

**En Banc Second Public Hearing on
“Current and Future Wholesale Electricity Markets”**

**before the
Pennsylvania Public Utility Commission**

**Testimony of
Kenneth Rose, Ph.D.
Independent Consultant**

**Harrisburg, Pennsylvania
November 6, 2008**

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Thank you for the opportunity to speak to you today. By way of introducing myself, let me summarize by saying that I am an independent consultant and also work with the Institute of Public Utilities at Michigan State University on their various educational programs for state regulatory and other public and private sector employees in the U.S. and abroad. Previously, I worked at the Ohio State University's National Regulatory Research Institute from 1989 to 2002, which was funded mostly by public utility commissions across the country, including Pennsylvania. In the last couple of years I have testified on the issue of electric industry restructuring before legislative or regulatory bodies in Arizona, Connecticut, Illinois, Michigan, Ohio, and Virginia. I am not currently working with any public or private organization in the state of Pennsylvania and I am not being compensated for my time here by anyone in or outside the state. The views and opinions I provide here are my own.

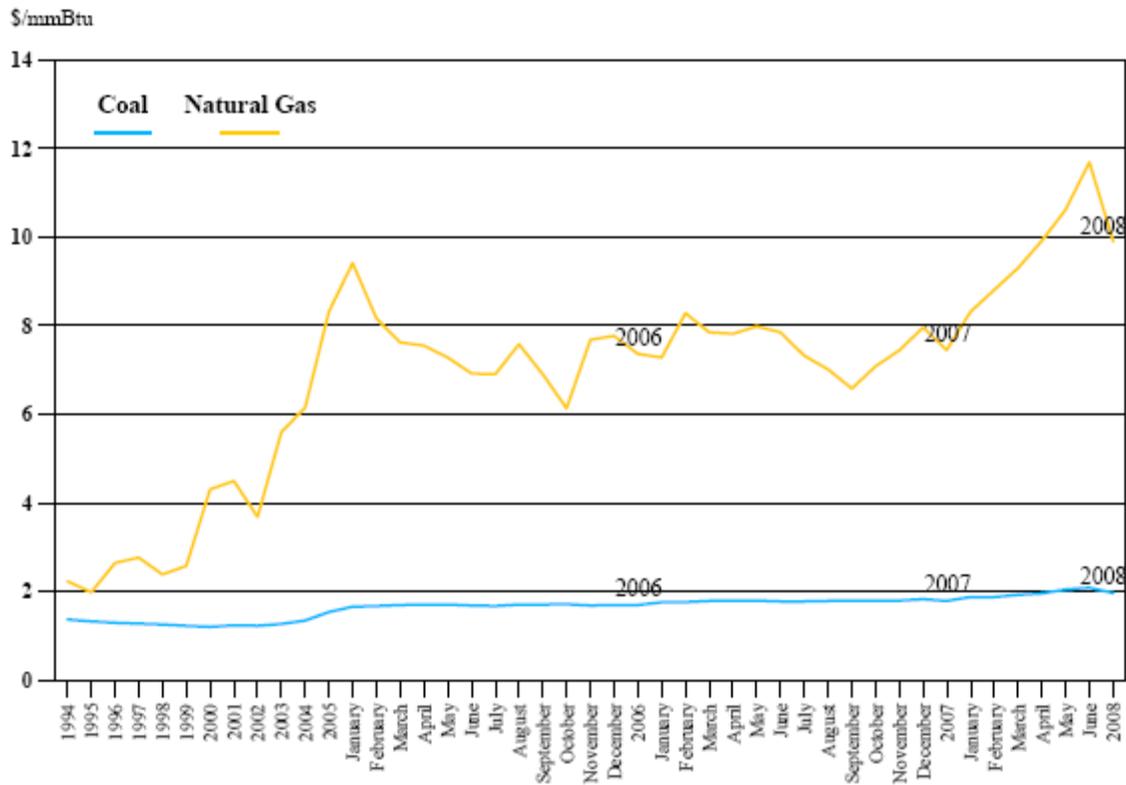
I will address three main topics at this time: 1) the fuel cost/electricity price connection, 2) the need for real market analysis, and 3) how retail customers are affected by the way wholesale markets have developed.

The Fuel Cost/Electricity Price Connection

Much has been made of the impact of fuel costs on electricity prices. There is little doubt that there is a connection, however, a few points should be kept in mind about this relationship. First, natural gas has had a disproportionate impact on the price of electricity in RTO energy markets – that is, disproportionate to the amount of natural gas that is actually used to generate power in the region. To see this, Figure 1 first shows the average cost of coal and natural gas for U.S. electric utilities. Natural gas prices have increased considerably, from \$2.6/mmBtu in 1999 to about \$10/mmBtu in

the middle of this year.¹ Coal costs have also increased, but at a relatively more modest pace, increasing from \$1.2/mmBtu in 1999 to about \$2/mmBtu for the same time period. When the load-weighted average annual LMP is added, as shown in Figure 2, it is clear that the average LMPs are closely correlated with the cost of natural gas. The PJM average LMPs have increased almost 127 percent from 1999 to the 2008 price through September. During that time, natural gas costs have increased 285 percent, while coal has increased by almost 61 percent.

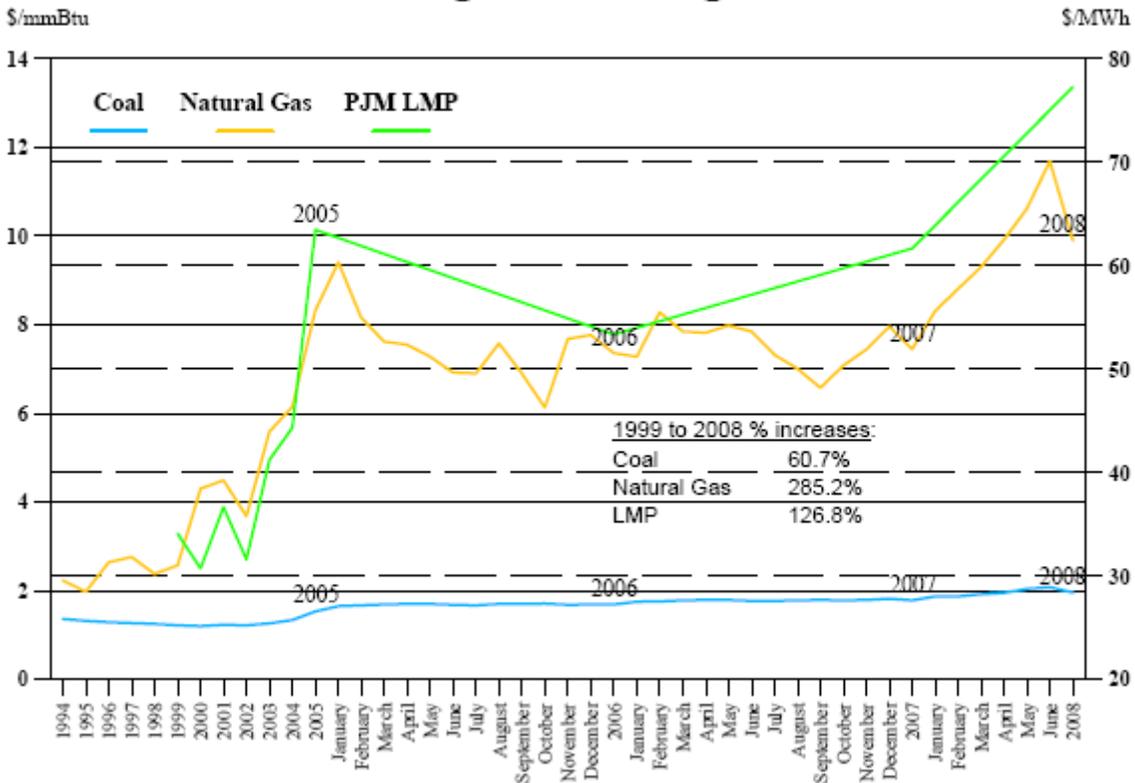
Figure 1. Average cost of coal and natural gas for U.S. electric utilities.



Source: EIA, Receipts, Average Cost and Quality of Fossil Fuels: Electric Utilities, 1994 through June 2008.

¹The data is through June 2008, the most recent month data was available when preparing this testimony. Happily for consumers, natural gas prices have been decreasing since late summer, but this trend is not yet reflected in the EIA utility fuel cost data.

Figure 2. Average cost of coal, natural gas, and PJM load-weighted average LMPs.



Sources: EIA, Receipts, Average Cost and Quality of Fossil Fuels: Electric Utilities, 1994 through June 2008. The PJM LMPs are the annual real-time, load-weighted average through September 2008; from testimony of Joseph E. Bowring on Oct. 23, 2008.

While natural gas cost does appear to be correlated to the electricity energy prices, natural gas only accounted for 7.7 percent of the generation in PJM during 2007. Coal and nuclear sources accounted for almost 90 percent of the generation. This proportion of the fuels used to generate electricity has been about the same for several years. The typical explanation for this disproportionate impact of natural gas on wholesale power prices is that natural gas is often the marginal fuel. In PJM, as in several other RTOs, the price for the units selected for dispatch is set by the highest offer price from a dispatched unit, or the marginal unit. During peak hours relatively more expensive units are used to meet demand and often these units use natural gas. As a result, the wholesale price can climb quickly and to hundreds of dollars per MWh when these units are dispatched.

However, while natural gas may be on the margin often and during peak times, it is not the fuel that is most often on the margin during the year in PJM – coal is on the margin for more hours. For total hours during the year in 2007, coal was the marginal fuel 70 percent of the hours, while natural gas was for 24 percent, and a mix of several different energy sources was used for the remaining 6 percent. Again, as with percent of generation, natural gas appears to have a disproportionate impact on the price of electricity.²

The point I would like to make here is that care must be taken when drawing conclusions based on lines on a graph. Figure 3 shows a data series that also appears to be related to the average LMPs. The trend lines move mostly in the same direction and roughly in tandem. One might conclude from this that these data are correlated and may have some causality relationship, that is until it is noticed that what is being compared are PJM's average LMPs to the manufacturing hourly compensation index of Sweden. I think it is safe to say that these data series are most likely not directly related.

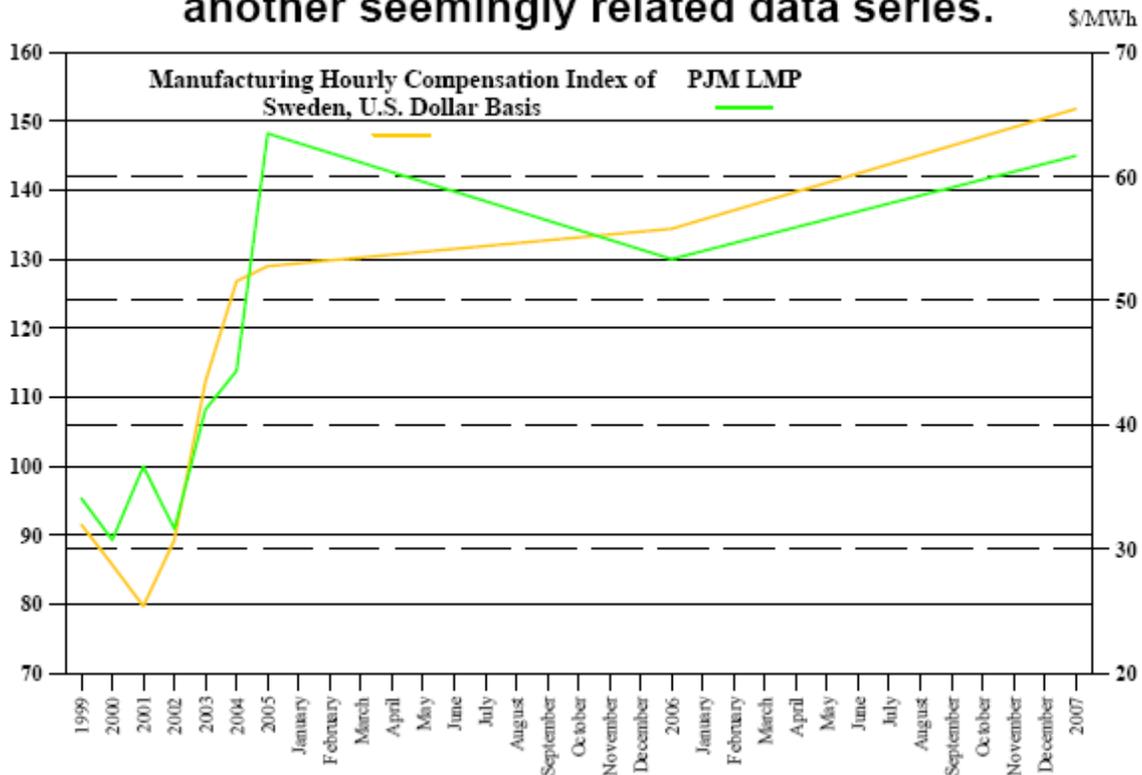
This is *not* to say that there is no relationship between fuel costs and electricity energy prices, of course there is – but conclusions cannot be drawn about the competitiveness or performance of the market based solely on the assertion that the price variation is due to fuel costs. I am in complete agreement with Joe Bowring, when he states that, “Given higher fuel prices, higher electricity prices do not mean that there is something wrong with the wholesale power market.” This is true, you cannot draw conclusions based solely on the fact that prices have gone up, or down for that matter. He continues, “In a perfectly competitive market, changes in input prices will change the

²A more detailed examination shows that fuel cost price changes do not always precisely match the movement of electricity prices on a shorter time scale (for example, month-to-month). Also, customer load is a significant factor in influencing electricity prices. This is discussed in more detail in a paper I prepared for the American Public Power Association (APPA): “The Impact of Fuel Costs on Electric Power Prices,” June 2007. Posted at:

<http://www.appanet.org/files/PDFs/ImpactofFuelCostsonElectricPowerPrices.pdf>

price of the final product.”³ This is true as well, however, it is also true that with monopoly or oligopoly, changes in input prices will change the price of the final product. Simply put, electricity price changes and its correlation with fuel costs is not a substitute for careful analysis of market performance.

Figure 3. PJM load-weighted average LMPs and another seemingly related data series.



Sources: EIA, Receipts, Average Cost and Quality of Fossil Fuels: Electric Utilities, 1994 through June 2008; PJM LMPs are the annual real-time, load-weighted average through September 2008, from testimony of Joseph E. Bowring on Oct. 23, 2008; and the Manufacturing Hourly Compensation Index of Sweden, U.S. Dollar Basis is from the Bureau of Labor Statistics.

Where I fundamentally disagree is with Joe Bowring is on his conclusion stated in his testimony that, “all market participants need to be assured that markets are competitive and that higher prices are not the result of the exercise of market power. This includes energy markets, capacity markets and ancillary services markets.” This is

³Testimony of Joseph E. Bowring, Public Hearing on the Current and Future Wholesale Electricity Markets, Pennsylvania Public Utility Commission, October 23, 2008, p. 11.

a claim that is not supported by his or anyone else's analysis. This leads to the second point I would like to make here today.

The need for real market analysis

All RTOs that have been approved by FERC have a market monitoring function. Most of these monitors use concentration measures such as the Herfindahl-Hirschman Index (HHI) and pivotal supplier indices. These measures are useful tools to characterize market structure. However, it should be kept in mind that these measures are screening tools to decide if further investigation is necessary -- they do not provide a definitive answer on the exercise of market power or of market performance. Over reliance on these types of measures can lead to incorrect or misleading conclusions of market performance.

To Joe Bowring's credit, his analysis goes further than most RTO market monitors. In addition to concentration measures he also uses a markup (or Lerner index) that estimates the markup of price over marginal cost, as a percentage of price. The usefulness of this measure depends critically on the scope of the analysis (for example, the products and the geographic area that are selected), the time period used, and how the marginal cost is estimated. Simply put, if the measure is too broad or aggregated, the results will be of little or no value. Also, the quality of the data will obviously affect the results. But the estimation of the marginal cost presents the biggest challenge for the market analyst. As the "independent market monitor" for PJM, Joe Bowring has chosen to estimate the marginal cost based on the "opportunity cost" of the suppliers. This method, in my view, overstates the actual marginal cost. The result is that the markup index then understates the amount of market power being exercised by suppliers – and causes one to reach the wrong conclusion on the competitiveness of the markets.

While PJM has a considerable amount of price and demand data available to the public, they do not release the data that would be required to conduct an estimate of this markup for an independent verification or other detailed analysis of the markets. FERC also has access to this data, but has not and does not conduct any analysis in

sufficient level of detail. These data should also be made available to the states to conduct their own analysis. While state commissions and others have tried to obtain this information, with the promise of not releasing the results in a form that may reveal the identity of individual suppliers, to my knowledge this data has never been provided.

To be clear, the responsibility to require this information be released to the states lies with FERC, not PJM. It should then be up to FERC and the states to see that independent analysis is conducted.

How retail customers in Pennsylvania are affected by the way wholesale markets have developed

The benefits from an RTO structure result from two main factors: first, the economies of scale from operating a larger transmission system over a larger geographic area, and second, the economic dispatch of a larger number and diverse set of generation resources over a larger region. These are cost savings from combining individual utility systems into a larger whole -- or synergistic benefits.⁴ However, various policy decisions in recent years then subdivided (or unbundled) electricity into energy, capacity, ancillary services, FTRs, etc., where it is expected that competition will develop for each of these component parts, and create market "savings." Providing these parts separately results in higher costs than when one company supplied them all together – creating an anti-synergy or "antergy" impact (or the opposite of synergy or negative synergy) on the system. This offsets the benefits from the larger regional transmission network. This problem exists even if there was no market power being exercised by suppliers – market power just makes it worse for customers by adding even higher costs.

The current complex RTO market structure that has evolved so far was not designed by anyone or any agency of the federal or state government. The current RTO apparatus was also not the result of competitive market forces. It *is* the result to

⁴It is possible to become too large of an area, where the increase in size of the system's region leads to higher average system costs per unit of output, or diseconomies of scale.

date of the accumulated FERC rulemaking and individual RTO decisions.⁵ These decisions were reached by FERC forming opinions based on the comments of market participants and guided by an overarching desire to create "competitive" markets – based mostly on hope that they will develop, not on sound economic principles or experience. What has evolved as a result of these actions are engineered markets, similar to the financial engineering we have seen on Wall Street (and we have found out how well that has worked out).

This added complexity raises costs for market participants and reduces transparency. Complexity is not the problem per se, we can deal with that, but it adds costs for participants and in many cases is unnecessary and counterproductive.

What does this mean for retail customers in Pennsylvania? This sum-of-the-parts-is-greater-than-the-whole phenomenon can be seen in the prices for "full-requirements" customers, that is, power for resale to retail customers, as seen in states with auctions or competitive bidding. In addition to energy (or generation) cost, there are congestion charges from transmission congestion or the cost of hedging to avoid the charge, capacity costs, ancillary service requirements (regulation, spinning reserve, etc.), transmission charges and other RTO administrative charges, and costs incurred by suppliers because of the risk they face, such as the loss of customers or from a change in demand. While many of these costs were expected when retail access began, the magnitude of the costs and the additional unexpected costs have contributed to the higher-than-expected costs of retail access.

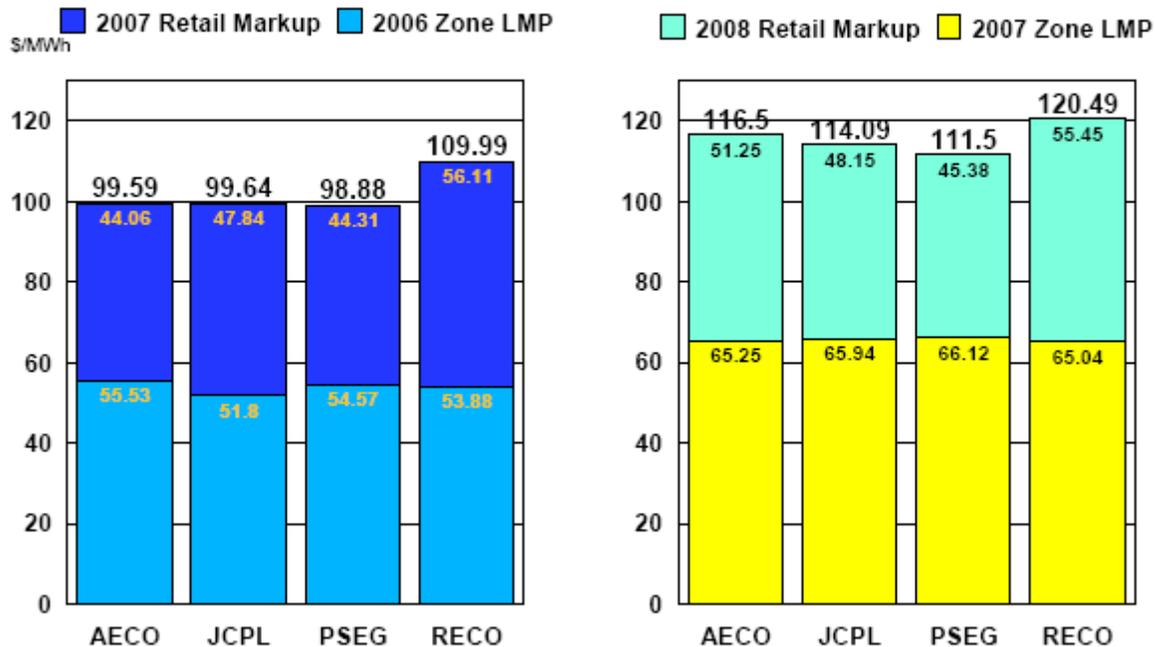
⁵How we created this problem is another story. Briefly, this complex structure resulted from chasing the symptoms that resulted from past policy choices that did not work out as hoped. This created a cycle of "fixes" that appear to be reasonable when addressing a particular problem, but resulted in different problems that then needed attention, and so on. The result is that we have ended up with the worst of both worlds, that is, a system that has the efficiency of regulation and with the stability of markets. The opposite of what we were aiming for back in the early 1990s when this undertaking began.

As an example, Figure 4 uses the results from the New Jersey “Basic Generation Service” (BGS) fixed-price auctions in 2007 and 2008. The auction price is for generation service only, and does not include distribution and other charges that are part of the total retail rate customers pay. The bars in the two panels are divided into two parts, the bottom of the bars are the average annual LMPs for the four zones in the state. The top of the bars show the difference between the final auction price (shown in bold above the bars) and the zonal LMPs, or the “retail markup” value. Assuming that the LMPs represent the cost to suppliers to obtain energy to resell to retail customers, this markup provides an indication of all the non-energy costs suppliers are recovering in the total generation price. The left panel shows the 2006 zonal LMPs and the 2007 auction results and the right panel shows the 2007 zonal LMPs and the 2008 auction results.⁶

The LMP or energy portion ranges from 49 percent to 59 percent of the total auction price. This means that 41 percent to 51 percent of the auction price is the non-energy components listed above. We cannot make this markup go down to zero, of course. But we can stop increasing it with more layers of costs and risks, and decrease it by eliminating unnecessary layers.

⁶The auctions are held early in the year, so the previous year's LMPs are used for the comparison. These are approximations since the actual expected energy costs are not known and may be different from these LMPs due to changing market conditions.

Figure 4. Zonal LMP, NJ retail generation prices, and retail markup.



Data Source: PJM Market Monitor and New Jersey Board of Public Utilities.

Conclusion

I have identified three important issues for Pennsylvania related to wholesale electricity markets. First, care needs to be given when considering the impact of fuel costs on electricity prices. Natural gas costs and electricity prices are correlated, but this correlation says nothing about the performance of PJM’s energy market. Which leads to the second issue, the way to determine the market’s performance is through more detailed and independent analysis – something we do not have at this time. FERC can and should require the necessary data to be made available to the states and allow them to conduct their own independent analysis. I recommend that Pennsylvania seek the cooperation of FERC in requiring that the necessary information be provided by the RTOs to you and other states. Finally, we have a complex

wholesale structure that no one asked for or designed. This has resulted from a practice of, when obstacles are met, to find solutions that typically provide more “incentives” or create another market apparatus. We need to break that cycle and get back to the basics of providing safe and reliable power at reasonable prices to customers and with a better balance between markets and regulation.

Brief Biography of Kenneth Rose, Ph.D.

Kenneth Rose is an independent consultant and a Senior Fellow at the Institute of Public Utilities at Michigan State University. Dr. Rose is a nationally recognized expert with more than twenty years of research experience in the structure, economics, and regulation of U.S. electricity markets. Dr. Rose's areas of expertise include electricity wholesale and retail market restructuring, market power, and market monitoring. Other research topics have included competitive bidding for power supply, regulatory treatment of uneconomic costs, Clean Air Act implementation, environmental externalities associated with electricity production, and other issues associated with the electricity industry and its regulation. Dr. Rose has directed or contributed to many reports, papers, articles, and books and has testified or presented at many legislative and public utility commission hearings, proceedings, conferences, and workshops. Dr. Rose previously was a Senior Institute Economist at The National Regulatory Research Institute at Ohio State University from 1989 to 2002 and also a lecturer for the School of Public Policy and Management at OSU. Prior to NRRI, Dr. Rose worked on many energy related issues at Argonne National Laboratory from 1984 to 1989. Dr. Rose received his B.S. (1981), M.A. (1983), and Ph.D. (1988) in Economics from the University of Illinois at Chicago.