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| Exhibit No.: | |
| Issue: | Natural Gas Prices |
| Witness: | Stan M. Kaplan |
| Type of Exhibit: | Direct Testimony |
| Sponsoring party: | The Empire District Electric Company |
| Case No: | |
| Date testimony prepared: | October 27, 2000 |

BEFORE THE PUBLIC SERVICE COMMISSION
STATE OF MISSOURI

# PREPARED DIRECT TESTIMONY OF

# STAN M. KAPLAN

ON BEHALF OF

# THE EMPIRE DISTRICT ELECTRIC COMPANY

Exhibit No. 10
Date 5/29/01 Case No. ER-2001-299
Reporter Kem

Jefferson City, Missouri

# Table of Contents

## Qualifications

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

**A.** My name is Stan M. Kaplan. I am a Managing Consultant with PA Consulting, a provider of energy and transportation consulting services. My business address is 1776 I Street, NW, Suite 600, Washington, D.C. 20006.

**Q.** Please summarize your educational and professional experience.

A. I received an A.B. in History from Rutgers University in 1974 and an M.A. in Public Affairs from the Lyndon B. Johnson School of Public Affairs, University of Texas at Austin, in 1977. Since receiving my graduate degree, I have worked in and studied the energy and utility markets for 22 years. In addition to the information in my resume, I will describe here my work for a regulatory agency and an electric utility that is particularly relevant to my testimony.

In July 1985, I joined the Public Utility Commission of Texas (PUCT) as a coal supply and transportation analyst. I later became Manager of Fuel Analysis for the PUCT. In this position, I was responsible for directing the PUCT staff's studies of the prudence of utility fuel and transportation contracts, including gas and coal supply and transportation agreements. These studies involved detailed reviews of the process by which utilities arrived at their fuel supply and transportation contracts and their administration of the agreements. When these studies determined that, by acts of commission or omission, utilities had imprudently incurred excessive fuel costs, disallowances were recommended to

the Commission. These reviews also often made recommendations to the utility for improving the management of its fuel and transportation procurement, and to the Commission on areas where further investigation or oversight was needed.

In addition to prudence reviews, I directed a variety of other fuel-related work at the PUCT. This included natural gas, coal, oil and nuclear fuel price forecasts, evaluations of fuel stockpile levels, and evaluations of the fuel supply for proposed power plants.

In October of 1987, I became Manager of Fuels Planning and Supply for Austin Energy, the municipal generating utility operated by the City of Austin, Texas. In that position, I was responsible for Austin Energy's involvement in natural gas, coal, rail, oil, and nuclear fuel procurement for wholly and jointly owned power plants. I was also responsible for contract administration, price forecasting and planning.

In June 1993, I left Austin Energy to join a predecessor firm to PA Consulting. At PA Consulting I direct or otherwise participate in consulting assignments involving natural gas and coal supply and transportation, and power market issues. This work frequently involves assisting electric utilities with planning for natural gas and coal procurement and transportation; negotiating gas and coal supply and transportation contracts; and support to utilities involved in fuel contract prudence reviews, contract arbitration and litigation.

**Q.** Have you previously filed testimony in regulatory proceedings?

**A.** Yes. During my tenure with PUCT, I filed testimony on numerous occasions in dockets involving most of the major generating utilities serving Texas. I also filed testimony as a witness for Austin Energy during rate proceedings, and have filed verified statements as an expert witness before the Surface Transportation Board and the Interstate Commerce Commission.

**Q.** Have you attached your resume?

**A.** Yes, as Schedule SMK-1.

## Purpose and Key Conclusions; Organization

**Q.** What is the purpose of your testimony?

**A.** I have been retained by The Empire District Electric Co. ("Empire" or "EDE") to testify on 1) the outlook for natural gas market prices through 2001, and 2) whether the New York Mercantile Exchange (NYMEX) natural gas futures prices provide a reasonable means of forecasting the market price for gas in 2001.

**Q.** Please summarize your key conclusions.

**A.** My key conclusions are in brief:

- Long-term factors have caused the recent run-up in gas prices. Long-term factors are now working to redress the gas supply and demand balance, but the full impact will not be felt for more than a year. It is likely that gas prices will average above $4.00 per MMBtu at least through 2001.

- The gas futures prices series is, in general, a reasonable means of forecasting gas prices. Based on historical experience, it is also likely to be a good indicator of the price of gas actually incurred by Empire.

**Q.** How is the remainder of your testimony organized?

**A.** The remainder of my testimony is divided into the following main sections:

- Developments in the Natural Gas Markets
- Why Prices Peaked in 2000, and the Gas Price Outlook
- Gas Price Forecasts and Gas Futures
- Applicability of the Henry Hub and Futures Prices to Empire's Gas Purchases
- Conclusions

## Developments in the Natural Gas Markets

**Q.** What has happened to the market price for natural gas during 2000?

**A.** During 2000, gas prices have risen to what are, by historical standards, extraordinary levels. As shown in Schedule SMK-2, spot prices in September and October of 2000 have exceeded $5.00 per MMBtu.

**Q.** What factors have contributed to the high gas prices in 2000?

**A.** Gas prices have been increasing since early 1999, in response to long-term forces that have been playing-out through the 1990s. These forces have had both positive and negative implications for gas supply.

On the plus side, domestic petroleum industry exploration and development (E&D) activity is now focused predominately on natural gas rather than oil. A variety of technological developments, such as 3-D seismic studies and directional drilling, have greatly increased the productivity of E&D activity, and reduced the cost per unit of gas found.

However, the dominant influence on gas supply is selling price. The market price has been relatively low – generally under $2.20 per MMBtu – through most of the 1990s. This is the equivalent of selling crude oil for only about $12.80 per barrel.

**Q.** What have the implications been of the consistently low prices for natural gas?

**A.** The low prices for gas have had a number of consequences that have contributed directly to the 2000 price spike. E&D activity, as measured by the drill rig count, moves in concert with price (see Schedule SMK-3). With a generally declining price trend in the 1997 to early-1999 time period, E&D activity declined.

With E&D activity in decline, reserve additions and additions to production capacity have lagged. In 1998 reserve additions fell significantly short of matching production. As noted by the Energy Information Administration (EIA, a unit of the US Department of Energy):

> U.S. dry natural gas reserves declined 2 percent in 1998. This broke a 4-year string of annual increases, and offset two-thirds of the gain in the prior 4 years. Natural gas reserve additions in 1998 replaced only 83 percent of gas production.[1]

In 1999, with gas prices on the upswing, reserve additions increased, but only sufficiently to bring total reserves back to the 1997 level.[2]

Domestic gas production capacity appears, for the time being, to have "topped-out." Between 1998 and 1999 gas consumption increased from 21.3 trillion cubic feet (Tcf) to 21.5 Tcf, but domestic production was essentially unchanged at 18.7 Tcf. Through September 2000 consumption is up slightly compared to the comparable period in 1999 (respectively 16.4 Tcf v. 16.0 Tcf,) but domestic production is again unchanged at 14.0 Tcf; this suggests that there is currently limited slack in production capacity.[3]

Although demand is down slightly for year-to-date 2000, lower prices have generally spurred an increase in gas demand, including in the industrial and electric sectors (see Schedule SMK-4). The industrial and electric demand growth is significant in that these sectors take substantial volumes of gas during the shoulder (spring and early fall) and summer months when gas demand had

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[1] EIA, *US Crude Oil, Natural Gas, and Natural Gas Liquids Reserves*, 1998, p. ix.

[2] Proved gas reserves were 167.2 trillion cubic feet (Tcf) at the end of 1997 and 167.4 Tcf at the end of 1999. See EIA, *Advance Summary: US Crude Oil, Natural Gas, and Natural Gas Liquids Reserves*, 1999, Table 1

[3] Source data from EIA, *Natural Gas Monthly*, September 2000, Table 2.

historically been low. The increase in gas demand during what had been the "off-season" relates to the last piece of the pricing puzzle – the role of gas storage.

**Q.** What is the significance of gas storage to gas supply and pricing?

**A.** The demand for gas is very seasonal. During the winter heating season demand peaks at levels far above production. The gas industry meets peak demands by injecting substantial volumes of gas into storage facilities during the summer and shoulder months, and then withdrawing the gas during the winter.

The increase in off-season demand, primarily from the industrial and power sectors, has created competition between gas consumers and storage operators for the available gas. This puts new pressure on prices during seasons when, in the past, demand had been slack and prices low.

Compounding this situation, in recent years storage operators have been putting progressively less gas into storage in preparation for the winter peak. While this moderates (but does not eliminate) the new off-peak competition for gas supplies, the practice of minimizing gas storage adds a new element of risk into the market.[4]

[4] Several factors appearing to have been driving operators to minimize storage inventories, including an effort to reduce working capital and to better tailor inventory with likely demand. The increased demand for off-season gas is also likely a factor.

## Why Prices Peaked in 2000, and the Gas Price Outlook

**Q.** How did the factors described above contribute to the price spike in 2000?

**A.** The price spike in 2000 is the result of the convergence of these factors. Demand continued to grow in 2000. Through September, total gas demand is up 2.5% compared to the comparable period in 1999. While this in itself would tend to put more pressure on supply, of greater significance is the increase in combined industrial and electric sector demand: up a substantial 6.6%.[5] As discussed above, growth in electric and industrial demand creates competition with storage operators for the off-season gas supplies, creating price pressures in what had once been a low price period.

These factors, along with market expectations of further increases in demand, triggered the takeoff in gas prices. Low storage levels exacerbated the situation. As shown below in Table 1, gas storage inventories in 2000 have badly lagged

**Table 1**
**Working Gas in Storage (BCF)**

| | 1999 | 2000 | Difference BCF | Difference Percent |
|---|---|---|---|---|
| January | 2094 | 1725 | -369 | -18% |
| June | 2157 | 1706 | -451 | -21% |
| September | 2884 | 2546 | -338 | -12% |

Source: EIA, Natural Gas Monthly, September 2000, Table 9

[5] EIA, *Natural Gas Monthly*, September 2000, Table 3.

1999 (which in turn were lower than in 1998). Buyers were rattled by low storage inventories, which they saw as creating the potential for shortages during the winter.

Low storage and high gas prices created a "feedback" loop that exacerbated the price run-up. High prices during 2000 encouraged storage operators to delay buying gas for their facilities (in the hope that prices would retreat). The resulting low storage levels added to the momentum for higher prices, which further delayed storage injections, putting even more pressure on prices.

A final factor has been the dramatic increase in oil prices. When gas supply is tight and prices are high, the price linkage between gas and residual oil strengthens because more boiler operators will begin to switch between the fuels. In 2000, tight gas supplies coincided with a tight, high-priced residual oil market. In October 2000, the spot price for low sulfur residual oil was $35.90 per bbl, equivalent to $5.71 per MMBtu.[6] This high price for the competing fuel reinforced high gas prices.

The combined result of these factors has been the surge in prices that has driven the cost of gas above $4.00 per MMBtu.

**Q.** Does the increase in gas prices reflect a permanent change in the outlook for gas supply?

**A.** No. The recent surge in prices does not mean that the nation is running out of gas. E&D activity, which matched the decline in prices, is now tracking the increase. Down the road this will lead to additional production in the US and Canada. Moreover, new supplies are coming on-line or are "in the pipeline" (such as the off-shore Sable Island gas production, and increased imports of liquefied natural gas). As more supply comes on-line, prices will eventually moderate.

**Q.** What is the outlook for gas prices in 2001?

A. It is reasonable to expect gas prices to average above $4.00 per MMBtu during 2001. Just as long-term factors, operating over a period of years, created the 2000 price run-up, it will take a period of years for market developments to drive prices consistently back under $4.00 per MMBtu. It will take time for the increase in drilling activity to translate into new discoveries, and then to develop those discoveries into productive sources of gas.

How long it will take for gas supply and demand to come into balance is uncertain. A key variable is the weather. Mild winters will accelerate the balancing process by putting less pressure on gas storage. However, cold winters could deplete storage, in which case storage operators attempting to refill their

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[6] *Natural Gas Week*, October 23, 2000, page 11.

facilities will compete intensely with industrial and power consumers for off-season gas, driving up the price of gas.

One recent trade journal article summarized the outlook as follows:

> With the storage injection season winding down, analysts have been gazing into their crystal balls and working out pricing and storage scenarios through the coming winter and following year.
>
> The results, no matter how liberally the numbers are massaged, foretell no end in sight to the high-price gas environment which has been a producer bonanza and end-user bloodbath.
>
> Even if consumers luck out with a warm winter, analysts say prices will be high well into 2001. A normal winter would leave storage holders struggling, and likely failing, to rebuild stocks to current low levels through next spring and summer, creating a market tighter than that which has pushed prices above $5/MMBtu this year.[7]

In summary, it appears likely that gas prices will be high through 2001, and will probably average more than $4.00 per MMBtu during the year.

## Gas Price Forecasts and Gas Futures

**Q.** What has been the track record of gas price forecasts?

**A.** The price of gas has been notoriously difficult to forecast.[8] Forecasters have consistently failed to capture long-term trends and short-term swings. This is due to a number of factors. As summarized by the EIA:

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[7] "Analysts See Repeat of Cycle: High Prices and Low Storage," *Natural Gas Week*, October 16, 2000.

[8] EIA, for example, has overestimated long-term gas prices by an average of more than 60%. See http://www.eia.doe.gov/oiaf/analysispaper/pdf/forecast_eval.pdf, Table 1.

> Energy prices have been far more difficult to predict than consumption, production, and net imports, and prices have been more typically overestimated than underestimated. More rapid technological improvements, the erosion of the market power of the Organization of Petroleum Exporting Countries in the mid-1980s, excess productive capacity, and market competitiveness are all factors that led to lower energy prices than projected. In the 1980s and 1990s, productivity and technology improvements and the effects of gradual deregulation and changes in industry structure have more than offset the factors that have tended to raise energy prices, such as resource depletion and increasing energy demand.[9]

An additional factor has been the unwillingness of forecasters to adjust their models and assumptions to reflect trends and experience at variance with their expectations. This is illustrated by the "fan chart" shown in Schedule SMK-5. The chart shows how over the years natural gas prices were relatively flat, but the forecaster (in this case EIA) did not make the fundamental changes in its analysis (i.e., correct a bias toward higher prices in the long-term) necessary to bring its projections in line with actual experience.

If forecasters have overstated gas prices, they have also failed to predict price run-ups, including the current price increase. For example, in late 1999, EIA projected that the annual average price of gas at the wellhead in 2000 would be $2.26 per Mcf, and Standard & Poors/Platts forecasted $2.58 per Mcf. The current estimate is for an annual average price in 2000 of $3.37 per Mcf, 49%

[9] Ibid., p. 1.

higher than EIA's forecast and 31% higher than S&P/Platt's. (EIA's current forecast for the fourth quarter of 2001 is a price of $4.57 per Mcf.)[10]

**Q.** What are gas futures?

**A.** A futures contract is "a supply contract between a buyer and seller, whereby the buyer is obligated to take delivery and the seller is obligated to provide delivery of a fixed amount of a commodity at a predetermined price [and time] at a specified location. Futures contracts are traded exclusively on regulated exchanges and are settled daily based on their current value in the marketplace."[11] Other characteristics of futures contracts are standardization (the quantity per contract, quality, delivery point and form of the contract are the same for all contracts) and transparent pricing immediately available to all participants in the market.

In practice, the physical sale and delivery of the asset rarely occurs. Rather, the futures contract is used as a "hedge." That is, by entering into "paper" commitments to buy or sell futures contracts at a known price, a party can limit its financial risks on physical transactions.

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[10] EIA, *Short-Term Energy Outlook*, October 2000 (Table 4) and January 2000 (Table 4); Standard & Poor's/Platts, US Energy Outlook, Fall/Winter 1999-2000, p. 75 (this report was published in November 1999).

[11] From the NYMEX on-line glossary, at http://www.nymex.com/.

In the case of natural gas, monthly futures contracts are traded on the NYMEX for gas delivered at the Henry Hub at Erath, Louisiana. The Henry Hub is an interchange point where seven interstate pipelines, two intrastate pipelines, and a gathering system connect. Accordingly, it is location where buyers and sellers have great flexibility for moving and trading gas, and is therefore suitable as a pricing point for gas.[12]

Natural gas futures can currently be purchased as far as 36 months ahead. Gas futures are widely traded, with annual trading volumes in excess of 16 million contracts (each contract represents a volume of 10,000 MMBtus of gas).

**Q.** Where can futures prices be found?

**A.** Prices are available in real-time through various financial reporting services. The end-of-day closing price is available in major news publications, such as the *Wall Street Journal.*

**Q.** Is the series of futures prices for each month of 2001 (often referred to as the futures "strip") a price forecast?

**A.** The futures strip is more than a forecast; it is a set of "forward prices" at which transactions can, and are, made. Gas futures represent the aggregated opinion of market participants (including gas producers, gas buyers, and speculators)

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[12] Capozza, Frank C., *Energy Futures Trading in the 90's*, 2nd Edition, page 2-7.

concerning the likely trajectory of prices. In a sense it consolidates all opinion and information in the market concerning the direction of prices.

Note that the futures prices have much more "real world" significance than an abstract forecast from a private or government agency. This is because the futures are forward prices at which real transactions are made hourly, by corporations seeking to hedge hundreds of million of dollars of gas sales and purchases.

**Q.** Is the futures strip a reasonable means of forecasting the price of natural gas?

**A.** Yes. In general, futures are a reasonable means of forecasting the price of gas (specifically, spot gas at the Henry Hub). Because the futures are rooted so tightly in the real world of gas sales, they have the important advantage of reflecting the full depth of market knowledge. The disadvantage is that the futures also reflect short-term factors, such as weather, that can roil the markets. However, no forecasting approach is perfect. As discussed above, the "professional" forecasters have manifested the opposite failing – refusing to adjust their forecasts to reflect trends at variance with their models.

In summary, the futures have the key advantage of being an up-to-date reflection of a gas market that has changed radically over the past year, and of representing the prices at which participants are actually making deals. It is an entirely reasonable means of forecasting gas prices.

## Applicability of Henry Hub and Futures Prices to Empire's Gas Purchases

**Q.** How does Empire purchase natural gas?

**A.** EDE has historically relied on a combination of daily purchases and purchases made under contracts lasting several months. The multi-month contracts typically cover a portion of expected gas demand during the peak summer season and the winter. The most recent multi-month contracts (with Oneok Gas Marketing Co. and Tenaska Marketing Ventures) have fixed prices. The daily purchases will, of course, vary with the market. All gas is purchased on a firm basis.

The gas is typically delivered to the EDE generation stations pursuant to a firm, long-term gas transportation contract with Williams Pipeline. If daily gas transportation requirements exceed the volume provided for by the Williams contract, Empire will buy gas on a delivered price basis from a third party with capacity on the Williams system.

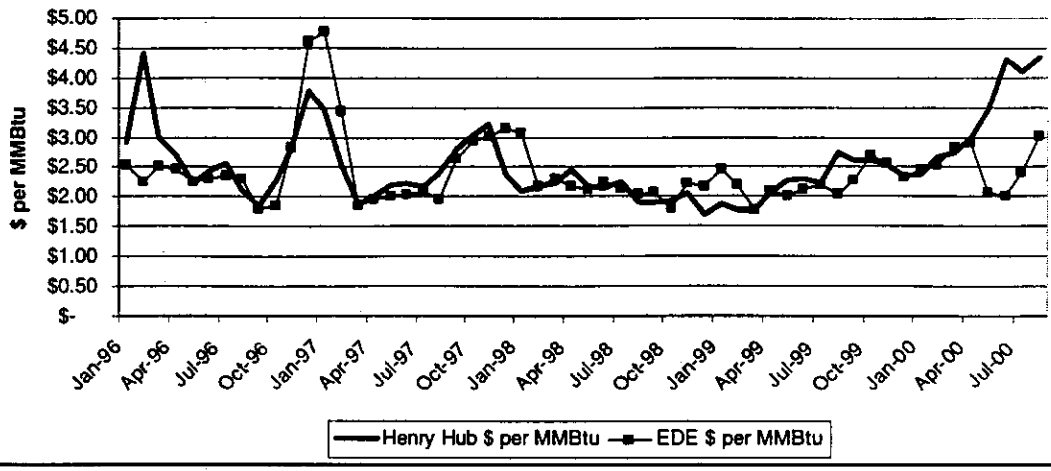
**Q.** How have Empire's gas prices compared to the Henry Hub spot price?

**A.** Empire's average monthly gas prices have been generally similar to the Henry Hub monthly price. For the 56-month period January 1996 through August 2000, the average gas supply cost incurred by Empire was $2.42 per MMBtu. Over that same period the average Henry Hub price was slightly higher, at $2.55 per MMBtu. For 32 months during the 56-month data period, the EDE supply price and the Henry Hub price were within 20 cents per MMBtu of each other (57% of

the time). The EDE price was lower on 17 occasions and higher on 15 occasions (see Schedule SMK-6).

A visual inspection of the price history (see Figure 1, below) also suggests that the EDE average price and the Henry Hub price have tracked closely.

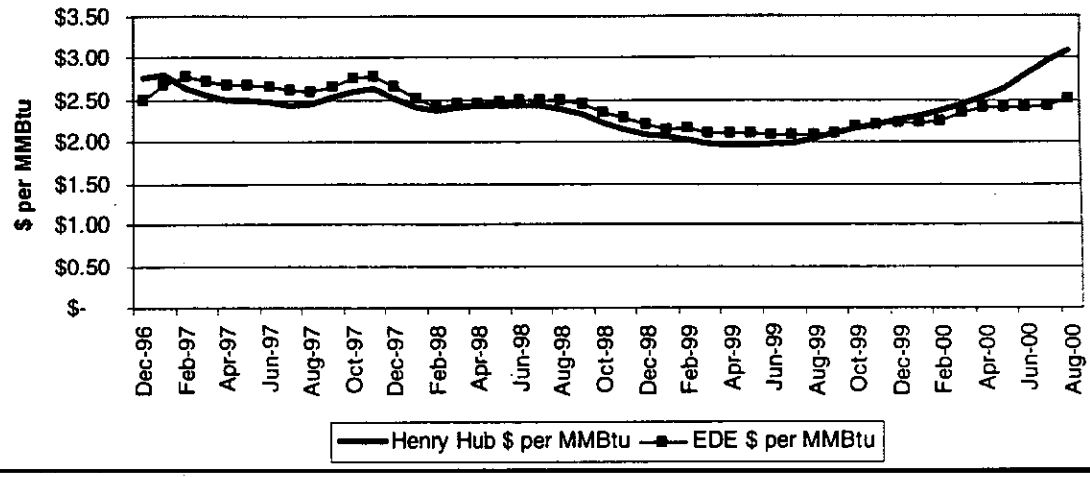
**Figure 1**
**Comparison Of EDE and Henry Hub Prices**




My understanding is that the instances when the EDE supply price and Henry Hub price have significantly diverged for a material period of time (e.g., early 1996 and mid-2000) reflect EDE multi-month gas supply contracts with fixed prices that differed from the market price. Most recently, Empire purchased gas during the period May – August 2000 under a contract with Oneok that provided for a fixed price of $2.014 per MMBtu. This low-priced agreement (entered into in 1998) explains why Empire's gas costs have been below the market price for part of 2000.

The close relationship between the EDE supply price and the Henry Hub price is further illustrated by Figure 2, which displays the prices as 12 month trailing averages. This analysis, which smoothes out the month-to-month variations in the price, shows that the trends for the Henry Hub and EDE supply prices are very similar. The primary deviation is in 2000, when EDE has benefited from the Oneok contract.

**Figure 2**
**Comparison Of EDE and Henry Hub Prices**
***12 Month Trailing Average***




**Q.** What conclusions do you draw from this review of Empire's historical gas price data?

**A.** Based on the historical information, EDE's gas supply prices have generally been similar to the Henry Hub price. As the NYMEX futures strip is a essentially a forward price series for Henry Hub, it therefore appears to be reasonable to use the futures prices as a forecast of the gas supply prices EDE will experience in 2001.

## Conclusions

**Q.** Please summarize your conclusions.

**A.** Long-term factors have caused the run-up in gas prices. These factors include depressed E&D activity, demand growth (particularly in the industrial and power sectors), and changes in the way gas storage is managed. Long-term factors are now working to redress the gas supply and demand balance, particularly the increase in E&D activity in response to higher prices, but the full impact of these developments will not be felt for more than a year. It is likely that gas prices will average above $4.00 per MMBtu during 2001.

The gas futures series is, in general, a reasonable means of forecasting gas prices. It is also a reasonable indicator of the price of gas actually incurred by Empire. EDE's gas supply costs have generally been similar to the Henry Hub spot price. As the NYMEX gas futures series is a forward price curve for spot gas at the Henry Hub, futures prices are therefore a reasonable means of forecasting the gas supply cost to Empire

**Q.** Does this conclude your direct testimony at this time?

**A.** Yes.

AFFIDAVIT

District of Columbia )
) ss
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On the 27th day of October, 2000, before me appeared Stan M. Kaplan, to me personally known, who, being by me first duly sworn, states that he is a Managing Consultant employed by PA Consulting and acknowledged that he has read the above and foregoing document and believes that the statements therein are true and correct to the best of his information, knowledge and belief.

Stan M. Kaplan

Subscribed and sworn to before me this 27th day of October, 2000.

My commission expires: July 14, 2002

# Resume

# Stan M. Kaplan

## Education

**University of Texas at Austin, Johnson School of Public Affairs** — MA, Public Policy, 1977

**Rutgers University** — BA, History, 1974

## Current Position: Managing Consultant, PA Consulting Group

Mr. Kaplan has worked for PA Consulting and its predecessor, Fieldston Company, since 1993. Consulting specialties and projects include:

- Fuel strategy and procurement assistance: coal and natural gas supply and transportation.
- Assistance to clients transitioning from coal to gas-fired generation, including: risk analyses of alternative plant sites; assessment of supply and transportation options; recommendations concerning the use of firm vs. interruptible transportation; recommendations for fuel oil backup.
- Litigation support, including: coal and rail contract litigation and settlement; prudence of utility management of nuclear power projects; prudence of fuel management; litigation related to IPP power prices and construction costs; and other fuel and power-related disputes.
- Valuation of existing and prospective fossil and nuclear power projects.
- Analysis of fossil and nuclear plant stranded costs.
- Benchmarking of costs and performance for fossil-fired and nuclear generating stations.
- Forecasts of fuel and electricity prices; generator dispatch analyses.
- Forecasts of SO2 and NOx allowance prices.
- Integration of existing and prospective environmental regulations with client generation strategy.
- Application of quantitative approaches to resolving client issues, including optimization models; probabilistic (Monte Carlo) analyses; and financial modeling.

## Prior Professional Experience

- **Austin Energy (Electric Utility), City of Austin (1987–1993). Manager, Fuels Planning & Supply.**
  - Managed the planning and procurement of gas, oil, coal, and nuclear fuel for a municipal electric utility with a 2400 Mw generation base.
  - Responsibilities included fuel purchases and contract administration; fuel strategy and planning; price forecasting; determination of fuel inventory targets; fuel accounting; and testimony for rate cases.
  - Part of utility teams for Clean Air Act Amendment compliance; rate case strategy; National Energy Plan comments.

- Primary City negotiator for short and long term gas, coal, and nuclear fuel supply and transportation contracts. Managed the City's interest in gas-producing properties.

- Responsible for a variety of fuels planning projects, including a study of gas storage options; fuel price forecasts; fuel choice for new generation; and development of a model used to determine the optimum monthly mix of purchases from the utility's various gas-supply contracts.

- Directed research efforts and made presentations which convinced the management and co-owners of the South Texas Nuclear Project to adopt a market-oriented approach to nuclear fuel purchases. Responsible for planning and building a spur pipeline which ended a 40-year monopoly on gas transportation to the utility's gas-fired plants.

- Managed a staff of eight FTEs; developed from scratch the utility's fuel accounting function. Presentations on numerous occasions to City Council, senior City management, and the management committees for jointly-owned power projects.

- **Public Utility Commission of Texas (1985–1987). Manager, Fuels Analysis.**

  - Managed review of the prudence of electricity utility fuel contracts and of utility strategies for buying gas, oil, coal, and nuclear fuel.

  - Responsible for the fuel aspects of Commission policy studies, e.g., study of central economic dispatch for Texas (ERCOT); calculation of utility avoided costs; assessment of the electricity supply and demand balance in Texas.

  - Evaluation of the need for proposed power plants.

  - Testified on numerous occasions on utility fuel issues.

- **Fieldston Company, Inc. (1984–1985). Consultant.**

  - Evaluated for US DOE the financial and operational performance of the major coal-hauling railroads, with the aim of determining whether changes were needed in the Staggers (rail deregulation) Act.

  - Assisted a utility in litigating a coal supply contract, including preparation of testimony and development of a financial model of the source coal mine.

  - Performed cost studies of rail movements of coal for a northeastern utility to find opportunities for rate reductions.

  - Editor for the first *Fieldston Coal Transportation Manual*, a comprehensive guide to rail, barge, and international coal transportation. Also wrote articles for the *Coal Transportation Report*, a biweekly newsletter

- **Other Energy and Environmental Positions (1978–1984).** Energy Ventures Analysis, Inc. and Jensen Associates — consulting studies of air regulations; natural gas, petroleum, and coal supply and demand; and performed economic evaluations of draft effluent guideline regulations for the US EPA; California Energy Commission and EMAY Corp. — studies of solar energy economics.

- **Other Positions (1977–1977).** Congressional Budget Office – summer intern (1976) and Center for Defense Information – Junior Fellow (1977); for both organizations worked on studies of weapons procurement policy.

## Testimony

Expert testimony on numerous occasions as a staff witness before the Public Utility Commission of Texas and for the City of Austin; deposed on several occasions as an expert or fact witness.

With James Heller, Joint Rebuttal Verified Statement, Docket No. 42051, Wisconsin Power & Light Co. v. Union Pacific Railroad Co., September 28, 2000.

Reply Verified Statement, Surface Transportation Board, Ex. Parte 627, Market Dominance Determinations -- Product and Geographic Competition, June 29, 1998.

Verified Statement and Reply Verified Statement, Surface Transportation Board, Docket 41989, PEPCO v. CSX Transportation, 1997.

Verified Statement, Surface Transportation Board, Finance Docket 33388, CSX Transportation, Inc., Norfolk Southern Railway Co. -- Control -- Conrail Inc., July 11, 1997.

Rebuttal Verified Statement, Interstate Commerce Commission, Docket 41191, West Texas Utilities v. Burlington Northern Railroad Co., July 20, 1995.

## Publications and Papers

*Strategic Analysis of Railroad Rate, Cost, and Service Prospects: Conflict or Cooperation?*, report prepared for EPRI, November 1999 (co-author Trygve Gaalaas).

*Utility Responses to Railroad Market Power*, report prepared for **EPRI**, October 1997.

"The Next Wave of Renegotiating Coal and Transportation Contracts," **Natural Resources & Environment**, Winter 1997.

*Coal Supply and Transportation Markets During Clean Air Act Phase One: Change, Risk and Opportunity*, report prepared for **EPRI**, January 1996 (co-author Jamie Heller).

"Long-Term Natural Gas Contracts and Electric Utilities: Balance of Benefits and Traps," **Natural Gas**, December 1993.

"Fuels, Natural Resources, and Technology: A Broader Context for Fuel Price Forecasting," presented at the **International Association for Energy Economics 15th North American Conference**, October 13, 1993.

"The New Keys to Gas Deliverability: Storage, Imports, and Resource Development," presented to the **SPE Gas Technology Symposium**, June 30, 1993.

"The Long View: Technology, Society and the Price of Fuel," presented to the **American Power Conference**, April 14, 1993.

"Storage and Imports Rearranging the Price Picture," **Natural Gas**, February 1993.

"Utility Planning for Natural Gas Storage," paper and presentation to the **New Gas Storage Strategies** conference, Houston, Texas, September 2–3, 1992.

"Fear and Loathing in the Gas Market," **Compliance Strategies Review**, September 28, 1992.

"The Short-Term Approach to Fuel Supply Strategy and Contracts," conference paper and presentation, **Power-Gen'91**, Tampa, Florida, December 4-5, 1991.

*Rail Transportation of Coal to Texas*, Working Paper 85-5, **Public Utility Commission of Texas**, October 1985.

Editor, ***Fieldston Coal Transportation Manual***, 1984–85 edition, Fieldston Company, 1984.

"Fuel Grade Coke Could Gain Status as Product," **Oil and Gas Journal**, October 10, 1983.

"Petroleum Coke as a Supplemental Industrial Fuel," paper and presentation, **Fifth Symposium on Industrial Coal Utilization**, June 6–7, 1983.

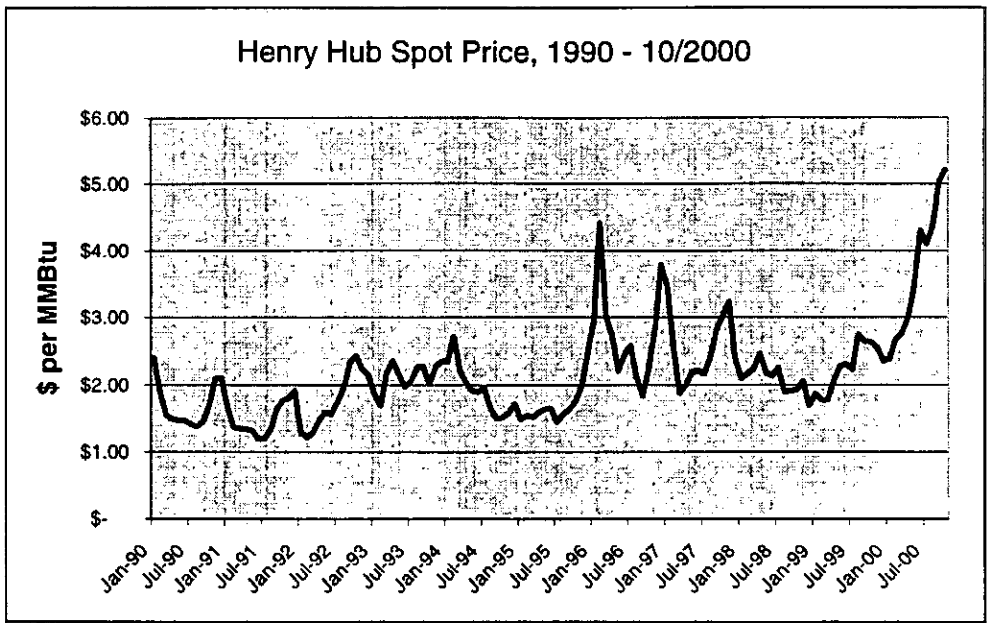
**Schedule SMK-2** **Page 1 of 1**

**CASH MARKET HUB TRADING**
**($/MMBtu)**
**Henry Hub, La.**

| | Jan. | Feb. | March | April | May | June | July | August | Sept. | Oct. | Nov. | Dec. | Average Annual | Average Annual Gas Price Expressed as |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1990 | $ 2.39 | $ 1.90 | $ 1.55 | $ 1.49 | $ 1.47 | $ 1.47 | $ 1.41 | $ 1.36 | $ 1.44 | $ 1.69 | $ 2.10 | $ 2.11 | $ 1.70 | $9.86 |
| 1991 | $ 1.67 | $ 1.36 | $ 1.34 | $ 1.33 | $ 1.31 | $ 1.20 | $ 1.19 | $ 1.31 | $ 1.63 | $ 1.77 | $ 1.81 | $ 1.92 | $ 1.47 | $8.53 |
| 1992 | $ 1.28 | $ 1.21 | $ 1.28 | $ 1.47 | $ 1.59 | $ 1.56 | $ 1.75 | $ 1.97 | $ 2.33 | $ 2.42 | $ 2.24 | $ 2.16 | $ 1.80 | $10.44 |
| 1993 | $ 1.88 | $ 1.69 | $ 2.18 | $ 2.35 | $ 2.17 | $ 1.97 | $ 2.06 | $ 2.26 | $ 2.27 | $ 2.02 | $ 2.26 | $ 2.34 | $ 2.11 | $12.24 |
| 1994 | $ 2.34 | $ 2.71 | $ 2.21 | $ 2.04 | $ 1.92 | $ 1.90 | $ 1.96 | $ 1.66 | $ 1.49 | $ 1.51 | $ 1.58 | $ 1.72 | $ 1.86 | $10.79 |
| 1995 | $ 1.48 | $ 1.54 | $ 1.52 | $ 1.59 | $ 1.64 | $ 1.65 | $ 1.44 | $ 1.56 | $ 1.63 | $ 1.76 | $ 1.98 | $ 2.45 | $ 1.80 | $10.44 |
| 1996 | $ 2.92 | $ 4.41 | $ 3.00 | $ 2.71 | $ 2.21 | $ 2.43 | $ 2.57 | $ 2.12 | $ 1.84 | $ 2.27 | $ 2.82 | $ 3.78 | $ 2.76 | $16.01 |
| 1997 | $ 3.47 | $ 2.55 | $ 1.88 | $ 2.00 | $ 2.19 | $ 2.21 | $ 2.17 | $ 2.40 | $ 2.80 | $ 3.03 | $ 3.23 | $ 2.37 | $ 2.57 | $14.91 |
| 1998 | $ 2.10 | $ 2.17 | $ 2.23 | $ 2.45 | $ 2.18 | $ 2.14 | $ 2.25 | $ 1.90 | $ 1.91 | $ 1.93 | $ 2.06 | $ 1.69 | $ 2.08 | $12.06 |
| 1999 | $ 1.87 | $ 1.78 | $ 1.78 | $ 2.07 | $ 2.27 | $ 2.30 | $ 2.23 | $ 2.74 | $ 2.63 | $ 2.63 | $ 2.54 | $ 2.35 | $ 2.25 | $13.05 |
| 2000 | $ 2.37 | $ 2.66 | $ 2.75 | $ 2.99 | $ 3.47 | $ 4.30 | $ 4.10 | $ 4.35 | $ 5.01 | $ 5.21 | | | $ 3.72 | $21.58 |

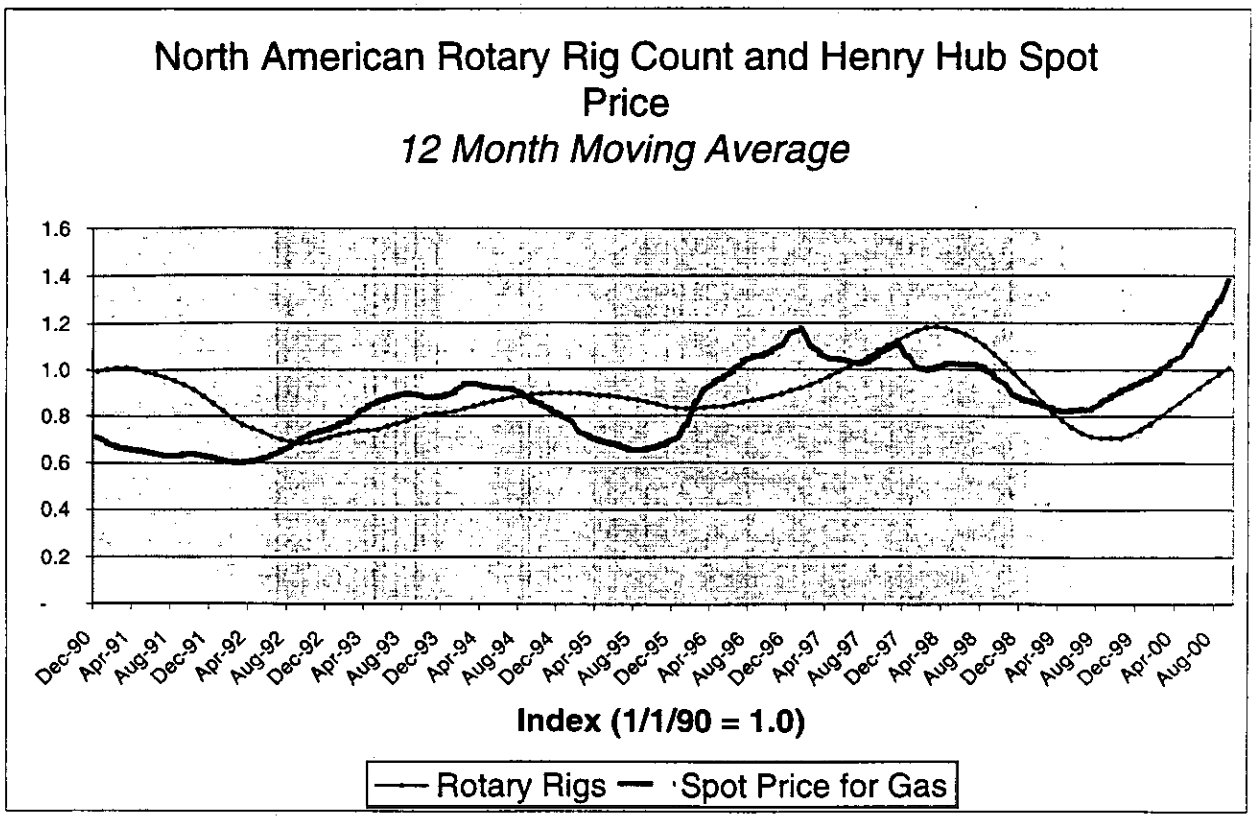
Note: oil-equivalent price is calculated for crude oil with 5.8 MMBtus per barrel.

Source: Natural Gas Week, October 23, 2000 and January 1, 1996.



**Schedule SMK -3**
**Rig Count and Gas Prices**






Sources: Natural Gas Week, October 23, 2000 and January 1, 1996; http://www.bakerhughes.com/investor/rig/excel/Worldwide1.XLS

**Schedule SMK-4**

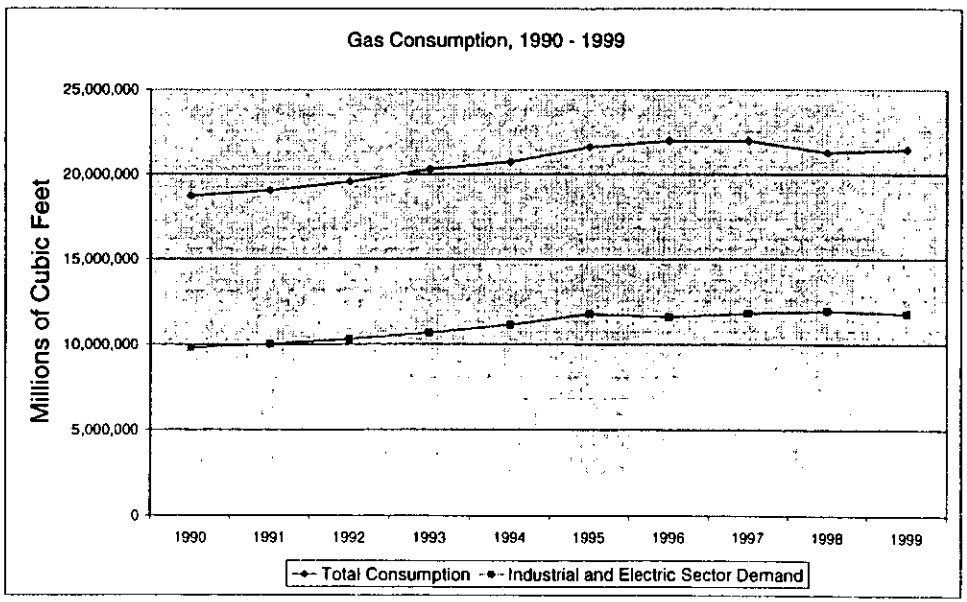


## Historical Gas Consumption in the US

| Sector | Units | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Natural Gas Consumed by the Residential Sector | MMcf | 4,391,324 | 4,555,659 | 4,690,065 | 4,956,445 | 4,847,701 | 4,850,318 | 5,241,413 | 4,983,772 | 4,520,276 | 4,670,481 |
| Natural Gas Consumed by the Commercial Sector | MMcf | 2,622,721 | 2,728,581 | 2,802,751 | 2,861,569 | 2,895,013 | 3,031,077 | 3,158,244 | 3,214,912 | 2,999,491 | 3,091,202 |
| Natural Gas Consumed by Industrial Facilities | MMcf | 7,018,414 | 7,230,962 | 7,526,898 | 7,981,433 | 8,167,033 | 8,579,585 | 8,870,422 | 8,832,450 | 8,686,147 | 8,672,215 |
| Natural Gas Consumed as Lease and Plant Fuel | MMcf | 1,236,392 | 1,129,268 | 1,170,821 | 1,171,940 | 1,123,720 | 1,220,168 | 1,249,662 | 1,203,179 | 1,157,498 | 1,231,519 |
| Natural Gas Consumed by the Industrial Sector -- Total | MMcf | 8,254,806 | 8,360,230 | 8,697,719 | 9,153,373 | 9,290,753 | 9,799,753 | 10,120,084 | 10,035,629 | 9,843,645 | 9,903,734 |
| Natural Gas Consumed as Pipeline Fuel | MMcf | 659,816 | 601,305 | 587,710 | 624,308 | 685,362 | 700,335 | 711,446 | 751,470 | 635,477 | 641,260 |
| Natural Gas Consumed as Vehicle Fuel | MMcf | 270 | 367 | 511 | 960 | | 2,674 | 2,932 | 4,424 | 5,079 | |
| Natural Gas Consumed by the Transportation Sector | MMcf | 660,086 | 601,672 | 588,221 | 625,268 | 687,103 | 703,009 | 714,378 | 755,894 | 640,556 | 641,260 |
| Natural Gas Consumed by Electric Utilities | MMcf | 2,787,332 | 2,789,014 | 2,765,608 | 2,682,440 | 2,987,146 | 3,196,507 | 2,732,107 | 2,968,453 | 3,258,054 | 3,125,417 |
| Total Natural Gas Consumption | MMcf | 18,716,269 | 19,035,156 | 19,544,364 | 20,279,095 | 20,707,716 | 21,580,664 | 21,966,226 | 21,958,660 | 21,262,022 | 21,432,094 |
| Total Consumption by Electric Utilities and Industrial Facilities | | 9,805,746 | 10,019,976 | 10,292,506 | 10,663,873 | 11,154,179 | 11,776,092 | 11,602,529 | 11,800,903 | 11,944,201 | 11,797,632 |

Note: blank signfies data is not available

Source: http://www.eia.doe.gov/pub/energy.overview/aer1999/excel/aer0605.xls



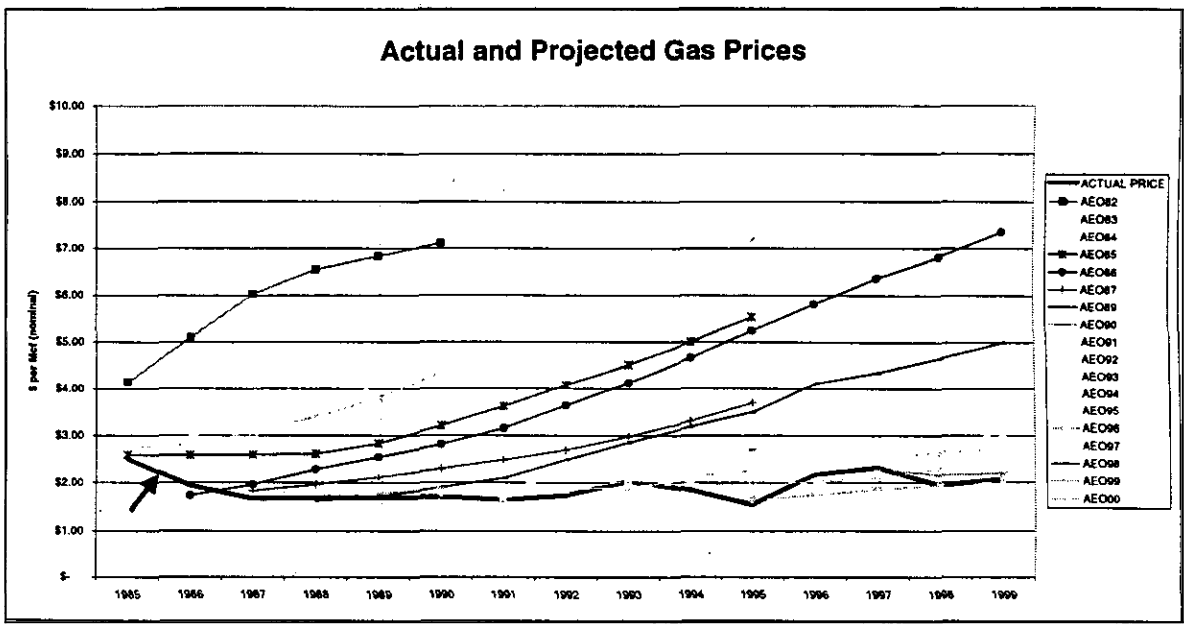
## Exhibit SMK-5

### EIA Forecasts of Wellhead Natual Gas Prices Vs. Actual Price

(nominal dollars per mcf)

| | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AEO82 | 4.15 | 5.10 | 6.02 | 6.55 | 6.83 | 7.11 | | | | | | | | | |
| AEO83 | 2.87 | 2.98 | 3.25 | 3.60 | 4.10 | 4.64 | | | | | 9.31 | | | | |
| AEO84 | 2.76 | 2.82 | 3.07 | 3.39 | 3.81 | 4.34 | | | | | 7.15 | | | | |
| AEO85 | 2.60 | 2.59 | 2.61 | 2.62 | 2.84 | 3.20 | 3.62 | 4.07 | 4.51 | 5.00 | 5.53 | | | | |
| AEO86 | | 1.73 | 1.96 | 2.29 | 2.55 | 2.82 | 3.14 | 3.64 | 4.12 | 4.66 | 5.24 | 5.81 | 6.36 | 6.81 | 7.35 |
| AEO87 | | | 1.83 | 1.96 | 2.12 | 2.30 | 2.49 | 2.70 | 2.98 | 3.29 | 3.69 | | | | |
| AEO89 | | | | 1.62 | 1.71 | 1.90 | 2.10 | 2.49 | 2.86 | 3.18 | 3.49 | 4.10 | 4.35 | 4.65 | 4.99 |
| AEO90 | | | | | 1.78 | 1.89 | | | | | 2.70 | | | | |
| AEO91 | | | | | | 1.77 | 1.91 | 2.12 | 2.29 | 2.38 | 2.43 | 2.48 | 2.56 | 2.65 | 2.92 |
| AEO92 | | | | | | | 1.69 | 1.86 | 2.04 | 2.14 | 2.32 | 2.43 | 2.61 | 2.79 | 3.07 |
| AEO93 | | | | | | | | 1.85 | 1.92 | 2.06 | 2.25 | 2.35 | 2.47 | 2.63 | 2.82 |
| AEO94 | | | | | | | | | 1.99 | 2.13 | 2.27 | 2.40 | 2.56 | 2.65 | 2.73 |
| AEO95 | | | | | | | | | | 1.90 | 1.99 | 1.93 | 2.03 | 2.09 | 2.29 |
| AEO96 | | | | | | | | | | | 1.64 | 1.74 | 1.85 | 1.95 | 2.03 |
| AEO97 | | | | | | | | | | | | 2.02 | 1.81 | 1.86 | 1.92 |
| AEO98 | | | | | | | | | | | | | 2.29 | 2.16 | 2.20 |
| AEO99 | | | | | | | | | | | | | | 1.98 | 2.14 |
| AEO00 | | | | | | | | | | | | | | | 2.15 |
| ***Actual Value*** | ***2.51*** | ***1.94*** | ***1.67*** | ***1.69*** | ***1.69*** | ***1.71*** | ***1.64*** | ***1.74*** | ***2.04*** | ***1.85*** | ***1.55*** | ***2.17*** | ***2.32*** | ***1.94*** | ***2.07*** |

Forecasts



**Schedule SMK-6**
**Henry HUB Cash Price and EDE Supply Price**
**Page 1 of 1**

## Prices

| | Henry Hub $ per MMBtu | EDE $ per MMBtu | 12 Month Trailing Averages Henry Hub $ per MMBtu | EDE $ per MMBtu |
|---|---|---|---|---|
| 1/1/96 | $2.92 | $2.54 | | |
| 2/1/96 | $4.41 | $2.25 | | |
| 3/1/96 | $3.00 | $2.52 | | |
| 4/1/96 | $2.71 | $2.45 | | |
| 5/1/96 | $2.21 | $2.24 | | |
| 6/1/96 | $2.43 | $2.30 | | |
| 7/1/96 | $2.57 | $2.36 | | |
| 8/1/96 | $2.12 | $2.30 | | |
| 9/1/96 | $1.84 | $1.81 | | |
| 10/1/96 | $2.27 | $1.85 | | |
| 11/1/96 | $2.82 | $2.82 | | |
| 12/1/96 | $3.78 | $4.60 | $2.76 | $2.50 |
| 1/1/97 | $3.47 | $4.75 | $2.80 | $2.69 |
| 2/1/97 | $2.55 | $3.44 | $2.65 | $2.79 |
| 3/1/97 | $1.88 | $1.86 | $2.55 | $2.73 |
| 4/1/97 | $2.00 | $1.96 | $2.50 | $2.69 |
| 5/1/97 | $2.19 | $2.02 | $2.49 | $2.67 |
| 6/1/97 | $2.21 | $2.05 | $2.48 | $2.65 |
| 7/1/97 | $2.17 | $2.08 | $2.44 | $2.63 |
| 8/1/97 | $2.40 | $1.97 | $2.47 | $2.60 |
| 9/1/97 | $2.80 | $2.64 | $2.55 | $2.67 |
| 10/1/97 | $3.03 | $2.93 | $2.61 | $2.76 |
| 11/1/97 | $3.23 | $3.02 | $2.64 | $2.78 |
| 12/1/97 | $2.37 | $3.15 | $2.53 | $2.66 |
| 1/1/98 | $2.10 | $3.07 | $2.41 | $2.52 |
| 2/1/98 | $2.17 | $2.17 | $2.38 | $2.41 |
| 3/1/98 | $2.23 | $2.29 | $2.41 | $2.45 |
| 4/1/98 | $2.45 | $2.18 | $2.45 | $2.46 |
| 5/1/98 | $2.18 | $2.12 | $2.45 | $2.47 |
| 6/1/98 | $2.14 | $2.24 | $2.44 | $2.49 |
| 7/1/98 | $2.25 | $2.13 | $2.45 | $2.49 |
| 8/1/98 | $1.90 | $2.04 | $2.40 | $2.50 |
| 9/1/98 | $1.91 | $2.06 | $2.33 | $2.45 |
| 10/1/98 | $1.93 | $1.79 | $2.24 | $2.36 |
| 11/1/98 | $2.06 | $2.23 | $2.14 | $2.29 |
| 12/1/98 | $1.69 | $2.18 | $2.08 | $2.21 |
| 1/1/99 | $1.87 | $2.46 | $2.07 | $2.16 |
| 2/1/99 | $1.78 | $2.20 | $2.03 | $2.16 |
| 3/1/99 | $1.78 | $1.78 | $2.00 | $2.12 |
| 4/1/99 | $2.07 | $2.08 | $1.96 | $2.11 |
| 5/1/99 | $2.27 | $2.01 | $1.97 | $2.10 |
| 6/1/99 | $2.30 | $2.12 | $1.98 | $2.09 |
| 7/1/99 | $2.23 | $2.20 | $1.98 | $2.10 |
| 8/1/99 | $2.74 | $2.05 | $2.05 | $2.10 |
| 9/1/99 | $2.63 | $2.28 | $2.11 | $2.12 |
| 10/1/99 | $2.63 | $2.70 | $2.17 | $2.19 |
| 11/1/99 | $2.54 | $2.57 | $2.21 | $2.22 |
| 12/1/99 | $2.35 | $2.34 | $2.27 | $2.23 |
| 1/1/00 | $2.37 | $2.46 | $2.31 | $2.23 |
| 2/1/00 | $2.66 | $2.53 | $2.38 | $2.26 |
| 3/1/00 | $2.75 | $2.83 | $2.46 | $2.35 |
| 4/1/00 | $2.99 | $2.90 | $2.54 | $2.42 |
| 5/1/00 | $3.47 | $2.07 | $2.64 | $2.42 |
| 6/1/00 | $4.30 | $2.01 | $2.81 | $2.41 |
| 7/1/00 | $4.10 | $2.41 | $2.96 | $2.43 |
| 8/1/00 | $4.35 | $3.01 | $3.10 | $2.51 |
| Arithmetic Average: | $2.55 | $2.42 | | |

## Price Differences

**Henry Hub Price - EDE Price**

| | Difference |
|---|---|
| 1/1/96 | $0.38 |
| 2/1/96 | $2.16 |
| 3/1/96 | $0.48 |
| 4/1/96 | $0.26 |
| 5/1/96 | ($0.03) |
| 6/1/96 | $0.13 |
| 7/1/96 | $0.21 |
| 8/1/96 | ($0.18) |
| 9/1/96 | $0.03 |
| 10/1/96 | $0.42 |
| 11/1/96 | $0.00 |
| 12/1/96 | ($0.82) |
| 1/1/97 | ($1.28) |
| 2/1/97 | ($0.89) |
| 3/1/97 | $0.02 |
| 4/1/97 | $0.04 |
| 5/1/97 | $0.17 |
| 6/1/97 | $0.16 |
| 7/1/97 | $0.09 |
| 8/1/97 | $0.43 |
| 9/1/97 | $0.16 |
| 10/1/97 | $0.10 |
| 11/1/97 | $0.21 |
| 12/1/97 | ($0.78) |
| 1/1/98 | ($0.97) |
| 2/1/98 | $0.00 |
| 3/1/98 | ($0.06) |
| 4/1/98 | $0.27 |
| 5/1/98 | $0.06 |
| 6/1/98 | ($0.10) |
| 7/1/98 | $0.12 |
| 8/1/98 | ($0.14) |
| 9/1/98 | ($0.15) |
| 10/1/98 | $0.14 |
| 11/1/98 | ($0.17) |
| 12/1/98 | ($0.49) |
| 1/1/99 | ($0.59) |
| 2/1/99 | ($0.42) |
| 3/1/99 | $0.00 |
| 4/1/99 | ($0.01) |
| 5/1/99 | $0.26 |
| 6/1/99 | $0.18 |
| 7/1/99 | $0.03 |
| 8/1/99 | $0.69 |
| 9/1/99 | $0.35 |
| 10/1/99 | ($0.07) |
| 11/1/99 | ($0.03) |
| 12/1/99 | $0.01 |
| 1/1/00 | ($0.09) |
| 2/1/00 | $0.13 |
| 3/1/00 | ($0.08) |
| 4/1/00 | $0.09 |
| 5/1/00 | $1.40 |
| 6/1/00 | $2.29 |
| 7/1/00 | $1.69 |
| 8/1/00 | $1.34 |

## Frequency Distribution of Price Differences

| *Range* | | | *Frequency* | *Cumulative %* |
|---|---|---|---|---|
| -$0.25 | and lower | | 8 | 14.3% |
| -$0.20 | to | -$0.25 | 0 | 14.3% |
| -$0.15 | to | -$0.20 | 3 | 19.6% |
| -$0.10 | to | -$0.15 | 2 | 23.2% |
| -$0.05 | to | -$0.10 | 4 | 30.4% |
| $0.00 | to | -$0.05 | 6 | 41.1% |
| $0.00 | to | $0.05 | 5 | 50.0% |
| $0.05 | to | $0.10 | 4 | 57.1% |
| $0.10 | to | $0.15 | 4 | 64.3% |
| $0.15 | to | $0.20 | 4 | 71.4% |
| $0.20 | to | $0.25 | 2 | 75.0% |
| $0.25 | and higher | | 14 | 100.0% |
| Total Count | | | 56 | |

Source: Natural Gas Week (October 23, 2000 and January 1, 1996); data supplied by EDE.