Exhibit No.:	
Issue:	Planning Prudence and Rates
Witness:	Bruce Biewald
Type of Exhibit:	Direct Testimony
Sponsoring Party:	Sierra Club
Case No,:	ER-2012-0174
Date Testimony Prepared:	August 2, 2012

MISSOURI PUBLIC SERVICE COMMISSION

CASE NO.: ER-2012-0174

Direct Testimony of Bruce E. Biewald

On Behalf of
Sierra Club

August 2, 2012

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Kansas City Power & Light Company's Request for Authority to Implement a General Rate Increase for Electric Service	))))	File No. ER-2012-0174

County of Middlesex)
) ss
Commonwealth of Massachusetts)

AFFIDAVIT OF BRUCE E. BIEWALD

Bruce E. Biewald, of lawful age, on his oath states: that he has participated in the preparation of this direct testimony in question and answer form consisting of 18 pages to be given as Direct Testimony in the above-named case; that the answers were given by him and that he has knowledge of the matters set forth in such answers; and that such matters are true to the best of his knowledge and belief.

Bruce E. Biewald

In witness whereof I have hereunto subscribed my name and affixed my official seal this 2nd day of August, 2012.

MELISSA SCHULTZ
Notary Public
Commonwealth of Massachusetts
My Commission Expires
July 27, 2018

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1. INTRODUCTION

Q. Please state your name and occupation.

A. My name is Bruce Edward Biewald. I am the founder and Chief Executive Officer of Synapse Energy Economics, 485 Massachusetts Avenue, Cambridge, MA 02139.

Q. Please describe Synapse Energy Economics.

A. Synapse Energy Economics ("Synapse") is a research and consulting firm, founded in 1996, which specializes in energy, economic, and environmental issues. Its primary focus is on electricity resource planning and regulation, including computer modeling, service reliability, resource portfolios, financial and economic risks, transmission planning, renewable energy portfolio standards, energy efficiency, and ratemaking. Synapse works for a wide range of clients, including attorneys general, offices of consumer advocates, public utility commissions, environmental organizations, the U.S. Environmental Protection Agency, Department of Justice, National Association of Regulatory Utility Commissioners, and others.

2. BACKGROUND

Q. Please summarize your educational background.

A. I have a Bachelor of Science degree from the Massachusetts Institute of Technology, where I studied Architecture, Building Technology, and Energy Use in Buildings.

Q. Please summarize your work experience.

A. I have more than 30 years of experience consulting on issues of energy economics and electric industry regulation. I have testified in more than 100 utility regulatory proceedings in 26 states and two Canadian provinces, in cases before State and Federal Courts, and in proceedings of the Federal Energy Regulatory Commission and the Nuclear Regulatory Commission's Atomic Safety and Licensing Board.

I have co-authored more than 100 reports, including studies for the Electric Power Research Institute, the U.S. Department of Energy, the U.S. Department of Justice, the

U.S. Environmental Protection Agency, the Office of Technology Assessment, the New England Governors' Conference, the New England Conference of Public Utility Commissioners, the Northeast States for Coordinated Air Use Management, the National Association of Regulatory Utility Commissioners, the National Commission in Energy Policy, the Ozone Transport Commission, the PJM Interconnection, and the United Nations Framework Convention on Climate Change.

My papers have been published in the *Electricity Journal*, the *Energy Journal*, *Energy Policy*, *Public Utilities Fortnightly*, and numerous conference proceedings.

As CEO of Synapse, I oversee a professional staff of 27 engineers, scientists, policy experts, and economists, conducting many dozens of consulting assignments each year.

Prior to founding Synapse, I was employed for 15 years at Energy Systems Research Group, which later became the Tellus Institute. For the latter eight years of my employment at Tellus, I was responsible for managing the firm's electricity program, which included research and consulting on all aspects of electric system planning, regulation, and restructuring.

My resume includes a listing of past testimony, reports, papers, and presentations, and is attached to this testimony as Schedule BEB-1.

Q. On whose behalf are you testifying in this case?

A. I am testifying on behalf of Sierra Club.

Q. Have you testified previously before the Missouri Public Service Commission (Missouri Commission)?

A. No, I have not.

3. PURPOSE OF TESTIMONY

Q. What is the purpose of your testimony?

A. I was retained by the Sierra Club to review and comment on the aspects of KCP&L's rate case filing that relate to KCP&L's existing coal-fired power plants.

4. SUMMARY CONCLUSIONS AND RECOMMENDATIONS

Q. Please summarize your key conclusions.

A. My main conclusions are as follows:

KCP&L mentions investments at La Cygne estimated at $1.23 billion (Direct Testimony of Burton Crawford, page 19, line 23) and at Montrose (page 20, lines 3 to 18).

KCP&L has an obligation to conduct prudent planning with regard to its investments, and that obligation is ongoing during the construction period.

For several reasons, it appears that the investment in La Cygne may be imprudent. KCP&L's own modeling showed the economic implications of the retire/retrofit decision to be highly sensitive to gas price forecasts, and KCP&L is projecting reduced load going forward, potentially making investments in La Cygne unnecessary. These factors, independently and collectively, may render an investment in retrofitting La Cygne uneconomic.

Many currently operating coal-fired power plants will soon be retired. To date, owners have announced the scheduled retirement by 2018 of nearly 200 units representing over 31,000 megawatts (MW) of capacity.

KCP&L has been updating the Kansas Corporation Commission (KCC) regarding the La Cygne retrofit project in a formal proceeding and the Missouri Commission Staff in at least two informal meetings, but there has been no formal transparent process in Missouri in which KCP&L has demonstrated, or even attempted to demonstrate, that it is conducting prudent planning with regard to its large retrofit investment in La Cygne and Montrose. The Company witnesses in this case provide some description of the projects,[1] but I have seen no information indicating that the Company is considering the planning decision of whether or not to proceed with the retrofit projects in light of changing market circumstances.

[1] Environmental retrofit plans are mentioned in the direct testimony of KCP&L witnesses Burton Crawford (pages 19 and 20) and Terry Bassham (page 11, line 17 to page 14, line 14) in this rate case.

The KCP&L IRP process in Missouri (Case No. EO-2012-0323) is one place in which the economic merits of coal plant retrofit decisions could and should be examined. However, the timeline for that IRP, with a Commission order due in 2013, is not adequate to verify efficient and prudent decision-making for retrofit projects that are now underway.

Like investments in La Cygne, investments in the Montrose coal-fired power plant warrant scrutiny. The economics of the Montrose units are poor, and any incremental investment in Montrose should be examined very carefully in order to determine that such investments are prudent, both in terms of construction and planning decisions.

Q. What are your recommendations?

A. I recommend that the Missouri Commission insist on prudent and proper planning for the La Cygne and Montrose projects.

I recommend that the staff cease informal meetings with KCP&L regarding the La Cygne project. Rather, planning issues of this magnitude should be addressed in a public and transparent process with full participation from all interested parties.

I recommend that the Missouri Commission make it clear to KCP&L that any additional investment in La Cygne and Montrose will not be recoverable from Missouri customers unless the prudence of making those investments is justified in economic terms in a proper planning analysis, subject to ongoing examination. I understand that construction has begun on some of the retrofit projects, but that does not mean that the decision to continue that construction in light of changing market conditions and expectations should not be reevaluated. Indeed, market conditions have changed so substantially in the last year or two that the initial decisions to begin construction must be reevaluated frequently, in order to determine whether it is prudent and reasonable to proceed with the projects.

I recommend that the Missouri Commission articulate, in its order in this rate case, that prudent planning includes an obligation for KCP&L to actively seek out relevant information, to conduct rigorous planning analysis, to continue to monitor and re-evaluate the decision as construction proceeds, and to thoroughly document and communicate the inputs, methodologies, and results of those planning analyses with the

stakeholders and the Missouri Commission. The planning should not be done in a piecemeal fashion, but rather should look forward in order to include appropriate consideration of all reasonably anticipated regulatory requirements. Any eventual rate recovery of the investment should be contingent upon KCP&L conducting and demonstrating prudent planning with regard to spending at these existing coal plants.

Q. Are you suggesting that the Missouri Commission conduct a "pre-approval" proceeding and rule on the prudence of the environmental retrofit projects?

A. No. My understanding is that the Missouri Commission will decide upon the prudence of these projects if and when they are complete, in a future rate case. I believe, however, that the Commission could usefully begin now to clarify what it expects to see in that future rate case in terms of prudent planning, and documentation of that planning. It would be unfortunate if the Company were unaware of Commission expectations, and conducted planning that was insufficient, or provided inadequate documentation for the Commission to make an appropriately informed decision in that future rate case.

Q. Why should the Missouri Commission begin to address the issue of coal plant retrofit economics and prudence now rather than waiting until a future rate case?

A. There are several reasons that planning prudence should start to be addressed as soon as possible. First, there is the practical consideration that it is difficult to recreate retrospectively what a reasonable planner would have known and done and decided at some specific date in the past. If the Missouri Commission does not begin to address planning prudence now, then it may be more challenging in a future rate case to make necessary determinations about what KCP&L planners assumed at various points in the past and to measure those assumptions against what should have been assumed. Only after the Missouri Commission has pieced together this history is it possible to assess the prudence of KCP&L's decisions both to undertake the retrofit projects in the first instance and to proceed with the construction of the retrofit equipment—even in the face of changing circumstances that bear on its cost-effectiveness. This puts a premium on documenting the prudence of planning decisions on an ongoing basis.

More importantly, once construction is complete, there is no way to truly avoid the costs of imprudent decision-making. In a rate case forum, the Missouri Commission's only option will be to *allocate* the costs—either to ratepayers or to shareholders in the form of a disallowance. While this allocation is necessary and appropriate, it cannot retroactively achieve an efficient result. By making it clear that KCP&L should address the project's economics and prudence in advance, the Missouri Commission has the opportunity to encourage responsible planning and consideration of a wider range of options, including options that result in positive outcomes and actually cost less overall.

At the very least, the Missouri Commission should establish now the key principles that it will apply to a future prudence determination, and require KCP&L to keep and provide complete documentation supporting its decision to continue with construction throughout the construction project despite worsening economic conditions, including declining sales, declining market prices, and other factors.

Q. How is your testimony organized?

A. The remainder of my testimony in sections 5 through 7 addresses the following subjects:

5. Coal plant retirement announcements and economic drivers
6. La Cygne
7. Montrose

5. COAL POWER PLANT RETIREMENTS IN THE UNITED STATES

Q. Why would a utility choose to retire a coal-fired power generating unit?

A. A utility would (and should) choose to retire any unit when it is prudent to do so – that is, when a careful and thorough analysis determines that the net present value of revenue requirements associated with keeping the unit operating exceeds the net present value of revenue requirements associated with retiring the unit. The energy and capacity to replace the retiring unit can include additional generation from existing power plants, new capacity (typically natural gas, renewable resources, energy efficiency, and demand

response), long-term and short-term market purchases, or portfolios that combine these resource types.

The costs associated with keeping the unit open include, but are not limited to, fixed and variable operating costs, fuel costs, and capital investments necessary to keep the plant operating reliably or to comply with environmental or other regulations. The costs associated with retiring the unit include those associated with maintaining safe and reliable service once the unit has been taken offline, including any necessary additional energy, capacity, or ancillary services.

Q. Are retirements of coal-fired units a common occurrence?

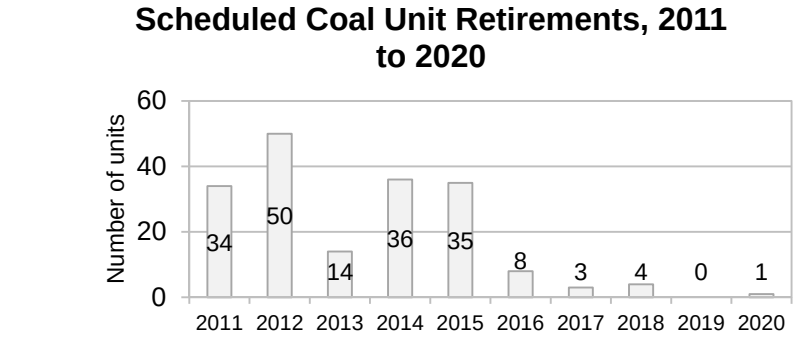
A. Yes. As of July 31, 2012, there are at least 185 non-cogenerating coal units totaling over 31,100 MW of capacity announced to be retired by 2020, as shown in Figure 1, below. I believe that substantial additional retirements are likely.

Q. What is driving the decisions to retire these coal units?

A. The decisions to retire existing coal-fired generating capacity are being made based on the economics. A combination of factors is causing the economic value of continued operation to be negative. These factors include the investments required to comply with environmental regulations, the risks of further regulations, aging and degradation of plant equipment, declining market prices for natural gas and wholesale electricity, and an increasingly broad and attractive range of alternative resources including renewable energy and energy efficiency.

Q. With regard to coal-fired unit retirements, why is 2016 important?

A. The Mercury Air Toxics Standards (MATS) and the Clean Air Interstate Rule (CAIR) will require compliance at most coal units by 2016. By retiring in advance of the compliance deadlines established by these rules, the unit owner avoids the retrofit capital costs necessary to comply with those regulations.



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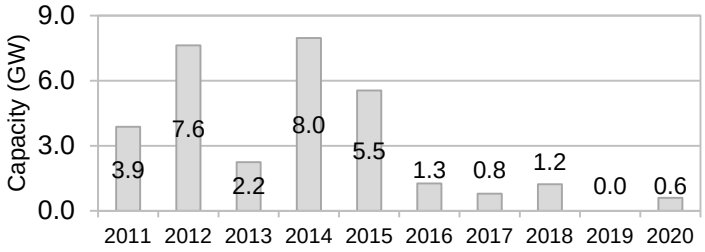

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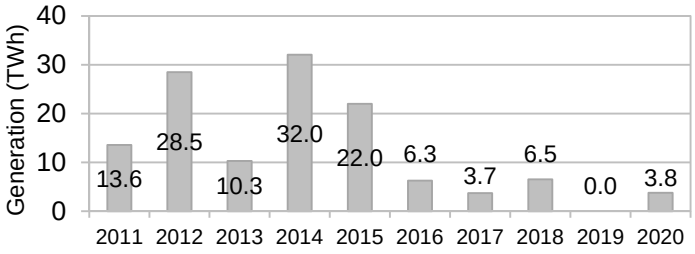

(c)

Figure 1: Announced Coal Retirements 2011-2020 represented by (a) units, (b) capacity, and (c) generation

6. LA CYGNE

Q. Please provide a brief summary of the history of the La Cygne project.

A. La Cygne Units 1 and 2 began operation in 1973 and 1977, respectively. On February 23, 2011, KCP&L, which operates both units, filed in Kansas for predetermination by the KCC to recover costs related to environmental upgrades required to come into compliance with recently finalized regulations. On August 19, 2011, the KCC approved predetermination, and on August 26, approximately six months after KCP&L filed for

predetermination, KCP&L entered into an Engineer, Procure, and Construct contract with La Cygne Environmental Partners, according to the direct testimony of Mr. Bassham in the current case (page 13). While the financial specifics are confidential, KCP&L has already committed to several retrofit-related expenditures. The retrofitted La Cygne generating station is expected to go into service by June 2015.

Q. Has KCP&L analyzed the economics of investing in La Cygne in order to continue operating the plant?

A. Yes, in analyses filed in Kansas, KCP&L witness Burton Crawford presented analysis of the expected costs of various scenarios in which La Cygne was retrofitted or retired and replaced with either a natural gas combined cycle plant or a combustion turbine (see direct testimony, page 10, starting at line 10). I have included information from KCP&L's modeling analysis in the Kansas docket here in my Schedule BEB-2. The first page of that schedule shows the expected value cost results for nineteen plans analyzed by KCP&L. Comparing the results for the lowest cost plan (KP05B, with Montrose retired and combined cycle capacity added) to the results for the plan with all of the La Cygne and Montrose units retired (KP06B) shows a difference of $204.8 million. This was KCP&L's estimate for the net benefits of retrofitting versus retiring La Cygne, as of February 2011, when testimony was submitted in Kansas.

Q. Have gas price forecasts changed since the time of KCP&L's original analysis?

A. Yes. Since the time of KCP&L's analysis (prior to the February 2011 filing date), gas prices have continued to drop. Spot prices for natural gas at Henry Hub, plotted in Figure 2, started 2011 at about $4.50/MMBtu, and declined during that calendar year to about $3 per MMBtu at the end of 2011. During 2012 so far, spot gas prices dipped to a low of below $2/MMBtu in the spring and then rose back to about $3/MMBtu.

KCP&L used a composite analysis of projections by several organizations in developing its fuel price forecasts, but since this analysis was developed in early 2011 many of these sources have revised their forecasts downward. The US Energy Information Administration has revised its forward-looking gas price forecasts downward in each of

the last four releases of its Annual Energy Outlook (AEO),[2] as shown in Figure 3. At $4.58/MMBtu, the 2020 Henry Hub Spot price in AEO 2012 was $0.53/MMBtu less than the corresponding price in AEO 2011. NYMEX futures show a similar trend, as shown in Schedule BEB-3. Forward looking NYMEX hub prices consistently declined between January 2010 and January 2012.

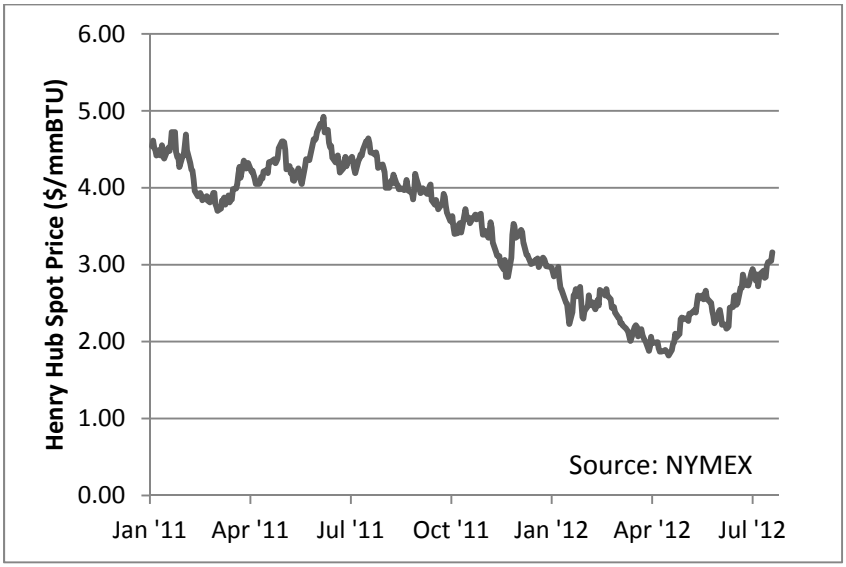

Figure 2: Recent Natural Gas Prices[3]

[2] US Energy Information Administration, Annual Energy Outlook. Available at: http://www.eia.gov/forecasts/aeo/. Last accessed 7/25/2012.

[3] Natural Gas Spot and Futures Prices (NYMEX). Available at: http://www.eia.gov/dnav/ng/NG_PRI_FUT_S1_D.htm. Last accessed July 25, 2012.

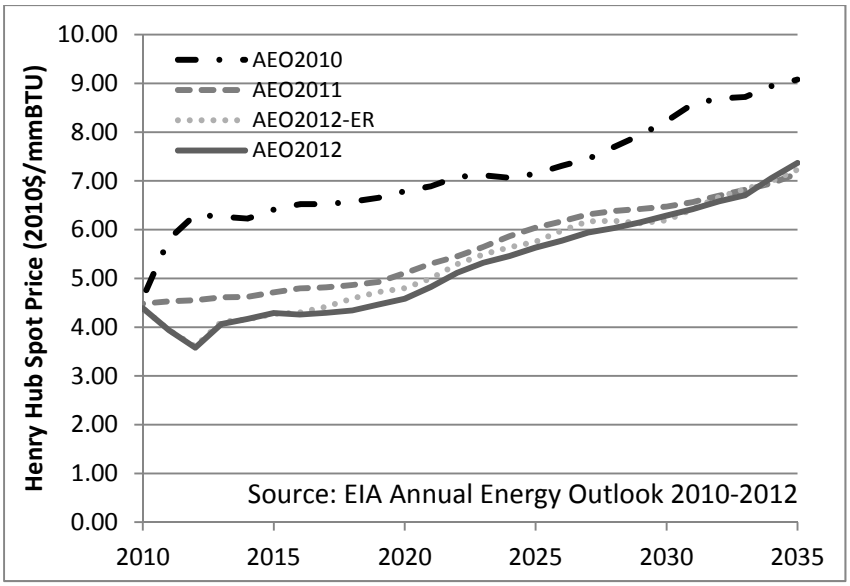

Figure 3: EIA Annual Energy Outlook Natural Gas Price Forecasts

It is worth noting that forecasts changed rapidly in 2011 alone, as shown in Schedule BEB-4. Filed by Brian Gallaway of Consumers Energy at the Michigan PSC in February 2012, this forecast shows NYMEX natural gas forwards declining substantially each month between July 2011 and December 2011.

According to Cambridge Energy Research Associates (one of the firms cited by KCP&L in developing its gas price forecasts) in a report for the World Economic Forum[4] released this year:

> "wholesale natural gas prices decreased from an average of US$ 6.73 per million British thermal units (MMBtu) for 2000 to 2008 to US$ 3.50 per MMBtu in October 2011 (prices in constant 2010 dollars). Going forward, IHS CERA forecasts natural gas prices at roughly half what they would have been without the shale production boom."

Another firm used by KCP&L in its analysis, IHS Global Insight, cited low prices in October 2011[5] contributing to a very low average price out as far as 2035:

[4] World Economic Forum "Energy for Economic Growth – Energy Vision Update 2012."Available at: http://www3.weforum.org/docs/WEF_EN_IndustryVision.pdf. Last accessed July 27, 2012.

[5] "The Economic and Employment Contributions of Shale Gas in the United States". Available at: http://anga.us/media/235626/shale-gas-economic-impact-dec-2011.pdf. Last accessed July 27, 2012.

> "The natural gas Shale Gale has transformed the US energy outlook in just three years, opening new possibilities for the future of energy in the United States, creating jobs, stimulating economic growth, and lowering gas prices. Between 2000 and 2008, the natural gas price at Henry Hub averaged $6.73 per MMBtu in constant 2010 dollars. But as shale production started to ramp up in significant volumes in 2009 and 2010, the price dropped to an average of $4.17 per MMBtu (constant 2010 dollars). By October 2011, it had declined further to $3.50 per MMBtu (constant 2010 dollars). From 2011 through 2035, IHS Global Insight projects that the price will average $4.79 MMBtu (constant 2010 dollars)."

A broad range of firms involved in understanding domestic and global gas markets are projecting that recent increases in gas supplies – and resulting lower prices – are here to stay. Such changes could certainly have an impact on the viability of coal-fired power plants, and the economic viability of a retrofitted La Cygne plant, as demonstrated in KCP&L's own analysis.

Q. How would these recent developments in natural gas prices influence the economic merits of retrofitting La Cygne?

A. Lower natural gas prices will tend to result in lower prices for electricity in the regional power market and in lower costs for replacing the energy that would otherwise be generated at La Cygne. KCP&L's analysis in its February 23, 2011 Kansas predetermination filing included a probabilistic analysis, which included a variety of model runs with varying input assumptions. These model runs included cases with and without the La Cygne retrofit at "low" gas prices. Under "mid" gas price assumptions KCP&L found that retiring La Cygne (scenario KP06B) was expected to result in revenue requirements of an additional $196 million dollars over the scenario in which La Cygne is retrofitted (KP05B).[6] Net benefits of about $200 million are not a compelling case for the retrofit investment when considered in the context of the scale of the investment, the total system revenue requirements and the many uncertainties in projecting the future benefits.

[6] This is similar to the $204.8 million result discussed above and differs because the $196 million figure is directly from a pair of model runs, while the $204.8 million figure is the probability weighted, or "expected" result for a set of runs in which various other input assumptions were allowed to vary.

In KCP&L analysis with low gas prices, the result turns around, and La Cygne retirement is found to be lower cost than retrofit by $368 million. The sources for these numbers are provided in Schedule BEB-2.

While the absolute value of the gas prices used in KCP&L's analysis remains confidential to the public, it is apparent that, based on the Company's own analysis, gas prices could shift the project from being an economically justified investment to an imprudent investment. Given developments in natural gas markets in the past year or so, the results of KCP&L's analysis should certainly be updated to determine whether it is prudent to continue to proceed with the retrofit project.

Q. In addition to lower gas prices, you mentioned that KCP&L sales forecasts are down. Could you please elaborate on the changes in expected sales?

A. Yes, I can provide some information on KCP&L's native load and off-system sales. I will address native load first. KCP&L's "historical and final forecasts" of net system input (NSI) are plotted in the first chart in Figure 4 below, which I have copied directly from the KCP&L's 2012 IRP (Vol 3, page 61). The annual actual NSI has been roughly flat since 2005. The forecasts, prepared every two or three years since the 2002 "update" have been declining, and the drop between the 2008 forecast and the 2012 forecast is particularly large. For example, the 2008 IRP forecast predicted a 2020 NSI at about 20,000 GWh, while the latest forecast is for only about 17,500 GWh.

The economic merits of spending on retrofits for La Cygne will be reduced with the declining sales.

The lower chart in Figure 4, also from KCP&L's 2012 IRP, shows historical KCP&L peak demand and forecasted peak demand. This shows a roughly similar picture.

Figure 30: Net System Input (NSI) Historical and Final Forecasts

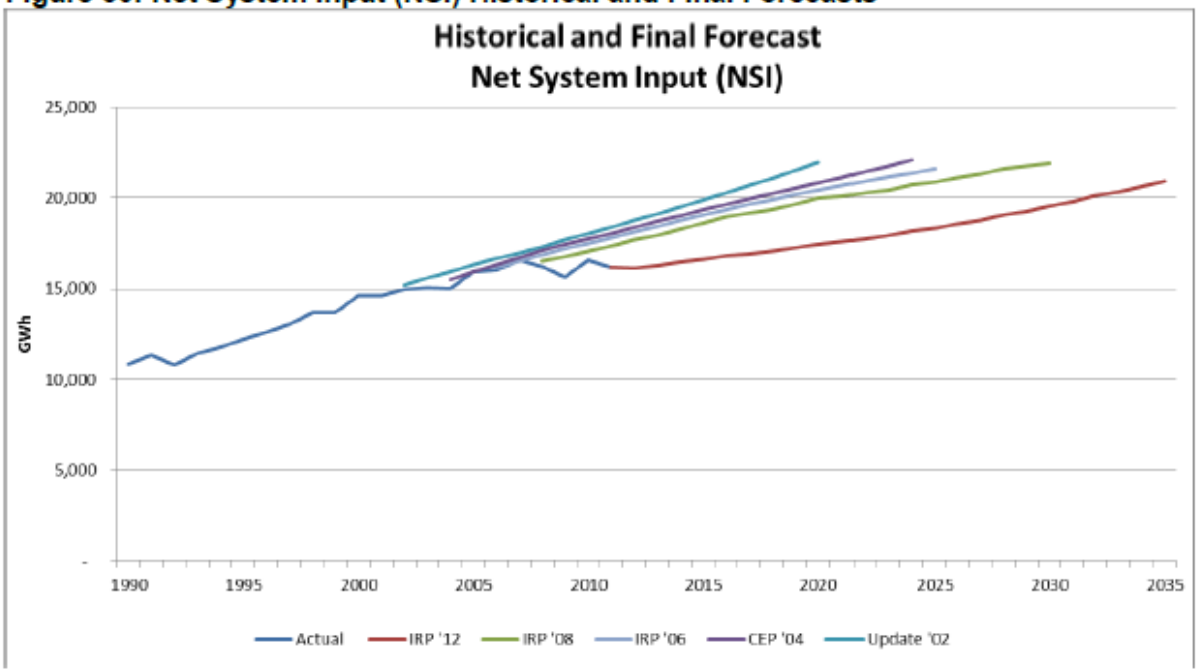

Figure 31: Peak Demand Historical and Final Forecasts

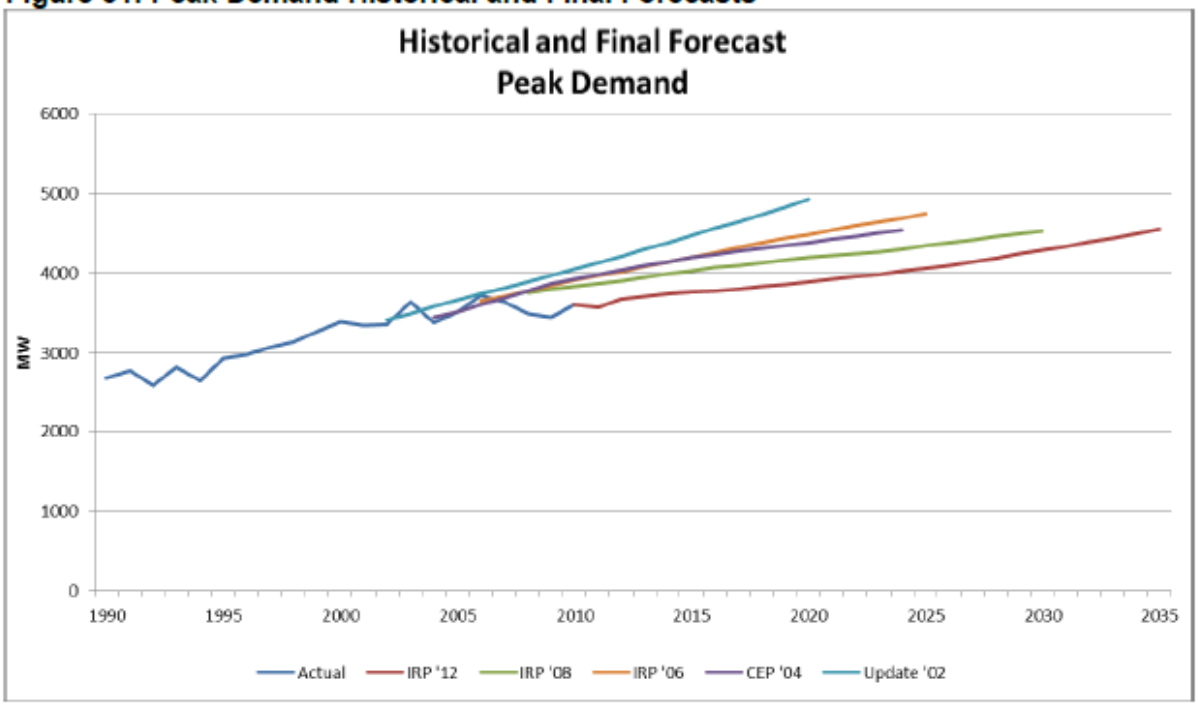

Figure 4: KCP&L NSI and Demand Forecasts[7]

[7] From April 2012 Integrated Resource Plan, Vol. 3, Pg 61 (Case No. EO-2012-0323).

Q. What about off-system sales?

A. According to the direct testimony of KCP&L witness Terry Bassham (page 7, lines 2-6) declining revenue from off-system sales is one of the primary reasons for KCP&L's request in this rate case:

> "Changes in the wholesale energy market including a challenging economy and low natural gas prices, have significantly impacted KCP&L's ability to sell power outside its service territory. In addition to a reduction in off-system sales margins, in recent months KCP&L has also lost several long term wholesale contracts once they expired."

The reduction in gas prices and electricity market prices that is responsible for the reduction in off-system sales margins will similarly influence the economic case for retrofitting a unit such as La Cygne. Specifically, some substantial portion of the projected economic benefits from retrofitting La Cygne is in the form of projected net benefits from off-system sales. As those benefits decrease, the case for retrofitting the plant sours. At the same time, those declining market prices also mean that the cost for purchasing power to replace retiring coal capacity will look relatively more attractive.

Q. Based on what assumptions has KCP&L reevaluated and cut back its energy efficiency investments?

A. On page 10 of his direct testimony, Mr. Ives states that low natural gas prices and the slow economic recovery (as well as the addition of Iatan 2) contributed to a reduction in demand for further capacity resources, such as energy efficiency, in the near term. It is inconsistent and unreasonable for KCP&L to use such changes as a basis for cutting back on proposed energy efficiency investments, but not to similarly reevaluate its much larger and riskier investment in the La Cygne units.

Q. Did the Kansas Corporation Commission hear evidence with regard to the economics of retrofitting La Cygne?

A. Yes. The KCC, in Docket No. 11-KCPE-581-PRE, considered testimony by KCP&L witnesses as well as intervenors, including several of my colleagues at Synapse Energy Economics. The KCC was faced with a request for "predetermination" under Kansas state law, in which it ruled on "rate-making principles and treatment." The KCC found

that KCP&L's plan to retrofit La Cygne 1 and 2 was "reasonable, reliable, and efficient under K.S.A. 2010 Supp. 66-1239(c)(3)." (KCC Order, page 3) The KCC also found that, if the construction costs were to exceed the estimated $1.23 billion, "KCP&L bears the burden of proof to show the amount it seeks to recover from ratepayers is just and reasonable." (KCC Order, page 3).

Q. Did the KCC, in that docket, say anything about planning prudence?

A. Yes. The KCC, in its Order (page 35), explained that:

> "Relying on this evidence, the Commission finds that KCP&L's decision to propose the La Cygne Project was prudent at the time the determination was made as reflected in the record. But the Commission cautions that it recognizes events change. Many witnesses have discussed changing scenarios in this proceeding that may impact the validity of this decision over the course of the implementation of the La Cygne Project. For example, witnesses discussed the historical volatility of the cost of natural gas as well as changing requirements related to protecting the environment. The week before the evidentiary hearing, on July 6, 2011, the EPA issued its long-awaited decision on Cross-State Air Pollution Rule (CSAPR) imposing additional requirements. Also, Westar Witness Haines urged that the Commission should hold a company accountable if a project receiving predetermination treatment failed to perform up to expectations presented during the predetermination proceeding. Thus, the issue of prudence does not end with a finding by this Commission that, at the time its determination was made, KCP&L made a prudent decision that the La Cygne Project was the least cost option. While implementing the La Cygne Project, KCP&L will need to continue to be careful, use caution, be attentive, and use good judgment in addressing ongoing changes that arise and in making decisions regarding the La Cygne Project to be sure its decision remains prudent." [Footnotes omitted.]

Q. What, in your view, should the Missouri Public Service Commission take from the Kansas docket?

A. Consistent with the KCC's language quoted above, KCP&L should be required to conduct, document, and demonstrate ongoing prudent planning and decision-making.

The Missouri Public Service Commission is independent from the KCC, and can make its own decisions about the prudence of KCP&L's plans. While there may be certain numbers and analyses from the Kansas docket that would be useful to consider in Missouri's decision-making process, it is my opinion that the Missouri Commission

should not rely heavily upon the findings from a docket in another jurisdiction without undertaking an independent review. The Kansas Commission in the Kansas docket was not presented with a comprehensive economic analysis including the full range of alternatives.

7. MONTROSE

Q. Please describe the Montrose coal-fired power plant.

A. The Montrose Generating Station consists of three KCP&L owned coal-fired units built in 1958, 1960, and 1964, with capacities of 170 MW, 164 MW, and 176 MW, respectively.

Q. What does KCP&L plan with respect to Montrose?

A. KCP&L witness Burton Crawford's direct testimony in this case briefly mentions Montrose (page 20 lines 3 to 18). Mr. Crawford explains that KCP&L is "in the process of adding environmental controls" at Montrose, and that these include the following controls for units 2 and 3: "separated over fire air system for NOx control; burner modifications for NOx control; and new burner management system." In addition, Mr. Crawford notes that KCP&L "may need to install baghouses and activated carbon injection" at Montrose. Costs estimates are provided for these retrofits, on a confidential basis (i.e., the numbers are redacted from the public version of Mr. Crawford's testimony).

Q. Is the Montrose Plant economic to operate on a forward basis?

A. No. In the Kansas predetermination docket for La Cygne, KCP&L demonstrated decisively that the Montrose plant should not be retrofitted to meet the suite of environmental obligations required over the next few years. KCP&L's analysis showed a net liability for retrofitting Montrose of $53 million (present value). (See KCP&L's analysis reproduced in Schedule BEB-2.) The expected value for Plan KP01 "All Retrofits in 2015" is $24,930.9 million. The expected value for Plan KP05B "Retire Montrose - CC Replace" is $24,877.9 million. The difference between the two plans is a net benefit of $53 million for retiring Montrose compared to retrofit with continued

operation. To be clear, KCP&L's own analysis found that retiring Montrose by 2016 was the lowest cost option. Since that time, it is likely that the economics of continued operation of Montrose have worsened due to declining gas prices (discussed in Section 6, above).

It is reasonable to believe that any of the near-term investments in Montrose (including those identified by Mr. Crawford (Direct Testimony, page 20, lines 3-14) will not forestall the plant's retirement in 2016. There may be a case that some very low cost investments in Montrose are justified on the basis of a few years of continued operation, but that case has not to my knowledge been made.

Q. How have the key drivers changed since the $53 million net loss for continued operation of Montrose was estimated?

A. There have, of course, been many changes in the variables that influence the economics of continued operation of Montrose. Most notable of the changes in key drivers is the decline in natural gas prices. The decline in natural gas prices and in forecasts of natural gas prices was discussed above. I expect that the decline in actual gas prices would cause the estimated benefit from retiring Montrose to be significantly greater than was estimated by KCP&L more than one year ago.

In the Kansas predetermination docket, KCP&L analyzed a case with "low" gas price projections. These results are included here in my Schedule BEB-2. The retire Montrose plan is found to be $408 million less expensive than retrofit with the low gas prices.

Q. Does this complete your Direct Testimony?

A. Yes.

Bruce Edward Biewald

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PROFESSIONAL EXPERIENCE

Synapse Energy Economics, Inc., Cambridge, MA. Founder and Chief Executive Officer, 1996 to present.
Advise clients on issues of energy economics, environmental impacts, and electric industry regulation. Provide litigation support and expert testimony, author reports, and lead a professional staff of 27 engineers, scientists, policy experts, and economists, conducting many dozens of consulting assignments each year. Areas of expertise include: electric power system planning, air emissions, climate change policy, market power, mergers and acquisitions, generation asset valuation and divestiture, nuclear and fossil power plant costs and performance, renewable resources, power supply contracts and performance standards, green marketing of electricity, nuclear plant decommissioning and radioactive waste issues, environmental externalities valuation, environmental compliance planning, energy conservation and demand-side management, electric power system reliability, avoided costs, dispatch modeling, economic analysis of power plants and resource plans, portfolio management, risk analysis, and risk management.

Tellus Institute, Boston, MA. Senior Scientist and Manager of the Electricity Program, 1989 to 1996; Research Associate and later Associate Scientist, 1980 to 1988.
Responsible for research and consulting on all aspects of electric system planning, regulation, and restructuring.

EDUCATION

B.S., Architecture, Building Technology, and Energy Use in Buildings. Massachusetts Institute of Technology, Cambridge, MA, 1981

Graduate courses in micro and macroeconomics. Harvard University Extension School, Cambridge, MA, 1989/90

SUMMARY OF TESTIMONY, PUBLICATIONS, AND PRESENTATIONS

Expert testimony on energy, economic, and environmental issues in more than 100 utility regulatory proceedings in 26 states and two Canadian provinces, in cases before State and Federal Courts, and in proceedings of the Federal Energy Regulatory Committee and the Nuclear Regulatory Commission's Atomic Safety and Licensing Board.

Co-author of more than 100 reports, including studies for the Electric Power Research Institute, the U.S. Department of Energy, the U.S. Environmental Protection Agency, the Office of Technology Assessment, the New England Governors' Conference, the National Association of Regulatory Utility Commissioners, and the United Nations Framework Convention on Climate Change.

Papers published in the *Electricity Journal*, the *Energy Journal*, *Energy Policy*, *Public Utilities Fortnightly*, and numerous conference proceedings.

Invited to speak by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers; American Society of Mechanical Engineers; Energy Foundation; International Atomic Energy Agency; the Latin American Energy Association (OLADE); National Association of Regulatory Utility Commissioners; National Association of State Utility Consumer Advocates; National Consumer Law Center; the Swedish Environmental Protection Agency (SNV); the U.S. Environmental Protection Agency; the European Federation of Clean Air and Environmental Protection Associations; and others.

TESTIMONY

United States Court of Appeals for the District of Columbia Circuit (Case 11-1375) Southwestern Public Service Company v. U.S. Environmental Protection Agency and Lisa P. Jackson, Administrator, U.S. Environmental Protection Agency – October 2011
Declaration on the use of probabilistic computer models to properly analyze system reliability, with regard to the Cross-State Air Pollution Rule (CSAPR).

United States Court of Appeals for the District of Columbia Circuit (Case 11-1315) United States Environmental Protection Agency v. Luminant Generation Company, LLC – October 2011
Declaration on the use of probabilistic computer models to properly analyze system reliability, with regard to the Cross-State Air Pollution Rule (CSAPR).

Nova Scotia Utility and Review Board – April 2011
Testimony on community-based feed-in tarriffs for renewable energy.

United States District Court for the Middle District of Louisiana (Civil Action No. 09-CV-100-RET-CN) United States v. Louisiana Generating LLC – October 2010
Rebuttal report on the use of computer models for electric system planning and projections of generating unit operations, including PROMOD simulation of power system dispatch. Also deposition January 2011.

United States District Court for the Eastern District of Michigan (Case 2:10-cv-13101-BAF-RWS) United States v. DTE Energy Company – June 2010
Declaration on the use of computer models for electric system planning and projections of generating unit operations. Also second declaration November 2010.

United States District Court for the North District of Alabama (Civil Action No. 2:01-CV-00152-VEH) United States v. Alabama Power Company – December 2009
Expert report on use of computer models for electric system planning and projections of generating unit operations. Also rebuttal report in May 2010, and deposition in June 2010.

United States District Court for the Eastern District of Kentucky, Lexington Division (Case 5:05-cv-0075-KSF) United States v. Kentucky Utilities Company – October 2008
Expert report on use of computer models for electric system planning, capital investment planning and economic analysis, and projections of generating unit operations.

Nova Scotia Utility and Review Board – August 2008
Review of rate case issues; power plant depreciation and load forecasting.

Nova Scotia Utility and Review Board – March 2008
Review of Nova Scotia Power Inc.'s demand-side management plan.

Indiana Utility Regulatory Commission (Cause Nos. 43114 and 43114S1) – May 2007
Review of IGCC Plant Proposal by Duke Energy Indiana and Vectren Testimony of Synapse Witnesses. Also cross answering testimony later in the month.

California Public Utilities Commission (Docket No. R.06-02-013) – March 2007
Joint testimony with William Steinhurst and Rick Hornby on electric utility long-term planning and procurement, including procurement strategy, treatment of carbon dioxide emissions, credit and collateral policies, customer risk tolerance, and resource needs.

New Jersey Board of Public Utilities (Docket No. EM05020106) – November and December 2005 and March 2006
Joint testimony with Bob Fagan and David Schlissel on the market power implications of the proposed merger between Exelon Corp. and Public Service Enterprise Group.

Indiana Utility Regulatory Commission (Cause Nos. 42861) – October 2005
Vectren (SIGECO) environmental compliance planning, including climate change policy and carbon price forecasting, energy efficiency and renewables as compliance options, and cost recovery issues.

United States District Court for the Eastern District of Kentucky, Lexington Division (Civil Action No.04-34-KSF, United States v. East Kentucky Power Cooperative – September 2005
Expert report on state regulation of electric utilities, use of computer models for system planning, capital investment planning and economic analysis, and projections of generating unit operations.

United States District Court for the Southern District of Indiana (Civil Action No.IP99-1693 C-M/S, United States v. Cinergy – May 2005
Expert report on state regulation of electric utilities, forecasting sales and resource requirements, use of computer models for system planning, capital investment planning and economic analysis, projections of generating unit operations, and the relationship between generator availability and output. Also, rebuttal report in September.

Federal Energy Regulatory Commission (Docket No. EC05-43-000) – April 2005
Market power analysis of the proposed merger of Exelon Corporation and Public Service Enterprise Group Incorporated. (Joint affidavit with David Schlissel.)

Nuclear Regulatory Commission Atomic Safety and Licensing Board (Docket No. 52-007-ESP and ASLBP No. 04-821-01-ESP) – April 2005
Affidavit on the environmental impacts and economic costs of a proposed new nuclear power project and alternatives.

Indiana Utility Regulatory Commission (Cause Nos. 42622 and 42718) – March 2005
Public Service Company of Indiana environmental compliance planning, including cost estimates for emission control technologies, climate change policy and carbon price forecasting, energy efficiency and renewables as compliance options, power plant retirement economics, and cost recovery issues.

National Research Council, Division on Engineering and Physical Sciences, Board on Energy and Environmental Systems (Project No. BEES-J-03-03-A) – March 2005
Alternatives for replacing the generation of the Indian Point Energy Center nuclear facility.

Georgia Public Service Commission (Docket No. 18300-U) – October 2004
Georgia Power Company's cost of service study, treatment of electrical distribution equipment, and proposed rates for the Metropolitan Atlanta Rapid Transit Authority.

Texas Public Utility Commission (Docket No. 29526) – June 2004
Issues in CenterPoint Energy Houston Electric LLC's true up filing, including environmental cleanup costs, excess mitigation credits, and construction work in progress. Also rebuttal testimony on June 14.

Texas Public Utility Commission (Docket No. 28818) – April 2004
The Independent Transmission Operator proposal of Energy Gulf States Utilities, Inc. (prefiled testimony adopted by Paul Peterson).

Indiana Utility Regulatory Commission (Cause No. 42359) – August 2003
Public Service Company of Indiana rate making issues including the impact of trackers on risks to shareholders and customers, costs of environmental compliance, treatment of merchant plant investment and risk, and joint dispatch issues.

Nevada Public Utilities Commission (Docket No. 03-1014) – April 2003
Review of Sierra Pacific Power Company's risk management and procurement of electric power in the wholesale markets.

Nevada Public Utilities Commission (Docket No. 02-11021) – March 2003
Review of Nevada Power Company's risk management and procurement of electric power in the wholesale markets.

United States District Court for the Southern District of Illinois (Civil Action No. 99-833-MJR, United States v. Illinois Power Company and Dynegy Midwest Generation, Inc.) – August 2003
Testimony at trial on analysis and opinions in rebuttal report dated October 2002 on use of computer models for system planning, projections of generating unit operations, and the relationship between generator availability and output.

State of Vermont, Windham Superior Court (Appeal of USGen New England, Inc. from 2001 Property Valuation by the Town of Rockingham) – September 2002
Electricity market prices and economic valuation of hydroelectric generating plant.

United States District Court for the Middle District of North Carolina (Civil Action No. 1:00 CV 1262, United States v. Duke Energy Corporation) – August 2002
Expert report on use of computer models for system planning, projections of generating unit operations, and the relationship between generator availability and output. (Joint report with Phil Hayet.)

Indiana Utility Regulatory Commission (Cause No. 41746) – July 2002
Reply testimony on a rate case settlement agreement, dealing with issues including NiSource's financial condition, service quality, environmental commitment, and electric rate impacts.

Connecticut Department of Public Utility Control (Docket No. 00-12-13RE01) – July 2002
The proposed sale of Seabrook Nuclear Station to FPL Energy Seabrook, LLC. Market power issues and market modeling.

United States District Court for the Southern District of Indiana (Civil Action No. IP99-1692-C-M/S, United States v. Southern Indiana Gas and Electric Company) – June 2002
Declaration on confidential business information and competitive harm.

Nevada Public Utilities Commission (Docket No. 02-2002) – April 2002
Review of Sierra Pacific Power Company's risk management and procurement of electric power in the wholesale markets.

Vermont Public Service Board (Docket No. 6596) – March 2002
Used and useful policy issues, electricity market prices, and above market costs of the purchase from Hydro Quebec.

Nevada Public Utilities Commission (Docket No. 01-11029) – February 2002
Review of Nevada Power Company's risk management and procurement of electric power in the wholesale markets.

Vermont Public Service Board (Docket No. 6545) – January 2002
Economic analysis of the proposed sale of Vermont Yankee nuclear plant and an associated Purchased Power Agreement.

New Jersey Board of Public Utilities (Docket No. EM01050308) – September 2001
Analysis of the proposed merger between Conectiv and PEPCo. Also, surrebuttal testimony in November. (Joint testimony with David Schlissel.)

Indiana Utility Regulatory Commission (Cause No. 41954) – June 2001
System planning and joint operation in a partially deregulated context.

State of Vermont, Windham Superior Court (Dockets S 362-9-99 and S372-9-99) – May 2001
Deposition on electricity market prices and economic valuation of hydroelectric generating plant.

Federal Energy Regulatory Commission (Docket No. ER01-200-001) – April 2001
Termination of the Cinergy Operating Agreement, treatment of merger savings, and affiliate relationships. Also cross-answering testimony in April.

New Jersey Board of Public Utilities (Docket No. EM00110870) – April 2001
Analysis of the proposed merger between FirstEnergy and GPU. Also, supplemental testimony in April. (Joint testimony with David Schlissel.)

Vermont Public Service Board (Dockets Nos. 6120 and 6460 – March 2001
Used and useful policy issues, electricity market prices, and above market costs of the purchase from Hydro Quebec. Also, surrebuttal testimony in April.

United States District Court for the Northern District of New York (Civil Action No. 00-CV-1738) – January 2001
Affidavit on the issuance and trading of SO_2 emission allowances under the Title IV of the Clean Air Act, in Clean Air Markets Group v. George E. Pataki et al.

Department of Energy (Docket No. EE-RM-500) – December 2000
Oral testimony on proposed rules for central air conditioner and heat pump energy conservation standards.

Illinois Commerce Commission (Docket No. 00-0361) – July 2000
Review of ComEd's funding for nuclear power plant decommissioning.

California Public Utilities Commission (Rulemaking 99-10-025) – July 2000
Distributed generation and related rate design issues. Also, rebuttal testimony in August.

Massachusetts Department of Environmental Protection – July 2000
Comments on reliability implications of proposed emission standards for power plants.

Arkansas Public Service Commission (Docket No. 00-048-R) – June 2000
Requirements for electricity market power analyses.

United States District Court for the Middle District of North Carolina (1:99CV00033) – March 2000
Expert report on replacement power costs in Carolina Power & Light Company vs. Yuasa Exide, Inc.

Illinois Commerce Commission (Docket No. 99-0115) – September 1999
Review of ComEd's nuclear power plant decommissioning cost estimates.

West Virginia Public Service Commission (Case No. 98-0452-E-GI) – August 1999
AEP and Allegheny Power restructuring, market power, divestiture of generation, electric system market price modeling, statistical analysis of comparable sales, and responsibility for stranded costs and gains.

Mississippi Public Service Commission (Docket No. 96-UA-389) – August 1999
Review of Entergy Mississippi, Inc. and Mississippi Power Company stranded cost filings, divestiture of generation, statistical analysis of comparable sales, responsibility for stranded costs and gains.

Connecticut Department of Public Utility Control (Docket No. 99-03-36) – July 1999
Connecticut Light and Power Company standard offer service, market prices for electricity and the influence of market power, simulation analysis of the New England electricity market.

Connecticut Department of Public Utility Control (Docket No. 99-03-35) – July 1999
United Illuminating Company standard offer service, market prices for electricity and the influence of market power, simulation analysis of the New England electricity market.

Utah Public Service Commission (Docket No. 98-2035-04) – June 1999
Cost savings expectations for the proposed merger of PacifiCorp and Scottish Power.

Washington Utilities and Transportation Commission (Docket No. UE-981627) – June 1999
Cost savings expectations for the proposed merger of PacifiCorp and Scottish Power and assessment of whether the merger is in the public interest.

Federal Energy Regulatory Commission (Docket Nos. EC98-40-00, et al.) – April 1999
Horizontal market power and barriers to entry in consideration of the proposed merger of American Electric Power Company and Central and South West Corporation.

Connecticut Department of Public Utility Control (Docket No. 99-03-04) – April 1999
Market power, market prices, and simulation modeling as related to the application of United Illuminating Company for recovery of stranded costs.

Connecticut Department of Public Utility Control (Docket No. 99-02-05) – April 1999
Market power, market prices, and simulation modeling as related to the application of Connecticut Light & Power Company for recovery of stranded costs.

Maryland Public Service Commission (Case No. 8797) – January 1999
Simulation analysis of the ECAR market and projected market prices for electricity for estimation of Potomac Electric Company's stranded generation costs and unbundled rates.

Maryland Public Service Commission (Case No. 8795) – December 1998
Simulation analysis of the PJM market and projected market prices for electricity for estimation of Delmarva Power and Light Company's stranded generation costs and unbundled rates.

Maryland Public Service Commission (Cases Nos. 8794 and 8804) – December 1998
Simulation analysis of the PJM market and projected market prices for electricity for estimation of Baltimore Gas and Electric Company's stranded generation costs and unbundled rates.

Vermont Public Service Board (Docket No. 6107) – September 1998
Excess capacity, used & useful, and the economics of Green Mountain Power's purchase from Hydro Quebec.

Mississippi Public Service Commission (Docket No. 96-UA-389) – September 1998
Analyses of market concentration and market power, behavior of affiliated companies, need for an independent system operator.

California Public Utilities Commission (Application No. 97-12-020) – July 1998
Nuclear power plant decommissioning and radioactive waste disposal. Also, rebuttal testimony in August.

Federal Energy Regulatory Commission (Docket No. EC97-46-000) – June 1998
Affidavit on market power implications of the proposed merger between Allegheny Power System and Duquesne Light Company.

New Jersey Board of Public Utilities (Docket Nos. EX4120585Y, EO97070460, and EO97070463) – March 1998
Economic and environmental benefits of energy efficiency, including estimation of marginal air emissions from the PJM System. (Joint testimony with Nathanael Greene, Edward Smeloff, and Thomas Bourgeois.)

Vermont Public Service Board (Docket No. 6018) – February 1998
Excess capacity and the economics of Central Vermont Public Service Company's purchase from Hydro Quebec.

Public Service Commission of Maryland (Case No. 8774) – February 1998
Market power implications of the APS-DQE merger.

Federal Energy Regulatory Commission (Docket Nos. OA97-237-000 and ER97-1079-000) – January 1998
Market power in New England electricity markets.

British Columbia Utilities Commission – November 1997
British Columbia Hydro and Power Authority Wholesale Transmission Services Application.

Pennsylvania Public Utility Commission (Docket R-00973981) – November 1997
West Penn Power Company Restructuring Plan. Environmental disclosure, consumer education, and allocation of default customers.

Pennsylvania Public Utility Commission (Docket R-00974104) – November 1997
Duquesne Light Company Restructuring Plan. Environmental disclosure, consumer education, nuclear decommissioning, and allocation of default customers. Also surrebuttal testimony in December 1997.

Mississippi Public Service Commission (Docket No. 97-UA-496) – November 1997
Petition of Mississippi Power Company for a Certificate of Public Convenience and Necessity Authorizing Construction of a Generating Plant in Jackson County.

Pennsylvania Public Utility Commission (Docket Nos. R-00973953 and P-00971265) – November 1997
Application of PECO Energy Company for approval of its restructuring plan and petition on Enron Energy Services Power, Inc. for approval of an electric competition and customer choice plan. Allocation of default customers.

Vermont Public Service Board (Docket No. 5983) – October 1997
Excess capacity and the economics of Green Mountain Power Company's purchase from Hydro Quebec. Also rebuttal testimony in December 1997 and supplemental rebuttal testimony in January 1998.

Pennsylvania Public Utility Commission (Docket No. R-00973953) – September 1997
Joint petition for partial settlement of PECO Energy Company's proposed restructuring plan and application for a qualified rate order. Environmental disclosure, nuclear decommissioning and spent fuel.

Pennsylvania Public Utility Commission (Docket No. R-00974009) – September 1997
Pennsylvania Electric Company's Restructuring Plan. Environmental disclosure, customer education, and nuclear issues.

Pennsylvania Public Utility Commission (Docket No. R-00974008) – September 1997
Metropolitan Edison Company's Restructuring Plan. Environmental disclosure, customer education, and nuclear issues.

Indiana Legislature, Regulatory Flexibility Committee -- September 23, 1997.
Testimony on "Electric Industry Restructuring To Benefit Consumers and the Environment: Stranded Costs, Nuclear Issues, and Air Emissions."

Pennsylvania Public Utility Commission (Docket No. R-00973954) – June 1997
Pennsylvania Power & Light Company's Restructuring Plan. Environmental disclosure, customer education, PJM market structure, nuclear decommissioning and spent fuel, rate design for stranded cost recovery. Also, surrebuttal testimony in August.

Pennsylvania Public Utility Commission (Docket No. R-00973953) – June 1997
PECO Energy Company's Restructuring Plan. Environmental disclosure, PJM market structure, nuclear decommissioning and spent fuel.

New York Public Service Commission (Case 96-E-0897) -- April 1997
Consolidated Edison Company's Plans for Electric Rate Restructuring. Analysis of market power in the New York City load pocket.

Pennsylvania Public Utility Commission (Docket No. R-00973877) -- February 1997
Application of PECO Energy Company for Issuance of a Qualified Rate Order. Nuclear power plant decommissioning costs, stranded cost recovery, and securitization.

New Hampshire Public Utilities Commission (DR 96-150) -- November 1996
Electric industry restructuring, including stranded costs, industry structure, market power, and nuclear issues.

Massachusetts Department of Public Utilities (96-100) -- July 1996
Nuclear plant stranded costs and decommissioning.

Vermont Public Service Board (5854) – July 1996
Electric industry restructuring, including stranded costs, industry structure, and environmental protection.

Ontario Energy Board (H.R. 23) -- June 1995
Electricity rate options (joint evidence with John Stutz).

Pennsylvania Public Utility Commission (R-00943271) -- April 1995
Discount rates and system benefits charge.

Colorado Public Utilities Commission (94A-516A) – January 1995
Construction of new generating resources.

Public Service Commission of Nevada (94-9002) – November 1994
Environmental and health impacts of a proposed power plant.

Nuclear Decommissioning Finance Committee of New Hampshire (93-001) – September 1994
Seabrook decommissioning cost, spent fuel storage, and cost collection methodology (joint testimony with William Dougherty).

Public Service Commission of Wisconsin (6630-CE-197 and 6630-CE-209) – September 1994
Point Beach externalities, economics, spent fuel storage, and aging (joint testimony with William Dougherty).

British Columbia Utilities Commission – August 1994
Greenhouse gas emissions and environmental externalities policy

Public Service Commission of Wisconsin (05-EI-14) – February 1994
Cost of decommissioning Point Beach and Kewaunee nuclear power plants. Also, rebuttal and surrebuttal testimony in February.

Delaware Public Service Commission (91-39) – September 1992
Nuclear and fossil power plant performance targets.

Massachusetts Department of Public Utilities (91-131) – December 1991
Internalization of environmental externalities, greenhouse gas valuation and policy.

Massachusetts Department of Public Utilities (91-131) – October 1991
Environmental externalities valuation, emissions effects and global warming.

Massachusetts Department of Public Utilities ((89-141, 90-73, 90-141, 90-194 and 90-270) – December 1990
The incorporation of environmental externalities in specific utility RFPs.

Massachusetts Department of Public Utilities (90-55) – June 1990
Costs and benefits of high-efficiency gas heating equipment.

Massachusetts Department of Public Utilities (86-36-G and 89-239) – March 1990
Environmental externalities of electric resources.

Florida Public Service Commission (890973-E1) – January 1990
Integrated energy planning, power plant emissions, and nuclear plant performance.

Pennsylvania Public Utilities Commission (R-891364) – October 1989
Generating capacity requirements of the Philadelphia Electric Company and the Pennsylvania-New Jersey-Maryland Interconnection.

Maryland Public Service Commission (8199) – October 1989
Performance standards for coal, oil, and nuclear power plants.

Michigan Public Service Commission (U-9172) – April 1989
Economic analysis of the Palisades Power Purchase Agreement. Ratepayer impacts, incentives, and implications for plant operation and decommissioning.

Pennsylvania Public Utility Commission (P-870216, P-880283, P-880284, and P-880286) – March 1989
Allegheny Power System planning and avoided costs.

Michigan Public Service Commission (U-8880) – February 1988
Detroit Edison Company power supply costs, economics of Fermi "buy-back" purchase, nuclear fuel expense, oil costs, and power transactions.

Michigan Public Service Commission (U-8866) – December 1987
Consumers Power Company power supply costs, including projections of oil prices and purchased power costs.

Pennsylvania Public Utility Commission (R-850220) – September 1987
Economic analysis of West Penn Power Company's participation in the Bath County Pumped Storage Project, and Allegheny Power System capacity reserve requirements. Also, surrebuttal testimony in October.

Arizona Corporation Commission (U-1345-85-367) – February 1987
Palo Verde decommissioning cost.

Michigan Public Service Commission (U-8545) – December 1986
Consumers Power Company power costs, projected cost of oil and purchased power, economic evaluation of the Big Rock Point nuclear unit.

Public Service Commission of Indiana (38045) – November 1986
Northern Indiana Public Service Company system reliability and excess capacity.

California Public Utility Commission (84-06-014 and 85-08-025) – July 1986
Diablo Canyon decommissioning cost and collection issues.

Michigan Public Service Commission (U-8042R) – June 1986
Review of Consumers Power Company system operations during 1985 and economic evaluation of the Big Rock Point nuclear unit.

Michigan Public Service Commission (U-8291) – April 1986
Detroit Edison Company power supply costs, application of a multi-area dispatch model.

Michigan Public Service Commission (U-8286) – February 1986
Consumers Power Company power supply costs, application of a multi-area dispatch model.

Maine Public Service Commission (85-132) – January 1986
Standard and long term rates for cogeneration and small power production. Surrebuttal testimony in February.

Arkansas Public Service Commission (84-249-U) – June 1985
Impact of the Grand Gulf nuclear unit upon Arkansas Power and Light Company and Middle South Utilities electricity production costs.

Kentucky Public Service Commission (8666) – February 1984
Production costing modeling issues.

REPORTS

The Carbon Footprint of Electricity from Biomass: A Review of the Current State of Science and Policy, by Jeremy Fisher, Sarah Jackson and Bruce Biewald. June 11, 2012.

Energy Benefits Resulting from the Investment of 2010 RGGI Auction Revenues in Energy Efficiency, prepared for Regulatory Assistance Project by Max Chang, David White, Patrick Knight, and Bruce Biewald. February 28, 2012.

Toward a Sustainable Future for the U.S. Power Sector: Beyond Business as Usual 2011, prepared for the Civil Society Institute by Geoff Keith, Bruce Biewald, Ezra Hausman, Kenji Takahashi, Tommy Vitolo, Tyler Comings, and Patrick Knight. November 16, 2011.

Big Risks, Better Alternatives: An Examination of Two Nuclear Energy Projects in the U.S., prepared for the Union of Concerned Scientists by Max Chang, David White, Ezra Hausman, Nicole Hughes, and Bruce Biewald. October 6, 2011.

Avoided Energy Supply Costs in New England: 2011 Report, prepared for Avoided-Energy-Supply-Component (AESC) Study Group by Rick Hornby, Paul Chernick, Dr. Carl Swanson, Dr. David White, Jason Gifford, Max Chang, Nicole Hughes, Matthew Wittenstein, Rachel Wilson, and Bruce Biewald. July 21, 2011.

Equipment Price Forecasting in Energy Conservation Standards Analysis Comments, submitted to the US Department of Energy on behalf of the Natural Resources Defense Council and the Appliance Standards Awareness Project. By Tim Woolf, Vladlena Sabodash, and Bruce Biewald. March 24, 2011.

2011 Carbon Dioxide Price Forecast. By Lucy Johnston, Ezra Hausman, Bruce Biewald, Rachel Wilson, and David White. February 11, 2011.

Benefits of Beyond BAU: Human, Social, and Environmental Damages Avoided through the Retirement of the U.S. Coal Fleet, prepared for Civil Society Institute by Jeremy Fisher, Rachel Wilson, Nicole Hughes, Matthew Wittenstein, and Bruce Biewald. January 25, 2011.

Electricity Energy Efficiency Benefits of RGGI Proceeds: An Initial Analysis, prepared for Regulatory Assistance Project by Max Chang, David White, Lucy Johnston, and Bruce Biewald. October 5, 2010.

Beyond Business as Usual: Investigating a Future without Coal and Nuclear Power in the U.S., prepared for Civil Society Institute by Geoffrey Keith, Bruce Biewald, Kenji Takahashi, Alice Napoleon, Nicole Hughes, Lauri Mancinelli, and Erin Brandt. May 11, 2010.

Co-Benefits of Energy Efficiency and Renewable Energy in Utah, prepared for State of Utah Energy Office by Jeremy Fisher, Rachel Wilson, Maximilian Chang, Jennifer Kallay, and Chris James of Synapse, and Jon Levy, Yurika Nishioka, and Paul Kirshen. March 24, 2010.

Avoided Energy Supply Costs in New England: 2009 Report, prepared for AESC/ Massachusetts Avoided Energy Supply Components Study Group by Rick Hornby, David White, Bruce Biewald, Chris James, Ben Warfield, and Max Chang of Synapse, and Paul Chernick, Carl Swanson, Ian Goodman, Bob Grace, and Jason Gifford, August 21, 2009.

Productive and Unproductive Costs of CO2 Cap-and-Trade: Impacts on Electricity Consumers and Producers, prepared for National Association of Regulatory Utility Commissioners, National Association of State Utility Consumer Advocates, National Rural Electric Cooperative Association, and American Public Power Association by Ezra Hausman, Jeremy Fisher, Lauri Mancinelli, and Bruce Biewald, July 15, 2009.

Incorporating Carbon Dioxide Emissions Reductions in Benefit Calculations for Energy Efficiency: Comments on the Department of Energy's Methodology for Analysis of the Proposed Lighting Standard, prepared for New York State Attorney General by Bruce Biewald, David White, Jeremy Fisher, Max Chang, and Lucy Johnston, May 13, 2009.

Cost and Benefits of Electric Utility Energy Efficiency in Massachusetts, prepared for the Northeast Energy Efficiency Council by Doug Hurley, Kenji Takahashi, Bruce Biewald, Jennifer Kallay, and Robin Maslowski, August 1, 2008.

Analysis of Indirect Emissions Benefits of Wind, Landfill Gas, and Municipal Solid Waste Generation, prepared for U.S. Environmental Protection Agency by Ezra Hausman, Jeremy Fisher, and Bruce Biewald, July 23, 2008.

Don't Get Burned: The Risks of Investing in New Coal-Fired Generating Facilities, prepared for Interfaith Center on Corporate Responsibility by David Schlissel, Lucy Johnston, Jennifer Kallay, Christopher James, Anna Sommer, Bruce Biewald, Ezra Hausman, and Allison Smith, February 26, 2008.

Tufts Cove Waste Heat Recovery Project, prepared for the Nova Scotia Utility and Review Board by Bruce Biewald, Bill Powers, and Ben Warfield, December 4, 2007 and revised August 4, 2008.

Avoided Energy Supply Costs: 2007 Final Report, prepared for AESC / Massachusetts Avoided Energy Supply Components Study Group by Rick Hornby, Carl Swanson, David White, Paul Chernick, Bruce Biewald, and Jennifer Kallay, August 10, 2007.

The Deerfield Wind Project – Assessment of the Need for Power and the Economic and Environmental Attributes of the Project, prepared for PPM Energy by Ezra Hausman, Bruce Biewald, and Kenji Takahashi, August 1, 2006.

Portfolio Management: Tools and Practices for Regulators, prepared for the National Association of Regulatory Utility Commissioners by William Steinhurst, David White, Rick Hornby, Alice Napoleon, Amy Roschelle, and Bruce Biewald, October, 2006.

Incorporating Energy Efficiency into the ISO New England Forward Capacity Market: Ensuring the Capacity Market Properly Values Energy Efficiency Resources, prepared for Conservation Services Group by Paul Peterson, Doug Hurley, Tim Woolf, and Bruce Biewald, June 5, 2006.

Ensuring Delaware's Energy Future: A Response to Executive Order Number 82, prepared for the Delaware Public Service Commission Staff by the Delaware Cabinet Committee on Energy with technical assistance from Synapse Energy Economics, March 8, 2006.

The Proposed Broadwater LNG Import Terminal Response to Draft Environmental Impact Statement and Update of Synapse Analysis, prepared for the Connecticut Fund for the Environment and Save The Sound by Ezra Hausman, Bruce Biewald, Kenji Takahashi, and David Schlissel, January 22, 2007.

RPM 2006: Windfall Profits for Existing Base Load Units in PJM, prepared for the Pennsylvania Office of Consumer Advocate by Bruce Biewald, Ezra Hausman, Paul Peterson, and David White, February 2, 2006.

An RPM Case Study: Higher Costs for Consumers, Windfall Profits for Exelon, prepared for Illinois Citizens Utility Board, by Ezra Hausman, Paul Peterson, David White, and Bruce Biewald, October 18, 2005.

Considering Climate Change in Electric Resource Planning: Zero is the Wrong Value, by Lucy Johnston, Amy Roschelle, Ezra Hausman, Anna Sommer, and Bruce Biewald, Rev 3, September 30, 2005.

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"Environmental Sustainability as a Goal in Resource Planning and Policy," Stephen Bernow and Bruce Biewald, Office of Technology Assessment workshop, Washington, DC. April 1993.

"Climate Change and the U.S. Electric Sector," Bruce Biewald and Stephen Bernow, presented at NARUC's 4th National Conference on Integrated Resource Planning, Burlington, Vermont, September 1992.

"Coordinating Clean Air Act Compliance with Integrated Resource Planning: The Role of Externalities," Stephen Bernow, Bruce Biewald, and Kristin Wulfsberg, the Eighth NARUC Biennial Regulatory Information Conference, Ohio State University, Columbus, Ohio. September 9-11, 1992.

"Direct Environmental Impacts of Demand-Side Management," Stephen Bernow, Frank Ackerman, Bruce Biewald, Mark Fulmer, Karen Shapiro, and Kristin Wulfsberg, American Council for an Energy Efficient Economy (ACEEE) 1992 Summer Study, September 1992.

"Modeling Fuel Cycle and Site-Dependent Environmental Impacts in Electric Resource Planning," Stephen Bernow and Bruce Biewald, invited paper at OECD-IEA Expert Workshop on Life-Cycle Analysis of Energy Systems, Paris, France, May 18 and 19, 1992. Proceedings published OECD/IEA Paris, 1993.

"Computer Model Use in Energy Conservation Planning," presented at the Latin American Energy Organization (OLADE) Seminar on Power Systems Computer Modeling in Quito, Ecuador, September 23-25, 1991.

"Environmental Externalities Measurement: Quantification, Valuation and Monetization," Bernow, Biewald and Marron, in External Environmental Costs of Electric Power, proceedings of a German-American workshop, Ladenburg, FRG, October 23-25, 1991. Edited by Olav Hohmeyer and Richard Ottinger, published by Springer-Verlag (Berlin, Heidelberg, New York).

"Some Microcomputer Tools for Least Cost Integrated Energy Planning: ECO, LEAP and EDB," Bruce Biewald and Harvey Salgo, presented at workshop on Energy Pricing and Planning, Bratislava, Czechoslovakia, May 21-22, 1991.

"**Confronting Uncertainty: Contingency Planning for Decommissioning,"** Bruce Biewald and Stephen Bernow, Chapter 18 of "Nuclear Decommissioning Economics," a special issue of *The Energy Journal* of the International Association for Energy Economics, Vol.12, March 1991.

"Avoided Emissions and Environmental Dispatch," Stephen Bernow and Bruce Biewald, presented at the Conference on "Demand-Side Management and the Global Environment," Arlington, Virginia, April 22-23, 1991.

"Environmental Benefits of DSM in New York: Long Island Case Study," Bruce Biewald and Stephen Bernow, presented at the Conference on "Demand-Side Management and the Global Environment," Arlington, Virginia, April 22-23, 1991.

"Full Cost Dispatch: Incorporating Environmental Externalities in Electric System Operation," Stephen Bernow, Bruce Biewald and Donald Marron, the *Electricity Journal*, March 1991.

"EDB: A Flexible Database System for Energy-Environmental Analysis," Bruce Biewald, Michael Lazarus, and David Von Hippel, presented at International Atomic Energy Agency (IAEA) Technical Committee Meeting on "Development of a Database for Comparative Health and Environmental Impacts of Various Energy Systems," in Vienna, Austria, October 15-19, 1990.

"Full Cost Economic Dispatch: Recognizing Environmental Externalities in Electric Utility System Operation," Stephen Bernow, Bruce Biewald, and Donald Marron, presented at NARUC Conference on Externalities, Jackson Hole, Wyoming, October 1990.

"An Assessment of Demand-Side Management Models and Their Use and Applicability in Canadian Utilities," Martin Adelaar and Bruce Biewald, in the proceedings of the Canadian Electrical Association Demand-Side Management Conference, Halifax, Nova Scotia, September 1990.

"**Avoided Cost Contracts Can Undermine Least Cost Planning,"** Stephen Bernow, Bruce Biewald, and Donald Marron, Energy Policy, September 1990.

"Environmental Externalities Measurement: Quantification, Valuation, and Monetization," Stephen Bernow, Bruce Biewald, and Donald Marron, in the proceedings of the Seventh NARUC Biennial Regulatory Information Conference, September 1990.

"Do We Really Need Nuclear Generating Companies?," Public Utilities Fortnightly, June 7, 1990.

"Nuclear Power Economics: Construction, Operation and Disposal," Bruce Biewald and Donald Marron, March 1989.

"Electric Utility System Reliability Analysis: Determining the Need for Generating Capacity," Stephen Bernow and Bruce Biewald, in the proceedings of the Sixth NARUC Biennial Regulatory Information Conference, September 1988.

"Nuclear Power Plant Decommissioning: Cost Estimation for Power Planning and Ratemaking," Stephen Bernow and Bruce Biewald, Public Utilities Fortnightly, October 29, 1987.

"Cost and Performance of Boiling Water Reactors," Stephen Bernow, Bruce Biewald and Tim Woolf, Public Utilities Fortnightly, August 1987.

PRESENTATIONS

(Note: Presentations that were accompanied by a written paper are listed in the section for "papers," above.)

"Saving Consumers Money by Closing Uneconomic Coal Units," presentation at the 2012 NASUCA Meetings, Charleston, SC, June 25, 2012.

"Utility Regulation and Coal," presentation at the Public Interest Environmental Law Conference, Eugene, Oregon, March 3, 2012.

"Review of Resource Planning around North America: Supply and Demand-Side Resource Planning in ISO/RTP Market Regimes," presentation at EUCI conference, October 17, 2011.

"Economics of Existing Coal Generation and Opportunities for Clean Electricity," presentation for the Energy Foundation, May 18, 2011.

"The U.S. Power System: Economic and Regulatory Challenges to Reducing Greenhouse Gas Emissions from the World's Largest Machine," presentation at Design Continuum, December 3, 2008.

"Economics of Electric Sector CO_2 Emissions Reduction: Making Climate Change Policy that People Can Live With," presentation at the NASUCA 2008 Annual Meeting, November 18, 2008.

"Selected Topics from Avoided Energy Supply Costs in New England 2007 Final Report," presentation at a MA DPU Technical Session, July 29, 2008.

"Prudent Planning and New Coal-Fired Generation," presentation at the CERES 2008 Conference, April 29, 2008.

"Climate Change Policies in the Northeast - Carbon Emission Caps and Energy Cost," presentation at the ASHRAE Winter Meeting, prepared for the American Society of Heating, Refrigerating and A/C Engineers, January 19, 2008.

"Efficiency and Renewable Energy for Carbon Constrained Electric Systems 2007," presentation at the NASUCA Annual Meeting, Anaheim, California, prepared for National Association of State Utility Consumer Advocates, November 12, 2007.

"Air Emissions Issues Associated DER in the Mid-Atlantic Region," presentation at the Mid-Atlantic State Energy and Environment Workshop on Distributed Energy Resources, September 27, 2007.

"Exploration of Costs for Load Side and Supply Side Carbon Caps for California," presentation at the Joint En Banc Hearing of PUC and CEC on Point of Regulation in the Electricity Sector (R.06-04-009), prepared for Regulatory Assistance Project, and California Public Utilities Commission, August 21, 2007.

"Portfolio Management: Tools and Practices for Regulators," presentation at the NARUC 2006 Summer Meeting in San Francisco, California, and for the Annual Convention in Miami, Florida, prepared for the National Association of Regulatory Utility Commissioners, July 2006 and November 2006.

"Electricity Price Increases: Causes, Effects, and Solutions," presentation at the Restructuring Roundtable, May 19, 2006.

"Forecasting and Using Carbon Prices in a World of Uncertainty," presentation to Electric Utilities Environmental Conference in Tucson, Arizona on January 22, 2006.

"Energy Efficiency in the Northeast," presentation at ACEEE National Conference on Energy Efficiency as a Resource, Berkeley, CA, September 27, 2005.

"The Shape of Things to Come: Incorporating Unproven Reserves of Efficiency Savings into Energy Models," presentation to the East Coast Energy Group, Washington, DC, November 10, 2004.

"Displaced Emissions from Renewables and Efficiency in the Northeast United States," presentation at a workshop convened by the Commission for Environmental Cooperation, the US Environmental Protection Agency, and the World Resources Institute, Washington DC, November 4, 2004.

"Electric Transmission Technical and Policy Issues," presentation at National Association of State Utility Consumer Advocates conference in Austin, Texas, June 14, 2004.

"Incorporating Renewable Generation into a Risk Management Strategy," presentation at the New England Conference of Public Utility Commissioners Symposium, Brewster, Massachusetts, May 25, 2004.

"Electricity Portfolio Management," presentation at Illinois State University Institute for Regulatory Policy Studies Conference on "Beyond 2006," Springfield, Illinois, May 20, 2004.

"Electricity Risk Management: Diversified Resource Portfolios," presentation at Electric Power Supply Association Meeting, Washington, D.C., May 6, 2004.

"Quantifying Emission Reductions from Local Government Actions," presentation to Metropolitan Washington Council of Governments Energy and Air Quality Conference, Washington DC, April 5, 2004.

"Electricity Portfolio Management," presentation to National Association of Regulatory Utility Commissioners' conference in Washington, D.C., March 9, 2004.

"Portfolio Management for Electricity," presentation at the Regulatory Assistance Project's workshop on portfolio management, Chicago, September 18, 2003.

"Issues in Estimating Electric System Displaced Emissions," presentation at the Commission for Environmental Cooperation Technical Meeting on Approaches to Estimating Environmental Benefits of Renewable Energy and Energy Efficiency, Washington, DC, July 27, 2003.

"Best Practices in Market Monitoring and Mitigation," presented at the National Association of State Utility Consumer Advocates Mid-Year Meeting in Austin, Texas, June 16, 2002.

"Regulation of Waste Management at Large Electric Utilities: Modeling Industry Impacts," US Environmental Protection Agency, August 7, 2001.

"Quality of Service in Performance-Based Regulation: US Experiences," presented at the Seminar on Regulation of Electricity Supply Quality, Milan, Italy, June 8, 2001.

"Demand Response in Electricity Markets," presented at the National Association of State Utility Consumer Advocates Mid-Year Meeting in Santa Fe, New Mexico, June 18, 2001.

Presentation on "Repowering the Midwest: The Clean Energy Development Plan for the Heartland," at the National Wind Coordinating Committee Upper Midwest Transmission Workshop, Minneapolis, Minnesota, May 1, 2001.

"Observations on New England's Electricity Markets," National Regulatory Research Institute Market Power Conference, Columbus, Ohio, April 10, 2001.

Presentation on "Derailing Coal: The Economics of Coal-Fired Electricity Generation in the U.S.," Tax Shift Strategy Meeting, Washington, D.C., December 2, 2000.

Presentation on "Repowering the Midwest: A Clean Energy Development Plan for the Heartland," presentation with Howard Learner at the National Association of Regulatory Utility Commissioners Annual Meeting, San Diego, California, November 14, 2000.

Presentation on "Electricity in New England: Market Imperfections of Failure?" at National Association of State Utility Consumer Advocates Annual Meeting, San Diego, California, November 13, 2000.

Presentation on "How Green is Green? Verifying Energy Advertising Claims," at the New England Conference of Public Utility Commissioners Symposium, Bretton Woods, New Hampshire, May 25, 1999.

Presentation on "Consumer Perspectives on Market Power – Case Studies from New England, New York, PJM, and Mississippi," IBC Conference on Market Power, Washington DC, May 24, 1999.

Presentation on "Grandfathering and Environmental Comparability," at the National Association of Regulatory Utility Commissioners 1998 Summer Committee Meetings, Seattle, July 26, 1998.

Presentation on "Tracking Electricity in the New England Market," at the National Association of Regulatory Utility Commissioners 1998 Summer Committee Meetings, Seattle, July 26, 1998.

Presentation on "Tracking Electricity in the New England Electricity Market," at the National Council on Competition and the Electricity Industry National Executive Dialogue on Customers' Right to Know, Chicago, May 13, 1998.

Presentation on "Comparable Environmental Regulations in a Restructured Electricity Industry: The Grandfathering Effect," National Association of Regulatory Utility Commissioners meeting in Washington, D.C., March 1, 1998.

Presentation on "Market Power in Electricity Generation," National Consumer Law Center Conference, Washington, D.C., February 9, 1998.

Presentation on "Electricity Market Power in New England," Massachusetts Electric Industry Restructuring Roundtable, Boston, December 15, 1997.

Presentation on wind power development and air quality, National Wind Coordinating Committee New England Wind Issues Forum, Boston, November 7, 1997.

Invited speaker on market power, National Association of State Utility Consumer Advocates meeting in Boston, November 12, 1997.

Presentation on "Distortions to Future and Current Competitive Electric Energy Markets Due to Grandfathering Environmental Regulations of Electric Power Plants," National Association of Regulatory Utility Commissioners meeting in Boston, November 9, 1997.

Presentation on "Electric Industry Restructuring as if the Environment Mattered," Boston Area Solar Energy Association, October 9, 1997.

Invited speaker on "Modeling Market Power in Electricity Generation," National Association of Regulatory Utility Commissioners meeting in San Francisco, July 22, 1997.

Presentation on "Performance-Based Regulation in a Restructured Electric Industry," National Association of Regulatory Utility Commissioners meeting in San Francisco, July 20, 1997.

Presentation on "State Initiatives and Regional Issues," New England Governors' Conference Workshop on Restructuring and Environmentally Sustainable Technologies, Warwick, Rhode Island, March 25, 1997.

Invited speaker on stranded costs, National Association of State Utility Consumer Advocates meeting in San Francisco, November 1996.

Presentation on “Nuclear Power Plant Decommissioning Costs and Electricity Restructuring,” Nuclear Decommissioning Trusts conference, New York City, November 18, 1996.

Invited speaker on stranded costs, Indiana Utilities Regulatory Commission Forum, Indianapolis, November 1, 1996.

Presentation on “Electric Industry Restructuring and the Environment,” at the Indiana Energy Conference, Indianapolis, Indiana, October 10, 1996.

Presentation on "Small Customers in a Restructured Electricity Industry: Transaction Costs, Advanced Metering Technologies and Aggregation Options" to the Consumers' Energy Conference, South Portland, Maine, July 1996.

Presentation on "Electric Generation Market Power in New England" to New England Conference of Public Utility Commissioners, Manchester Village, Vermont, May 1996.

Presentation on "Advanced Metering for Residential Customers on Electricity Restructuring" to National Consumer Law Center's 10th Annual Conference in Washington, DC, February 1996.

Presentations on "Market Power," "Environmental Aspects of Restructuring" and "Market Access for Small Customers" to Vermont Public Service Board workshops on electricity restructuring, January and February 1996.

Presentation on "Environmental Impacts of Energy: Sustainability and Social Costing" to British Columbia Utilities Commission Workshop, Vancouver, BC, March 1995.

Presentation on "Competition and Economic Efficiency" to the National Council on Competition and the Electric Industry, December 1995.

Presentation on "Compliance Planning Under Regulatory Uncertainty," to EPA "Opportunities Conference: Energy Efficiency and Renewable Energy," Washington, DC, June 1993.

Presentation on "Energy and Sustainability" to Hydro-Quebec Conference, Hampshire College, Amherst, Massachusetts, April 1993.

Invited Speaker on environmental externalities, ASME "ECO World" conference in Washington, DC, June 1992.

Invited Speaker, Association of Energy Engineers, Boston, Massachusetts, February 1992.

Presentation of Acid Rain Abatement Optimization Model to the Swedish Environmental Protection Agency, Solna, Sweden, November 1991.

Presentation on Integrated Resource Planning to Boston Gas Company, July 1990.

Training on Methods for Calculating Electric System Avoided Costs, provided to energy planners and policy makers from five Southeast Asian countries sponsored by U.S. Agency for International Development and administered by the Institute of International Education, May 1990.

Invited Speaker, National Association of State Utility Consumer Advocates (NASUCA) Mid-Year Meeting, Annapolis, Maryland, and June 1988.

Invited Speaker, Conference on New Developments in Nuclear Decommissioning Costs and Funding Methods, sponsored by the Northeast Center for Professional Education, Washington, DC, April 1988.

Updated July 2012.

NPVRR - Expected Value & Ranges

Discount Rate **7.885%**

CapEx Run Scenario Scenario	Plan #	Rank	Diff v Low	Exp Value	Max	Min	10th %-Tile	Median	90th %-Tile	SCPC	CC	CTs	Retro	Units	Retire
With Oct 2010 DSM/EE Levels															
All Retrofits in 2015	KP01	2	53.0	24,930.9	28,424.5	21,743.8	22,361.8	25,028.7	26,538.8			616	1,212	L1, L2, M1, M2, M3	0
Retire L1 - CT Replace	KP02A	7	110.1	24,987.9	28,566.5	21,821.9	22,618.5	25,113.8	26,491.3			924	840	L2, M1, M2, M3	372
Retire L1 - CC Replace	KP02B	5	78.3	24,956.2	28,540.9	21,853.3	22,612.1	25,077.3	26,438.1		300	616	840	L2, M1, M2, M3	372
Retire L2 - CT Replace	KP03A	6	104.3	24,982.2	28,555.5	21,812.7	22,584.9	25,112.8	26,503.3			924	882	L1, M1, M2, M3	330
Retire L2- CC Replace	KP03B	4	75.1	24,953.0	28,536.1	21,844.5	22,579.2	25,080.9	26,443.5		300	616	882	L1, M1, M2, M3	330
Retire L1 & L2 - CT Replace	KP04A	11	216.8	25,094.7	28,766.1	21,836.1	22,762.0	25,260.4	26,503.5			1,309	510	M1, M2, M3	702
Retire L1 & L2 - CC Replace	KP04B	9	145.8	25,023.6	28,698.6	21,892.0	22,758.9	25,153.3	26,506.2		600	693	510	M1, M2, M3	702
Retire L1 & L2 - Coal Replace	KP04C	14	592.4	25,470.3	29,248.7	22,245.8	23,024.2	25,533.4	27,173.9	600		693	510	M1, M2, M3	702
Retire Montrose - CT Replace	KP05A	3	64.3	24,942.2	28,502.6	21,789.9	22,582.0	25,062.0	26,406.9			1,078	702	L1, L2	510
Retire Montrose - CC Replace	KP05B	1	0.0	24,877.9	28,439.9	21,842.3	22,637.2	24,995.3	26,342.6		600	462	702	L1, L2	510
Retire Montrose - Coal Replace	KP05C	13	420.7	25,298.6	28,957.6	22,057.9	22,778.8	25,429.3	27,062.4	600		462	702	L1, L2	510
Retire All - CT Replace	KP06A	12	346.5	25,224.4	29,027.0	21,867.4	23,260.2	25,324.2	26,638.9			1,848	0	None	1,212
Retire All - CC Replace	KP06B	10	204.8	25,082.7	28,842.7	21,990.7	23,257.5	25,189.7	26,509.6		1,200	616	0	None	1,212
Retire All - Coal Replace	KP06C	15	1,100.2	25,978.0	29,959.3	22,598.0	23,523.0	26,156.3	27,836.3	1,200		616	0	None	1,212
Retire Montrose - CC Replace (This Scenario added for DR 43 at request of KCC)	KP07B	8	119.7	24,997.6	28,664.4	21,932.7	22,872.8	25,075.6	26,436.9		900	616	330	L2	882
With Sept 2009 DSM/EE Levels															
All Retrofits in 2015	KR01	4	174.4	24,454.4	27,803.8	21,339.8	21,940.0	24,610.6	26,025.8			308	1,212	L1, L2, M1, M2, M3	0
Retire L1 - CC Replace	KR02B	3	119.0	24,399.0	27,824.4	21,447.3	22,094.7	24,549.2	25,832.2		300	385	840	L2, M1, M2, M3	372
Retire L2- CC Replace	KR03B	2	96.6	24,376.5	27,788.4	21,421.2	22,037.8	24,536.1	25,827.1		300	308	882	L1, M1, M2, M3	330
Retire Montrose - CC Replace	KR05B	1	0.0	24,279.9	27,668.7	21,387.6	22,068.9	24,392.1	25,671.6		600	154	702	L1, L2	510

Note: These runs do not include any costs changes for these different DSM/EE Levels - Therefore comparisons to Oct 2010 DSM Level results are not meaningful.

Source: Excel file "Analysis from 11-KCPE-581-PRE\KCC_20110225-23-Att-KCC-Q23-La Cygne Retrofit NPVRR (2-11-11 Runs)_Filed Case.xls" tab "Summary", provided by KCPL in response to KCC Staff Data Request #DR23 in Kansas Docket No. 11-KCPE-581-PRE, submitted by KCP&L

Worksheet Row Number													
1		**Resource Additions / Retrofits**											
2	**Plan #**	SCPC	CC	CTs	Retrofits	**EP**	**Load**	**Const Costs**	**Cap Cost**	**CO2**	**Gas**	**Coal**	**PVRR**
35	KP01			616	1212	33	Mid	Mid	Mid	Mid	**Mid**	Mid	24,957.0
40	KP01			616	1212	38	Mid	Mid	Mid	Mid	**Low**	Mid	25,308.5
611	KP05B		600	462	702	33	Mid	Mid	Mid	Mid	**Mid**	Mid	24,900.1
616	KP05B		600	462	702	38	Mid	Mid	Mid	Mid	**Low**	Mid	24,900.9
803	KP06B		1,200	616	0	33	Mid	Mid	Mid	Mid	**Mid**	Mid	25,095.7
808	KP06B		1,200	616	0	38	Mid	Mid	Mid	Mid	**Low**	Mid	24,533.1

Source:	Excerpt from Excel file "Analysis from 11-KCPE-581-PRE\KCC_20110225-23-Att-KCC-Q23-La Cygne Retrofit NPVRR (2-11-11 Runs)_Filed Case.xls" tab "EP Ranks", provided by KCPL in response to KCC Staff Data Request #DR23 in Kansas Docket No. 11-KCPE-581-PRE, submitted by KCP&L

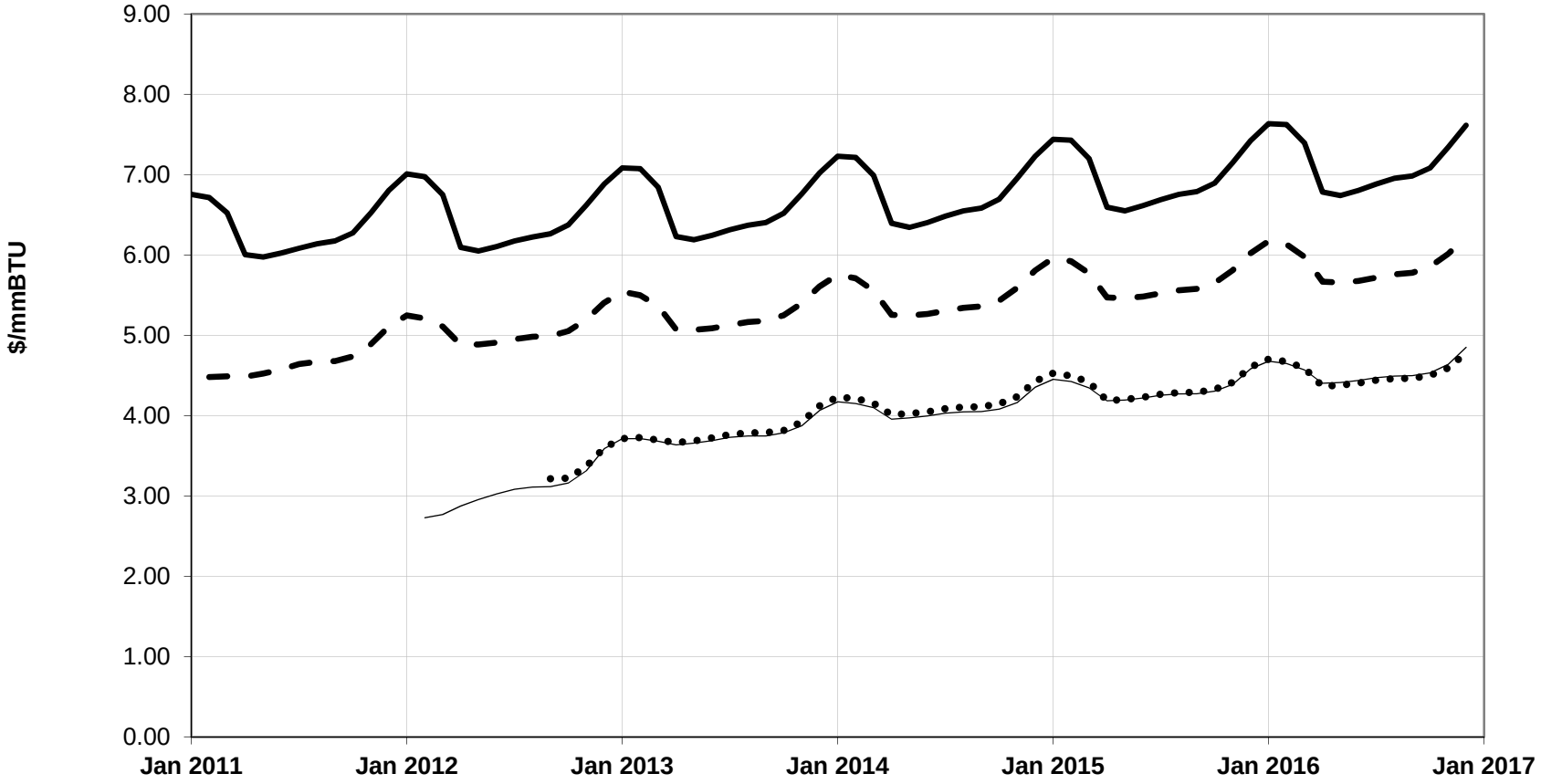
NPVRR - Expected Value & Ranges

Discount Rate		7.885%					
CapEx Run Scenario							
Scenario	Plan #	La Cygne Status	Montrose Status	PVRR Mid Gas	PVRR Low Gas	Net PVRR Benefits of Additional Retirement Mid Gas	Net PVRR Benefits of Additional Retirement Low Gas
With Oct 2010 DSM/EE Levels							
All Retrofits in 2015	KP01	Retrofit	Retrofit	24,957	25,309	-	-
Retire Montrose - CC Replace	KP05B	Retrofit	Retire	24,900	24,901	(57)	(408)
Retire All - CC Replace	KP06B	Retire	Retire	25,096	24,533	196	(368)

Notes:	PVRR expressed in millions of 2009$. All non-gas variables (load, construction cost, capital cost, CO2 cost, and coal cost) at "mid" level.

Source:	Based upon Excel files "Analysis from 11-KCPE-581-PRE\KCC_20110225-23-Att-KCC-Q23-La Cygne Retrofit NPVRR (2-11-11 Runs)_Filed Case.xls" tabs "Summary" and "EP Ranks", provided by KCPL in response to KCC Staff Data Request #DR23 in Kansas Docket No. 11-KCPE-581-PRE, submitted by KCP&L

NYMEX Henry Hub Natural Gas Forwards



NYMEX Henry Hub

(Commodity Index)

Case No: U-16890
Exhibit: A-27 (BDG-6)
Witness: BDGallaway
Date: February 2012