REDACTED VERSION

STATE OF IOWA
IOWA UTILITIES BOARD

In Re:		
	)	
Interstate Power and Light	**)**	**Docket No. SPU-05-15**
Company and FPL Energy	**)**	
Duane Arnold, LLC	**)**	

Surrebuttal Testimony of
Ezra D. Hausman, Ph.D.
Synapse Energy Economics, Inc.

On Behalf of the
Iowa Office of Consumer Advocate

REDACTED VERSION

October 24, 2005

Q. Please state your name, position and business address.

A. My name is Dr. Ezra D. Hausman. I am a Senior Associate with Synapse Energy Economics, Inc, 22 Pearl Street, Cambridge, MA 02139.

Q. On whose behalf are you providing surrebuttal in this case?

A. I am testifying on behalf of the Iowa Office of Consumer Advocate ("OCA").

Q. Are you the same Dr. Ezra Hausman who previously filed direct testimony in this proceeding?

A. Yes, I am.

Q. What is the purpose of your surrebuttal testimony?

A. I would like to address certain aspects of the rebuttal testimony of IPL witnesses Kitchen, Aller and Friedman. Specifically, I would like to explain my use of a coal-burning IGCC proxy plant as the basis for the price forecasts I submitted with my direct testimony. Specifically, I would like to make clear that this approach does not depend on whether or not IPL itself has plans to build such a plant to produce replacement energy for the Duane Arnold Energy Center (DAEC), and I would like to touch upon the implications of my use of this particular proxy plant. I would like to address the objections expressed by witnesses Kitchen and Friedman regarding the carbon emissions cost projections used in my analysis. Finally, I would like to address the electricity price forecasts presented by IPL witness Friedman in his rebuttal testimony, and explore why his forecast presents such a different electricity price outlook from that presented with my direct testimony.

Q. What is your response to the assertions by IPL witnesses Kitchen, on page 12 lines 4 through 16, and Aller, on page 53 lines 16 through 22, that an IGCC plant would be excessively expensive to build?

A. While it is true that an IGCC plant is anticipated to have high capital costs, it's variable operating costs, and especially fuel costs, are expected to be much lower than those of other base load generating technologies. I chose this technology because, according to the projected cost comparison that I performed, it will be the least expensive conventional, fossil fuel burning technology for providing new base load capacity in the time frame under consideration. This is so with or without considering the carbon emissions price forecasts provided with my analysis, and despite the high carbon content of coal compared with that of other fossil fuels.

Q. IPL witness Aller refers to IGCC as "an unproven and extremely costly technology" (p. 53, lines 18-19.) Do you agree with this characterization?

A. I agree that IGCC is new and not yet proven on a large scale, and may turn out to be more costly than I have forecasted based on technology cost parameters from the U.S. Department of Energy's Annual Energy Outlook (AEO) report for 2005. Further, I note that while there are few operating IGCC plants in the United States at this time, there are a large number proposed throughout the country, so I am clearly not alone in believing that this technology looks economically appealing compared to other fossil fuel-burning technology options. However, if it turns out that the costs are greater than I have assumed, then my price forecasts (and the expected cost of replacement power for DAEC) should be revised upwards.

Q. What is you response to witness Aller's assertion (page 54, lines 3 through 6) that IPL has not even modeled the IGCC technology in its resource planning?

A. While this may be true, it is not relevant to my analysis. I was asked to forecast the market price of electricity to estimate what the cost of power would be to replace the output from DAEC. As explained in my direct testimony, I used the all-in cost of a coal-burning IGCC plant as a conservative proxy for the cost of replacement base load power. This is not meant to imply whether or not IPL is planning to or likely to build such a plant to replace base load energy from DAEC. The point is that some conventional base load generation is expected to be required during the forecast period, either to meet load growth, or to replace existing capacity, or both. For this to occur, the all-in costs of such a plant must be covered by the revenues it will expect to receive.

Q. Is it true, as stated by IPL witness Friedman, that you "advocate[d] the use of EIA AOE [sic] 2005 generator characteristics data, but then change[d] the target capacity factor contained in that publication"?

A. Yes, I did use an 85% capacity factor for an IGCC unit whereas the AEO report suggests an 80% capacity factor. By my judgment, an 85% capacity factor is more realistic for a technology at the stage of maturity this will have attained during the study period. However, I would point out that this was a conservative assumption, and had I used a lower capacity factor, it would have led to higher energy prices to cover the all-in costs of the technology. Had it not been an adjustment in the direction of conservatism, I would not have made it.

Q. IPL witnesses Kitchen (page 12, line 17 through page 13, line 5) and Friedman (page 21, lines 6 through 21) assert that because there are no current costs associated with carbon emissions in the State of Iowa, it is inappropriate to use such costs as a basis for your electricity price forecasts. What is your reaction to this line of reasoning?

A. I was asked, as an expert analyst, to forecast prices for the study period to the best of my ability. There are many unknowns underlying such a forecasting exercise, and this is no exception. None of us know with precision what the cost of fuel will

be 20 years into the future, or labor costs, or whether some entirely new technology will exist which will revolutionize the production of electricity. The same is true with emissions costs, especially in an environment where regulations are rapidly evolving. However, it is my job to forecast these things to the best of my ability, given my experience in this area and my careful review of relevant information resources.

One easy way to forecast something uncertain, I suppose, would be to just take today's value and project it indefinitely into the future. Another option might be to take anything that is subject to uncertainty, and assume that it will have a value of zero in the future. I think that witnesses Kitchen and Friedman would agree that in general, neither of these is a particularly useful or reasonable forecasting approach. However, these approaches seem to be exactly what Kitchen and Friedman suggest regarding carbon emissions prices. This is so despite the fact that IPL, as illustrated in their response to Data Request 91, [redacted]

Synapse Energy has taken what I believe to be a more reasonable and justifiable approach, which is to analyze the relevant literature and economics and to project a likely CO_2 emissions price into the future, while acknowledging that there is considerable uncertainty associated with this forecast. While I certainly agree that my forecast may be either too low or too high, I am quite confident that this approach is better than ignoring all of the evidence and forecasting a price of zero forever.

Q. IPL witnesses Kitchen and Friedman further assert that the future price of carbon emissions is unknown and unmeasureable, and therefore that it is inappropriate to use such costs as a basis for your electricity price forecasts. What is your reaction to this line of reasoning?

A. If this were done for a ratemaking proceeding, I might agree that it is premature to quantify emissions costs for carbon dioxide in the near term on this basis.

However, what we are discussing here is a price forecast undertaken as part of a long-term planning exercise, and underlying significant investment or divestment decision-making. In this case it is inappropriate to neglect costs due to their uncertainty. Instead the most reasonable approach would be to make the most educated estimate possible, acknowledging the range of uncertainty in the analysis. To do otherwise would be to bias and distort the analysis.

Q. IPL Witnesses Kitchen (page 13, lines 3-4) refers to the carbon emissions costs in your direct testimony as a "carbon tax". Do you agree with this characterization?

A. I do not. As I discussed in my direct testimony (page 6, lines 1-27), any cap-and-trade emissions regulation, which I consider most likely for regulating carbon emissions in the future, involves an initial allocation of emission allowances. It is often the case that many of these allowances are allocated to existing sources such as fossil fuel burning power plants, to moderate the economic impact of this new requirement. I would expect this to be the case with the allocation of CO_2 emissions allowances.

Because these permits are valuable and tradable, using them involves an opportunity cost, and this would be taken into account in the price of electricity offers. More relevant to my analysis, the market price of these permits would strongly affect investment decisions on the part of power plant developers. This is because new fossil fuel power plants are less likely to be awarded emissions permits, and would have to recover the cost of obtaining these permits on the market in the all-in cost of producing electricity. Thus, existing generators would see minimal financial impact from this mechanism, and in fact it might be to their benefit because (a) they would now have the option to sell emissions allowances instead of power, and (b) many generators would benefit from the higher price of electricity. Developers of new power plants, on the other hand, would have a financial incentive to minimize the carbon emissions from any generation additions.

However, because the implementation of this mechanism would not fundamentally take the form of an additional cost on existing generators, I think it is more accurate to characterize it as "carbon regulation" rather than as a "carbon tax".

Q. Turning now to IPL witness Friedman's electricity price forecast, can you explain how your price forecasting approach differed from that of witness Friedman, as described in his rebuttal testimony page 4, line 12 through page 6, line 15, and tabulated in Exhibits REF-1 and REF-2?

A. Mr. Friedman and I used quite different approaches in generating our forecasts. The most fundamental assumption underlying my forecast was that, because new base load capacity is anticipated to be built by and during the study period, the price of electricity (including energy and capacity) will have to be sufficient to cover the all-in costs of such a new-base load plant. That is to say, the per-MWh price of electricity plus capacity will have to be greater than or equal to the total, annualized costs of the plant, divided by the total number of megawatt-hours that the plant will produce in a year. The all-in cost includes capital costs, as well as fixed and variable operating costs including fuel and cost of emissions. The number of megawatt-hours produced is simply the capacity of the plant, times the capacity factor, times the 8760 hours in a year.

If this condition were not met, then plants would be cancelled or retired until the price rises at least to this level, because no one builds or runs power plants for the purpose of losing money.

[redacted]

[redacted]

Q. **Do you agree with the 2006 values for the prices of natural gas and electricity used by Mr. Friedman for his price forecast?**

A. [redacted]

[redacted] I am afraid that gas has not been in the neighborhood of [redacted] for quite a while now, and I don't believe it will return to that value anytime soon, if at all. Current futures for the coming winter, according to NYMEX, show that gas trading at closer to $14/MMBTU. (NYMEX futures do show a downward trend after this, falling to about $7.50/MMBTU for December 2010; however, given that the recent trading volume for this period is essentially zero, I would say that this is not a very meaningful price indicator.) While some of the current high price is likely to be a transient effect related to the recent hurricanes in the Gulf of Mexico, this is clearly not the whole story. Gas prices were much higher than Mr. Friedman's estimate in July and August of 2005, before the hurricanes were even on the horizon.

Thus my answer is that I do not agree with the values Mr. Friedman has used as a starting point for the price of either gas or electricity, nor with the implicit relationship between the two.

Q. **Do you agree with the [redacted] projected by Mr. Friedman for natural gas prices, between 2005 and 2010?**

A. My judgment is that the current market price of natural gas reflects both long-term fundamentals and short term effects of the recent hurricanes. In terms of the long-term fundamentals, prices have been pushed upwards recently both by escalating demand (a large number of new, gas-fired power plants have been built in the last five years) and by dwindling domestic production. Because of both of these factors, many more new discoveries have been required each year to keep up with growth in demand. According to the EIA, for example, between 1991 and 1996, an average of 9,158 natural gas wells were completed each year in the United States, while from the years 1997 to 2002, the yearly average was

14,701—more than a 60% increase in the number of new wells. However, annual gas production for those same years increased by under 7%--from an average of 17,930 Bcf/y (billion cubic feet per year) for the years 1991 to 1996, to an average of 19,137 Bcf/y for the years 1997 to 2002. As this illustrates, natural gas recovery in the United States has become progressively more difficult, more expensive and less productive in recent years, at the same time that demand has increased (and is still increasing) due to the growing demand for gas-fired generation.

Finally, I note that there are about 45 current proposals for new liquefied natural gas (LNG) import terminals in the United States. While I don't believe that all of these will be built, and indeed there would be insufficient global supply of LNG to serve them all, the fact that so many investors are interested in sinking billions into developing these LNG assets suggests to me that at least these investors expect gas prices to remain high for quite a while.

All of this is to say that I disagree with [redacted] (Again, the declining futures reported by NYMEX today do not reflect any appreciable volume of trades.) While I believe the current extremely high natural gas price will moderate to a certain extent, I do not believe gas prices will return to the levels he has implied in his forecast for a great while, if ever. I would be quite surprised if they do in the 2005 to 2010 time frame. Anyone who believes they will should be out selling gas futures as quickly as they can, for these projections are [redacted] as I have indicated.

Q. Does Mr. Friedman take any of these market fundamentals into account in projecting the price of natural gas and electricity from the period from 2006 to 2010?

A. Assuming that the entirety of Mr. Friedman's forecast is as represented in his rebuttal testimony and in the response to DR-249, [redacted]

[redacted]

A. As long as natural gas is on the margin for much of the time, I would expect the price of electricity to rise at approximately the rate that the price of natural gas increases. If enough new coal-fired generation is built so that coal is often on the margin, the relationship between natural gas and electricity prices will be weaker.

However, I find it curious that while Mr. Friedman agrees that new coal units are likely to be built during the study period, he seems unconcerned with the fact that his forecasted electricity price forecasts imply that any such plant would hemorrhage money. Elsewhere in Mr. Friedman's rebuttal testimony (page 23, lines 3 through 9) he suggests that IPL could purchase blocks of energy from the market at the marginal cost of production for an IGCC, "and [match] these energy costs with capacity derived from newly constructed combustion turbines." Nice as

this would be for ratepayers, it is just not realistic. The combined price of energy and capacity on the market, which is what IPL would face for replacing DAEC from the market, must be sufficient to cover the all-in costs of new generation. Otherwise, that generation is simply not going to be available.

Q. Do you agree with the capacity price component of Mr. Friedman's forecast?

A. [redacted]. As I said in my direct testimony, however, I do not know what form the market will take decades into the future, and how the price of electricity will be divided into energy and capacity costs in Iowa. What I do know, and what is illustrated from these ongoing processes in the northeast, is that no one is going to build new power plants unless they are confident that both their variable and fixed costs can be recovered in some manner. I have therefore not made a distinction between energy and capacity in my price forecast, but have forecast a combined value for both that will be sufficient to cover all of the costs of new base-load generation investments.

Q. Do you have any other comments with regard to Mr. Friedman's price forecasts?

A. I do. One of the problems with [redacted] is that the opportunity is lost to consider how the future market environment may be different from that of the past. One difference that I highlight in my analysis is that in the future, it is extremely likely that new generation will be faced with emissions costs for the carbon dioxide they produce. [redacted]

[redacted] This is quite unrealistic, and is decidedly out of step with what most analysts who have reviewed this issue have surmised. (This issue is explored in detail in exhibit Exhibit__DAS-1, Schedule _F, submitted by OCA witness Schlissel with his direct testimony.) Because my forecast is based upon expected future developments in the marketplace, I make my best estimate of future carbon dioxide emissions price, based upon an extensive review of research conducted by Synapse Energy personnel. [redacted]

Q. According to the rebuttal testimony of IPL witness Aller (p. 52, lines 20 through 26), the price forecasts presented by Mr. Friedman are the same ones used in the re-licensing study for DAEC. Do you feel that this was an appropriate use of this forecast?

A. As I discussed above, my analysis is that Mr. Friedman's prices ignore several crucial fundamental market drivers, and as a result produce [redacted] Further, as illustrated in Exhibit__EDH-2, Schedule A, Mr. Friedman's analysis is based upon a review of a single day's issue of Megawatt Daily, fed into an analytical exercise that was performed upon what look like two post-it notes. I find it hard to believe that anyone would base a nuclear plant re-licensing study on this superficial level of analysis.

Over the last several years, I have personally performed a large number of electricity price forecasting studies to support power plant development and purchase decisions in electricity markets throughout the United States, as well as to support litigation, regulatory and damage calculation proceedings. These studies typically rely on complex models to forecast future market operations, and take advantage of a detailed, in-depth analysis of the underlying market drivers to

support this exercise. Such an approach also allows the consideration of a range of possible futures, so that the sensitivity of the outcome to these market drivers can be analyzed. My clients have willingly spent tens of thousands of dollars on these analyses because they are so central to their decision-making, and because a high level of confidence and credibility is required. Given this, I find it hard to believe that IPL would rely on such a cursory forecasting exercise as that performed by Mr. Friedman, in support of such a momentous decision as re-licensing a nuclear power plant. If this is indeed the case, I believe that a reassessment based upon a much more sophisticated, careful and realistic market analysis is in order.

Q. Does this conclude your surrebuttal testimony?

A. Yes, it does.