

**REDACTED VERSION**

**STATE OF IOWA  
IOWA UTILITIES BOARD**

**In Re:**

<b>Interstate Power and Light</b>	)	
<b>Company and FPL Energy</b>	)	<b>Docket No. SPU-05-15</b>
<b>Duane Arnold, LLC</b>	)	

**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

REDACTED VERSION

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

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

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

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

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

8 A. Yes, I am .

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

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

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

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

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

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

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

REDACTED VERSION

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

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

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

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

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

REDACTED VERSION

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

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

15 [REDACTED]  
16 Synapse Energy has taken what I believe to be a more reasonable and justifiable  
17 approach, which is to analyze the relevant literature and economics and to project  
18 a likely CO<sub>2</sub> emissions price into the future, while acknowledging that there is  
19 considerable uncertainty associated with this forecast. While I certainly agree that  
20 my forecast may be either too low or too high, I am quite confident that this  
21 approach is better than ignoring all of the evidence and forecasting a price of zero  
22 forever.

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

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

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

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

10          A. I do not. As I discussed in my direct testimony (page 6, lines 1-27), any cap-and-  
11          trade emissions regulation, which I consider most likely for regulating carbon  
12          emissions in the future, involves an initial allocation of emission allowances. It is  
13          often the case that many of these allowances are allocated to existing sources such  
14          as fossil fuel burning power plants, to moderate the economic impact of this new  
15          requirement. I would expect this to be the case with the allocation of CO<sub>2</sub>  
16          emissions allowances.

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



REDACTED VERSION

1 [REDACTED]  
2 [REDACTED]  
3 [REDACTED]  
4 [REDACTED]  
5 [REDACTED]  
6 [REDACTED]  
7 [REDACTED]  
8 [REDACTED]  
9 [REDACTED]  
10 [REDACTED]  
11 [REDACTED]  
12 [REDACTED]  
13 [REDACTED]  
14 [REDACTED]

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

17 A. [REDACTED]  
18 [REDACTED]  
19 [REDACTED]  
20 [REDACTED]  
21 [REDACTED]  
22 [REDACTED]  
23 [REDACTED]  
24 [REDACTED]  
25 [REDACTED]  
26 [REDACTED]  
27 [REDACTED]  
28 [REDACTED] I am afraid that gas has

REDACTED VERSION

1 not been in the neighborhood of [REDACTED] for quite a while now, and I  
2 don't believe it will return to that value anytime soon, if at all. Current futures for  
3 the coming winter, according to NYMEX, show that gas trading at closer to  
4 \$14/MMBTU. (NYMEX futures do show a downward trend after this, falling to  
5 about \$7.50/MMBTU for December 2010; however, given that the recent trading  
6 volume for this period is essentially zero, I would say that this is not a very  
7 meaningful price indicator.) While some of the current high price is likely to be a  
8 transient effect related to the recent hurricanes in the Gulf of Mexico, this is  
9 clearly not the whole story. Gas prices were much higher than Mr. Friedman's  
10 estimate in July and August of 2005, before the hurricanes were even on the  
11 horizon.

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

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

17 **A.** My judgment is that the current market price of natural gas reflects both long-  
18 term fundamentals and short term effects of the recent hurricanes. In terms of the  
19 long-term fundamentals, prices have been pushed upwards recently both by  
20 escalating demand (a large number of new, gas-fired power plants have been built  
21 in the last five years) and by dwindling domestic production. Because of both of  
22 these factors, many more new discoveries have been required each year to keep  
23 up with growth in demand. According to the EIA, for example, between 1991 and  
24 1996, an average of 9,158 natural gas wells were completed each year in the  
25 United States, while from the years 1997 to 2002, the yearly average was  
26 14,701—more than a 60% increase in the number of new wells. However, annual  
27 gas production for those same years increased by under 7%--from an average of  
28 17,930 Bcf/y (billion cubic feet per year) for the years 1991 to 1996, to an  
29 average of 19,137 Bcf/y for the years 1997 to 2002. As this illustrates, natural gas

REDACTED VERSION

1 recovery in the United States has become progressively more difficult, more  
2 expensive and less productive in recent years, at the same time that demand has  
3 increased (and is still increasing) due to the growing demand for gas-fired  
4 generation.

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

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

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

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

25 [REDACTED]

26 [REDACTED]

27 [REDACTED]

REDACTED VERSION

1 [REDACTED]  
2 [REDACTED]  
3 [REDACTED]  
4 [REDACTED]  
5 [REDACTED]  
6 [REDACTED]  
7 [REDACTED]  
8 [REDACTED]  
9 [REDACTED]  
10 [REDACTED]  
11 [REDACTED]  
12 [REDACTED]

13 A. As long as natural gas is on the margin for much of the time, I would expect the  
14 price of electricity to rise at approximately the rate that the price of natural gas  
15 increases. If enough new coal-fired generation is built so that coal is often on the  
16 margin, the relationship between natural gas and electricity prices will be weaker.  
17 However, I find it curious that while Mr. Friedman agrees that new coal units are  
18 likely to be built during the study period, he seems unconcerned with the fact that  
19 his forecasted electricity price forecasts imply that any such plant would  
20 hemorrhage money. Elsewhere in Mr. Friedman’s rebuttal testimony (page 23,  
21 lines 3 through 9) he suggests that IPL could purchase blocks of energy from the  
22 market at the marginal cost of production for an IGCC, “and [match] these energy  
23 costs with capacity derived from newly constructed combustion turbines.” Nice as  
24 this would be for ratepayers, it is just not realistic. The combined price of energy  
25 and capacity on the market, which is what IPL would face for replacing DAEC  
26 from the market, must be sufficient to cover the all-in costs of new generation.  
27 Otherwise, that generation is simply not going to be available.

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

2 A. [REDACTED]

3 [REDACTED]

4 [REDACTED]

5 [REDACTED]

6 [REDACTED]

7 [REDACTED]

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

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

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

25 [REDACTED]

26 [REDACTED] This is quite  
27 unrealistic, and is decidedly out of step with what most analysts who have  
28 reviewed this issue have surmised. (This issue is explored in detail in exhibit  
29 Exhibit\_\_DAS-1, Schedule \_F, submitted by OCA witness Schlissel with his

REDACTED VERSION

1 direct testimony.) Because my forecast is based upon expected future  
2 developments in the marketplace, I make my best estimate of future carbon  
3 dioxide emissions price, based upon an extensive review of research conducted by  
4 Synapse Energy personnel. [REDACTED]

5 [REDACTED]

6 [REDACTED]

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

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

19 Over the last several years, I have personally performed a large number of  
20 electricity price forecasting studies to support power plant development and  
21 purchase decisions in electricity markets throughout the United States, as well as  
22 to support litigation, regulatory and damage calculation proceedings. These  
23 studies typically rely on complex models to forecast future market operations, and  
24 take advantage of a detailed, in-depth analysis of the underlying market drivers to  
25 support this exercise. Such an approach also allows the consideration of a range of  
26 possible futures, so that the sensitivity of the outcome to these market drivers can  
27 be analyzed. My clients have willingly spent tens of thousands of dollars on these  
28 analyses because they are so central to their decision-making, and because a high  
29 level of confidence and credibility is required. Given this, I find it hard to believe

**REDACTED VERSION**

1           that IPL would rely on such a cursory forecasting exercise as that performed by  
2           Mr. Friedman, in support of such a momentous decision as re-licensing a nuclear  
3           power plant. If this is indeed the case, I believe that a reassessment based upon a  
4           much more sophisticated, careful and realistic market analysis is in order.

5   **Q.    Does this conclude your surrebuttal testimony?**

6   **A.    Yes, it does.**

7