STATE OF INDIANA **CAC EXHIBIT C (DAS)**

INDIANA UTILITY REGULATORY COMMISSION

VERIFIED PETITION OF DUKE ENERGY INDIANA, INC., (1) SEEKING AUTHORITY TO REFLECT COSTS INCURRED FOR THE EDWARDSPORT INTEGRATED GASIFICATION COMBINED CYCLE GENERATING FACILITY ("IGCC PROJECT") PROPERTY UNDER CONSTRUCTION IN ITS RATES AND AUTHORITY TO RECOVER EXERNAL COSTS THROUGH ITS INTEGRATED COAL GASIFICATION COMBINED CYCLE GENERATING FACILITY COST RECOVERY ADJUSTMENT, STANDARD CONTRACT RIDER NO. 61 PURSUANT TO IND. CODE SECTIONS 8-1-8.8-11 AND -12; (2) SEEKING AN EXPEDITED APPROVAL OF AN UPDATED COST ESTIMATE FOR THE IGCC PROJECT, INCLUDING APPROVAL OF AN ONGOING REVIEW PROGRESS REPORT PURSUANT TO IND. CODE 8-1-8.7; AND (3) SEEKING APPROVAL OF AND COST RECOVERY ASSOCIATED WITH THE STUDY OF CARBON CAPTURE, SEQUESTRATION AND/OR ENHANCED OIL RECOVERY FOR THE IGCC PROJECT PURSUANT TO AN ALTERNATIVE REGULATORY PLAN UNDER IND. CODE SECTION 8-1-2.5-6	)	**CAUSE NO. 43114** **IGCC-1**

DIRECT TESTIMONY OF DAVID A. SCHLISSEL

ON BEHALF OF THE

CITIZENS ACTION COALITION OF INDIANA

SAVE THE VALLEY

VALLEY WATCH

SIERRA CLUB

JULY 22, 2008

PUBLIC VERSION
PROTECTED MATERIALS REDACTED

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1. Introduction and Qualifications

Q. What is your name, position and business address?

A. My name is David A. Schlissel. I am a Senior Consultant at Synapse Energy Economics, Inc, located at 22 Pearl Street, Cambridge, MA 02139.

Q. Please describe Synapse Energy Economics.

A. Synapse Energy Economics ("Synapse") is a research and consulting firm specializing in energy and environmental issues, including electric generation, transmission and distribution system reliability, market power, electricity market prices, stranded costs, efficiency, renewable energy, environmental quality, and nuclear power.

Synapse's clients include state consumer advocates, public utilities commission staff, attorneys general, environmental organizations, federal government and utilities. A complete description of Synapse is available at our website, www.synapse-energy.com.

Q. Please summarize your educational background and recent work experience.

A. I graduated from the Massachusetts Institute of Technology in 1968 with a Bachelor of Science Degree in Engineering. In 1969, I received a Master of Science Degree in Engineering from Stanford University. In 1973, I received a Law Degree from Stanford University. In addition, I studied nuclear engineering at the Massachusetts Institute of Technology during the years 1983-1986.

Since 1983 I have been retained by governmental bodies, publicly-owned utilities, and private organizations in 28 states to prepare expert testimony and analyses on engineering and economic issues related to electric utilities. My recent clients have included the New Mexico Public Regulation Commission, the General Staff of the Arkansas Public Service Commission, the Staff of the Arizona Corporation Commission, the U.S. Department of Justice, the Commonwealth of Massachusetts, the Attorneys General of the States of Massachusetts, Michigan, New York, and Rhode Island, the General Electric Company, various cities and

towns in Connecticut, New York and Virginia, state consumer advocates, and national and local environmental organizations.

I have testified before state regulatory commissions in Arizona, New Jersey, Connecticut, Kansas, Texas, New Mexico, New York, Vermont, North Carolina, South Carolina, Maine, Illinois, Indiana, Ohio, Massachusetts, Missouri, Rhode Island, Wisconsin, Iowa, South Dakota, Georgia, Minnesota, Michigan and Florida and before an Atomic Safety & Licensing Board of the U.S. Nuclear Regulatory Commission.

A copy of my current resume is attached as Exhibit DAS-1.

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

A. I am testifying on behalf of the Citizens Action Coalition of Indiana, Valley Watch, Save the Valley and the Sierra Club – Hoosier Chapter.

Q. Have you previously submitted testimony in Cause No. 43114?

A. Yes. I filed Direct Testimony in Cause No. 43114 in May 2007 (CAC Exhibit E).

Q. What is the purpose of this testimony.

A. Synapse was retained to review the petition filed by Duke Energy Indiana ("Duke" and "the Company") on May 1, 2008 and the Company's related testimony and exhibits. In particular, Synapse was asked to review the reasons for the recent 18.4 percent increase in the estimated cost of the Edwardsport IGCC Project, to examine whether further cost increases can be expected, and to analyze whether Duke's new modeling analyses show that completion of the Edwardsport Project is the least cost, lowest risk option. This testimony presents the results of our analyses.

2. Summary of Conclusions and Recommendations

Q. Please summarize your primary conclusions.

A. My primary conclusions are follows:

1. Duke should have anticipated that the cost of the Edwardsport Project would increase above the $1.985 billion cost estimate the Company presented in Cause No. 43114.

2. It is reasonable to expect that the cost of the Edwardsport Project will increase further in the four years or more until the Project is completed.

3. The updated Strategist modeling analyses presented by Duke witness Jenner do not show that completion of the Project is the lowest cost, lowest risk option for the Company's ratepayers.

4. Duke overstates the threat that the addition of new natural gas generation in place of the Edwardsport Project poses to its ratepayers.

Q. Please summarize you primary recommendations.

A. The Commission should not approve the revised estimated construction cost for the Edwardsport IGCC Project and should revoke the Certificate of Public Convenience and Necessity for the proposed Project.

3. Duke Should Have Anticipated in Cause No. 43114 that the Cost of the Edwardsport Project Would Exceed its $1.985 Billion Estimate

Q. Duke attributes the newly announced 18.4 percent increase in the estimated cost of the Edwardsport Project to a number of factors including (1) "higher than anticipated" contract costs from major vendors, (2) "higher than expected" inflationary increases on major pieces of equipment, and (3) "higher than average expected inflation" over the course of the construction period, expected to be reflected in contractors' costs, labor costs, and other equipment costs.[1] Do you agree that the increases that the project experienced were higher than could have reasonably been anticipated or expected in the spring of 2007?

A. No. I think that based on the construction environment that the Company discussed in the testimony of Mr. Moreland in Cause No. 43114 and the evidence that I presented in my Direct Testimony, it was clear that the $1.985 billion cost that Duke was estimating for the Edwardsport Project could rise significantly.[2] In fact, while I did not predict the specific cost increases that the Company has included in its revised $2.350 billion cost estimate, I did testify that it was reasonable to assume that the proposed Edwardsport IGCC Project could experience further cost increases before it is completed:

> Duke may have to increase the estimated cost of the project once it completes its design and/or the selection of equipment suppliers. Moreover, any number of factors could lead to even higher costs during the remaining years before the proposed IGCC Project is completed, if indeed a Certificate is issued and the Project is allowed to continue. These factors could include the worldwide competition for power plant equipment, commodities and labor, project delays, regulation-related costs, and weather conditions. Thus, there is no guarantee that the current capital cost estimate for the proposed IGCC Project will be the last.[3]

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1 *Verified Petition*, Cause No. 43114 IGCC-1, May, 1, 2008, at pages 6 and 7.

2 See the Direct Testimony of David A. Schlissel in Cause No. 43114, at page 31, line 30, to page 33, line 9.

3 Id, at page 33, lines 14-21.

Q. What was the Company's response in Cause No. 43114 to your testimony on this issue?

A. Company witness Roebel responded that the $1.985 billion cost estimate was:

> … as reasonable as possible at this time. As I have testified before with respect to the Company's environmental compliance projects, with any multi-year construction project I would expect to see relatively minor changes from ongoing impacts and refinements to the project as a normal part of an ongoing construction program. However, with the completion of the [Front End Engineering Design] FEED Study we have a significant amount of detailed knowledge about the project, more knowledge than normal for this stage of a major project. We were given unprecedented access to the GE and Bechtel teams working on the FEED Study and their work product. As we stated in the FEED Study Report, Bechtel was able to perform take offs from engineering drawings, a much more accurate method for estimating quantities. Bechtel obtained current pricing for over 90% of the bulk quantity materials and equipment from vendors. The estimate was rigorous and performed by seasoned personnel using accepted estimating techniques. In my opinion, the estimate is reasonable.[4]

Mr. Roebel also testified that the then current $1.985 billion estimate was based on very recent quotes and estimates from vendors and suppliers and on pricing data obtained as late as March, 2007.[5]

Q. Did Duke perform any sensitivity analyses in the Strategist modeling it presented in Cause No. 43114 to reflect any potential increases in the capital cost of the Edwardsport Project?

A. No. As I discussed in my May 15, 2007 Direct Testimony, the Company actually used an estimated cost for the Edwardsport Project that was approximately 5.2 percent lower than its then currently estimated cost for the proposed Project.[6]

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[4] Rebuttal Testimony of John J. Roebel, Petitioner's Exhibit No. 27 in Cause No. 43114, at page 2, lines 7-20.

[5] Id, at page 3, lines 17-19.

[6] Direct Testimony of David A. Schlissel, Cause No. 43114, at liens 1-14.

Q. Should Duke have been confident in the spring of 2007 in the accuracy of its $1.985 billion estimated cost for the Edwardsport Project?

A. No. The estimated costs of many new coal-fired power plants were increasing as a result of the very same factors that Duke and I cited in our testimony in Cause No. 43114, principally the worldwide competition for the resources, commodities and equipment used in the design and construction of new power plants. Terms like "skyrocketing" were being applied to power plant cost estimates. In an uncertain environment like this, the Company should have allowed for the possibility that the cost of the proposed Edwardsport Project would continue to rise, perhaps significantly. However, it failed to do so even though, as I noted in my Direct Testimony, the Company had prepared sensitivity analyses reflecting higher plant capital costs for its proposed Cliffside Project in North Carolina.[7]

4. It is Reasonable to Assume that the Cost of the Edwardsport Project Will Exceed Duke's Current $2.350 Billion Estimate

Q. Do the factors which led to recent power plant construction cost increases in the past few years appear to have abated or diminished in any significant way?

A. No. It is reasonable to expect that the factors that have led to dramatic increases in power plant construction costs in recent years will lead to further increases in costs and in construction delays in the five or more years before the projects are scheduled to be completed. For example, a May 15, 2008 story in the Wall Street Journal noted that "escalating steel prices are halting and slowing major construction projects worldwide and limiting shipbuilding and oil and gas exploration." The same article noted that "Steel prices are up 40 percent to 50 percent since December, and industry executives say they have not reached a peak" and "raw materials prices have surged in the past year, fueled in part because of the rapid industrialization of China, India and other developing nations."

[7] Id, at page 34, lines 10-16.

Indeed, the evidence suggests that the worldwide competition for resources or the existing supply constraints and bottlenecks affecting coal-fired plant construction costs will not clear anytime in the foreseeable future.

Q. Duke witness Turner testifies that "Industry trade publications are filled with accounts of the upward pressure on construction costs as a result of [the boom in the construction of new power plants and other major infrastructure]."[8] Do you agree?

A. Yes.

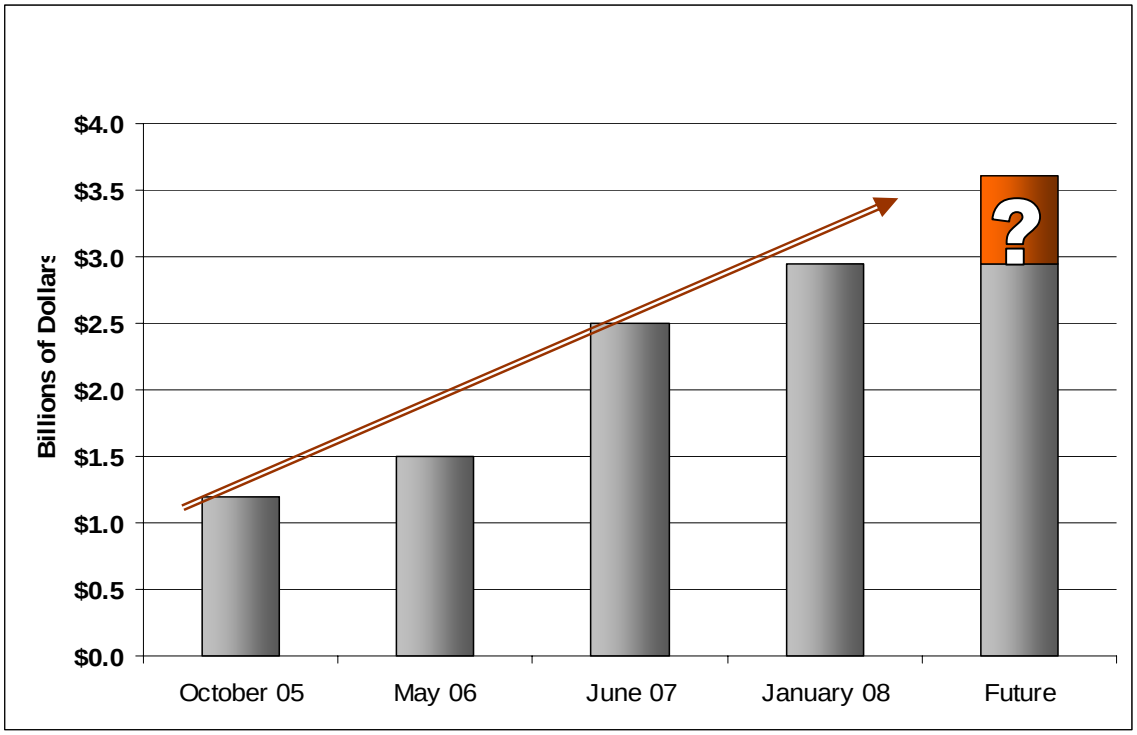
Q. Can you provide some examples of the recent cost increases experienced by proposed coal-fired power plants since you filed your Direct Testimony in Cause No. 43114 in May of 2007?

A. Yes. Mr. Turner cites the examples of the cost increases announced for Santee Cooper's Pee Dee River coal-fired power plant and Kansas City Power & Light's Iatan 2 project.[9] In addition, increases have been reported for a significant number of other proposed coal-fired power plant projects as well. For example, the following are illustrative of the cost increases being experienced by proposed coal-fired power plants:

- The estimated cost of AMP-Ohio's proposed 960 MW coal-fired power plant increased by 15 percent in just the six months between June 2007 and January 2008. As shown in Figure 1 below, the estimated cost of the project had nearly doubled between May 2006 and January 2008. The estimated cost of the 960 MW project had risen to nearly $3 billion, not including financing costs, representing a construction cost of more than $3,100/kW.

[8] Testimony of James L. Turner, Petitioner's Exhibit A, at page 8, lines 5-9.
[9] Id, at page 8, lines 11-14.

Figure 1: AMP-Ohio AMPGS Cost Increases 2005-2008 ($)



- In mid-June 2008, Wisconsin Power & Light ("WPL") announced a nearly 40 percent increase in the estimated cost of its proposed 300 MW Nelson Dewey 3 coal-fired power plant. The previous estimate had been prepared in late 2006. The estimated cost for this Circulating Fluid Bed plant is now above $3,500/kW, in early 2008 dollars. The company has similarly estimated that the cost of building a new supercritical coal plant, if it were started today, would exceed $3,500/kW. In support of its new cost estimates, WPL presented testimony that noted that "EPC [Engineering, Procurement and Construction] pricing for other non-IGCC, primarily coal-fired generating projects under construction or in the planning stages have similarly increased with many projects falling in the $2,500 to $3,800/kW range, without AFUDC or uncommon owner's costs (e.g., major railway additions.)."[10]

Nor are coal-fired power plants that are under construction immune to further cost increases. For example, as Mr. Turner noted, Kansas City Power & Light just announced a 15 percent price increase for the Iatan 2 power plant that has been under construction for several years and is scheduled to be completed by 2010.

This shows that one cannot assume that the cost of a plant will be fixed when construction begins.

Q. Have any proposed coal-fired power plants been delayed or cancelled during the past few years as a result of rising construction costs?

A. Yes. Rising commodity prices and increasing construction cost risks have been responsible, at least in part, for the cancellation or delay of more than fifty proposed coal-fired power plants since mid-2006. The following examples are illustrative of the factors and risks which have contributed to these cancellations and delays:

- Westar Energy announced in December 2006 that it was deferring site selection for a new 600 MW coal-fired power plant due to significant increases in the facility's estimated capital cost of 20 to 40 percent, over an 18 month period. This prompted Westar's Chief Executive to warn: "When equipment and construction cost estimates grow by $200 million to $400 million in 18 months, it's necessary to proceed with caution."[11] As a result, Westar Energy has suspended site selection for the coal-plant and is considering other options, including building a natural gas plant, to meet growing electricity demand. The company also explained that:

  > most major engineering firms and equipment manufacturers of coal-fueled power plant equipment are at full production capacity and yet are not indicating any plans to significantly increase their production capability. As a result, fewer manufacturers and suppliers are bidding on new projects and equipment prices have escalated and become unpredictable.[12]

- Tenaska Energy cancelled plans to build a coal-fired power plant in Oklahoma in 2007 because of rising steel and construction prices. According to the Company's general manager of business development:

  > ".. coal prices have gone up "dramatically" since Tenaska started planning the project more than a year ago.
  >
  > And coal plants are largely built with steel, so there's the cost of the unit that we would build has gone up a lot… At one

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[10] Direct Testimony of Charles J. Hookham on behalf on Wisconsin Power & Light Company in Public Service Commission of Wisconsin Docket No. 6680-CE-170, June 2008, at page 21.

[11] Available at http://www.westarenergy.com/corp_com/corpcomm.nsf/F6BE1277A768F0E4862572690055581C/$file/122806%20coal%20plant%20final2.pdf.

[12] Id.

> point in our development, we had some of the steel and equipment at some very attractive prices and that equipment all of a sudden was not available.
>
> We went immediately trying to buy additional equipment and the pricing was so high, we looked at the price of the power that would be produced because of those higher prices and equipment and it just wouldn't be a prudent business decision to build it."[13]

- In April 2008, Associated Electric Cooperative, Inc., the wholesale power supplier for 57 electric cooperatives in Missouri, Southeast Iowa, and northeast Oklahoma, delayed its plans to build the Norborne 660 MW coal-fired power plant due to increasing costs and other uncertainties. According to AECI:

  > The Norborne project costs have significantly increased in less than three years and are now estimated at $2 billion due to worldwide demand for engineering, skilled labor, equipment and materials.
  >
  > The U.S. Department of Agriculture Rural Utilities Service, a traditional funding source for rural electric cooperatives, is currently unable to finance baseload generation for cooperatives. Although AECI's AA credit rating is one of the strongest ratings among all electric utilities nationally, seeking private lending would further increase project costs.
  >
  > There also is increasing uncertainty in the regulatory environment, and Congress continues to debate the environmental and economic impact of reducing greenhouse gas emissions, making the cost of reducing carbon dioxide from power plants unknown.[14]

  At the same time it was cancelling its proposed coal plant, AECI noted that it would continue to look at energy efficiency initiatives, natural gas, renewable and nuclear resources to address future generation needs.

- Xcel Energy announced in October 2007 that it was indefinitely deferring its plans to build an IGCC plant in Colorado because the development costs were higher than the utility originally expected.[15]

- Tampa Electric cancelled a proposed IGCC plant in the fall of 2007 due to uncertainty related to CO_2 regulations, particularly capture and

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[13] Available at www.swtimes.com/articles/2007/07/09/news/news02.prt.
[14] http://www.aeci.org/NR20080303.aspx.
[15] Denver Business Journal, October 30, 2007.

sequestration issues, and the potential for related project cost increases. According to a press release, "Because of the economic risk of these factors to customers and investors, Tampa Electric believes it should not proceed with an IGCC project at this time," although it remains steadfast in its support of IGCC as a critical component of future fuel diversity in Florida and the nation.

- In June 2007, the Tondu Corp. announced that it was suspending plans to build a planned 600 MW IGCC facility in Texas citing high costs and other concerns related to technology and construction risks.[16]

Q. Is there any evidence in the Company's testimony that suggests that the cost of the proposed Edwardsport Project could increase significantly above Duke's current $2.350 billion estimate?

A. Yes. Duke witness Turner testifies that the current EPRI-based range of costs for IGCC projects is $2.325 to $3.063 billion for a plant in service in 2012.[17] Although Mr. Turner is correct that the increased Edwardsport IGCC cost estimate is within this range, it is at the very bottom end of the range.

Q. Does the current Duke cost estimate for the Edwardsport IGCC Project include the costs of adding carbon capture and sequestration?

A. It appears that the answer is no.

Q. Will all of the contract prices for the Edwardsport Project be fixed prior to the start of the main construction activities?

A. No. Duke is unclear about exactly which costs will not be fixed. However, it is clear from Mr. Turner's testimony and the Company's response to data requests that much, if not most, of the scope of the Project will not be covered by fixed contract prices.[18] Thus, the Project will remain exposed to significant cost escalation.

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[16] http://www.reuters.com/article/companyNewsAndPR/idUSN1526955320070615

[17] Testimony of James L. Turner, Petitioner's Exhibit A, at page 8, line 21, to page 9, line 1.

[18] For example, see the Testimony of James L. Turner, at page 10, lines 1-5 and Duke's response to CAC 1.6.

Q. Is it your testimony that Duke should increase its estimated cost for the Edwardsport IGCC Project at this time?

A. No. However, Duke should have performed a series of sensitivity scenarios in its new Strategist modeling analyses that reflect higher plant capital costs. It would have been reasonable to assume increases of 20 percent and 40 percent for these sensitivity scenarios. Instead, the Company remains overly optimistic that it will not be forced by events beyond its control to raise the Edwardsport Project's construction cost even further than the current $2.350 billion estimate.

Q. Did Duke perform any sensitivity scenarios for higher plant construction costs as part of the Strategist modeling analyses discussed by Company witness Jenner?

A. No. Despite having been wrong about the accuracy/reasonableness of its $1.985 billion cost estimate in May 2007, Duke has assumed that there will be no further increases beyond its current $2.350 billion estimated cost. Consequently, Duke has assumed that it will not experience any further cost increases in the four years or more that the Project will remain under construction even though the estimated cost of the Project has increased by 18.4 percent in just the past year.

Q. Should the Commission set a cap on the construction cost that Duke is able to recover from ratepayers?

A. Yes. If the Company is confident in its current cost estimate, as its witnesses have testified in this proceeding, Duke should be willing to agree to cap its cost recovery for the proposed plant to its current cost estimate, less any federal, state, and local incentives it may receive. That way Duke, and not its ratepayers, would bear the risks associated with further cost increases. This is especially true given the relatively small Net Present Value benefits that the Company's new Strategist modeling runs show for completion of the Edwardsport Project.

5. The Company Has Used an Unreasonably Low Set of CO_2 Prices in its New Strategist Modeling Analyses

Q. What CO_2 prices did Duke use in the new Strategist modeling analyses discussed by Company witness Jenner?

A. **[REDACTED]**

Q. How was this forecast developed?

A. The forecast was based on the safety valve prices included in the legislation introduced in the current U.S. Congress by Senators Bingaman and Specter.

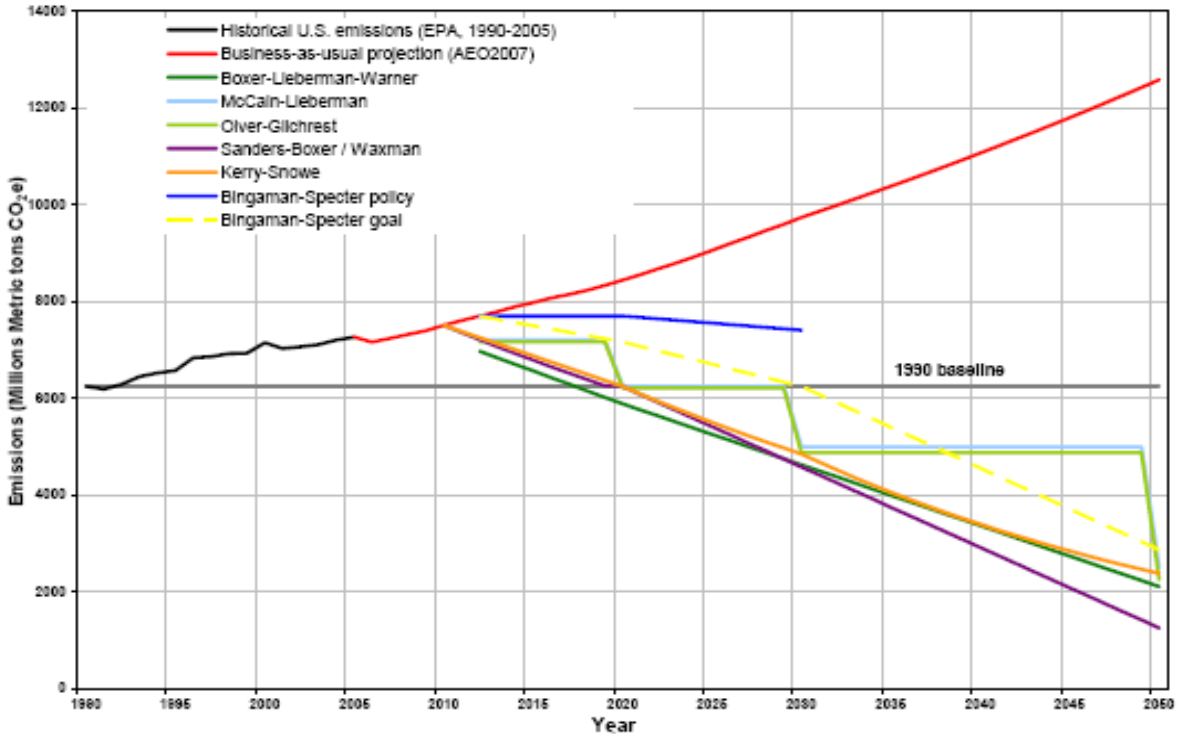
Q. Does the CO_2 price forecast used by Duke reasonably capture the possible magnitude of greenhouse gas regulations that would apply to the Duke Energy Indiana system?

A. No. First, because of the uncertainty surrounding future greenhouse gas regulation, it is appropriate to consider a range of CO_2 emissions allowance prices, just as resource planners, including Duke, normally consider a range of projected fuel prices. Second, there is really no compelling reason why Senator Bingaman and Specter's proposed legislation would be passed by Congress and enacted into law over all of the other major climate change bills currently in Congress. It is certainty not the only bill that has garnered significant attention. Moreover, unlike the legislation introduced by Senators Lieberman and Warner, the Bingaman-Specter bill was not voted out of committee in the Senate nor debated and voted on by the entire Senate.

Q. Is the Bingaman-Specter proposal consistent with the other climate change legislation that has been introduced in the current Congress?

A. No. As shown in Figure 2 and Table 1 below, all of the other major bills that have been introduced in Congress would require significantly larger reductions in CO_2 emissions than the Bingaman-Specter proposal.

Figure 2: Emissions Reductions Required under Climate Change Bills in Current U.S. Congress[19]



[19] Source – Pew Center on Global Climate Change - http://www.pewclimate.org/docUploads/Cap-and-Trade-Chart.pdf.

Table 1. Summary of Mandatory Emissions Targets in Proposals Introduced in the current U.S. Congress

Proposed National Policy	Title or Description	Year Proposed	Emission Targets	Sectors Covered
Feinstein-Carper S.317	Electric Utility Cap & Trade Act	2007	▪ 2006 level by 2011 ▪ 2001 level by 2015 ▪ 1%/year reduction from 2016-2019 ▪ 1.5%/year reduction starting in 2020	Electricity sector
Kerry-Snowe S.485	Global Warming Reduction Act	2007	▪ 2010 level from 2010-2019 ▪ 1990 level from 2020-2029 ▪ 2.5%/year reductions from 2020-2029 ▪ 3.5%/year reduction from 2030-2050 ▪ 65% below 2000 level in 2050	Economy-wide
McCain-Lieberman S.280	Climate Stewardship and Innovation Act	2007	▪ 2004 level in 2012 ▪ 1990 level in 2020 ▪ 20% below 1990 level in 2030 ▪ 60% below 1990 level in 2050	Economy-wide
Sanders-Boxer S.309	Global Warming Pollution Reduction Act	2007	▪ 2%/year reduction from 2010 to 2020 ▪ 1990 level in 2020 ▪ 27% below 1990 level in 2030 ▪ 53% below 1990 level in 2040 ▪ 80% below 1990 level in 2050	Economy-wide
Olver, et al HR 620	Climate Stewardship Act	2007	▪ Cap at 2006 level by 2012 ▪ 1%/year reduction from 2013-2020 ▪ 3%/year reduction from 2021-2030 ▪ 5%/year reduction from 2031-2050 ▪ equivalent to 70% below 1990 level by 2050	US national
Bingaman–Specter S.1766	Low Carbon Economy Act	2007	▪ 2012 levels in 2012 ▪ 2006 levels in 2020 ▪ 1990 levels by 2030 ▪ President may set further goals ≥60% below 2006 levels by 2050 contingent upon international effort	Economy-wide
Lieberman-Warner S. 2191	America's Climate Security Act	2007	▪ 2005 level in 2012 ▪ 1990 level in 2020 ▪ 65% below 1990 level in 2050	U.S. electric power, transportation, and manufacturing sources.
Boxer-Lieberman-Warner S. 3036	Substitute for S. 2191	2008	▪ 4% below 2005 level in 2012 ▪ 19% below 2005 level in 2020 ▪ 71% below 2005 level in 2050	Economy wide
Markey HR. 6186	The Investing in Climate Action and Protection Act	2008	▪ 2005 level in 2012 ▪ 20% below 2005 level by 2020 ▪ 80% below 2005 level by 2050	Economy wide

Q. How do the CO_2 prices used by Duke in its new Strategist analyses compare with the CO_2 prices that would be required to achieve the emissions reductions that would be mandated by the climate change bills shown in Table 1 and Figure 2?

A. There have been a large number of independent modeling analyses of climate change proposals in the current U.S. Congress. As shown in Figures 3 and 4 below, the CO_2 prices used by Duke in its new Strategist modeling are low compared to the CO_2 prices that result from analyses of the major climate change bills that have been introduced in the current Congress and their corresponding greenhouse gas emissions reduction goals.

The three red lines in Figure 3 represent the current Synapse High, Mid and Low CO_2 price forecasts that I will discuss later in this testimony. The black line at the bottom represents the CO_2 prices used by Duke in its new Edwardsport Strategist modeling analyses. The other lines in Figure 3 reflect the approximately 75 scenarios examined in the various independent modeling analyses of the current climate change proposals.

Protected Materials Redacted

Figure 3: Duke CO_2 Prices versus Results of Independent Analyses of Climate Change Bills in Current U.S. Congress (Annual Costs in 2007$ per short ton of carbon dioxide equivalent) [REDACTED]

Figure 4: Duke CO_2 Prices versus Results of Independent Analyses of Climate Change Bills in Current U.S. Congress (Levelized Costs 2013-2030 in 2007$ per short ton of carbon dioxide equivalent) [REDACTED]]

It is clear from Figures 3 and 4 that the CO_2 prices used by Duke Energy Indiana in the new Strategist modeling analyses presented by Ms. Jenner are at the extreme low end of the results of other analyses.

Q. What are the independent sources of the annual and CO_2 prices presented in Figures 3 and 4?

A. The CO_2 prices shown in Figures 3 and 4 above have been developed from the results of the following independent analyses:

- The Energy Information Administration of the U.S. Department of Energy's ("EIA") assessment of the Energy Market and Economic Impacts of S. 280, the Climate Stewardship and Innovation Act of 2007 (July 2007).

- The October 2007 Supplement to the EIA's assessment of the Energy Market and Economic Impacts of S. 280, the Climate Stewardship and Innovation Act of 2007.
- The EIA's assessment of the Energy Market and Economic Impacts of S. 1766, the Low Carbon Economy Act of 2007 (January 2008).
- The EIA's assessment of the Energy Market and Economic Impacts of S. 2191, the Lieberman-Warner Climate Security Act of 2007 (April 2008).
- The U.S. Environmental Protection Agency's ("EPA") Analysis of the Climate Stewardship and Innovation Act of 2007 – S. 280 in 110th Congress (July 2007).
- The EPA's Analysis of the Low Carbon Economy Act of 2007 – S. 1766 in 110th Congress (January 2008).
- The EPA's Analysis of the Lieberman-Warner Climate Security Act of 2007 – S. 2191 in 110th Congress (March 2008).
- Assessment of U.S. Cap-and-Trade Proposals by the Joint Program at the Massachusetts Institute of Technology ("MIT")on the Science and Policy of Global Change (April 2007)
- Analysis of the Cap and Trade Features of the Lieberman-Warner Climate Security Act – S. 2191 by the Joint Program at MIT on the Science and Policy of Global Change (April 2008).
- The Lieberman-Warner America's Climate Security Act: A Preliminary Assessment of Potential Economic Impacts, prepared by the Nicholas Institute for Environmental Policy Solutions, Duke University and RTI International (October 2007).
- The Lieberman-Warner Climate Security Act – S. 2191, Modeling Results from the National Energy Modeling System – Preliminary Results, Clean Air Task Force, January 2008.
- Economic Analysis of the Lieberman-Warner Climate Security Act of 2007 Using CRA's MRN-NEEM Model, CRA International, April 2008.
- Analysis of the Lieberman-Warner Climate Security Act (S. 2191) using the National Energy Modeling System (NEMS/ACCF/NAM), a report by the American Council for Capital Formation and the National Association of Manufacturers, NMA, March 2008.

Q. How did you develop the 2008 Synapse CO_2 price forecasts that are included in Figures 3 and 4?

A. The Synapse CO_2 price forecasts shown in Figure 3 begin in 2013. This assumes that climate change legislation will be passed by the next Congress and that the implementation of the regulatory scheme will take two years.

The Synapse Low CO_2 Price Forecast starts at $10/ton in 2013, in 2007 dollars, and increases to approximately $23/ton in 2030. This represents a $15/ton levelized price over the period 2013-2030, in 2007 dollars.

This Low Forecast reflects our judgment that Congress begins regulation of greenhouse gas emissions slowly by either:

- including a very modest or loose cap, especially in the initial years,
- including a safety valve price similar to the Technology Accelerator Payment in the current Bingaman-Specter Legislation (S. 1766), or
- allowing for substantial offset flexibility including the use of substantial numbers of international offsets.

Alternatively, this Low Forecast may reflect a decision by Congress to adopt a set of aggressive complementary policies as part of a package to reduce CO_2 emissions. These complementary policies could include a substantial Renewal Portfolio Standard, increased automobile CAFÉ mileage standards, and/or substantial energy efficiency investments. Such complementary policies would lead directly to a reduction in CO_2 emissions independent of federal cap-and-trade or carbon tax policies, and would lower the overall cost of reaching any particular federally-mandated goal.

The Synapse High CO_2 Price Forecast starts at $30/ton in 2013, in 2007 dollars, and rises to approximately $68/ton in 2030. This High Forecast represents a $45/ton levelized price over the period 2013-2030, also in 2007 dollars.

This High CO_2 Price Forecast reflects somewhat more aggressive emissions reduction targets, greater restrictions on the use of offsets, some restrictions on the availability or cost of technology alternatives such as nuclear, biomass and carbon capture and sequestration, and more aggressive international actions (thereby

resulting in fewer inexpensive international offsets available for purchase by U.S. emitters). Our High CO_2 Price Forecast does not reflect the adoption of aggressive complementary policies in the United States.

Synapse also has prepared a Mid CO_2 Price Forecast that starts relatively low, $15/ton in 2013, in 2007 dollars, but then climbs to $53/ton by 2030. The levelized cost of this mid CO_2 price forecast is $30/ton, in 2007 dollars, which is the midpoint between the $15/ton Low CO_2 Price Forecast and the $45/ton High CO_2 Price Forecast. The Mid CO_2 price forecast represents a scenario in which CO_2 prices begin rather low, as in the Synapse Low CO_2 Price Forecast but then climb significantly over time as federal regulation of CO_2 emissions becomes progressively more stringent.

Q. Are there credible CO_2 price scenarios even higher than the Synapse High CO_2 Price Forecast?

A. Yes. There are some credible CO_2 price scenarios that are significantly higher than our Synapse High Price Forecast. These scenarios would place greater restrictions on the availability of alternatives to carbon-emitting technologies and/or would more strictly constrain the use of international and domestic offsets. However, we do not believe that the CO_2 prices developed in such scenarios are likely given political considerations, because there may potentially be avenues available for meeting likely emissions goals that would mitigate the cost to below these levels. But this may change over time due to changes in technical, economic, and political circumstances, more stringent CO_2 emissions targets, and/or developments in scientific evidence.

Q. What are the bases for the Synapse High, Mid and Low CO_2 price forecasts?

A. In general, our CO_2 price forecasts are based on:

- Our review of the current political conditions in the U.S. concerning climate change;
- The results of publicly available modeling analyses of the climate change proposals that have been introduced in the current U.S. Congress that I have identified above;

- The ranges of CO_2 prices that have been used by the financial community, regulatory commissions and utilities in electric resource planning;
- Our review of the estimated costs for such technology alternatives as energy efficiency, renewable resources, nuclear power, and carbon capture and sequestration;
- Our work experience on global climate change and electric resource planning issues and our professional judgment.

Q. Ms. Jenner has testified that Duke has used the same CO_2 prices in its new Strategist modeling of the Edwardsport Project that it used in its 2007 IRP analyses.[20] Is this correct?

A. Not entirely. In its 2007 IRP Duke prepared a set of sensitivity analyses using what it termed a "High Carbon Case." However, the Company has used only a single set of CO_2 prices in this proceeding. As shown in Figure 5, below, the CO_2 prices in this "High Carbon Case" were substantially higher than the CO_2 prices Duke has used in this proceeding.

[20] Direct Testimony of Diane L. Jenner, Petitioner's Exhibit C, at page 4, lines 15-16.

Figure 5: Duke CO_2 IRP "High Carbon Case" Prices versus the CO_2 Prices Used in the Strategist Modeling for this Proceeding (Annual Costs in 2007$ per short ton carbon dioxide equivalent) [REDACTED]

Q. What CO_2 prices do you recommend that Duke be required to use when re-examining the economics of continuing the Edwardsport IGCC Project?

A. We believe that the Synapse High, Mid and Low CO_2 price forecasts represent a reasonable range of emissions allowance prices that should be used in resource planning analyses like those presented by Duke witness Jenner. But even if the IURC were to decide not to require Duke to use the Synapse CO_2 price forecasts in this proceeding, the Company should be required, at an absolute minimum, to prepare a set of analyses using the "High Carbon Case" that it used in its 2007 IRP modeling.

6. Duke Overstates the Threat Posed to Ratepayers by Adding New Natural Gas Generation in Place of the Edwardsport Project

Q. Do you agree with Ms. Jenner that a utility should have concerns with over-reliance on natural gas?[21]

A. In general, I agree that over-reliance on natural gas could be a concern. However, the figures cited by Ms. Jenner do not show that Duke would be over-relying on natural gas without the Edwardsport IGCC Project. Indeed, Duke's system-wide natural gas usage would only be between 6% and 12% by 2025.[22] This is not an unreasonable amount. Similarly, the capacity factors that Ms. Jenner cites for the Noblesville and new CC units ("up to 47%") are not unreasonable. Utilities achieve 47 percent and higher capacity factors at combined cycle units on a regular basis and assume such performance in their resource planning.

Fuel diversity is a good idea, especially for a Company like Duke Energy Indiana which is heavily dependent on coal-fired power plants. In addition, increased reliance on energy efficiency and renewable resources is another way, in place of building the Edwardsport Project, for Duke to avoid unreasonably increasing its reliance on natural gas.

Q. Ms. Jenner testifies that with the anticipated promulgation of carbon regulations, it is generally anticipated that natural gas prices will only continue to rise, as more utilities rely on natural gas as the primary fuel source.[23] Do you agree?

A. In theory, it is possible that natural gas demand could be higher due to CO_2 emission regulations and, as a result, natural gas prices might be expected to be higher than otherwise would be the case. However, the effect is very complicated and will depend on a number of factors which will both increase and decrease the demand for natural gas. These factors include: the amount of new natural gas capacity that is built as a result of the higher coal-plant operating costs due to the

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[21] Id, at page 8, lines 21-23.
[22] Id, at page 8, lines 12-14.
[23] Id, at page 9, lines 2-14.

CO_2 emission allowance prices; the amount of additional DSM and renewable alternatives that become economic and are added to the U.S. system; the levels and prices of any incremental natural gas import;, and changes in the dispatching of the electric system. Indeed, given all of these factors it is possible that the prices of natural gas would be reduced as a result of CO_2 emissions regulations. Thus, it is very difficult to determine, at this time, the amount by which natural gas prices might increase, or even decrease, due to CO_2 emission regulations.

Q. Do you have any comment on the testimony of Ms. Jenner on the EIA's recently released analysis of Senate Bill S. 2191, the carbon cap-and-trade bill introduced by Senators Lieberman and Warner?[24]

A. Yes. Ms. Jenner is correct that the EIA scenarios that assume constraints on the development of new nuclear generation, biomass, and carbon capture and sequestration do show some moderate increases in natural gas prices. However, as shown in Figure 6 below, those same scenarios also show much higher CO_2 prices than Duke has used in its Strategist modeling analyses.

[24] Id, at page 9, lines 5-14.

Figure 6: CO_2 Prices in EIA Modeling of S. 2191 vs. versus the CO_2 Prices Duke Has Used in the Strategist Modeling for this Proceeding (Annual Costs in 2007$ per short ton of carbon dioxide equivalent) [REDACTED]

If Duke wants to rely on the results of these EIA modeling scenarios for the position that federal regulation of greenhouse gas emissions will lead to higher natural gas prices, it also should be using the CO_2 prices produced by the EIA in modeling those scenarios. It is inconsistent, and not supported by the EIA modeling, to assume that the much lower CO_2 prices that would result from the adoption of the Bingaman-Specter proposal, S. 1766, with safety valve prices, also would result in substantially higher natural gas prices. Indeed, we have seen no evidence supporting such a position in our reviews of any of the modeling analyses of any of the climate change proposals in the current U.S. Congress.

Q. Please summarize your conclusions.

A. It was reasonable in the spring of 2007 to assume that the construction cost of the Edwardsport IGCC Project would increase above the Company's then current

estimate. Therefore, Duke should not have been surprised that the cost has risen by 18.4 percent in the intervening year. It also is reasonable to expect that the Project's construction cost will continue to increase as a result of the same worldwide competition for power plant design and construction resources, commodities and equipment that has led to the recent 18.4 percent increase.

In addition, the new Strategist modeling analyses presented by Duke witness Jenner are critically flawed and biased in favor of the Edwardsport Project because (1) the Company uses an unreasonably low set of CO_2 prices and (2) it failed to prepare any sensitivity analyses to reflect further plant construction cost increases. Finally, Ms. Jenner overstates the threat to Duke Energy Indiana's ratepayers of the addition of new natural gas-fired generating capacity in place of the Edwardsport Project.

Q. Does this complete your testimony?

A. Yes.