("average availability"). The difference in average availability versus maximum availability assumptions alone caused an $8,000,000 change in projected annual revenue requirements.

Q. IS THERE A WAY THESE DIFFERENCES IN PURCHASED POWER MODELING COULD BE MINIMIZED?

A. Yes. To mitigate the "battle of the models" that has been common in the past, I agree with Empire's recommendation to implement an IEC or an FAC to account for the volatility of both natural gas prices and non-contract purchased power prices and capacity availability.

VI. Production Cost Modeling Results

Q. WHAT WERE THE RESULTS OF EMPIRE'S BASE PRODUCTION COST MODEL RUN?

A. Empire's Base Run, which is summarized in Schedule JST-11 as Run 1, calculated a total company on-system fuel and purchased power cost of $123,017,390 or $24.39/MWh. This run assumes the gas prices and non-contract purchased power prices and availability described in my testimony above.

Q. HOW DOES THIS COMPARE TO THE $121,665,153 THAT EMPIRE WITNESS MR. BEECHER PRESENTED IN HIS TESTIMONY FOR ON-SYTSTEM FUEL AND PURCHASED POWER EXPENSE USING HIS STRAIGHT FORWARD, FIVE ADJUSTMENT METHOD?

A. As Mr. Beecher states, the difference between his method and the output of the base model run is only $1.35 million or 1.1 percent of total on-system fuel and purchased power costs. Considering that the model is making dispatching decisions on an hourly basis and that the dispatch decisions are based on a number of variables, a difference would obviously be expected. However, Mr. Beecher's straight forward approach does bring merit and support to the results of the production cost model.

Q. DID EMPIRE PERFORM ANY ADDITIONAL PRODUCTION COST MODEL RUNS TO DETERMINE WHAT LEVEL OF RISK THEY WOULD BE EXPOSED TO IF GAS OR PURCHASED POWER PRICES WERE HIGHER?

A. Yes. Empire performed several model runs that keyed on three main variables to get a better understanding of their effects on total fuel and purchased power expenses. These three variables were natural gas price, non-contract purchased power price, and non-contract purchased power availability. These are the three variables that are the most uncertain in the future and have also been the most debated in previous rate proceedings. The results of these runs (Run 2 through Run 12) are presented in Schedule JST-14.

Q. PLEASE DISCUSS HOW THE THREE VARIABLES WERE CHANGED IN THE RUNS.

A. Several runs were made that varied the natural gas price from approximately $3.00/MMBtu all the way up to $5.50/MMBtu. At each gas price, a run was made where the availability of non-contract purchased power was changed between maximum availability and average availability (based on 2003 actual purchases). A couple of additional runs were made using the base gas price assumptions but using non-contract purchased power prices for each hour of the year that were output from a regional production cost model and again varying the availability of non-contract purchased power between maximum and average.

Q. PLEASE SUMMARIZE THE RESULTS OF THESE PRODUCTION COST MODELING RUNS.

A. The results of these runs provided a range of $102,544,000 ($20.33/MWh) to $129,720,000 ($25.72/MWh) for levels of fuel and purchased power expenses. It is worth noting that this range is a little more than $25,000,000 and that the natural gas cost assumptions vary by approximately $2.50/MMBtu at these minimum and maximum levels of expense. In a normal year Empire estimates that it will burn approximately 10,000,000 MMBtu of natural gas. Using this assumption and the $2.50/MMBtu gas range, it is quite apparent that the $25,000,000 difference in the runs is largely due to the natural gas cost input. Thus, the price of natural gas has an enormous impact on the expected revenue requirements in the model affecting

the fuel expense itself, the level of purchased power bought, and the projected level of operation of each of Empire's generating units.

Q. WITH THESE RUNS IN MIND, WHAT WOULD BE YOUR RECOMMENDATION IN TERMS OF AN IEC FOR EMPIRE?

A. While fuel and purchased power expenses of nearly $130,000,000 may seem high compared to recent levels, Empire did experience twelve month ending on-system fuel and purchased power expenses that were in excess of $123,000,000 in July of 2001. Because of current projections of natural gas prices, it is not out of the question that fuel and purchased power expenses could approach $130,000,000 in the near future at Empire. Again, no one can predict with any certainty the future price of natural gas or non-contract purchased power. Because of these uncertainties, I believe an IEC that had a $20,000,000 true-up range would be equitable to Empire, its customers, and its shareholders. This $20,000,000 range would roughly equate to a $2.00/MMBtu range of natural gas prices. A range from $105,000,000 ($20.82/MWh) in total fuel and purchased power to a base subject to refund of $125,000,000 ($24.79/MWh) for the test year, as presented in Mr. Beecher's testimony, would seem equitable in this case. Recent history shows that there is a possibility, if conditions are favorable, that fuel and purchased power prices could dip slightly below $105,000,000 and the model runs show that if conditions are right they could go above $125,000,000, meaning that both Empire, its customers, and its shareholders, have a minimal amount of exposure to under- or over-recovery. This range of total on-system fuel and purchased power expense would roughly equate to a gas price range of $3.25/MMBtu to $5.25/MMBtu.

VII. Summary

Q. PLEASE PROVIDE A SUMMARY OF YOUR TESTIMONY.

A. The model that Empire uses for production costing modeling is a chronological dispatch model that is well-known and widely used throughout the electric utility industry. Empire has carefully and conscientiously developed data to model its generating units that reflect actual operation and historical averages for most input parameters. However, there is no way to avoid the fact that forecasting of natural gas prices and non-contract purchase power prices and capacity availability

generally end up in a "battle of the models" between the Company and the Commission Staff over the appropriate level of fuel and purchased power expense due to the great volatility and uncertainty associated with the projection of these parameters. Such unproductive battles over significant unknowns, that cannot ever be known in advance, leads me to the conclusion that the implementation of an IEC or an FAC is in order to recognize the risks and uncertainty associated with rate making for fuel and purchased power expense based on deterministic modeling in a risky world.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes, it does.

SCHEDULE JST-0

Jill S. Tietjen Resume

Jill S. Tietjen Testimony and Deposition Listing

Jill S. Tietjen Articles/Speeches Listing

JILL S. TIETJEN

Consulting Engineer

An electrical engineer experienced in electric utility and related planning processes and analyses, primarily in the areas of generation, transmission, and fuels. Experienced expert witness.

EMPLOYMENT CHRONOLOGY

2001 - present	Technically Speaking, Founder and Principal University of Colorado at Boulder, Various Titles Independent Consultant; Senior Engineer, McNeil Technologies Senior Management Consultant, R.W. Beck (since 2003)
1997-2000	University of Colorado at Boulder Director, Women in Engineering Program and Independent Consultant
1995-1997	Stone & Webster Management Consultants, Inc. Assistant Vice President
1992-1995	Principal, Hagler Bailly Consulting (Previously RCG/Hagler Bailly) Boulder, Colorado
1984-1992	Stone & Webster Management Consultants, Inc. Assistant Vice President
1981-1984	Mobil Oil Corporation Planning Analyst, Mining and Coal Division
1976-1981	Duke Power Company Planning Engineer

CONSULTING ASSIGNMENTS

Clean Air

Examined the process used by Big Rivers Electric Corporation to determine that a scrubber should be installed at Henderson Station Two. Presented testimony on the proposed environmental surcharge before the Kentucky Public Service Commission.

Prepared acid rain workshops for company's Utility Management Development Program. Analyzed coal price projections associated with acid rain compliance plans for Illinois Power and the Allegheny Power System. Authored papers on impacts of acid rain legislation.

Cogeneration/Independent Power Production

Managed several projects relating to the efficiency of qualified facilities. One project involved preparation of an affidavit in a Federal Energy Regulatory Commission hearing. Managed an appraisal of an IPP in bankruptcy.

Evaluated fuel contracts - primarily coal and petroleum coke - associated with cogeneration projects in various states. Evaluated steam and power sales contracts as well as operational aspects, avoided cost projections, and transmission issues of projects. Prepared feasibility studies and financial viability analysis.

Assisted Public Service Company of Colorado evaluate the options available with regard to the possible repowering/conversion of the Fort St. Vrain nuclear power plant. Assistance included solicitation and evaluation of potential bidders and preparation of request for proposal.

Competitive Bidding

Managed competitive bidding solicitations for supply-side and/or renewable resources. Projects included RFP and PPA development and evaluations of bids. Clients: Northern States Power, The Empire District Electric Company, San Diego Gas & Electric, SaskPower, and Southwestern Public Service.

Economic Analysis

Investigated the competitive market price for the sale of power from coal-fired, geothermal, and hydroelectric power plants. Performed earnings value evaluations for appraisal evaluations.

Projected levelized annual costs for generating units planned for construction. Analysis included evaluation of fuel costs (including both mine and transportation components), escalation rates, operating and maintenance costs, levelizing factors and appropriate capacity factors.

Expert Testimony

Ms. Tietjen has prepared testimony or affidavits for cases before the Federal Energy Regulatory Commission and before regulatory agencies in the states of Illinois, Kansas, Kentucky, Maine, Missouri, Ohio, South Dakota, and Wyoming. Topics have included fuel procurement practices, policies, and procedures; integrated resource planning; nonutility generation markets; economic dispatch practices; avoided costs; fuel and purchased power expenses; and electric system reliability.

Fuels

Assessed market potential for international coals to various destinations including Egypt and South America. Reviewed the economics of several Australian coals for a power plant in South Australia. Analysis included lignite, subbituminous and bituminous coals under various environmental scenarios.

Analyzed projected fuel costs, supply and availability for coal-fired power plants. Evaluated coal contracts and prepared market assessments.

Generation Planning

Evaluated capacity planning alternatives using several models.

Performed production costing and generation expansion modeling for a wide range of domestic and international utilities.

As project manager, developed and applied a decision methodology to evaluate plant life management option decisions for the gas and oil-fired units in California for the California Energy Commission.

Integrated Resource Planning

Project manager of integrated resource planning studies for Bangor Hydro-Electric, Black Hills Power and Light, and the Empire District Electric Company. Efforts supported with testimony filed in multiple jurisdictions.

Management Audits

Managed fuel practices and policies audits of utilities. Participated in a management audit investigating issues of generation planning. Participated in evaluations of system dispatch practices and procedures.

Mergers/Acquisitions

Evaluated impacts of a proposed merger and later a proposed acquisition for Tri-State Generation and Transmission and Colorado-Ute Electric Association. Areas examined included production costs, power purchases, power sales, and fuel contracts.

Power Pooling

Evaluated power pooling costs and benefits for utilities in Indiana and Ohio. Analysis included centralized dispatch, energy brokering system, and economy interchanges. Examined spinning reserve requirements and fuel impacts of pooling operation.

Pre-Audit Counsel

Helped utilities prepare to undergo management audits. Areas assisted include fuels, purchasing, power production, environmental affairs, gas supply and planning. Assisted in interview training.

Ratemaking Principles

Served as advisor to the Iowa Utilities Board on a priori ratemaking principles for utility construction of electric power generation in Iowa.

Renewable Resources

Served as project manager for assessment of alternative wind technologies for a Midwestern utility. Examined the feasibility and economics of biomass generation for a sawmill in Wyoming, an electric utility in Arizona, a reservation in Minnesota, and a public utilities district in California.

Transmission Planning

Identified potential transmission corridor development in California. Examined related environmental issues. Established an advisory committee composed of utilities, federal and state agencies and special interest groups to facilitate transmission line planning. Evaluated bulk power transmission system issues in California. Examined impacts of Qualifying Facility development in certain areas of the Pacific Gas and Electric and Southern California Edison systems.

Examined the impacts of regional operation on Iowa Power's transmission system. Analyzed associated transmission issues including some MAPP proposals. ENEREX operation and the condition of the Company's 161-kV system.

Participated in audits of transmission and distribution loss calculation practices for Northern States Power and Alberta Power Limited.

Other

Project manager and expert witness for a proceeding in Illinois with regard to a reliability rule proposed by the staff of the Illinois Commerce Commission.

UTILITY BACKGROUND

System Planning

Conducted generation planning studies including production costing and capacity mix analyses using modern computerized planning tools including. Investigated alternative and renewable technologies.

Prepared economic analyses. Examined fuel use requirements. Assisted in fuel budget preparation. Evaluated maintenance scheduling and generation dispatching practices.

Evaluated alternative load control strategies. Studies included cost/benefit analysis and simulation of strategies with examination of resultant impact on utility operations.

Other

Member of McGuire Nuclear Station's Crisis Management Team. Speaker's Bureau. On-campus recruitment.

COAL EXPERIENCE

Fuels

Prepared competitive marketability studies of coals throughout the United States. Examined the competitiveness of U.S. coals in markets outside the country primarily the Pacific Rim and Europe as compared to Australian, South African and Canadian coals. Conducted utilization studies of coals for use in the marketing of coal to a number of U.S. utilities.

Cogeneration

Studies the feasibility of coal-fired cogeneration for enhanced oil recovery at Mobil's facilities in Kern County, California.

Economic Analysis

Assess the economics of various pricing scenarios for coal contracts. Evaluated mining costs and profitability.

OTHER

Strategic Planning

Participated in the development of the five-year strategic plan and associated budgets and justifications for an alternative energy entity.

Marketing

Participated in marketing coal from the Powder River Basin, Wyoming to a wide spectrum of utilities.

AFFILIATIONS

Society of Women Engineers — 1991-92 National President, Fellow.

Georgia Transmission Corporation, Board of Directors, 1997 – present.

Colorado State Board of Registration for Professional Engineers and Professional Land Surveyors, 1996-2004, Chair, 2001-2003.

Institute of Electrical and Electronics Engineers, Power Engineering Society, Senior Member.

International Women's Forum (Colorado), Board of Directors, 1998 – 2000.

Women's Forum of Colorado Foundation, Board of Directors, 1997 - 2000, President, 1998 – 2000.

Rocky Mountain Electrical League Board of Directors, 1994-2002; President, 1999-2000.

Rocky Mountain Electrical League Foundation Board of Directors, 1999-present, Chair, 2002-present.

Girl Scouts – Mile Hi Council Board of Directors, 1999-present, Chair, 2003-present.

Board of Trustees, Arapahoe Library District, 1995-2000, President, 1997 – 1999.

Women in Engineering Programs & Advocates Network - Board of Directors, 1995 – 2001.

Leadership Denver 1996.

HONORS

1990 Certificate of Honor — Colorado Engineering Council.

Listed in *Who's Who in Engineering, Who's Who in Science and Engineering,* and *Who's Who in Technology.*

1991 John E. Daly Award for Consulting Excellence — Stone & Webster Management Consultants.

Soroptomist International Women of Distinction Award, 1995.

Woman of Distinction, Mile Hi Girl Scouts Council, 1997.

IEEE *Spectrum* Advisor of the Year, 2000.

Presidential Citation Award, Professional Land Surveyors of Colorado, 2000,

Woman in Technology Award from the Women's Foundation of Colorado, Subaru, and News4, 2001.

Distinguished Service Award, Society of Women Engineers, 2002.

Horizon Award, Outstanding Professional, The Partnership to Advance Science, Engineering, and Technology, 2003.

Colorado Women's Leadership Coalition, 2004 Woman Leader of Excellence.

EDUCATION AND OTHER

University of Virginia, B.S., Applied Mathematics with a minor in Electrical Engineering, 1976. (Tau Beta Pi, Virginia Alpha).

University of North Carolina at Charlotte, M.B.A., 1979.

Registered Professional Engineering, Colorado.

4/2004

JILL S. TIETJEN

Consulting Engineer

Testimony and Deposition

Known as Jill S. Baylor May 1976-August 1996

1. Public Utilities Commission of Ohio. "Economic Dispatch Practices, Toledo Edison." 1985.

2. Public Utilities Commission of Ohio. "Fuel Procurement Practices, Policies and Procedures, Toledo Edison." 1987.

3. Maine Department of Environmental Protection. (On behalf of Bangor Hydro-Electric Company.) "Net Benefit Analysis for the Veazie Development and the Basin Mills Development: Integrated Resource Planning." 1992.

4. Wyoming Public Service Commission, Docket No. 20002-EA-92-27. (On behalf of Black Hills Power & Light Company.) "Integrated Resource Planning." 1993.

5. South Dakota Public Utilities Commission, Dockets Nos. EL92-026 and EL92-027. (On behalf of Black Hills Power & Light Company.) "Avoided Costs, Integrated Resource Planning, and Evaluation of Non-Utility Generation Markets." 1993.

6. Missouri Public Service Commission, Case ER-93-41. (On behalf of St. Joseph Light and Power Company.) "Rebuttal Testimony on Production Cost Model, Fuel, and Interchange." 1993.

7. Federal Energy Regulatory Commission, Docket Nos. EL93-45-000 and QF83-248-002. (On behalf of Energy Systems Division of Thermo Electron Corp., et al.) 1993.

8. Illinois Commerce Commission, Docket No. 92-0168. (On behalf of Commonwealth Edison and Central Illinois Public Service Company.) "Reliability Regulation and Measurement." 1993.

9. Kentucky Public Service Commission, Big Rivers Electric Corporation PSC Case No. 94-032. (On behalf of the Kentucky Industrial Utility Customers.) "Coal Price Forecasting and Markets." 1994.

10. General Services Administration Contract Board of Appeals, Contracting Dispute, 1994.

11. Wyoming Public Service Commission, Docket No. 20002-ER-95-48. (On behalf of Black Hills Power & Light Company.) "Integrated Resource Planning." 1995.

12. South Dakota Public Utilities Commission, Docket No. 95-003. (On behalf of Black Hills Power and Light Company.) "Integrated Resource Planning." 1995.

13. Missouri Public Service Commission, Case No. EC-95-28. (On behalf of The Empire District Electric Company.) "Avoided Costs." 1995.

14. Kansas Corporation Commission, Docket No. 191, 205-U. (On behalf of The Empire District Electric Company.) "Avoided Costs." 1995.

15. Colorado Senate Judiciary Committee, Regarding House Bill 1299 "Equal Opportunity Act of 1997," March 10, 1997.

16. Division of Administrative Hearings, State of Colorado, Claim No. 4-338-220, Patricia Bush vs. Coors Ceramics, Witness for the Respondent, February 24, 1998.

17. Commission on the Advancement of Women and Minorities in Science, Engineering, and Technology Development, October 7, 1999.

18. Expert Report on Professional Engineering Behavior and Ethics, United States District Court, District of Colorado, Civil Action No. 99-S-260, Eva B. Huntsinger vs. The Board of Directors of the E-470 Public Highway Authority, Witness for the Plaintiff, October 22, 1999.

19. Colorado Commission on Higher Education, Regarding the Surveying and Mapping Program at Metropolitan State College of Denver, on behalf of the Colorado State Board of Registration for Professional Engineers and Professional Land Surveyors, April 6, 2000.

20. Expert Report on Professional Engineering Behavior and Ethics, District Court, Case No. 00 CV 1690, Division 5, Eva B. Huntsinger v. CH2M Hill Companies, et.al., December 17, 2001.

21. Missouri Public Service Commission, Case No. ER-2002-424. (On behalf of The Empire District Electric Company.) "Purchased Power Pricing and Availability." 2002.

22. Colorado Senate State Veterans and Military Affairs Committee, Regarding Senate Bill 03-080 "Licensure of Landscape Architects," January 28, 2003.

23. Wyoming Senate Revenue Committee, Regarding House Bill HB0188, "Renewable Energy Equipment-Sales Tax Exemption, February 21, 2003.

24. Colorado House of Representatives Business Affairs and Labor Committee, Regarding House Bill 284, Sunset Review of the State Board of Registration for Professional Engineers and Professional Land Surveyors, December 4, 2003.

25. Colorado House of Representatives Business Affairs and Labor Committee, Regarding House Bill 04-1115, Sunset Review of the State Board of Registration for Professional Engineers and Professional Land Surveyors, January 27, 2004.

1/28/2004

JILL S. TIETJEN

Consulting Engineer

Articles/Speeches

Known as Karen Jill Stein 1954-1976

Known as Jill S. Baylor May 1976-August 1996

Books

1. Quoted in *Members of the Club: The Coming of Age of Executive Women*. 1993. Dawn-Marie Driscoll and Carol R. Goldberg. New York: The Free Press, A Division of Macmillan, Inc.
2. *She Does Math! Real-Life Problems from Women on the Job* (contributing author). 1995. M. Parker, ed. Washington, DC: The Mathematical Association of America.
3. *Keys to Engineering Success*. 2001. Jill S. Tietjen, Kristy A. Schloss, et. al. Upper Saddle River, New Jersey: Prentice Hall. [Brief review in *SWE: Magazine of the Society of Women Engineers*, March/April 2001, p. 4.]
4. *Setting the Record Straight: An Introduction to the History and Evolution of Women's Professional Achievement*. 2001. Betty Reynolds, Ph.D. and Jill S. Tietjen, P.E. Denver, Colorado: White Apple Press.
5. *Setting the Record Straight: The History and Evolution of Women's Professional Achievement in Engineering*. 2001. Betty Reynolds, Ph.D. and Jill S. Tietjen, P.E. Denver, Colorado: White Apple Press.
6. *Setting the Record Straight: The History and Evolution of Women's Professional Achievement in Accounting*. In press. Betty Reynolds, Ph.D. and Jill S. Tietjen, P.E. Denver, Colorado: White Apple Press.
7. *Setting the Record Straight: The History and Evolution of Women's Professional Achievement in Science*. In press. Betty Reynolds, Ph.D. and Jill S. Tietjen, P.E. Denver, Colorado: White Apple Press.

Technical Reports

1. *RDI's Outlook for Power in the U.S.* (contributing author), Resource Data International, 1998.
2. *Outlook for Power in North America, 1999 Annual Edition* (contributing author), Resource Data International, 2000.
3. *Electric Transmission: Pathway To Power*, Financial Times *Energy*, 2000.
4. Quoted and pictured in the Executive Summary, *Women In Technology Report*, Status of Women and Girls in Colorado, Women's Foundation of Colorado, 2001.

Articles (Technical)

1. "Transmission Loss Evaluation for Electric Systems" (with Martin W. Gustafson). IEEE 87 SM 467-4, *IEEE Transactions on Power Systems*, 3(3):1026-1032.
2. "Considerations in the Formation of Power Pooling Arrangements" (with Leslie A. Buttorff). 1987. *Public Utilities Fortnightly*, November 26.
3. "The Equivalent Hours Loss Factor Revisited" (with Martin W. Gustafson and Steven S. Mulnix). IEEE 88 WM 166-1, *IEEE Transactions on Power Systems*, 3(4):1502-1507.

4. "Operational Losses Savings Attributable to Load Management" (with Martin W. Gustafson). IEEE 88 SM 659-5, *IEEE Transactions on Power Systems*, 4(1):229-235.
5. "Approximating the System Losses Equation" (with Martin W. Gustafson). 1989. IEEE 89 WM 146-2 — PWRS, *IEEE Transactions on Power Systems*, 4(3):850-855.
6. "Power-System Loss Calculations Are Updated" (with Martin W. Gustafson). 1989. *Transmission and Distribution*, November.
7. "Acid Rain Impacts on Utility Plans for Plant Life Extension." 1990. *Public Utilities Fortnightly*, March.
8. "Making New Rules" (with Michael T. Burr, et al.). 1991. *Independent Energy*, July/August.
9. "The Fair Access Debate." 1991. *Independent Energy*. September.
10. "Direct Water Heater Load Control — Estimating Program Effectiveness Using an Engineering Model" (with Martin W. Gustafson and Gary Epstein). February 1993. IEEE 92 WM 130-5 — PWRS, *IEEE Transactions on Power Systems*, 8(1):137-143.
11. Discussion for "Bulk Transmission System Loss Analysis." Nadira, Wu, Maratukulam, Weber, and Thomas (with Martin W. Gustafson). May 1993. IEEE 92 WM 097-6 — PWRS, *IEEE Transactions on Power Systems*, 8(2):414.
12. "Estimating Air Conditioning Load Control Effectiveness Using an Engineering Model" (with Martin W. Gustafson and Gary Epstein). August 1993. IEEE 92 SM 420-0 PWRS, *IEEE Transactions on Power Systems*, 8(3):972-978.
13. "Communicating the Value of Dispatchability for Nonutility Generation Projects" (with D. Cotcher, K.D. Krauss, and D. Logan). January 1995. IEEE 95 WM 123-0 — PWRS, *IEEE Transactions on Power Systems*.

Articles (Nontechnical)

1. "Nuclear Power." 1980. *The Charlotte Observer*, Letter to the Editor, October 16.
2. "Nuclear Power Will Fill Energy Gap." 1980. *The Charlotte Observer*, Letter to the Editor, December 28.
3. "The 'Good Old Days': A Short Course in Appliance History." 1989. *U.S. Woman Engineer*, January/February.
4. "SWE Career-Guidance Programs." 1989. *The Woman Engineer*, SWE Column, April/May, pp. 16-17.
5. "SWE Co-Sponsors Program with NASA." 1989. *Woman Engineer*, Fall, pp. 12-13.
6. "SWE Highlights Women Achievers." 1989/1990. *Woman Engineer*, SWE Column, Winter.
7. "Women Engineers on the Job." 1990. *Engineering Horizons*, Spring.
8. "The SWE Achievement Award." 1990. *Woman Engineer*, SWE Column, Spring.
9. "Newsletter Award." 1990. *U.S. Woman Engineer*, September/October, p. 41.
10. "Break Through The Glass Ceiling." 1991. *Woman Engineer* (SWE Column). Spring.
11. "President's Note: Recognizing Our Achievements." 1991. *U.S. Woman Engineer*. July/August, p. 2.
12. "A Family Business: Opportunities for the Female Entrepreneur." 1991. *U.S. Woman Engineer*, July/August, pp. 23-24.
13. "President's Note: Providing Guidelines for Successful Projects." 1991. *U.S. Woman Engineer*. September/October, p. 3.
14. "President's Note: Awards: Keys to Visibility and Recognition." 1991. *U.S. Woman Engineer*. November/December, p. 2.
15. "Girls are not encouraged to be engineers." 1991. *The Denver Post* (Letter to the Editor). December 29.
16. "President's Note: One Person Can Make a Difference." 1992. *U.S. Woman Engineer*. January/February, p. 2.
17. "We Haven't Come Such a Long Way, Gary." 1992. *Business Week* (Letter to the Editor). January 20.
18. "Stepping Stones to Career Success." 1992. *Careers and the Engineer*, Spring.
19. "Today's society needs engineers of both sexes." 1992. *The Houston Chronicle*, February 27.
20. "Let's stop discouraging girls from careers in engineering and science." 1992. *The Denver Post*, February 29.

21. "President's Note: SWE Enhances Leadership Skills." 1992. *U.S. Woman Engineer*. March/April, p. 3.
22. "Encouraging girls in science, math: Steps are simple, vital." 1992. *The Cincinnati Post*, March 5.
23. "How about 'L.A. Engineer'?" 1992. *The News & Observer*, Raleigh, N.C., March 15.
24. "President's Note: Valuing Diversity." 1992. *U.S. Woman Engineer*. May/June, p. 3.
25. "What I Wish I Had Known When I Graduated from College: Lessons Learned in the Corporate World." 1992. *U.S. Woman Engineer*, November/December.
26. "The Value of Networking." 1993. *U.S. Woman Engineer*, January/February.
27. "Living a Better Life" (with Alexis C. Swoboda). 1993. *U.S. Woman Engineer*, March/April.
28. "The Importance of Networking." 1993. *The Woman in Engineering Program Newsletter* (University of Colorado - Boulder). Fall, page 4.
29. "Women in Motion: Pioneers in Transportation" (with Alexis C. Swoboda). 1994. *SWE Magazine of the Society of Women Engineers*, March/April.
30. "Why is That Woman Wearing a Balloon? Or GET A LIFE!" 1994. *SWE Magazine of the Society of Women Engineers*, May/June, p. 37.
31. "Engineers Can Be Leaders." 1994. *SWE Magazine of the Society of Women Engineers*, November/December.
32. "Turbines do kill raptors, but there's no free lunch." 1994. *The Denver Post*, Letter to the Editor, December 22, 1994.
33. "Admiral Grace Murray Hopper Inducted into National Women's Hall of Fame." 1995. *IEEE Annals of the History of Computing*, Volume 17, No. 1, pp. 59-61.
34. "Women Who Made a Difference: Technological Bridges" (with Alexis C. Swoboda). 1995. *SWE: Magazine of the Society of Women Engineers*, March/April, pp. 16-20.
35. "Snappy Responses to Obnoxious Comments," 1996. *SWE: Magazine of the Society of Women Engineers*, January/February, pp. 23-24.
36. "Steps to Leadership Success," 1996. *SWE: Magazine of the Society of Women Engineers*, May/June, pp. 42-46.
37. "Facilitated Discussion: An Interactive Look at Affirmative Action (with Kristy A. Schloss)," 1996. *SWE: Magazine of the Society of Women Engineers*, July/August, pp. 16-19.
38. "The View Through the Glass Ceiling (with Kristy A. Schloss)," 1996. *SWE: Magazine of the Society of Women Engineers*, September/October, pp. 36-39.
39. "Community Trusteeship," 1997. *SWE: Magazine of the Society of Women Engineers*, May/June, pp. 32-38.
40. "Reporting disappoints," 1997. *The Rocky Mountain News*, Letter to the Editor, July 1.
41. "Choices," 1997. *SWE: Magazine of the Society of Women Engineers*, July/August, pp. 14-15.
42. "Girls need encouraging to learn math, science" 1998. *The Denver Rocky Mountain News*, Letter to the Editor, November 2.
43. "Taking Humor Seriously (with Kristy A. Schloss)," 1999. *SWE: Magazine of the Society of Women Engineers*, May/June, pp. 68-72.
44. "Response to Letter to the Editor, 1999. *SWE: Magazine of the Society of Women Engineers*, September/October, p. 7, 77-79.
45. "Women in Engineering: The Dawn of an Era," *Colorado Engineer Magazine*, Fall 1999, Volume 96, Number 2, pp. 16-19.
46. "Engineering is energizing with WIEP," *Carillon*, January 21, 2000, Diversity Supplement.
47. "All Board Rules Being Overhauled!" *Board News*, Colorado Board of Registration for Professional Engineers and Professional Land Surveyors, Volume XI, April 2000, pp. 1 and 3.
48. "Joy Burns: Businesswoman, Sportswoman, Philanthropist, *Zenith Woman*, Fall 2000, Volume 4, Number 3, p. 28.
49. "Annie Dodge Wauneka: Legendary Mother of the Navajo," *SWE: Magazine of the Society of Women Engineers*, January/February 2001, p. 73.
50. "2001: A SWE Odyssey Invites You to Denver, Colorado," *SWE: Magazine of the Society of Women Engineers*, January/February 2001, pp. 77-79.

51. "2001: A SWE Odyssey Welcomes You to Denver, Colorado," *SWE: Magazine of the Society of Women Engineers*, June 2001, p. 16.
52. "Electronic Signatures & Other Rule Changes," *Board News*, Colorado Board of Registration for Professional Engineers and Professional Land Surveyors, Volume XIII, December 2001, pp. 5 and 7.
53. "End Note," *Virginia Engineering*, Winter 2002, p. 16.
54. "Conferences offer many networking opportunities," *Front Range TechBiz*, April 22-28, 2002, p. 16.
55. "Conferences offer many networking opportunities," *Mass High Tech*, April 22-28, 2002, p. 22.
56. "The FE Exam as an Assessment Tool," 2nd National Conference on Outcomes Assessment for Program Improvement, 2002 ABET Annual Meeting, Pittsburgh, Pennsylvania, November 1, 2002.
57. "GREAT women and their Stories," (with Alexis C. Swoboda, P.E.) *SWE: Magazine of the Society of Women Engineers*, Winter 2003, pp. 16-20.
58. "What is That P.E. After Your Name?" (with Alexis C. Swoboda, P.E.) *SWE: Magazine of the Society of Women Engineers*, Winter 2004, pp. 45-46.

Articles (Featured in)

1. One of 10 engineers profiled in "What We Wish We Had Known," by Ellen Branddt, *Graduating Engineer*, March 1988.
2. Profiled in "Finding the Right Job," *The Woman Engineer*, Spring 1989.
3. Quoted in article titled "Engineering fails to break sex barriers," by Connie Pryzant, *The Dallas Morning News*, July 31, 1989.
4. Guest Editor, Pictured and biography presented, *U.S. Woman Engineer*, January/February 1990, p. 1.
5. Quoted in article titled "How We're Shortchanging Women Engineers," by George Nobbe, *Graduating Engineer*, February 1990.
6. Quoted in article titled "Nine Career Tips From Top Minority Managers," by Christopher C. Williams, *Graduating Engineer*, April 1990.
7. Quoted in article titled "Networking," by Peggy Schmidt, *Graduating Engineer*, October 1990.
8. Quoted in article titled "Dressing for Engineering Careers," by Courtney S. Susemiehl, *Engineering Horizons*, 1990/1991 Women's Edition.
9. Quoted in article titled "Taking Stock of Your Future," by Adriana Reyneri, *Graduating Engineer*, February 1991.
10. Profiled and pictured in an article titled "Women still rare in engineering," by Caryl Buckstein, *Rocky Mountain News*, May 12, 1991.
11. Profiled and pictured in an article titled "U.Va. Graduate is SWE President-Elect," *Virginia Engineering*, Spring 1991.
12. Pictured and biography presented in, "Meet the 1991-1992 Society President," Society of Women Engineers 1991 National Convention and Student Conference Program – Engineering Our Future Enhancing the Quality of Life, June 24-29, 1991, p. 143.
13. Quoted in an article titled "Salute to Excellence: Computer pioneer receives national recognition," *Around the Fleet*, September 20, 1991, p. 5.
14. Profiled and pictured in an article titled "Baylor Elected President of Engineering Society," *Rocky Mountain Electrical League News*, October 1991, p. 3.
15. Featured in an interview titled "Careers Unlimited," by Kathleen Groll Connolly, *Science and Engineering Horizons*, 1991/92 Women's Edition.
16. Pictured and biography presented in "Highlights From The Denver IRAC" by Gayle Langley, The American Society of Mechanical Engineers – Rocky Mountain Region XII Newsletter, February 1992, pp. 1-2.
17. Featured in an article titled "We Ask You: What is the toughest problem you've ever had to solve?" *Graduating Engineer*, February 1992.
18. Quoted in an article titled "Job Opportunity Barometer," by Valerie Law, *Graduating Engineer*, February 1992.

19. Quoted in an article titled "The Pond Factor," by Mary Ann Castronovo Fusco, *Graduating Engineer*, February 1992.
20. Featured in an article titled "New careers open to women, but overall progress is slow," by William Charland, *Rocky Mountain News*, March 15, 1992.
21. Featured in an article titled "Getting more women into the field of engineering," by William Charland, *Sentinel Enterprise*, Fitchburg, MA, April 2, 1992.
22. Quoted in an article titled "Erasing Gender Stereotypes in Engineering," *Mechanical Advantage*, Spring 1992.
23. Featured in an article titled "Woman blazes a trail in field of engineering," *Journal-Bulletin*, May 11, 1992.
24. Featured in an article titled "Engineers break gender stereotypes," by William Charland, *Seattle Times/Seattle Post Intelligencer*, October 18, 1992.
25. Featured in an article titled "Women Engineers Face Barriers, Opportunities," by Gabrielle Solomon, *National Business Employment Weekly*, February 26-March 4, 1993.
26. Profiled and pictured in an article titled "Baylor appointed to Women's Forum," *Rocky Mountain Electrical League News*, November 1993, p. 3.
27. Quoted and pictured in an article titled "Hopper Inducted in National Women's Hall of Fame," By Anne Perusek, *SWE Magazine of the Society of Women Engineers*, November/December 1994.
28. Quoted and pictured in an article titled "Manufacturing a New Engineer," by Anne Erickson, *Science and Engineering Horizons*, 1994/1995 Women's Edition.
29. Quoted in an article titled "Businesswomen call for accommodation," by Jo'El Roth, *The Denver Business Journal*, March 15-21, 1996, page 9C.
30. Referenced in an article titled "Launching the U.S.S. Hopper," *SWE: Magazine of the Society of Women Engineers*, March/April 1996, p. 13.
31. Pictured and referenced in an article titled "SWE Members Attend Launch of U.S.S. Hopper," *SWE: Magazine of the Society of Women Engineers*, March/April 1996, p. 35.
32. Quoted in an article titled "You'll Go a Long Way Ms. Engineer," by Terry Deal, *Computer and Engineering Horizons - Women's Edition*, 1996-1997, pp. 12-17.
33. Quoted in an article titled "Is an MBA for me?" by Margo Hittleman, *SWE Magazine of the Society of Women Engineers*, September/October 1997, pp. 30-34.
34. Quoted in an article titled "Women engineers: Their impacts aren't cosmetic," by Jack Cox, *The Denver Post*, November 23, 1997, page 8E.
35. Quoted in an article titled "CU engineering grad sees name in lights," *Rocky Mountain News*, May 10, 1998, page 30A.
36. Quoted in an article titled "New Director Expands WIEP Efforts," *CU Engineering*, 1998.
37. Quoted in an article titled "On the Margins? Prof says women scientists face obstacles," by Matt Sprengeler, *Colorado Daily*, December 1, 1998, pp. 1-3.
38. Quoted in an article titled "Women in Engineering Program focuses on taking intimidation out of science," by Danielle Jimenez, *Carillon*, January 15, 1999, Diversity Supplement.
39. Featured and pictured in an article titled "Technical Women on Corporate Boards," by Elizabeth A. Bretz and Linda Geppert, *IEEE Spectrum*, February 1999, pp. 50-56.
40. Quoted in an article titled "CU women engineer their own success," by Danielle Seymour, *Carillon*, April 9, 1999, p. 8.
41. Quoted in an article titled "Career Update: Women in engineering gaining slowly, but steadily," by Lara Jackson, *Control Engineering*, June 1999, p. 17.
42. Quoted in an article titled "CU-Boulder encourages female engineers," by Anitha Ibrahim, *Boulder Planet*, June 30-July 6, 1999.
43. Quoted in an article titled "Workshop harnesses bundle of energy," by Amy Bounds, *Daily Times Call*, August 8, 1999, p. B1.
44. Quoted in an article titled "Progressive Schools Strive to Meet Industry Demand," by Shelley Lane, *Women's Business Chronicle*, August/September 1999, p. 12.

45. Quoted in an article titled "Scientist creates opportunities for minorities," by Stuart Warner, *Plain Dealer* (Cleveland, Ohio), September 18, 1999.
46. Quoted in an article titled "Number of women in top jobs at UCB still low," by Jefferson Dodge, *Silver & Gold Record*, September 23, 1999, p. 5.
47. Quoted in an article titled "Report: Women discriminated against at CU," by Nadia White, *Daily Camera*, October 6, 1999, p. 1A.
48. Quoted in an article titled "The Congressional Commission on the Advancement of Women and Minorities in Science, Engineering and Technology Development," by Anne Perusek, *SWE: Magazine of the Society of Women Engineers*, November/December 1999, p. 26.
49. Quoted and pictured in an article titled "From the Classroom to the Boardroom," by Paula Lipp, *Graduating Engineer and Computer Careers*, February 2000, pp. 18-23.
50. Quoted and pictured in an article titled "Recollections from the SWE Presidents," *SWE: Magazine of the Society of Women Engineers,* January/February 2000, pp. 38-56.
51. Quoted in article titled "The First Lady of Engineering," by Anne Perusek, *SWE: Magazine of the Society of Women Engineers*, January/February 2000, pp. 82-92.
52. Quoted in an article titled "State draws line on dropping surveying degree," by Dave Curtin, *The Denver Post*, April 7, 2000, p. 2B.
53. Quoted in an article titled "Female execs to join Girl Scouts at camp," by Dahlia, *Denver Rocky Mountain News*, May 2, 2000, p. 14D.
54. Pictured and profiled in an article titled "Meet the movers: Jill Tietjen reinvigorates the women's program at UC-B," by Pru Peterson *Diversity/Careers in Engineering and Information Technology*, April/May 2000, pp. 94-100.
55. Quoted in an article titled "Girls attend career camp," *Golden Transcript*, June 26, 2000.
56. Quoted in an article titled "Teens explore careers at Scouts' Camp CEO," *The Villager*, July 6, 2000.
57. Quoted in an article titled "Why so few female engineering students?" by Katie Ford, *The Denver Business Journal*, July 21-27, 2000, pp. 11A and 14A.
58. Highlighted in an article titled "Wauneka becomes a legend," by Jim Maniaci, *Gallup Independent*, August 28, 2000.
59. Quoted in an article titled "Getting women on board good for business," by Mike Cote, *Sunday Camera*, (Boulder, Colorado), September 17, 2000, p. F1.
60. Quoted in an article titled "Women discuss life in the boardroom," by Lyn Berry *The Denver Business Journal*, September 29 – October 5, 2000, pp. 15A – 18A.
61. Quoted in an article titled "Colleges hold key to boost female engineer numbers," by Katie Ford, *Boston Business Journal*, September 29, 2000, pp. 42 and 44.
62. Quoted in an article titled "No-slide Rule," by DeeDee Correll, *The Daily Times-Call* (Longmont, CO), October 15, 2000, pp. F1 and F8.
63. Quoted in an article titled "Mentors sought for women engineering program," *Boulder County Business Report*, October 20, 2000.
64. Quoted in an article titled "Biz leaders headed to camp," by Dahlia, *Rocky Mountain News*, February 27, 2001, p. 14D.
65. Quoted and profiled in an article titled "Definition for success," by Gary Massaro, *Rocky Mountain News*, February 28, 2001, p. 28A
66. Quoted in an article titled "Getting It Right," by Margaret Mannix, *Prism*, March 2001, pp. 14-20.
67. Quoted in an article titled "Girl Scout camp reaches future CEOs," by Lyn Berry, *The Denver Business Journal*, March 9-15, 2001, p. 21A.
68. Quoted and pictured in an article titled, "Corporate Leaders go to Girl Scouts' Camp CEO," by Rachelle Trujillo, *Zenith Woman*, Spring 2001, pp. 14-15.
69. Quoted, pictured, and profiled in an article titled "50 Years of Leadership" by Jennifer Tarplee, *SWE: Magazine of the Society of Women Engineers*, March/April 2001, pp. 52-56.
70. Profiled in an article titled "Governor Makes Appointments to the Board," *Board News*, Colorado State Board of Registration for Professional Engineers and Professional Land Surveyors, April 2001, p.2.

71. Quoted in an article titled "Leaders of Today and Tomorrow Connect at Girl Scout Camp CEO," by Rachelle Trujillo, *The Urban Spectrum*, April 2001, pp. 24-25.
72. Quoted in an article titled "Women techies unite," by Suzanne Lainson, *ColoradoBiz*, May 2001, p. 58.
73. Quoted and pictured in an article titled "Girl Scouts' Camp CEO Links Corporate Pioneers with Leaders of Tomorrow," by Rachelle Trujillo *Colorado Women News*, May 2001, pp. 22-24.
74. Pictured and named in an article titled "The National Academy of Engineering Summit on Women in Engineering: Two Years Later," by Peggy Lane, P.E., *SWE: Magazine of the Society of Women Engineers*, June 2001, pp. 129-134.
75. Quoted and pictured in an article titled "Women engineer their future," by Janet Forgrieve, *Rocky Mountain News*, June 26, 2001, p. 7B.
76. Quoted in an article titled "Networking: The grid for distributing Your Power," by Karen Susman, *Electric Energy*, Annual Magazine of the Rocky Mountain Electrical League, August 2001, pp. 24-27.
77. Quoted in an article titled "Teaching From a Clean Slate," by Caitlin Kelly, *IEEE Spectrum*, September 2001, pp. 59-60.
78. Quoted in an article titled "Women in Business: Women prospering in high-tech careers," by Deborah J. Myers, *The Boulder County Business Report*, November 2, 2001.
79. Quoted in an article titled "Career fair to focus on teen girls and science," by Andrew Bach, *The Salina Journal* (Salina, Kansas), January 4, 2002.
80. Quoted in an article titled "U.Va. Women of Engineering," by Josephine P. Pipkin, *Virginia Engineering*, Winter 2002, pp. 10-12.
81. Quoted in an article titled "Women engineers building school's excellence," by Josephine P. Pipkin, *Inside UVa*, February 22, 2002, pp. 4-5.
82. Quoted in an article titled "Engineering a Warmer Welcome for Female Students: The discipline tires to stress its social relevance, an important factor for many women," by Elizabeth F. Farrell, *The Chronicle of Higher Education*, February 22, 2002, pp. A31-A32.
83. Quoted and pictured in an article titled "Who Will Be the New Faces in Engineering Leadership?" *Momentum*, Mississippi State University College of Engineering, Spring 2002, pp. 15-16.
84. Quoted in an article titled "Job Interviews That Make You Sweat: How to Handle Tough Questions With Ease," by Susan V. Parson, *SWE: Magazine of the Society of Women Engineers*, April/May 2002, pp. 64-65.
85. Quoted in an article titled "Feast or Famine: Here's How The Economy and War Affect Women Engineers," by Deborah J. Myers, *Woman Engineer*, Spring 2002, pp. 36-37.
86. Pictured and featured in an article titled "Distinguished Service Award: Jill S. Tietjen, P.E.," *SWE: Magazine of the Society of Women Engineers*, Conference 2002, p. 44.
87. Profiled, pictured, and quoted in an article titled "Director Profile: Jill Tietjen," GTC Update, October 31, 2002, pp. 3-4.
88. Profiled in an article titled "Biography of Jill Tietjen, Recipient of the Distinguished Service Award," *Rocky Mountain Section News*, November/December 2002, p. 8. Citation for award provided on page 1 of same publication.
89. Highlighted in an article titled "Ready, set, go high tech," *Gender Matters*, The Women's Foundation of Colorado, Winter 2002, p. 1.
90. Highlighted in an article titled "Women in the National Academy of Engineering," by Peggy Layne, P.E. *SWE: Magazine of the Society of Women Engineers*, Winter 2003, pp. 12-14.
91. Profiled in an article titled "Women of Distinction will give girls valuable insights at career event," *Volunteer View*, Girl Scouts – Mile Hi Council, April 2003, p. 7.
92. Quoted in an article titled "Denver women leaders mentor Girl Scouts at career conference," *North Denver Tribune*, April 2003.
93. Pictured with an article titled "Girl Scouts name 20 Women of Distinction," by Dahlia, *Rocky Mountain News*, May 29, 2003, p. 14D
94. Highlighted in an article titled "Denver women leaders mentor Girl Scouts at career conference," *Volunteer View*, Girl Scouts – Mile Hi Council, June/July 2003, p. 5.

95. Pictured and profiled in an article titled "Mile Hi Council honors volunteers at dinner," *Volunteer View*, Girl Scouts – Mile Hi Council, June/July 2003, p. 1.
96. Profiled in an article titled "Volunteers Make the Difference," *CUEngineering*, College of Engineering and Applied Science, University of Colorado at Boulder, 2003, p. 31.
97. Profiled in "Girl Scouts – Mile Hi elects Tietjen as new chair," *Intermountain Jewish News*, June 13, 2003.
98. Profiled in "Briefcase: Nonprofits," *Denver Business Journal*, June 20-26, 2003, p. A31.
99. Pictured and highlighted in "On The Move," *Rocky Mountain News*, June 27, 2003, p. 8B.
100 Quoted in an article titled "Geeky Girls: Aims program puts projects in hands, minds of girls," by Carl McCutchen, *Greeley Tribune*, July 19, 2003.
101 Quoted and pictured in an article titled "Past Presidents Recall RMEL and the Issues and Fun of Their Terms," by Jennifer Bernal, *Electric Energy*, Rocky Mountain Electrical League, August 2003, pp. 20-22.
102 Pictured and highlighted in "womentowatch," by Judy Harris, *Colorado Woman News*, September 2003, p. 24.
103 Pictured and highlighted in "Girl Scouts Council Elects Tietjen as Chairperson of Board," SWE – Rocky Mountain Section News, September/October 2003, p. 7.
104 Quoted, pictured, and profiled in an article titled "Amped Up About Electrical Engineering: These Six Women Engineers Power Ahead," by Elizabeth Carlassare, *Woman Engineer*, Fall 2003, pp. 18-21.
105 Quoted, pictured, and profiled in an article titled "Member Profile: Jill S. Tietjen, P.E.," Society of Women Engineers *Rocky Mountain Section News*, November/December 2003, pp. 6-7.
106 Profiled in article titled "Tietjen Awarded Horizon Award for Outstanding Professional," Society of Women Engineers *Rocky Mountain Section News*, November/December 2003, p. 7.
107 Highlighted in the "People" section of *The Bent of Tau Beta Pi*, Winter 2004, p. 48.
108 Pictured and profiled in a job announcement in the *Daily Journal*, December 29, 2003.
109 Pictured and profiled in "Kudos" *S'more News*, Girl Scouts – Mile Hi Council, Spring 2004, p. 6.

Conference Papers (Technical)

1. "Power by Wire — Expectations and Realities," Proceedings of the Sixth Annual Coal Market Strategies Conference — Dynamics of Utility Coal Use, 2:1-21, Denver, CO, November 1-3, 1988. (Awarded one of 10 best papers for 1988 for Stone & Webster employees.)
2. "Wheeling — Issues and Challenges," Proceedings of the 1989 Electric Utility Business Environment Conference and Exhibition, 101-115, Denver, CO, sponsored by Electric Utilities Consultants, Inc. and RCG/Hagler Bailly, Inc., March 28-30, 1989.
3. "Air Quality Concerns: Impacts on Utility Plans for Life Extension of Coal-Fired Power Plants," Proceedings of the Seventh Annual Coal Market Strategies Conference — Utility Coal Use, Acid Rain, and Other Uncertainties, 3:1-16, Denver, CO, sponsored by Edison Electric Institute Western Coal Council, October 26, 1989. (Awarded one of 10 best papers for 1989 for Stone & Webster employees.)
4. "Transmission Pricing Policies and Access," Proceedings of the 1990 Electric Utility Business Environment Conference and Exhibition, 49-55, Denver, CO, sponsored by Electric Utilities Consultants, Inc. and RCG/Hagler Bailly, Inc., March 7-9, 1990.
5. "Analyzing Utility System Losses." Presented at the T&D World Expo '90, March 1990.
6. "Future Electric Generation: Clean Air At What Cost?" Proceedings of the Fifteenth Annual Conference — Issues in Gas, Electricity, and Telecommunications, 5, July 18-20, 1990. (Awarded one of 10 best papers for 1990 for Stone & Webster employees.)
7. "Transmission Access: Who Pays and How?" Proceedings of the Transmission & Wheeling Conference, 61-70, Denver, CO, sponsored by Electric Utilities Consultants, Inc. and Stone & Webster Management Consultants, Inc., November 8-9, 1990.
8. "Open Access." 1990. Power-Gen '90. November.

9. "Plant Life Management Option Selection Decision Methodology" (with David S. Galpin and Roger L. Johnson). 1990. Power-Gen '90. December.
10. "Why Inter-Area Electric Transmission?" (with Fred E. Depenbrock), Proceedings of the American Power Conference, Volume 53-I, 588-591, Chicago, IL, sponsored by the Illinois Institute of Technology, April 1991.
11. "Decision Methodology for Plant Life Management Option Selection" (with David S. Galpin and Roger L. Johnson), Proceedings of the American Power Conference, Volume 53-I, 485-491, Chicago, IL, sponsored by the Illinois Institute of Technology, April 1991. (Awarded one of 10 best papers for 1991 for Stone & Webster employees.)
12. "Transmission Access: Technical and Political Implications" (with Glenn A. Davidson), Proceedings of the 2nd Annual Transmission & Wheeling Conference, 127-134, Denver, CO, sponsored by Electric Utilities Consultants, Inc. and Stone & Webster Management Consultants, Inc., November 21-22, 1991.
13. "New Transmission Lines: Do We Really Need Them?" (with Glenn A. Davidson). Presented at the Strategic Utility Planning Conference, June 25-26, 1992. (Awarded one of 10 best papers for 1992 for Stone & Webster employees.)
14. "Licensing a Coal-Fired Power Plant in the 1990s — A Utility's Success Story" (with Tom Ohlmacher, Douglas M. Logan, Ludwig Funke, and Scott Carpenter). 1993. Power-Gen '93.
15. "Uncertainty Analysis Without Tears" (with Douglas M. Logan). Proceedings of EPRI's Ninth Electric Utility Forecasting Symposium, September 8-10, 1993.
16. "Modeling Renewable Energy Resources in Utility Planning Models" (with Douglas M. Logan, Alan Taylor, and Peter Lilienthal), Proceedings of the National Regulatory Conference on Renewable Energy, 315-329, Savannah, GA, sponsored by the National Association of Regulatory Utility Commissioners, October 3-6, 1993.
17. "Load Forecasting: Ensuring a Solid Foundation for Integrated Resource Planning" (with Douglas M. Logan and Chris Neil), Proceedings of the Electric Systems Planning and Operations Conference, 1-10, Denver, CO, sponsored by Electric Utilities Consultants, Inc., November 11-13, 1993.
18. "Where and Why Coal Will Remain the Big Player," Proceedings of the Natural Gas and Electric Power Industries Conference, Washington, D.C., sponsored by The Institute of Gas Technology, November 11-13, 1996.
19. "Transmission 101: Understanding the Grid," Coal Market Strategies 2001 – Fueling the Nation's Energy Needs: Bridging the Barriers to Future Coal-fired Power," San Antonio, Texas, October 15-17,. 2001.

Conference Papers (Nontechnical)

1. "Interviewing Skills: Putting Yourself in the Driver's Seat," Proceedings of the Society of Women Engineers' National Convention and Student Conference — Strength Through Diversity: Women & Technology, 313-326, Oakland, CA, June 26-July 2, 1989.
2. "Living A Better Life" (with Alexis C. Swoboda), Proceedings of the Society of Women Engineers' National Convention and Student Conference — Building Tomorrow on Yesterday's Blueprints, 272-278, New York, NY, June 25-July 1, 1990.
3. "Mathematics, Minerals and Molecules" (with Alexis C. Swoboda), Proceedings of the Society of Women Engineers' National Convention and Student Conference — Building Tomorrow on Yesterday's Blueprints, 308-316, New York, NY, June 25-July 1, 1990.
4. "Living A Better Life" (with Alexis C. Swoboda), Conference Record of MIDCON/90, Dallas, TX, sponsored by IEEE and ERA, September 11-13, 1990.
5. "Mathematics, Minerals and Molecules" (with Alexis C. Swoboda), Conference Record of MIDCON/90, Dallas, TX, sponsored by IEEE and ERA, September 11-13, 1990.
6. "Women in Engineering and Science: The Limited Past, A Limitless Future" (with Alexis C. Swoboda), Proceedings of the Society of Women Engineers' National Convention and Student Conference — Engineering Our Future: Enhancing the Quality of Life, San Diego, CA, June 24 29, 1991.

7. "Mathematics, Minerals and Molecules" (with Alexis C. Swoboda), Proceedings of the Ninth International Conference of Women Engineers and Scientists, University of Warwick, United Kingdom, July 14-20, 1991.
8. "Space: Women Challenge the Final Frontier" (with Cynthia Hesse), Proceedings of the Society of Women Engineers' National Convention and Student Conference — Space Challenges: Earth and Beyond, J:4-8, Orlando, FL, June 22-27, 1992.
9. "Women in Motion: Pioneers in Transportation" (with Alexis C. Swoboda), Proceedings of the Society of Women Engineers' National Convention and Student Conference — Gear Up 2000, Women in Motion, 312-316, Chicago, IL, June 21-27, 1993.
10. "Women Who Made a Difference: Technological Bridges" (with Alexis C. Swoboda), Proceedings of the Society of Women Engineers' National Convention and Student Conference — Engineering: A Bridge Into the 21st Century, 69-74, Pittsburgh, PA, June 22-26, 1994.
11. "Facilitated Discussion: An Interactive Discussion on Affirmative Action (with Kristy A. Schloss)," Proceedings of the Women in Engineering Programs Advocates Network Conference — Capitalizing on Today's Challenges, 263-267, Denver, CO, June 1-4, 1996.
12. "Steps to Leadership Success," Proceedings of the Women in Engineering Programs Advocates Network Conference — Capitalizing on Today's Challenges, 9-14, Denver, CO, June 1-4, 1996.
13. "Women Engineers Bridging The Gender Gap (with Betty Reynolds, Ph.D.)," Proceedings of the 1999 International Symposium on Technology and Society – Women and Technology: Historical, Societal, and Professional Perspectives," 206-210, New Brunswick, New Jersey, July 29-31, 1999.
14. "Designing Engineering and Science Education for the 21st Century (with Suzanne Franks, Ph.D., Richard Gallagher, Ph.D., Jeff Wright, Ph.D., and Jane Z. Daniels, Ph.D.)," Proceedings of the Women in Engineering Programs & Advocates Network Conference – Second Stage Transformations: Creating a New Vision in the 21st Century, 93-98, Washington, DC, June 25-27, 2000.

Technical Presentations

1. "The Mechanical Performance of Polyglycolic Acid Sutures." Presented to the Virginia Academy of Science, May 1975.
2. "Mechanical Performance of Surgical Sutures." Presented at the American Society of Mechanical Engineers Regional Student Conference, March 1976. (Awarded second place.)
3. "How to Evaluate Utility Staff Resource Plans" (with Martin W. Gustafson). Presented to the California Municipal Utilities Association, February 1987.
4. "Geothermal Project Development and Management Market Analysis," (with Leslie A. Buttorff), presented to the Geothermal Resources Council as part of a short course, Sparks, NV, October 9-10, 1987.
5. "Transmission Access and Wheeling." Presented at the Rocky Mountain Electrical League Spring Conference, May 1990.
6. "Engineering and Rate Making Fundamentals," Power Transmission: Access, Pricing and Regulation, San Francisco, CA, presented to Infocast, Inc., September 23, 1991.
7. "Coal Issues and Electric Fuel Management." Stone & Webster Management Consultants' annual Utility Management Development Program, Annual lecture, 1986-1992.
8. "Natural Gas and Coal: Competition or Cooperation?" Presented at Denver Coal Club. February 11, 1993.
9. "Where are We and How Did We Get There?" 32nd Annual Paul D. Scholz Symposium on Technology and Its Role in Society, University of Iowa, Iowa City, Iowa, April 5, 2001.
10. "What is Happening in California?" Englewood (Colorado) Lions Club, Englewood, CO, June 19, 2001.
11. "Powering Our Future," Boulder Rotary Club, Boulder, CO, January 4, 2002.

Nontechnical Presentations

"Steps to Leadership Success" or "Steps to Personal Success":

1. Keynote address, Society of Women Engineers' Region J regional conference, Portland, Oregon, October 7, 1995.
2. Society of Women Engineers' Region I student conference, University of Missouri - Columbia, February 3, 1996.
3. Society of Women Engineers' Region I student conference, University of Colorado - Boulder, February 22, 1997.
4. Society of Women Engineers National Convention and Student Conference — The Road to Southwestern Enchantment, Albuquerque, New Mexico, June 25, 1997.
5. Mechanical Engineering Technology class, Metro State College, Denver, Colorado, October 10, 1997.
6. Society of Women Engineer's Region I student conference, University of Tulsa, Tulsa, Oklahoma, February 21, 1998.
7. Society of Women Engineers National Convention and Student Conference — Diversity: Look How Far We've Come, Houston, Texas, June 18, 1998.
8. Pike's Peak Section, Society of Women Engineers, Awards Banquet, Colorado Springs, Colorado, July 18, 1998.
9. Metropolitan State College Mechanical Engineering Technology Project Management Class, Denver, Colorado, September 25, 1998.
10. Virginia Tech Society of Women Engineers, Blacksburg, Virginia, October 1, 1998.
11. University of Wyoming Society of Women Engineers, Laramie, Wyoming, January 27, 1999.
12. Technical Careers Institute, Society of Women Engineers, New York, New York, April 21, 1999.
13. Keynote Speaker, Transformations Graduation Ceremony, Higher Education and Advanced Technology Center, Denver, CO, August 18, 1999.
14. Gill Leadership Conference: Making Dilbert's World Diverse, Boulder, Colorado, April 8, 2000.
15. National Council of Examiners for Engineering and Surveying, Western Zone Meeting, Grand Junction, Colorado, May 20, 2000.
16. Society of Women Engineers National Conference – Beyond 2000: Exploring Perspectives, Washington, DC, June 29, 2000.
17. Society of Women Engineers, Santa Clara Valley Section, Keynote Address, Palo Alto, California, October 18, 2000.
18. Society of Women Engineers, Region J Conference – The Global Workplace in the New Millennium, Keynote Address, Boise, Idaho, October 21, 2000.
19. Duke University, Society of Women Engineers, Durham, NC, November 1, 2000.
20. Girl Scouts – Mile Hi Council, Denver, CO, January 24, 2001.
21. American Indian Science and Engineering Society Region III Conference, Denver, CO, April 6, 2001.
22. Keynote Speaker, Girls in the Middle Conference, La Junta, CO, April 7, 2001.
23. Keynote Speaker, Girl Scouts – Mile Hi Council Silver & Gold Celebration, Denver, CO, April 30, 2001.
24. Keynote Speaker, Society of Women Engineers, Sierra Foothills Section Tenth Anniversary Banquet, Folsom, California, May 12, 2001.
25. Public Seminar, Mississippi State University, Starkville, Mississippi, February 18, 2002.
26. Mini-Conference, Society of Women Engineers, Rocky Mountain Section, Golden, Colorado, April 20, 2002.
27. Women in Cable & Telecommunications, Take your child to work day, Englewood, Colorado, April 25, 2002.
28. Black & Veatch Corporation, Aurora, Colorado, August 22, 2002.
29. Institute of Electrical and Electronics Engineers Spring 2003 Annual Conference, University of Denver, Denver, Colorado, March 1, 2003.

"What I Wish I Had Known When I Graduated From College":

1. Society of Women Engineers Region I Student Conference, Wichita State University, Wichita, Kansas, October 1, 1988.

2. University of Virginia Society of Women Engineers, Charlottesville, Virginia, April 1989.
3. University of Colorado at Boulder Society of Women Engineers, Boulder, Colorado, September 20, 1989.
4. Vanderbilt University Society of Women Engineers, Nashville, Tennessee February 20, 1992.
5. University of Colorado at Boulder Society of Women Engineers, Boulder, Colorado, March 14, 1992.
6. Keynote Address, Society of Women Engineers' 1991-1992 Awards Banquet, Cornell University, Ithaca, New York, April 22, 1992.
7. Keynote Address, Oklahoma State University Evening With Industry, Stillwater, Oklahoma, September 26, 1994.
8. University of Wyoming Society of Women Engineers, Cheyenne, Wyoming, January 28, 1997.
9. University of Colorado – Boulder Society of Women Engineers, September 10, 1997.
10. University of Virginia Society of Women Engineers, Charlottesville, Virginia, October 27, 1997.
11. Georgia Tech Society of Women Engineers, Atlanta, Georgia, November 4, 1997.
12. University of Denver Society of Women Engineers, Denver, Colorado, November 10, 1997.
13. American Society of Mechanical Engineers, University of Colorado - Boulder, March 5, 1998.
14. Colorado State University, Society of Women Engineers, Fort Collins, Colorado, September 29, 1998.
15. University of Colorado at Boulder, Society of Women Engineers, Boulder, Colorado, October 27, 1998.
16. University of Virginia, Society of Women Engineers, Charlottesville, VA, January 28, 1999.
17. Kansas State University, Society of Women Engineers, Manhattan, KS, October 13, 1999.
18. Georgia Tech, Society of Women Engineers, Atlanta, GA, November 9, 1999.
19. University of Virginia, Society of Women Engineers, Charlottesville, VA, January 27, 2000.
20. University of Colorado at Boulder, American Institute of Chemical Engineers, Boulder, Colorado, February 15, 2000.
21. University of Wyoming, Society of Women Engineers, Cheyenne, Wyoming, November 7, 2000.
22. University of Virginia, Society of Women Engineers, Charlottesville, Virginia, January 25, 2001.

<u>"Taking Humor Seriously":</u>

1. Black & Veatch Corporation, Aurora, Colorado, August 22,2002.

<u>"Volunteering: Cornerstone to Career Success":</u>

1. Keynote Speaker, National Engineers Week Luncheon, Annual Joint Luncheon, Kansas City, MO, February 22, 2001.
2. Keynote Speaker, Society of Women Engineers, Pacific Northwest Section, Seattle, Washington, May 15, 2001.
3. Keynote Speaker, Institute of Electrical and Electronics Engineers Spring 2003 Annual Conference, University of Denver, Denver, Colorado, March 1, 2003.
4. Society of Women Engineers Mini-Conference, Rocky Mountain Section, University of Denver, Denver, Colorado, April 19, 2003.

<u>"Networking Or How May I Help You?":</u>

1. Keynote Speaker, Society of Women Engineers, Region G Conference, University of Akron, Akron, OH, November 3, 2001.
2. Graduate Student and Fellow Seminar, Mississippi State University, Starkville, Mississippi, February 18, 2002.
3. Society of Women Engineers Mini-Conference, Rocky Mountain Section, University of Denver, Denver, Colorado, April 19, 2003.

<u>"Breaking the Mold: Women Engineers and Scientists":</u>

1. Keynote Speaker, Teen Women in Science and Technology Career Fair, Kansas State University – Salina, Salina, Kansas, January 8, 2002.

2. Keynote Speaker, Society of Women Engineers National Engineers' Week Banquet, Mississippi State University, Starkville, Mississippi, February 18, 2002.
3. Keynote Speaker, Society of Women Engineers, 2003 Exploring Engineering and Technology, Denver, Colorado, February 24, 2003.
4. Keynote Speaker, Women's Leadership Symposium and Luncheon: Women and Technology, University of Colorado – Colorado Springs, Colorado Springs, Colorado, February 26, 2003.
5. Women in Information Technology – Northern Colorado, Agilent, Fort Collins, Colorado, March 9, 2004.

1. "SWE in your future." Presented at the Society of Women Engineers' Region H Student Conference, October 20, 1990.
2. "Engineers of Tomorrow: Breaking the Mold." Presented at the American Society of Mechanical Engineers Regional Conference, August 23, 1991.
3. Moderator of Panel: "Competition in the Utility Industry: Evolving Still" Utility Women's Conference, Atlantic City, NJ, September 12, 1991.
4. "Engineers of Tomorrow: Breaking the Mold." Presented at Power Supply USA, November 4-5, 1991.
5. "Enhancing Your Career Through SWE: Why the Need for SWE," Presented at the Sierra Foothills Section Chartering Banquet, Roseville, CA, November 16, 1991.
6. "Is an Engineering Career in Your Future?" Presented as the Keynote Address for "Women In Engineering . . . A Winning Combination," University of Pittsburgh, November 22, 1991.
7. "The Changing Face of the Engineer." Presented at the New York Academy of Sciences, Engineering Section, March 11, 1992.
8. "Developing Tomorrow's Technical Workforce." Presented at the Rocky Mountain Regional Tech Prep Conference, March 26, 1992.
9. "The Changing Face of the Engineer: Breaking the Mold." Presented at Oklahoma State University, July 23, 1992.
10. "Developing Tomorrow's Technical Workforce." Presented at the Association for Women Geoscientists, September 12, 1992.
11. "SWE - What's In It For Me?" Presented at the University of Wyoming, September 17, 1992.
12. "Historical Women in Engineering and Science: Unknown But Not Forgotten." Presented at U.S. West Advanced Technologies, March 1993.
13. "Tomorrow's Technical Workforce: Breaking the Mold." Presented to the American Business Women's Association, August 14, 1993.
14. Panel Participant, "Women and Minorities in Water Resources - Practitioner's Perspective," ASCE 21st Annual Conference, Water Resources Planning and Management Division, May 23, 1994.
15. "My Experiences as a Woman Engineer," Presented to the University of Denver, The Making of An Engineer Program, June 28, 1994.
16. "My Experiences as a Woman Engineer," Presented at the University of Denver, October 19, 1994.
17. "Engineering Women: Amending History." Presented at U.S. West, March 1995.
18. Moderator and Panel Participant: "Snappy Responses to Obnoxious Comments," Society of Women Engineers National Convention and Student Conference — Engineering - Revolutionizing our Lives, Boston, MA, July 1, 1995.
19. "SWE and You," Presented at the University of Wyoming, September 1995.
20. Fellows Panel Participant: "Rabble Rousers," Presented at the Society of Women Engineers Region I Conference, Denver, Colorado, October 21, 1995.
21. "My Experiences as a Woman Engineer," Presented to the University of Denver, January 24, 1996.
22. "Engineering Women: Amending History." Presented at U.S. West Advanced Technologies, March 22, 1996.
23. "Tomorrow's Technical Workforce: Breaking the Mold," Presented to Alpha Omega Epsilon, August 16, 1996.

24. Moderator and Panel Participant: "What Do I Want To Be When I Grow Up?" Society of Women Engineers National Convention and Student Conference — The Road to Southwestern Enchantment, Albuquerque, New Mexico, June 26, 1997.
25. "Responsibilities of Professional Engineers," Presented to the Civil Engineering Senior Seminar, University of Colorado - Boulder, October 8, 1997.
26. "My Career Experiences," Presented to first year project classes, University of Colorado - Boulder, February 25 and February 27, 1998.
27. "Historical Women in Science and Engineering," U.S. West Advanced Technologies, March 16, 1998.
28. Panel Member, "High-Tech Women: Daring To Be Different," Women's Forum of Colorado, March 23, 1998.
29. Panel Participant: "Volunteerism: How Can It Help Your Career?" Society of Women Engineers National Convention and Student Conference — Diversity; Look How Far We've Come, Houston, Texas, June 19, 1998.
30. "My Career Path," Civil Engineering Senior Seminar, University of Colorado at Boulder, Boulder, Colorado, September 9, 1998.
31. "SWE: What's In It For me?" Keynote Speaker, Colorado School of Mines, Society of Women Engineers' Evening With Industry, Golden, Colorado, September 14, 1998.
32. Moderator and Panel Member, "Points of View Across the Ages," Women's Forum of Colorado, November 17, 1998.
33. "My Career Experiences," Presented to first year engineering students, University of Colorado - Boulder, November 17, 1998.
34. "The Rocky Mountain Electrical League," Proceedings of the Megawatt Daily Conference – Powering the Rockies and the Southwest, Denver, CO, May 5-6, 1999.
35. Panel Member, "Professional Engineering Registration in Colorado," Society of Petroleum Evaluation Engineers, Denver, CO, July 14, 1999.
36. Panel Member, "Science in the Third Millennium: Who, what and for whom?" University of Colorado at Boulder, Boulder, CO, September 16, 1999.
37. Panel Member, "How Many Careers in a Lifetime?" Society of Women Engineers National Conference – Beyond 2000: Exploring Perspectives, Washington, DC, June 29, 2000.
38. Panel Member, "President's Leadership Institute," Society of Women Engineers National Conference – Beyond 2000: Exploring Perspectives, Washington, DC, July 1, 2000.
39. Panel Member, "Getting Women on Corporate and Other Powerful Boards," Boulder Business and Professional Women, Boulder, CO, September 21, 2000.
40. "My Career Experiences," Introduction to Engineering Class, University of Colorado at Boulder, Boulder, CO, October 10, 2000.
41. Plenary Panel Member, "Power and Expertise," Writing the Past, Claiming the Future: Women and Gender in Science, Medicine, and Technology, Saint Louis University, Saint Louis, Missouri, October 13, 2000.
42. "My Educational and Career Experiences," with Kristy Schloss, Students Underrepresented in Math, Engineering, Technology, and Science, Front Range Community College, Westminster, CO, November 28, 2000.
43. Career Day Speaker with Kristy Schloss, CH2M Hill's National Engineer's Week Event, Denver Museum of Nature and Science, Denver, CO, March 20, 2001.
44. Keynote Speaker, "The Power of Mentoring," MentorNet Partners Forum, Palo Alto, CA, March 30, 2001.
45. Panel Member, "Model Law Task Force & Colorado State Board of Registration," Professional Engineers of Colorado Annual Convention, Breckenridge, CO, June 9, 2001.
46. "Women as Leaders in Science and Technology: Promoting Competence and Confidence," with Kristy Schloss, Prentice Hall National Symposium on Education, Denver, CO, June 14, 2001.
47. "Historical Women in Engineering and Science," United Parcel Service, Westminster, CO, September 5, 2001.

48. Featured Speaker, "Networking," IEEE Women in Engineering Committee, Power Engineering Society Winter Conference, New York, NY, January 29, 2002.
49. Commencement Speaker, Kansas State University at Salina, Salina, Kansas, May 11, 2002.
50. "Women and their Entry into the Professions," Eclectics, Denver, CO, May 17, 2002.
51. Closing Keynote Speaker, "Women in Technology: Imagining the Future," High Tech: Low Numbers – Imagine Women in Technology Conference, Denver, Colorado, August 14, 2002.
52. "Ethics and Professionalism," Civil Engineering Senior Seminar, University of Colorado at Boulder, Boulder, Colorado, September 25, 2002.
53. Panel Member, Women in Technology Panel, sponsored by Rollie Heath for Governor, Broomfield, Colorado, September 26, 2002.
54. Panel Member, CareeReality Educator Workshop, DeVry University, Broomfield, Colorado, March 4, 2003.
55. "Women in Academia: Past, Present, and Future," Graduate Teacher Program Special Workshop Series, University of Colorado at Boulder, Boulder, Colorado, April 14, 2003.
56. "Using the FE Examination as an Outcomes Assessment Tool," with David L. Whitman and John Steadman, ASEE Annual Meeting, Nashville, TN, June 23, 2003.
57. Keynote Speaker, UCCS SWE Day, Society of Women Engineers, Colorado Springs, Colorado, September 13, 2003.
58. Keynote Speaker, Academic Forum & Roundtable, 2003 Society of Women Engineers National Conference, Birmingham, AL, October 10, 2003.
59. Keynote Speaker, ChevronTexaco Lectures Series Luncheon, Colorado School of Mines, Golden, CO, October 15, 2003.
60. Panel Member, Sunset Review Process, Professional Engineers of Colorado, Denver, Colorado, November 12, 2003.
61. "Two Viewpoints on Ethics and the Environment," (with Connie H. King), Colorado Water Congress – Workshop on Legal Ethics in Water and Environmental Law, Denver, Colorado, November 12, 2003.
62. Panel Member, CareeReality Educator Workshop, DeVry University, Colorado Springs, Colorado, January 30, 2004.
63. Keynote Speaker (with Vi Brown), Society of Women Engineers Sonora Region Conference, Phoenix, Arizona, March 5, 2004.
64. "Qualifying for PE Licensure," (with Angie Kinnaird), American Society of Civil Engineers Younger Members, Denver, Colorado, March 23, 2004.

THE EMPIRE DISTRICT ELECTRIC COMPANY

Thermal Unit Model Inputs

	Rated Capacity (MW)	Modeld Max Capacity (MW)	Modeld Min Capacity (MW)	Heat Rate Curve		Ramp Rate (MW/hr)	Normalized Outage (Days)	Forced Outage Rate (%)	Mean Repair Time (Hours)	Min Down Time (Hours)	Min Up Time (Hours)	Fuel Ratio (MMBtu)	Start		Variable O&M ($/MWh)
				Capacity (MW)	Heat Rate (Btu/kWh)								Fuel (MMBtu)	Cost ($)	
Asbury 1	193	183	105	110 140 162 188 191	11485 11230 11135 11180 11210	90	30	7%	60	90		91% / 9%	1200 (oil)	2500	0.60
Asbury 2	17	16	4	4 20	18300 18200	8	30	20%	60	60		91% / 9%	0	0	5.00
Iatan	80	80	40	70 80	10100 10025		30	8%	60	60		87% / 13%	1200 (oil)	2500	0.60
Riverton 7	38	30	20	20 27 38	12700 12500 17000	40	25	6%	48	90		75% / 25%	600 (gas)	1000	1.00
Riverton 8	54	42	32	30 46 54	12080 11980 21610		25	6%	72	90		100%	600 (gas)	1000	1.00
Riverton 9	12	12	4	4 12	18500 17500	6	16	10%	60	24	8		50 (gas)	1500	3.75
Riverton 10	16	16	6	6 16	18500 17500	8	16	10%	60	24	8		50 (gas)	1500	3.75
Riverton 11	16	16	10	10 16	18500 18000	8	16	10%	60	24	8		50 (gas)	1500	3.75
Energy Center 1	86	76	30	30 50 70 85 90	17850 15800 14750 14200 14000	60	25	10%	72	24	12		150 (gas)	5000	3.00
Energy Center 2	85	75	30	30 50 70 85 90	17850 15800 14750 14200 14000	60	25	10%	72	24	12		150 (gas)	5000	3.00
Energy Center 3	50	50	25	25 38 50	12400 11200 10600	40	16	10%	60	2	2		0	300	3.00
Energy Center 4	50	50	25	25 38 50	12400 11200 10600	40	16	10%	60	2	2		0	300	3.00
State Line 1	89	86	80	60 85	14750 13425	60	25	10%	120	24	24		150 (gas)	5000	3.00
SLCC 1x1	250	250	150	150 175 200 225 250	8000 7700 7400 7100 6850	90	30	7%	72	36	48		300 (gas)	13,000	3.50
SLCC 2x1	500	50	10	10 20 30 40 50	7600 7250 6900 6750 6850	20	30	14%	72	36	72		300 (gas)	2500	3.00

EMPIRE DISTRICT ELECTRIC COMPANY

Generating Unit's Historical Heat Rates

	1999	2000	2001	2002	2003	5-Yr. Avg
Asbury	11,162	11,483	11,269	10,568	11,135	11,123
Iatan	10,093	10,296	9,851	9,982	10,054	10,053
Riverton 7	12,775	12,482	12,825	12,827	13,700	12,939
Riverton 8	11,778	12,376	12,153	12,109	12,021	12,086
Riverton 9	18,626	18,105	18,259	18,892	20,841	18,514
Riverton 10	17,839	18,196	24,764	18,859	18,620	18,315
Riverton 11	18,396	18,476	18,879	18,962	19,795	18,572
Energy Center 1	15,773	15,792	17,180	18,793	18,345	16,474
Energy Center 2	16,011	15,916	15,653	18,814	16,448	16,080
Energy Center 3					11,240	11,240
Energy Center 4					11,307	11,307
State Line 1	12,342	13,029	11,562	13,341	12,715	12,647
State Line CC	NA	NA	6,993	7,552	7,502	7,386

THE EMPIRE DISTRICT ELECTRIC COMPANY

FORCED OUTAGE RATES

	Asbury 1	Asbury 2	Iatan 1	Riverton 7	Riverton 8	Riverton 9
1999	0.87%	3.82%	7.71%	1.48%	0.03%	0.27%
2000	3.70%	29.43%	0.00%	1.67%	0.76%	2.98%
2001	6.46%	42.93%	8.04%	0.02%	2.99%	33.42%
2002	3.32%	18.06%	4.54%	1.70%	2.77%	7.00%
2003	4.29%	17.07%	4.29%	0.33%	16.69%	5.68%
5-YR						
Average	3.73%	22.26%	4.92%	1.04%	4.65%	9.87%
1998 - 2002 GADS	4.37%	N/A	5.06%	4.18%	4.18%	54.85%

	Riverton 10	Riverton 11	EC 1	EC 2	EC 3	EC 4
1999	16.82%	5.45%	0.72%	1.07%		
2000	13.60%	0.10%	2.99%	9.93%		
2001	0.53%	3.70%	24.12%	19.76%		
2002	3.60%	2.77%	24.02%	4.46%		
2003	0.00%	0.00%	1.67%	8.47%	9.75%	6.44%
5-YR						
Average	6.91%	2.40%	13.25%	11.61%	9.75%	6.44%
1998 - 2002 GADS	54.85%	54.85%	25.96%	25.96%	25.96%	25.96%

	State Line 1	*SLCC 1x1	*SLCC 2x1
1999	38.96%		
2000	8.71%		
2001	47.39%	4.97%	4.97%
2002	19.58%	0.67%	0.67%
2003	6.40%	3.58%	3.58%
5-YR			
Average	24.50%	3.18%	3.18%
1998 - 2002 GADS	25.96%	3.49%	3.49%

FOR = $\dfrac{\text{Unscheduled Outage Hours}}{\text{(Unscheduled Outage Hours + Hours On-Line)}}$

*SLCC FOR is for the unit as a whole

THE EMPIRE DISTRICT ELECTRIC COMPANY

EQUIVALENT FORCED OUTAGE RATES

	Asbury 1	Asbury 2	Iatan 1	Riverton 7	Riverton 8	*SLCC 1x1	*SLCC 2x1
1999	1.49%	3.82%	14.79%	1.48%	0.03%		
2000	4.74%	30.68%	2.27%	1.67%	0.76%		
2001	10.00%	42.93%	8.04%	0.02%	2.99%	14.30%	14.30%
2002	12.84%	18.14%	9.55%	1.70%	2.77%	12.09%	12.09%
2003	6.58%	20.41%	5.84%	0.33%	16.69%	11.58%	11.58%
5-YR							
Average	7.13%	23.20%	8.10%	1.04%	4.65%	12.66%	12.66%
1998 - 2002 GADS	6.35%	N/A	7.17%	6.15%	6.15%	7.14%	7.14%

EFOR = $\dfrac{\text{Unscheduled Outage Hours + Weighted Derate Hours}}{\text{(Unscheduled Outage Hours + Weighted Derate Hours + Hours On-Line)}}$

***SLCC EFOR is for the unit as a whole**

THE EMPIRE DISTRICT ELECTRIC COMPANY

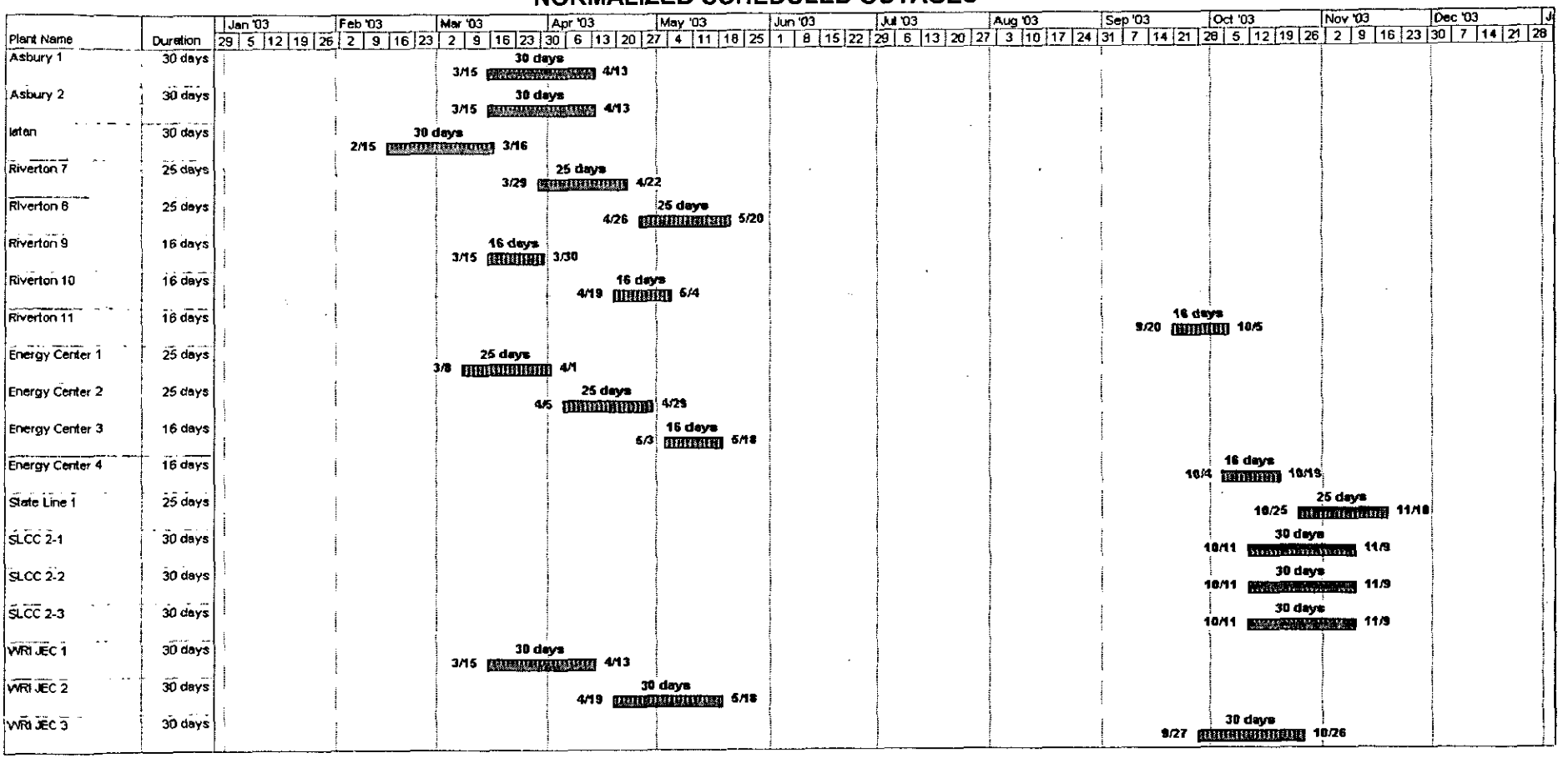
SCHEDULED OUTAGES FOR THERMAL UNITS

	Hours					Average	Average	GADS 1998 - 2002	Modeled
	1999	2000	2001	2002	2003	Hours	Days	Days	Days
Asbury 1	836.6	808.3	2356.9	564.6	658.5	1045	44	30	**30**
Asbury 2	1171.3	808.3	2356.9	654.6	658.5	1130	47	30	**30**
Iatan	52.3	59.8	462.9	1897.9	826.1	660	27	32	**30**
Riverton 7	357.7	1445.8	153.7	219.1	288.1	493	21	34	**25**
Riverton 8	423.0	855.0	379.3	422.0	1084.1	633	26	34	**25**
Riverton 9	7.6	401.5	0.0	0.0	288.1	139	6	18	**16**
Riverton 10	274.7	3912.4	2.5	267.9	0.0	891	37	18	**16**
Riverton 11	279.2	149.2	2.5	2296.8	0.0	546	23	18	**16**
Energy Center 1	803.7	365.8	798.8	3546.5	35.7	1110	46	25	**25**
Energy Center 2	3539.8	109.7	199.7	1090.7	55.4	999	42	25	**25**
Energy Center 3	NIS	NIS	NIS	NIS	0.0	0	0	25	**16**
Energy Center 4	NIS	NIS	NIS	NIS	0.0	0	0	25	**16**
State Line 1	179.5	460.8	616.9	925.4	116.6	460	19	25	**25**
SLCC	NIS	NIS	735.6	1473.5	798.7	1003	42	28	**30**
JEC 1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	32	**30**
JEC 2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	32	**30**
JEC 3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	32	**30**

NIS - NOT IN SERVICE

THE EMPIRE DISTRICT ELECTRIC COMPANY

NORMALIZED SCHEDULED OUTAGES



THE EMPIRE DISTRICT ELECTRIC COMPANY

DELIVERED COAL PRICES

Asbury Blend Coal $/MMBtu	
2004	1.403

Asbury PRB Coal $/MMBtu 2004	
Jan-Jun	1.07
Jul-Dec	1.028
Average	1.049

Riverton Blend Coal $/MMBtu	
2004	1.26

Riverton PRB Coal $/MMBtu 2004	
Jan-Jun	1.248
Jul-Dec	1.207
Average	1.228

Iatan Average Blended Price $/MMBtu	
2004	0.778

OZARK BEACH GROSS* GENERATION HISTORY

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TTL	Capacity Factor
1972	6,296	3,254	1,872	7,761	7,684	4,362	4,474	4,174	3,799	3,795	7,393	6,751	61,615	43.8%
1973	7,222	8,140	6,491	3,810	585	0	108	1,682	3,916	4,623	4,237	6,728	47,542	33.9%
1974	4,058	7,455	10,292	9,861	8,271	4,315	2,435	4,518	4,312	1,077	7,167	5,912	69,673	49.7%
1975	8,266	8,548	7,608	6,938	8,455	5,139	5,899	6,233	2,635	3,029	2,322	4,154	69,226	49.4%
1976	4,184	2,492	2,819	6,771	8,599	6,033	8,651	4,987	2,843	3,398	6,338	6,407	63,522	45.2%
1977	8,481	3,139	3,265	1,661	700	2,811	3,334	1,784	4,330	4,576	6,338	6,677	47,096	33.6%
1978	6,309	5,939	6,177	8,495	9,359	8,385	7,473	3,800	5,270	5,959	4,413	2,927	74,506	53.2%
1979	5,591	3,494	7,601	6,534	3,450	850	2,095	6,284	7,179	2,865	4,702	5,988	56,633	40.4%
1980	2,494	3,581	6,119	4,997	5,132	7,752	8,203	5,522	3,279	1,163	3,208	1,391	52,841	37.6%
1981	1,530	2,182	2,046	803	1,382	2,137	2,625	2,537	1,772	1,306	2,372	3,238	23,930	17.1%
1982	7,881	8,784	9,468	4,486	1,695	7,036	4,775	3,950	2,759	2,912	4,459	4,770	62,975	44.9%
1983	1,215	8,097	9,186	9,066	7,463	4,227	7,933	7,644	3,324	1,234	4,512	9,159	73,060	52.1%
1984	2,689	3,187	8,764	9,338	7,725	5,286	4,203	6,326	2,720	4,402	5,816	5,065	65,521	46.6%
1985	352	3,270	5,781	2,831	840	516	903	2,450	5,504	4,765	5,938	8,081	41,231	29.4%
1986	7,537	6,842	8,644	9,923	8,226	5,732	7,756	5,463	5,126	5,484	8,602	6,143	85,478	61.0%
1987	2,114	5,969	11,330	10,469	6,860	3,422	3,902	3,296	2,379	1,471	6,061	10,255	67,528	48.2%
1988	10,605	9,533	11,647	9,268	6,440	4,306	3,283	7,010	4,375	3,429	3,360	3,847	77,103	54.9%
1989	4,860	7,443	7,671	8,439	6,325	6,409	4,499	4,824	3,226	5,909	3,219	1,049	63,873	45.6%
1990	1,526	8,451	10,173	8,770	2,966	-13	464	3,240	7,540	5,292	2,372	8,991	59,772	42.6%
1991	10,249	9,226	7,348	9,338	6,189	2,852	3,979	5,252	3,389	5,199	8,201	8,889	80,111	57.2%
1992	6,810	7,576	6,541	3,675	1,876	7,335	5,124	5,684	6,968	8,527	6,676	11,079	77,871	55.4%
1993	9,701	9,900	11,285	10,841	9,000	10,060	10,832	7,029	5,459	6,415	6,903	5,483	102,908	73.4%
1994	9,680	9,062	10,772	9,834	3,836	2,727	6,008	9,355	5,060	2,690	6,958	7,801	83,783	59.8%
1995*	9,981	9,716	10,582	8,692	7,149	4,545	2,743	6,208	4,834	2,934	3,077	841	71,302	50.9%
1996*	2,717	4,822	3,636	3,450	6,212	2,952	2,666	6,329	5,076	6,706	9,089	9,205	62,860	44.7%
1997*	10,149	7,255	10,246	9,531	4,351	2,856	8,387	6,731	5,869	6,031	3,406	2,766	77,578	55.3%
1998*	8,187	9,626	10,524	6,874	4,895	6,166	6,980	8,171	4,909	2,049	1,407	91	69,879	49.9%
1999*	4,032	7,854	11,966	10,694	7,729	8,210	10,769	9,442	4,815	3,489	1,928	5,427	86,355	61.6%
2000*	4,584	2,221	761	423	574	3,511	10,858	11,824	3,894	1,182	4,586	6,732	51,150	36.4%
2001*	4,372	6,707	7,578	3,024	1,486	2,520	7,267	7,001	1,788	3,174	3,932	4,861	53,710	38.3%
2002*	4,811	7,455	7,630	5,910	1,415	0	171	1,050	4,212	3,624	5,518	3,789	45,585	32.4%
2003*	6,274	5,554	4,879	2,640	4,802	4,302	7,962	9,149	3,443	2,466	2,970	3,739	58,180	41.5%
Average	5,774	6,462	7,522	6,723	5,052	4,273	5,211	5,592	4,250	3,787	4,921	5,570	65,137	46.5%
5-YR AVG	**5,010**	**5,958**	**6,563**	**4,538**	**3,201**	**3,709**	**7,405**	**7,693**	**3,630**	**2,787**	**3,787**	**4,910**	**59,192**	**42.2%**

*Net Generation values are presented starting in 1995.

5-YR Average values were used for modeling purposes.

THE EMPIRE DISTRICT ELECTRIC COMPANY

HISTORICAL UNDISTRIBUTED AND OTHER COSTS

	1999	2000	2001	2002	2003	5-YR AVERAGE
Asbury	487,116.78	606,120.01	585,054.74	613,783.51	569,227.05	572,260.42
Riverton 7 & 8	157,337.95	120,557.31	132,242.09	126,809.25	133,382.32	134,065.78
Iatan	645,070.14	699,058.12	788,642.06	798,278.48	497,808.64	685,771.49
Total Coal	1,289,524.87	1,425,735.44	1,505,938.89	1,538,871.24	1,200,418.01	1,392,097.69
SLCC	-	-	2,195,355.86	8,240.35	869,744.44	614,668.13
Riverton CT's	-	-	-	-	27,332.21	5,466.44
State Line 1 & 2	803.95	(61.80)	201.33	1,027.26	53,272.99	11,048.75
Energy Center CT's	907.78	(17.40)	398.42	881.13	59,300.54	12,294.09
Total Gas	1,711.73	(79.20)	2,195,955.61	10,148.74	1,009,650.18	643,477.41
Total	1,291,236.60	1,425,656.24	3,701,894.50	1,549,019.98	2,210,068.19	2,035,575.10
Adjustments						
Enron (Gas)					(1,000,000.00)	(639,020.70)
SLCC Test Fuel (Gas)			(2,195,103.51)			
Adjusted Total	**1,291,236.60**	**1,425,656.24**	**1,506,790.99**	**1,549,019.98**	**1,210,068.19**	**1,396,554.40**

THE EMPIRE DISTRICT ELECTRIC COMPANY

Schedule JST - 10

GENERATION HISTORY

	1994 - 2003 ACTUALS (MWH)										5 YR* AVG
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	1999-03
ASBURY 1 NSO	1,280,956	1,268,597	1,077,246	1,318,692	1,168,703	1,303,051	1,265,786	961,968	1,208,101	1,293,108	1,206,403
ASBURY 2 NSO	86,814	48,573	12,611	4,352	14,804	3,661	19,370	6,976	5,890	8,472	8,874
TOTAL ASBURY NSO	1,367,770	1,317,170	1,089,857	1,323,044	1,183,507	1,306,712	1,285,156	968,944	1,213,991	1,301,580	1,215,277
IATAN NSO	644,571	622,498	651,533	598,343	596,356	607,672	486,658	542,113	475,273	587,257	539,795
RIVERTON 7 NSO	185,307	136,046	181,724	156,838	173,649	167,577	149,460	171,562	173,937	178,158	168,139
RIVERTON 8 NSO	294,735	298,731	307,948	294,689	274,591	296,169	272,573	286,793	280,122	220,357	271,203
RIVERTON PEAK NSO	50,989	71,097	70,671	25,000	20,467	36,077	22,197	34,651	21,301	1,910	23,227
TOTAL RIVERTON NSO	531,031	505,874	560,343	476,527	468,707	499,823	444,230	493,006	475,360	400,425	462,569
TOT ENERGY CENTER NSO	3,041	52,132	59,517	66,204	141,026	77,854	102,574	114,898	15,644	63,121	74,818
STATE LINE 1 NSO		46,826	32,491	43,729	115,004	118,302	180,111	53,293	33,880	23,151	81,747
STATE LINE CC NSO *								588,151	873,099	728,161	729,804
TOTAL STATE LINE NSO *		46,826	32,491	120,668	278,024	406,409	330,907	641,444	906,979	751,312	766,578
TOTAL THERMAL NSO	2,546,413	2,544,500	2,393,741	2,584,786	2,667,620	2,898,470	2,649,525	2,760,405	3,087,247	3,103,695	2,899,868
OZARK BEACH NSO	83,556	71,302	62,860	77,578	70,631	86,349	51,132	53,635	45,430	58,118	58,933
TOTAL EDE NSO	2,629,969	2,615,802	2,456,601	2,662,364	2,738,251	2,984,819	2,700,657	2,814,040	3,132,677	3,161,813	2,958,801
PURCHASES NSI NET	1,092,858	1,324,173	1,763,827	1,642,642	1,764,294	1,517,368	2,116,984	2,002,032	1,871,560	1,868,996	1,875,388
INADVERTANT	130	651	(507)	998	(1,474)	307	(555)	(354)	720	31	30
NSI REQUIREMENT	3,720,515	3,937,177	4,204,598	4,250,155	4,471,314	4,473,229	4,794,585	4,800,756	4,917,875	4,950,161	4,787,321
GENERATION SALES	2,442	3,449	15,323	55,849	29,757	29,265	22,501	14,962	87,082	80,679	46,898

* 3-Year Average for SLCC and Total State Line. SLCC (300 MW) came on-line June 2001 and first ran at full capacity in July 2001

THE EMPIRE DISTRICT ELECTRIC COMPANY

PRODUCTION COST MODEL RESULTS FOR BASE FUEL & PURCHASED POWER - NSI

Run 1: Base Run

	GWH	F &PP Cost Incl Start	$/MWH			Starts	GBTU Excl Starts	Avg Heat Rate Excl Starts	
Asbury 1	1,304.50	15,853.60	12.15			12	14,594	11,187	
Asbury 2	8.70	171.00	19.66			43	158	18,207	
Total Asbury	1,313.20	16,024.60	12.20			55	14,752	11,234	
Iatan 1	580.10	4,615.70	7.96			14	5,817	10,027	
	166.70	2,692.60	16.15			12	2,156	12,930	
Riverton 8	271.50	4,025.10	14.83			9	3,262	12,014	
Riverton 9and10	3.20	277.80	86.81			12	58	18,031	
Riverton 11	1.70	149.30	87.82			16	31	18,235	
Total Riverton	443.10	7,144.80	16.12			49	5,506	12,426	
Energy Center 1	31.10	2,405.20	77.34			36	515	16,553	
Energy Center 2	16.80	1,356.70	80.76			26	283	16,851	
Energy Center 3	50.30	2,645.00	52.58			223	573	11,392	
Energy Center 4	27.30	1,440.00	52.75			132	311	11,381	
Total EC	125.50	7,846.90	62.53			417	1,682	13,399	
State Line 1	50.30	3,235.90	64.33			15	682	13,563	
SLCC 1x1	1,006.00	36,166.70	35.95			25	7,648	7,602	
SLCC 2x1	42.90	1,485.50	34.63			17	310	7,233	
Total SL	1,099.20	40,888.10	37.20			57	8,641	7,861	
Gas Turb (incl Starts)	1,229.60	49,162.10	39.98			502	10,437	8,488	
Total Thermal	3,561.10						36,397	10,221	
Ozark Beach	59.20								
Undistributed & Other		1,397.00							
Gas Firm Transportation		6,931.29							
Total EDE	3,620.30	84,848.39	23.44						
Jeffrey PP Contract	1,064.20	14,253.00	13.39						
Spot Purchases	358.30	7,722.00	21.55						
Total Purchases	1,422.50	21,975.00	15.45	28.2%	PP % of NSI				
Tot F&PP NSI (without demand)	5,042.80	106,823.39	21.18						
							MCF Gas	10,242.49	
Purcahsed Power Demand Charges		16,194					Heat Cont Gas	1.019	
							Avg Gas Cost	4.71	$/mmbtu
Total F&PP NSI (with demand)		123,017.39	24.39						

THE EMPIRE DISTRICT ELECTRIC COMPANY

2005 Natural Gas Prices

	MMBtu	Hedged* $/MMBtu	Total		Spot NYMEX*
Jan-05	450,000	4.46	$ 2,006,100		5.70
Feb-05	450,000	4.41	$ 1,984,950		5.64
Mar-05	150,000	3.76	$ 564,450		5.48
Apr-05	150,000	3.76	$ 564,450		5.01
May-05	150,000	3.76	$ 564,450		4.91
Jun-05	300,000	4.02	$ 1,206,450		4.94
Jul-05	800,000	4.18	$ 3,342,550		4.97
Aug-05	800,000	4.18	$ 3,342,550		4.98
Sep-05	250,000	4.00	$ 998,950		4.95
Oct-05	150,000	3.76	$ 564,450		4.97
Nov-05	250,000	4.06	$ 1,015,950		5.13
Dec-05	300,000	4.21	$ 1,261,950		5.30
Total	4,200,000		$ 17,417,250		
	Wt. Average	4.15		Average	5.16

*As of Feb 24, 2004

Note:
For modeling purposes, Empire first uses hedged natural gas prices and quantities to meet on-system natural gas needs. The remainder of on-system gas needs are assumed to be purchased at spot market (NYMEX) prices.

2003 Natural Gas Costs

	MMBTtu	Cost before Derivative (Gain)/Loss $	Derivative (Gain)/Loss $	Total $	Total $/MMBtu
January	680,005	2,256,459	(1,010,879)	1,245,580	1.83
February	279,972	1,728,991	(925,445)	803,546	2.87
March	308,378	1,605,329	(2,803,389)	(1,198,060)	(3.89)
April	1,018,936	4,981,480	(588,829)	4,392,651	4.31
May	512,097	2,581,526	(908,620)	1,672,906	3.27
June	377,956	2,018,553	(1,304,321)	714,232	1.89
July	1,185,653	5,359,026	(1,047,499)	4,311,526	3.64
August	1,444,713	6,751,960	(669,382)	6,082,578	4.21
September	28,291	140,276	(793,237)	(652,961)	(23.08)
October	22,990	(105,206)	(62,610)	(167,816)	(7.30)
November	170,607	568,615	(131,247)	437,368	2.56
December	420,009	2,247,109	(427,980)	1,819,129	4.33
Total	**6,449,607**	**30,134,117**	**(10,673,437)**	**19,460,680**	**3.02**

***Figures presented are for commodity charges and do not include firm transportation (pipeline delivery) charges.*

THE EMPIRE DISTRICT ELECTRIC COMPANY

Production Cost Model Run Summary
Sensitivity on Gas Price, Availability and Price of Spot Purchased Power

	Run Number	Nat Gas $/Mmbtu	Staff PP Method	Gas (1,000 MCF)	Spot PP GWH	Tot PP % of NSI	Total Cost ($1,000)	$/Mwh	
Hedged & NYMEX Gas	1	4.71	Avg Cap	10,242.49	358.30	28.2%	123,017	24.39	
	2	4.60	Max Cap	7,264.67	662.30	35.0%	114,524	22.71	
Hedged & NYMEX Gas	3	4.73	Avg Cap	10,538.27	315.30	27.3%	124,025	24.59	
	4	4.61	Max Cap	7,782.43	584.60	33.6%	116,437	23.09	
$4.00 Gas	5	4.00	Max Cap	7,288.71	661.80	35.0%	109,864	21.78	
	6	4.00	Avg Cap	10,259.47	359.20	28.2%	114,924	22.79	
$5.15 Gas	7	5.15	Max Cap	7,038.37	675.30	35.3%	117,995	23.40	
	8	5.15	Avg Cap	9,937.78	370.00	28.4%	126,309	25.05	
$3.02 Gas	9	3.02	Max Cap	7,823.06	624.80	34.1%	102,544	20.33	Lowest Case
	10	3.02	Avg Cap	10,667.32	333.00	27.5%	104,598	20.74	
$5.50 Gas	11	5.50	Max Cap	7,017.37	673.30	35.3%	120,442	23.88	
	12	5.50	Avg Cap	9,898.23	370.50	28.4%	129,720	25.72	Highest Case

Regional Model PP Prices