

STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

JOINT PETITION AND APPLICATION OF PSI ENERGY, INC. , D/B/A)
DUKE ENERGY INDIANA, INC., AND SOUTHERN INDIANA GAS)
AND ELECTRIC COMPANY, D/B/A VECTREN ENERGY DELIVERY)
OF INDIANA, INC., PURSUANT TO INDIANA CODE CHAPTERS 8-1-)
8.5, 8-1-8.7, 8-1-8.8, AND SECTIONS 8-1-2-6.8, 8-1-2-6.7, 8-1-2-42 (A))
REQUESTING THAT THE COMMISSION: (1) ISSUE APPLICABLE)
CERTIFICATES OF PUBLIC CONVENIENCE AND NECESSITY AND)
APPLICABLE CERTIFICATES OF CLEAN COAL TECHNOLOGY TO)
EACH JOINT PETITIONER FOR THE CONSTRUCTION OF AN)
INTEGRATED GASIFICATION COMBINED CYCLE GENERATING)
FACILITY ("IGCC PROJECT") TO BE USED IN THE PROVISION OF)
ELECTRIC UTILITY SERVICE TO THE PUBLIC; (2) APPROVE THE)
ESTIMATED COSTS AND SCHEDULE OF THE IGCC PROJECT; (3))
AUTHORIZE EACH JOINT PETITIONER TO RECOVER ITS)
CONSTRUCTION AND OPERATING COSTS ASSOCIATED WITH)
THE IGCC PROJECT ON A TIMELY BASIS VIA APPLICABLE RATE)
ADJUSTMENT MECHANISMS; (4) AUTHORIZE EACH JOINT)
PETITIONER TO USE ACCELERATED DEPRECIATION FOR THE)
IGCC PROJECT; (5) APPROVE CERTAIN OTHER FINANCIAL)
INCENTIVES FOR EACH JOINT PETITIONER ASSOCIATED WITH)
THE IGCC PROJECT; (6) GRANT EACH JOINT PETITIONER THE)
AUTHORITY TO DEFER ITS PROPERTY TAX EXPENSE, POST-IN-)
SERVICE CARRYING COSTS, DEPRECIATION COSTS, AND)
OPERATION AND MAINTENANCE COSTS ASSOCIATED WITH THE)
IGCC PROJECT ON AN INTERIM BASIS UNTIL THE APPLICABLE)
COSTS ARE REFLECTED IN EACH JOINT PETITIONER'S)
RESPECTIVE RETAIL ELECTRIC RATES; (7) AUTHORIZE EACH)
JOINT PETITIONER TO RECOVER ITS OTHER RELATED COSTS)
ASSOCIATED WITH THE IGCC PROJECT; AND (8) CONDUCT AN)
ONGOING REVIEW OF THE CONSTRUCTION OF THE IGCC)
PROJECT)

CAUSE NO. 43114

VERIFIED PETITION OF DUKE ENERGY INDIANA, INC. FOR)
AUTHORITY PURSUANT TO AN ALTERNATIVE REGULATORY)
PLAN AUTHORIZED UNDER I.C. 8-1-2.5 ET SEQ. AND I.C. 8-1-6.1,8-1-)
8.7, AND 8-1-8.8 TO DEFER AND SUBSEQUENTLY RECOVER)
ENGINEERING AND PRECONSTRUCTION COSTS ASSOCIATED)
WITH THE CONTINUED INVESTIGATION AND ANALYSIS OF)
CONSTRUCTING AN INTEGRATED COAL GASIFICATION)
COMBINED CYCLE ELECTRIC GENERATING FACILITY)

CAUSE NO. 43114
IGCC-4-S1

SURREBUTTAL AND SETTLEMENT TESTIMONY OF DAVID A. SCHLISSEL
ON BEHALF OF THE
CITIZENS ACTION COALITION OF INDIANA
SAVE THE VALLEY
VALLEY WATCH
SIERRA CLUB
November 12, 2010

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Table of Contents

Introduction.....	1
Significantly Changed Circumstances and Need.....	5
DEI’s Mismanagement and Failure to Fully Disclose Critical Information.....	27
Flaws in the Proposed Settlement Agreement.....	52
Findings and Recommendations.....	56

List of Exhibits

DAS-S1	DEI’s Need for Edwardsport’s Capacity
DAS-S2	<i>Edwardsport IGCC Project Update Presentation</i> , DEI President Stanley, June 9, 2007
DAS-S3	<i>Investing in the First Wave of Gasification Projects</i> , Bret Scholtes, GE Financial Services, May 24, 2007
DAS-S4	<i>Duke Energy Indiana Edwardsport IGCC Project Update</i> , Project Director Rex Sears, October 2008

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1 **Introduction**

2 **Q. Please state your name and business address.**

3 A. My name is David A. Schlissel. I am the President of Schlissel Technical
4 Consulting, Inc., 45 Horace Road, Belmont, MA 02478.

5 **Q. Have you previously filed testimony in this case?**

6 A. Yes. I filed Direct Testimony on July 30, 2010 on behalf of the Citizens Action
7 Coalition of Indiana, Valley Watch, Save the Valley and the Sierra Club.

8 **Q. What is the purpose of your testimony?**

9 A. The purpose of this Surrebuttal and Settlement Testimony is to discuss:

- 10 a. Changed circumstances affecting the need for the Duke Edwardsport
11 Project.
- 12 b. Unreasonable assumptions that bias the results of the Company's new
13 modeling analyses in favor of completion of Edwardsport as an IGCC
14 plant.
- 15 c. The evidence which shows that Duke Energy Indiana has grossly
16 mismanaged its resource planning for the Edwardsport IGCC Project and
17 has failed to fully disclose to the IURC the significant risks and
18 uncertainties associated with the construction and operation of the Project.
- 19 d. Flaws in and omissions from the proposed settlement agreement that
20 would result in ratepayers continuing to bear significant risks associated
21 with the Edwardsport Project if the settlement were to be approved as
22 filed.

23 **Q. Please summarize your primary findings.**

24 A. My primary findings are that:

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- 1 1. There is no need for the capacity from Edwardsport to ensure adequate
2 system reliability.
- 3 • Circumstances have changed significantly since the CPCN was
4 issued in November 2007.
- 5 • DEI's own exhibits show that the Complete as NGCC and No
6 IGCC scenarios each would provide adequate capacity to provide
7 for a 13.9% reserve margin.
- 8 2. The Cost of the Edwardsport Project has skyrocketed since 2007 with the
9 plant now expected to cost almost \$5,000 per kilowatt.
- 10 3. The results of DEI's economic analyses, including its most recent
11 modeling, have shown, at most, a marginal benefit in some scenarios to
12 completing Edwardsport as an IGCC unit. In other scenarios, completing
13 the plant as an IGCC unit has been, and continues to be, a higher cost
14 option than canceling the project and/or completing it as an NGCC unit.
- 15 4. DEI's modeling analyses are biased by a number of unreasonable
16 assumptions including the following:
17 • The unreasonably optimistic assumption that a first-of-a-kind
18 IGCC plant will have high availability and high capacity factors in
19 all years of the study period.
- 20 • The assumption that CO₂ allowance costs will be extremely low.
21 The allowance costs in Company's "High CO₂" sensitivity case
22 would be more reasonable as base case scenario.
- 23 • The assumption that there will not be any incremental energy
24 efficiency savings after approximately the years 2021 in the base
25 case and 2019 in the high energy efficiency case.
- 26 5. Completing Edwardsport as an IGCC plant is the riskiest option.
- 27 • There is a significant potential for operating problems in first-of-a-
28 kind unit for extended period after the projected in-service date.
- 29 • CO₂ allowance costs could be significantly higher than DEI has
30 modeled.

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- 1 • Edwardsport’s capital costs could be significantly higher than the
2 Company has assumed if CCS is required to comply with an
3 eventual federal climate change regulatory regime.
- 4 • The Project could experience further cost increases and schedule
5 delays prior to its actual in-service date.
- 6 6. DEI has grossly mismanaged its resource planning for the Edwardsport
7 Project and has failed to fully disclose to the IURC the risks and the
8 significance of higher construction costs.
- 9 • The Company failed to acknowledge to the IURC that “First
10 Mover” risks associated with the engineering and construction of a
11 first-of-a-kind IGCC plant would expose the Project to significant
12 increases in capital costs and delay(s) in in-service date.
- 13 • The Company repeatedly refused in 2007 and 2008 to consider
14 scenarios in its Edwardsport economic analyses with higher plant
15 capital costs.
- 16 • DEI failed in late 2009 and early 2010 to promptly conduct new
17 economic studies after it finally recognized in the fall of 2009 that
18 the project was going to cost more than the \$2.35 billion that the
19 IURC had approved.
- 20 • DEI continued to spend money on construction at a rapid rate
21 between October 2009 and March 2010, turning to-go costs into
22 sunk costs and trying to make the project into a self-fulfilling
23 prophecy.
- 24 7. The proposed settlement agreement is inadequate to address these issues
25 and would leave the Company’s ratepayers exposed to very significant
26 risks. Indeed, the proposed settlement would not only reimburse but would
27 reward DEI for huge cost increases associated with the Company’s failure
28 on a timely basis to acknowledge, reflect in modeling and report to the
29 Commission the economic implications of “First Mover Issues.”

30 **Q. Please summarize you primary conclusions and recommendations.**

31 **A. My conclusions and recommendations are as follows:**

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- 1 1. The Company clearly knew, even before beginning to build Edwardsport,
2 the significant technology risks and potential for additional construction
3 costs that a large scale, first-of-a-kind IGCC project necessarily presented.
- 4 2. However, the Company refused to acknowledge and analyze those risks
5 and costs in its testimony before the IURC. Instead DEI reported to the
6 IURC at every stage that the project risks were manageable and that its
7 costs were under control.
- 8 3. DEI also failed to update its economic assessments of the continuing need
9 for the project on a timely basis to reflect the much higher risks and costs
10 to which its ratepayers actually were being exposed.
- 11 4. This course of conduct represents gross mismanagement, especially for
12 DEI as the successor to PSI Energy with its Marble Hill and Wabash River
13 No. 1 experiences.
- 14 5. For these reasons, I recommend that the IURC:
 - 15 A. Revoke or modify the Edwardsport CPCN in this subdocket
16 pursuant to IC 8-1-8.5-5.5 and 8-1-8.7-5.
 - 17 B. Initiate an investigation into (1) whether the Company's conduct
18 constitutes fraud, concealment, and/or gross mismanagement
19 within the meaning of the Utility Power Plant Construction Act,
20 and (2) if there has been fraud, concealment or gross
21 mismanagement, the amount of costs incurred to construct the
22 Edwardsport Project that should be disallowed for ratemaking
23 purposes.

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1 **Significantly Changed Circumstances Since the CPCN for the**
2 **Edwardsport IGCC Project Was Issued in November 2007**

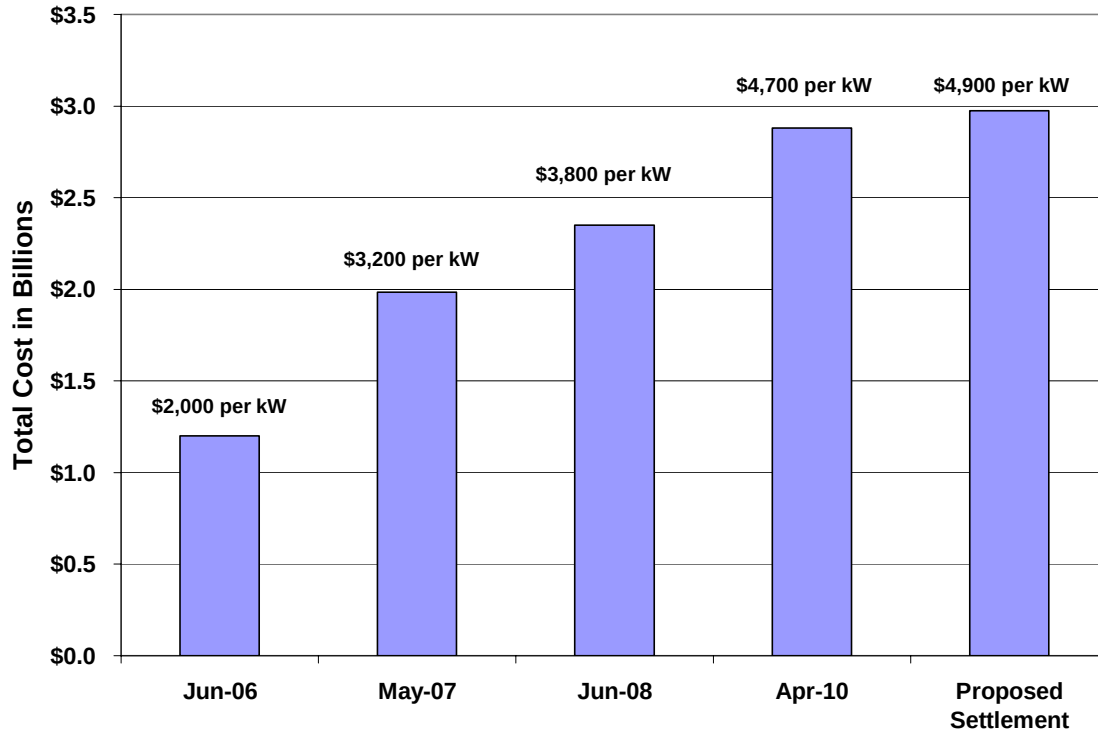
3 **Q. What key circumstances have changed significantly since the CPCN was**
4 **issued for the Edwardsport IGCC Project in November 2007?**

5 A. As shown in Figure 1, below, the Edwardsport IGCC Project’s estimated
6 construction cost has increased dramatically above the \$1.985 billion estimate
7 initially presented by DEI in Cause No. 43114. At the same time, as shown in
8 Figure 2, the Company’s projected loads also have been significantly reduced
9 since 2007.

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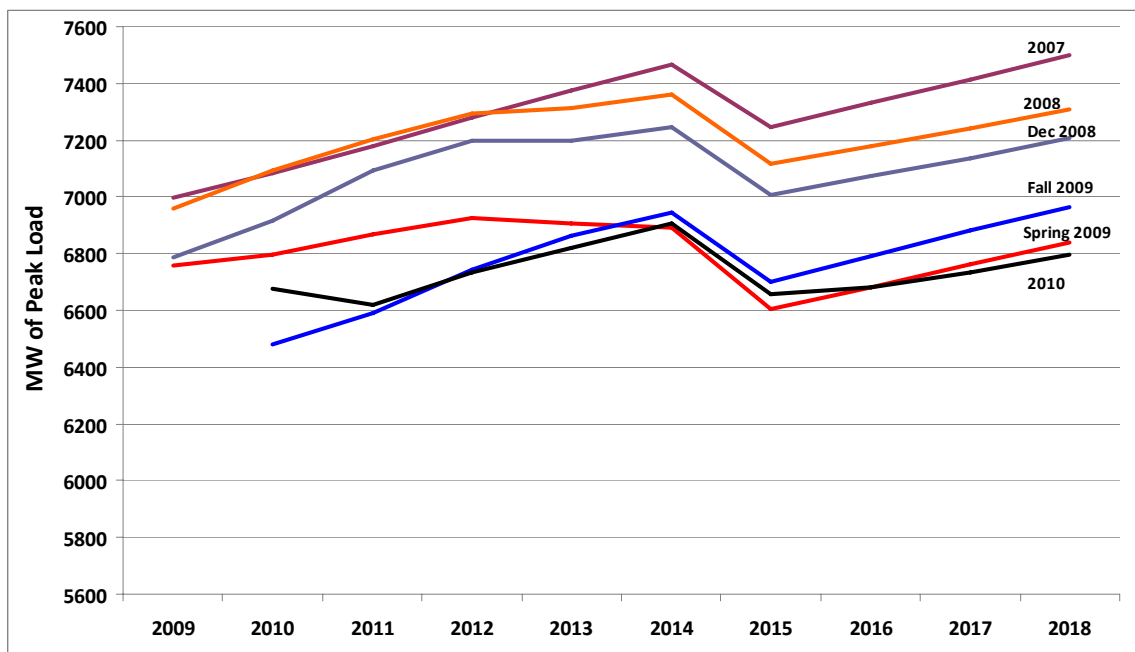
Figure 1: Changes in Edwardsport Capital Cost Estimates 2006-2010 (including AFUDC).



3

4

Figure 2: Changes in DEI Load Forecasts 2007-2010.



5

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1 In addition, when DEI originally petitioned the Commission for Certificates of
2 Public Convenience and Necessity for the Edwardsport project, Vectren was a
3 partner in the project and it was contemplated that company would own 20
4 percent of the project and its electric generation. But, that is no longer the case
5 and DEI is now owns 100% of the plant and its generation.

6 **Q. Do DEI's current load and resource analyses show a need for the capacity**
7 **and energy from the Edwardsport IGCC Project?**

8 A. No. A review of Exhibits BB-1 through BB-12 in DEI witness Hager's
9 Supplemental Settlement Testimony shows that the Company would have
10 adequate capacity if it either completed Edwardsport as a natural gas combined
11 cycle unit or if it abandoned the Edwardsport IGCC Project entirely and took
12 other actions to ensure it would have adequate supply to meet its demands plus
13 reserve requirements.

14 **Q. Please explain.**

15 A. Exhibit DAS-S1 shows the Company's annual loads and resources balance for the
16 years 2010 through 2030. Exhibit DAS-S1 compares the Company's forecasted
17 peak demands with available supply assuming that no additions to Duke's system
18 are made after 2010. There are two demand scenarios because DEI modeled two
19 separate assumptions reflecting the amount of energy efficiency that was achieved
20 on its system. The "Base" scenario is Duke's assumption of energy efficiency
21 absent the IURC's Phase II order. The "High EE" scenario reflects the IURC's
22 Phase II order targets. All demand-side management activities including demand
23 response are accounted for on the load side in this Exhibit. Both load trajectories
24 include DEI's 13.9% reserve margin.

25 The available capacity column in Exhibit DAS-S1 reflects an assumption that no
26 additional capacity is added or purchased after 2010. It also assumes that Wabash

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1 River 2-5 are retired in 2015 and that Gallagher 1 and 3 are converted to gas in
2 2013. Under these assumptions we find 7,161 MW of available capacity in 2010.¹

3 Load and resource balance analyses like Exhibit DAS-S1 and Exhibits BB-1
4 through BB-12 in Ms. Hager's Supplemental Settlement Testimony look only at
5 the circumstances during the peak time of the year – that is, the hour or the hours
6 during which the Company's loads are the highest. These load-resource balance
7 analyses do not tell what type of demand and/or supply side resource(s) are the
8 most economic option for meeting an identified load during peak hours.
9 Economic analyses such as those discussed by Ms. Hager are required to answer
10 that question.

11 Consequently, what the information on Exhibit DAS-S1 shows is:

- 12 1. Even without the capacity from the Edwardsport IGCC Project, DEI does
13 not have a significant need for new capacity until 2016 in either the base
14 energy efficiency scenario or the high energy efficiency scenario. This
15 would be almost four years after the date that DEI now projects for
16 Edwardsport's September 30, 2012 in-service date.
- 17 2. The Company's perceived need for capacity during the peak hours of 2016
18 is driven by the planned retirement of Wabash River Units 2-5 in 2015 and
19 the loss of the share of Gibson Unit 5 that is assigned to IMPA and
20 WVPA.
- 21 3. With the IURC's Phase II order energy efficiency targets (and even with
22 Duke's unreasonable assumption that no incremental energy efficiency is
23 achieved after 2019), the Company would not need all of the capacity
24 from the Edwardsport IGCC Project to meet a 13.9 percent reserve margin
25 requirement until the summer of 2022.

¹ Petitioner's Exhibit BB-1 says that DEI has 7,208 MW of capacity in 2010. Ms. Hager's supply vs. demand balance was not consistent with her modeling in a number of respects including this

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1 If meeting peak hour capacity needs and reserve requirements were the only
2 consideration, DEI could just add enough combustion turbine capacity as needed.
3 However, that may not be most economic option. Consequently, an economic
4 analysis is needed to determine whether adding combustion turbines or a new
5 natural gas combined cycle unit or a new IGCC unit is the low cost/low risk
6 alternative.

7 **Q. Dr. Richard Stevie, the Company's witness on energy efficiency, states that**
8 **DEI has more confidence in its "Base" case level of energy efficiency than in**
9 **the Phase II targets ordered by the IURC because it is consistent with an**
10 **EPRI study on the potential for energy efficiency. Would you agree with Dr.**
11 **Stevie's assessment?**

12 A. No. First, I would note that the EPRI study Dr. Stevie references is a national
13 assessment and doesn't account for differences in the energy efficiency
14 achievements across states and utility service territories. In fact, the study
15 acknowledges that in 2006 there were several states that, as a percentage of sales,
16 saved *more* than EPRI's highest achievable incremental reduction (0.85% per
17 year). Though it acknowledges this fact, the study fails to address why EPRI
18 would conclude that there is *less* energy efficiency *potentially* achievable than
19 what some states have *actually* achieved.

20 **Q. In its modeling, DEI assumed that no incremental energy efficiency would be**
21 **achieved after 2019. Is that assumption reasonable?**

22 A. No. This implies that after 10 years of increasing savings, there would suddenly
23 be no incremental energy efficiency available. There's no support for such an
24 assumption. For example, the state of Vermont created an energy efficiency
25 utility (similar to a third party administrator) in 1999. In 2008, Vermont saved
26 2.59% of sales but the efficiency utility did not rest on its laurels and clam to have

one. There may also be slight differences in assumed net capacity. However, since it is less than 1% of total capacity, I do not consider this difference material for purposes of this comparison.

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1 achieved all available savings. Instead, in its contract for 2009-2011, the
2 Vermont efficiency utility committed to achieve energy savings of 360,000 MWh
3 savings annually, equivalent to 5.6% of 2008 sales.

4 **Q. Do the Company’s most recent modeling analyses show that completion of**
5 **Edwardsport as an IGCC Project is clearly the lowest cost option?**

6 A. No. Remarkably (given the approximately \$2 billion that has been spent on the
7 Project) DEI’s most recent modeling analyses do not show a clear and substantial
8 economic advantage to completing Edwardsport as an IGCC Project across a wide
9 range of scenarios.

10 **Q. Please explain.**

11 A. DEI witness Hager’s Supplemental Settlement Testimony presents the results of
12 24 different scenarios that DEI has modeled. As shown on Ms. Hager’s Exhibit
13 BB-13, twelve of these scenarios assume the Company’s current \$2.88 billion
14 cost estimate for Edwardsport. The remaining twelve scenarios assume the \$2.975
15 billion so-called “hard cap” cost figure. Each of these groups of twelve scenarios
16 is broken down into four ‘base’ scenarios, four ‘high gas’ scenarios and four ‘high
17 CO₂’ price scenarios.

18 Exhibit BB-13, supported by the detailed results presented in Confidential Exhibit
19 BB-14, shows that completing Edwardsport as an IGCC unit is the lowest cost
20 option in seven of the eight ‘high gas’ price scenarios. However, completing
21 Edwardsport as an IGCC unit is the lowest cost option in only 5 of the remaining
22 sixteen. In the other 11 scenarios, completing Edwardsport as an IGCC is the
23 most expensive or the next-to-most expensive alternative. Included in these 11
24 scenarios are the 8 scenarios that DEI misleadingly calls “High CO₂.” As I will
25 explain in a moment, the CO₂ prices in this scenario can in no reasonable way be
26 considered to be very “high.”

27 In other words, Edwardsport is only shown to be the lowest cost option in 11 of
28 the 24 scenarios presented by Ms. Hager – and 7 of those 11 scenarios reflect the

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1 Company's new "high gas" price sensitivity. In the other 13 scenarios, either the
2 option in which Edwardsport is completed as an NGCC unit or the option in
3 which the Project is abandoned is the lowest cost alternative.

4 **Q. Is the Company's "High Gas" scenario credible?**

5 A. No. I agree that there is uncertainty about long-term natural gas prices, but the
6 identification of the tremendous shale gas deposits in the U.S. and Canada
7 probably will mean gas prices will remain relatively low for a number of years
8 into the near future, if not longer.

9 The problem with the Company's "High Gas" scenario is that it assumes that gas
10 prices will be about 35 percent higher (as compared to the Company's base case
11 gas price forecast) in every year of the planning period beginning in 2012. As
12 shown in Confidential Figure 6 in my Direct Testimony, the Most Recent Duke
13 Forecast of natural gas prices, which Ms. Hager has said the Company has used as
14 the base case in its most recent modeling analyses, tracks relatively close to the
15 NYMEX Henry Hub futures prices through about 2022. Given that there is no
16 evidence that Henry Hub futures prices will increase by anywhere near 35 percent
17 at any point in the relatively near future (say through 2016-2018), there does not
18 appear to be any basis for the Company to make such an assumption in its "High
19 Gas" scenarios. Ten or fifteen years in the future, natural gas prices may be very
20 different from what we forecast today, but given the large reserves of shale gas in
21 the U.S., it does not seem to be reasonable to expect such a significant upward
22 change in gas prices above current NYMEX futures prices for near future years
23 through 2016 or 2018, as the Company assumes in its "High Gas" price scenarios.

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1 **Q. Does the Company’s assumption in its “High Gas” price scenarios that**
2 **natural gas prices would be 35 percent higher even for near term years (such**
3 **as 2012 through 2016 or 2018) have a significant impact on the results of the**
4 **modeling?**

5 A. Yes. Given that future costs are discounted, near term price increases for natural
6 gas will have a larger impact on PVRR than longer term price increases.
7 Consequently, it is reasonable to expect that the assumption of 35 percent higher
8 near term gas prices had a very significantly impact on the relative economics of
9 the Complete as IGCC by unreasonably raising the near term costs of the
10 Complete as NGCC and the No IGCC scenarios.

11 **Q. Are there any other flaws or biases in the Company’s “High Gas” price**
12 **scenarios?**

13 A. Yes. The Company has argued that one of the reasons why it has lowered its
14 projected CO₂ prices between 2009 and 2010 was to reflect the impact of lower
15 natural gas prices. For example, Ms. Hager has testified that “Two factors that
16 will have a significant impact on CO₂ allowance prices are natural gas prices and
17 the amount of coal generation that is retired nationally as a result of more
18 stringent environmental regulations.”² However, when the Company assumed 35
19 percent higher natural gas prices in its “High Gas” price scenarios, it did not raise
20 the CO₂ allowance prices, accordingly. This is inconsistent with the Company’s
21 own testimony and it biases the analyses in favor of completion of the
22 Edwardsport IGCC Project.

² Rebuttal Testimony of Janice D. Hager in Cause No. 43114 IGCC-4S, at page 6, lines 13-15.

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1 **Q. During the November 3rd technical conference, Duke CEO James Rogers**
2 **raised concern about overreliance on gas generation on the Duke Energy**
3 **Indiana system. Does DEI’s modeling support this concern?**

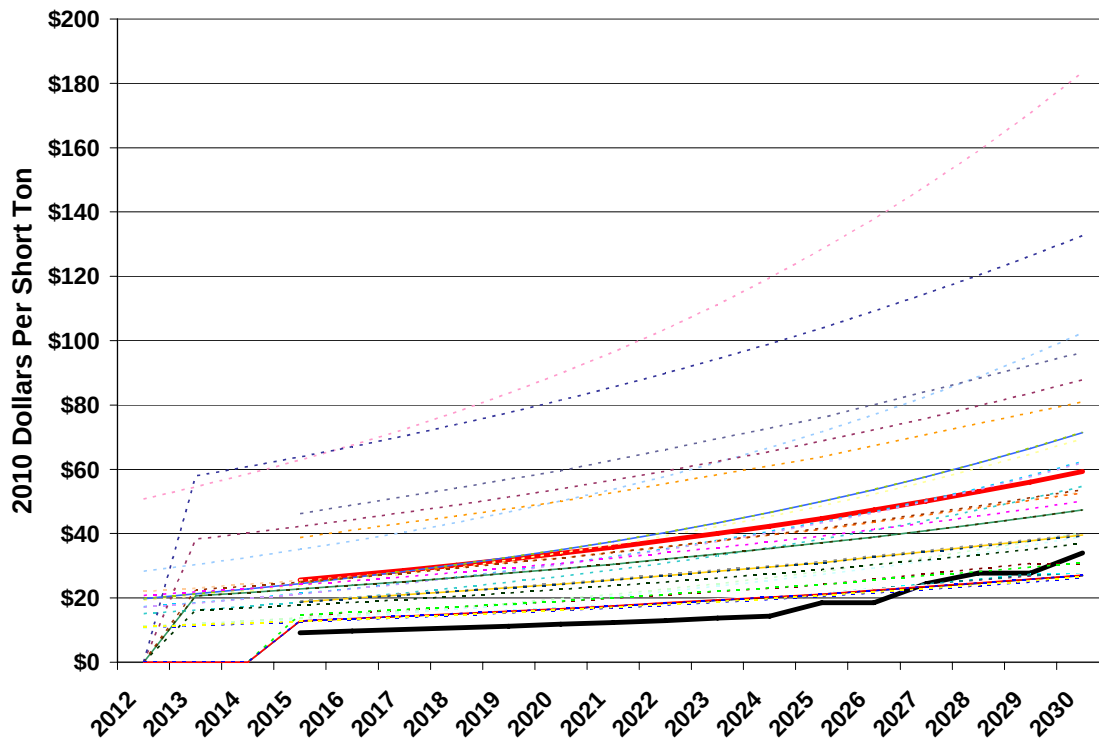
4 A. No. Even if Edwardsport is not completed, the portion of DEI’s total energy that
5 would be generated from gas-fired units would not rise above 5% through 2020.
6 And it reaches a maximum of only 8% in 2029. These levels clearly do not
7 present any risk of an “overreliance” on gas on DEI’s system.

8 **Q. Earlier you said that DEI misleadingly labeled its CO₂ price sensitivity as a**
9 **“High CO₂” scenario. Please explain the basis for this testimony.**

10 A. As shown in Figures 3 and 4, below, DEI’s 2010 projected CO₂ allowance prices,
11 which it uses for its base case scenarios in the new modeling presented by Ms.
12 Hager in her Rebuttal and Supplemental Settlement Testimony, are very low
13 when compared to the recent modeling of the Waxman-Markey bill and the
14 American Power Act. Figure 3 compares annual costs in 2010 dollars while
15 Figure 4 compares levelized prices for the years 2015-2030, also in 2010 dollars.
16 The solid red line in Figure 3 represents DEI’s 2009 CO₂ prices and the lower
17 solid black line represents the Company’s new 2010 CO₂ prices. DEI’s 2009 CO₂
18 prices are used in what DEI now calls its “High CO₂” scenario.

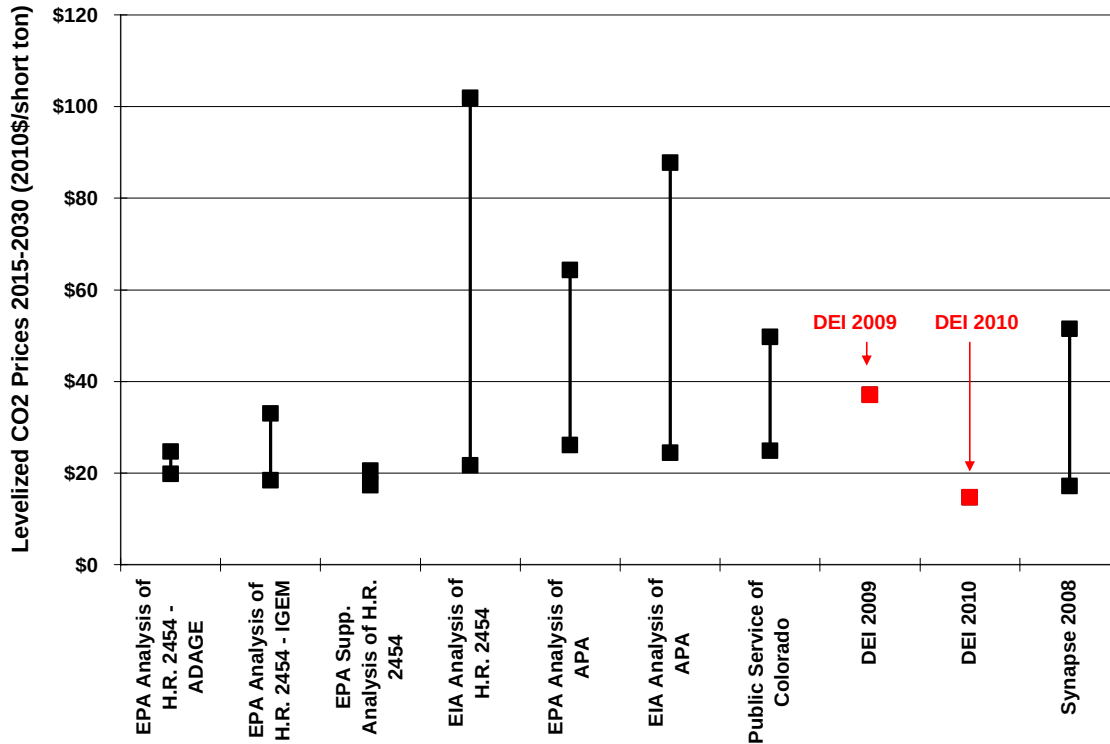
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1 **Figure 3: Annual Duke Energy Indiana 2009 and 2010 CO₂ Emissions**
2 **Allowance Prices Compared to Results of EPA and EIA**
3 **Modeling of Waxman-Markey and American Power Act**



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Figure 4: Levelized Duke Energy Indiana 2009 and 2010 CO₂ Emissions Allowances Compared to Results of EPA and EIA Modeling of Waxman-Markey and American Power Act



As can be seen from Figures 3 and 4, DEI's 2009 CO₂ price forecast should represent a reasonable base case while the Company's 2010 CO₂ price forecast could represent the lower end of a range of reasonable forecasts – even though it has a price trajectory which is lower than any of the price scenarios developed by the EPA and EIA in their modeling of the Waxman-Markey bill and the proposed American Power Act.

However, it clearly is not reasonable to do the reverse, that is, to use the very low DEI 2010 CO₂ price forecasts as the base case while calling the DEI 2009 CO₂ price forecasts a "High CO₂" scenario. As can be seen from both Figure 3 and Figure 4, there are many scenarios, examined by the EPA and EIA, in which CO₂ prices could be substantially higher than the Company's 2009 CO₂ price forecast.

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Q. When did the EPA and EIA prepare the modeling results that are presented in Figure 3 and Figure 4?

A. The EIA and EPA modeling analyses whose results are presented in Figure 3 and Figure 4 are very recent, having been released between June 2009 and June 2010 as follows.

- EPA Analysis of H.R. 2454 (Waxman-Markey Bill) – June 2009
- EIA Analysis of H.R. 2454 (Waxman-Markey Bill) – August 2009
- EPA Supplemental Analysis of H.R. 2454 – January 2010
- EIA Analysis of the American Power Act – May 2010
- EPA Analysis of the American Power Act – June 2010

Q. Figure 4, above, includes a set of CO₂ prices listed as Public Service of Colorado. Please explain what these prices represent.

A. Pursuant to a state law, Public Service of Colorado has this past summer and fall been examining options for reducing NO_x emissions from its coal units in the Denver Metropolitan Area by the end of 2017.³ Part of the Company analyses has included the modeling of various alternatives for reducing NO_x emissions. One of these alternatives would be adding emissions control equipment. Another alternative would be to retire four coal units at the Company's Cherokee site while building gas-fired combined cycle replacements. In its modeling analyses, Public Service used a base carbon price assumption of \$20 per ton beginning in 2014 and escalating at 7 percent per year in nominal terms.⁴ Public Service of Colorado also assumed a "high" CO₂ price of \$40 per ton, also beginning in 2014 and escalating at 7 percent per year in nominal terms. As can be seen from Figure 4, above, the low end of the range considered by Public Service of Colorado is

³ Public Service of Colorado filed these analyses in Colorado Public Utilities Commission Docket No. 10M-245E on August 13, 2010.

⁴ Direct Testimony of Gary J. Magno on behalf of Public Service Company of Colorado, Docket No. 10M-245E, filed August 13, 2010, at page 13, lines 17-19/

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1 significantly higher than the DEI 2010 CO₂ prices that DEI wants to use as a
2 “base case” in this proceeding. Similarly, the high end of the range of CO₂ prices
3 used by Public Service of Colorado is much higher than the DEI 2009 CO₂ price
4 forecasts that DEI labels as its “High CO₂” scenario.

5 **Q. Do the results of DEI’s modeling show that the Company will achieve**
6 **significant long-term CO₂ reductions if it adds the Edwardsport IGCC**
7 **Project?**

8 A. The results of the Company’s modeling for the base case scenarios involving
9 completion of the Edwardsport IGCC Project show a [REDACTED]
10 over the twenty year period 2010 through 2030.

11 **Figure 5: Annual DEI CO₂ Emissions if Edwardsport IGCC Projected is**
12 **Completed [CONFIDENTIAL]**
13

14

15 [REDACTED]

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1 The projected CO₂ emissions for the Gallagher Retirement and the Gallagher
2 Conversion scenarios are almost the same. Consequently, they appear as a single
3 line in Figure 5.

4 **Q. Has the Company included any sensitivity analyses in its modeling to reflect**
5 **continued escalation in the cost of Edwardsport Project?**

6 A. Ms. Hager’s Rebuttal testimony included the results for modeling runs for a
7 higher capital cost sensitivity that reflected an increase of 10 percent above DEI’s
8 current \$2.88 billion estimate.

9 **Q. What were the results of the higher capital cost sensitivity that Ms. Hager**
10 **presented in her Rebuttal Testimony?**

11 A. The results reported by Ms. Hager show that with a capital cost just 10 percent
12 higher than the Company’s current \$2.88 billion estimate, completing
13 Edwardsport is the most expensive option in both the base case energy efficiency
14 and the high energy efficiency scenarios.⁵

15 **Q. Did the Company rerun these 10 percent higher capital cost sensitivities as**
16 **part of the revised modeling analyses presented in Ms. Hager’s Supplemental**
17 **Settlement Testimony?**

18 A. No. Instead, Ms. Hager says the Company relied on the scenarios with the
19 proposed settlement “hard cap” of \$2.975 billion to show the potential impact of
20 higher capital costs.

21 **Q. Was this reasonable?**

22 A. No. The \$2.975 billion “hard cap” in the proposed settlement is only 3.3 percent
23 higher than the Company’s current \$2.88 billion estimate. The IURC should have
24 the information to determine what impact a higher capital cost (say the 10 percent
25 studied by Ms. Hager previously, or even a 20 percent higher capital cost) would

⁵ Rebuttal Testimony of Janice D. Hager in Cause No. 43114 IGCC-4S, at page 24, lines 5-16.

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1 have on the relative economics of completing the Project as an IGCC unit. The
2 options before the IURC at this time are not simply whether to accept or reject the
3 proposed settlement. Given the results of the Company's most recent modeling
4 analyses, conversion of the IGCC Project to an NGCC unit or abandonment also
5 remain economic options.

6 **Q. Have you seen any evidence that there may already be a significant risk that**
7 **the Company's \$2.88 billion estimate for the Edwardsport IGCC Project will**
8 **be exceeded?**

9 A. Yes. The testimony filed by DEI witness Womack last week in Cause No. 43114
10 IGCC-6 shows that the Company already is at risk of eating through the
11 unallocated project contingency with an ultimate impact of increasing the cost
12 beyond the \$2.88 billion figure in which the Company expressed high confidence
13 just this past spring and summer. The project also appears to be at risk of a
14 significant delay, although Mr. Womack tries hard to suggest ways such a delay
15 might still be avoided.

16 **Q. What is the currently expected project completion date?**

17 A. According to Mr. Womack:

18 The Project master schedule as of the end of October 2010 is
19 projecting an in-service date of August 26, 2012 and a substantial
20 completion date of November 28, 2012. However, we will be
21 completing the full integration of our detailed start-up and testing
22 plan into the master schedule shortly, and we believe the impact of
23 that revision may be a delay of the in-service date to approximately
24 September 30, 2010.....⁶

25 **Q. What is the current project cost estimate?**

26 A. According to Mr. Womack:

⁶ Direct Testimony of W. Michael Womack in Cause No. 43114 IGCC-6, at pages 5 and 6.

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1 The current Project cost estimate is \$2.88 billion. As of the end of
2 September 2010, the cost estimate includes \$89,584,861 of
3 unallocated risk allowance (contingency). However, possible cost
4 increases in the construction labor contracts, which we are tracking
5 continually, would use all of that risk allowance if they materialize.
6 While the cost increase trends in these labor contracts are not yet
7 firm enough to warrant a contingency drawdown, it seems likely
8 that they will impact the Project cost to some degree, possibly
9 eating up all the currently unallocated contingency, leaving no
10 contingency for unexpected costs during start-up and testing and
11 no contingency for additional financing charges.⁷

12 **Q. What are the most important issues affecting the schedule at this**
13 **time?**

14 A. According again to Mr. Womack:

15 The primary issue that we are managing at this time is the ability to
16 achieve, on a sustained level, the needed installation levels for the
17 Project commodities; particularly piping, insulation, and electrical
18 wire and cable. For piping, the schedule is based on being able to
19 install 40,000 linear feet of pipe per month for the months of
20 October 2010 through approximately April 2011. During October
21 2010, we were able to achieve this planned rate of installation.
22 Insulation work will follow closely behind the piping work. For the
23 electrical work, we must ramp up to an installation level of
24 approximately 500,000 linear feet of wire and cable per month. We
25 need to ramp up to that level quickly and sustain it from November
26 2011 through approximately March 2011. During October 2010,
27 we were able to achieve approximately 250,000 linear feet.
28 Although our contractors have plans to continue ramping to the
29 required installation level, electrical cable and wire installation
30 remain a risk to our schedule.⁸

31 **Q. Have you identified any other flaws or significant biases in the new modeling**
32 **analyses presented by DEI witness Hager in her Rebuttal and Supplemental**
33 **Settlement testimonies?**

34 A. Yes. In addition to the three biases that I have just discussed (that is, the failure to
35 include a higher capital cost scenario in its newest modeling, the use of

⁷ Id.

⁸ Id.

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1 unreasonably high natural gas prices in the “High Gas” scenario, and the use of
2 unreasonably low CO₂ prices in the base case analyses), DEI’s modeling reflects
3 three other biases in favor of completion of Edwardsport as an IGCC Project:

- 4 • The failure to include off-system capacity purchases as part of a portfolio
5 of alternatives to the completion of Edwardsport.
- 6 • As noted above, the failure to project incremental energy efficiency
7 savings after 2019 in the High EE scenarios and after 2021 in the Base EE
8 Scenarios.
- 9 • The overly optimistic assumption of very high operating performance for
10 the Edwardsport IGCC Project in all years of the study period.
- 11 • The continued failure to account for the costs of carbon capture and
12 sequestration and for the impacts that adding and operating CCS would
13 have on Edwardsport’s operating efficiency and MW output.

14 **Q. What annual operating performance does DEI assume that Edwardsport will**
15 **achieve?**

16 A. DEI has said that it anticipates that the capacity factor of the Edwardsport IGCC
17 Project will be approximately 82 percent.⁹

18 **Q. What capacity factors does Edwardsport achieve in the Company’s most**
19 **recent modeling analyses?**

20 A. In the Company’s Complete as IGCC cases, Edwardsport operates at a
21 [REDACTED]
22

23 **Q. What annual availability does DEI assume for Edwardsport in order to**
24 **achieve such high capacity factors?**

25 A.
26 [REDACTED]
27

⁹ DEI Response to DEI-IG 5.7 in Cause No. 43114 IGCC 4S.

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1

2

[REDACTED]

3

4

5 **Q. Is it reasonable to assume that an Edwardsport IGCC plant would achieve**
6 **such a high level of performance in every year of its operating life?**

7 A. No. It is not reasonable to assume that the Edwardsport IGCC plant would
8 achieve such high capacity factors and such high availability in all years in spite
9 of the fact that the Company now admits that it is the first-of-a-kind unit with
10 unique IGCC technology. There certainly is no basis for assuming that the IGCC
11 plant would achieve high availability and high capacity factors during the early
12 years of its operations.

13 **Q. Did the two existing IGCC plants in the U.S. experience problems during**
14 **their initial operations that reduced their availability and capacity factors?**

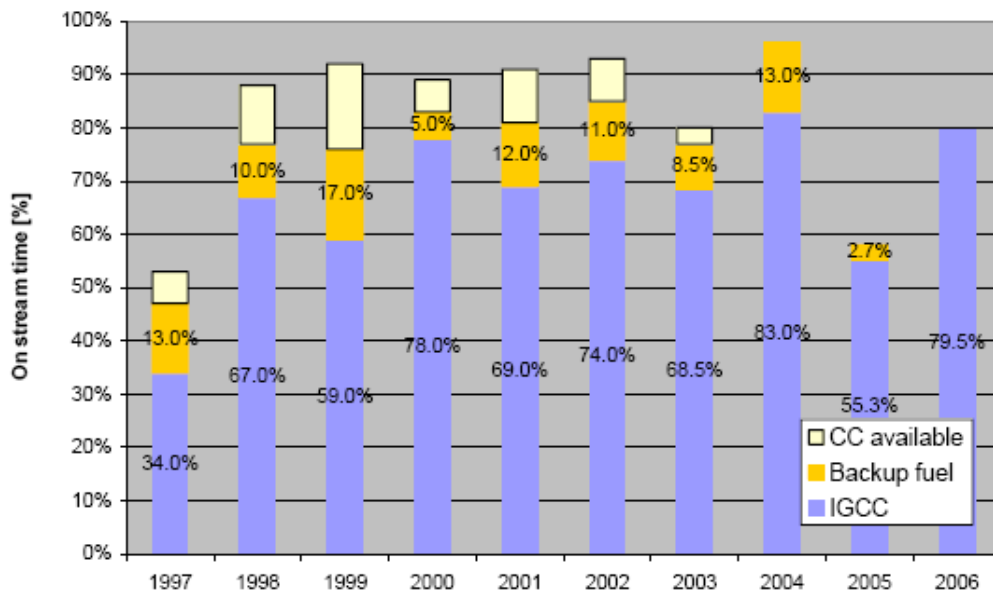
15 A. Yes. As Duke's Group Vice President of Regulated Fossil/Hydro Generation
16 McCollum told the North Carolina Utilities Commission back in 2007, it took the
17 two existing IGCC plants in the U.S. six to eight years to reach 80 percent
18 capacity factors.¹⁰ In fact, both units experienced serious operating issues that
19 adversely affected their availability and neither Polk Station or Wabash River
20 achieved availability of even 84 percent in any year through 2006.

21 In fact, as shown in Figure 6 and Figure 7, below, the each unit's actual
22 availability through 2006 was significantly lower each year than DEI now
23 assumes in its modeling of the Edwardsport IGCC Project.

¹⁰ North Carolina Utilities Commission Order in Docket No. E-7, SUB 790, issued March 25, 2007, at page 25.

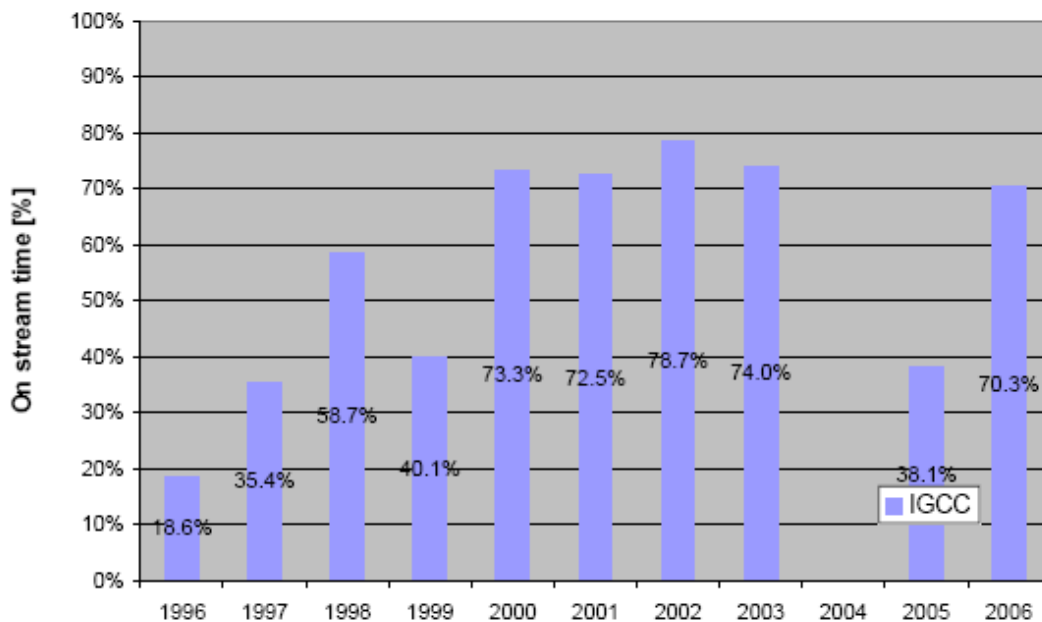
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1 **Figure 6: Annual Availability of the Polk Station IGCC¹¹**



2

3 **Figure 7: Annual Availability of Wabash River¹²**



4

¹¹ EPRI Report *Integrated Gasification Combined Cycle (IGCC) Design Considerations for High Availability*, Volume 1: Lessons from Existing Operations, Technical Update, March 2007, at page 3-12.

¹² Id., at page 3-8.

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1 Thus, where DEI assumes availabilities in all years after the first four months of
2 Edwardsport's operation, the actual experience shows much lower availabilities at
3 both Wabash River and Polk Station. Polk Station's availability as an IGCC
4 ranged between 55.3 percent and 79.5 percent in the nine years between 1998 and
5 2006. Wabash River's availability ranged between 35.4 percent and 78.7 percent
6 during the same period. In contrast, DEI is assuming that starting in 2013 (merely
7 months after it begins commercial operation) Edwardsport will achieve an
8 availability in excess of 80 percent in every year.

9 **Q. Did the assumption that Edwardsport would achieve approximately 82**
10 **percent capacity factors in almost every year of the study period affect the**
11 **results of the Company's most recent modeling analyses?**

12 A. Yes. I am sure that this assumption that Edwardsport would have a very high
13 availability and would achieve high capacity factors in every year had a major
14 impact and heavily biased the modeling analyses in favor of the Project's
15 completion as an IGCC unit.

16 **Q. Is it prudent for DEI to make this assumption in this proceeding?**

17 A. No.

18 ¹³**Q. Did the results of DEI's earlier modeling analyses in Cause Nos. 43114,**
19 **43114S1 and 43114 IGCC-1 similarly reflect high availabilities and capacity**
20 **factors for the Edwardsport IGCC Project?**

21 A. Yes.

22 **Q. Have you seen any evidence that DEI ever attempted to calculate a break-**
23 **even capacity factor for the Edwardsport IGCC Project as part of its**
24 **economic modeling analyses?**

25 A. No. In fact, DEI witness Diane L. Jenner testified in Cause 43114 that:

¹³ Rebuttal Testimony of Diane L. Jenner in Cause No. 43114, at page, lines 16-20.

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1 The testimony [IIG witness Phillips] has cited merely states that the
2 model runs showed the plant running at approximately 82% capacity
3 factor, period. In addition, in response to a data request from the
4 Indiana Industry Group (IIG 2.3) asking at what capacity factor the
5 IGCC must run to be the least cost option, **Duke Energy Indiana**
6 **explicitly stated that Duke Energy Indiana did not perform any**
7 **STRATEGIST model runs to determine the capacity factor at**
8 **which the IGCC must run to be the least cost option.** (Emphasis
9 added)

10 **Q. Was the Company’s failure to determine a break-even capacity factor at**
11 **which the IGCC unit must run to be the least cost option prudent?**

12 A. No.

13 **Q. In your direct testimony you criticized DEI’s modeling analyses for their**
14 **failure to include the costs of carbon capture at the Edwardsport plant. Did**
15 **DEI include those costs in its supplemental settlement modeling?**

16 A. No.

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1 **Q. Ms. Hager responds that “the decision to capture and sequester CO₂ will be a**
2 **separate economic decision” and that “the IGCC project is a component of**
3 **the Company’s plan to modernize its fleet.”¹⁴ Would you agree that the**
4 **Project can be justified on these grounds?**

5 A. No. Any new power plant would, in general, serve to “modernize” DEI’s fleet.
6 The question here is what does an IGCC plant bring to the table that is worth its
7 extra cost? Ms. Hager goes on to say in that same testimony, that “a key attribute
8 of IGCC technology is its potential for capturing carbon dioxide as compared to a
9 pulverized coal plant.”¹⁵ Ms. Hager would seem to be arguing that the Company
10 can justify an IGCC plant because it *may* more cheaply capture CO₂, but then not
11 compare the cost-effectiveness of the plant including the cost of capture with
12 other alternatives which would avoid some or all of the plant’s need for capture.
13 This argument plainly biases any analysis in favor of IGCC.

14 **Q. Ms. Hager testifies that “the analyses we performed included a reasonable**
15 **value for the cost of CO₂ allowances which acts as a proxy for cost-effectively**
16 **capturing and sequestering the CO₂.” Do you agree?**

¹⁴ Rebuttal Testimony of Janice Hager, at page 8, lines 5-6, and at page 9, lines 1-2.

¹⁵ Rebuttal Testimony of Janice Hager, page 9, lines 2-4.

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1 A. No. The results of DEI's own modeling analyses contradict that claim because the
2 model does *not* choose any plant with CCS even though it given the option of
3 selecting either an IGCC plant with 65 percent or 90 percent CCS or a pulverized
4 coal unit, also with 65 percent or 90 percent CCS. The model clearly does not
5 select any unit with CCS because the CO₂ allowance prices that DEI assumes in
6 its modeling analyses are too low to encourage the addition of CCS – in other
7 words, it is cheaper for the model to continue to purchase allowances instead of
8 adding and operating CCS.

9 DEI's CO₂ allowance projection cannot reasonably be claimed to approximate the
10 cost of CCS if the technology is never selected in its modeling. Instead, DEI's
11 modeling would seem to suggest that carbon capture will never be a cost-effective
12 choice because the cost of CCS is substantially higher than DEI's assumed cost of
13 purchasing CO₂ allowances even in what the Company calls its "High CO₂"
14 scenario.

15 **DEI's Mismanagement of the Edwardsport IGCC Project and the**
16 **Company's Failure to Fully Disclose Critical Information to the**
17 **IURC**

18 **Q. Figure 1, earlier in this testimony, shows that the Edwardsport IGCC**
19 **Project's currently estimated cost is approximately \$4,700 per kW, or about**
20 **45 percent higher than the Company's estimate in Cause No. 43114 in 2007.**
21 **Should DEI have anticipated these cost increases?**

22 A. Yes. The cost increases that have been experienced by the Edwardsport IGCC
23 Project were inevitable, foreseeable and foreseen.

24 **Q. What evidence should have led DEI to conclude that significant increases in**
25 **the cost of the Edwardsport Project beyond its initial \$1.985 billion estimate**
26 **were inevitable?**

27 A. Industry experience beginning in about 2003 showed that coal plant construction
28 costs were skyrocketing. At the same time, the Company knew that the
29 Edwardsport Project would be a first-of-a-kind IGCC plant, and, therefore, would

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1 clearly be exposed to significant risks and uncertainties. The potential for higher
2 costs at Edwardsport was especially acute given the relatively incomplete state of
3 project engineering during 2007 and 2008.

4 **Q. Is it clear that DEI knew by 2007 of the industry experience concerning**
5 **soaring coal plant construction costs?**

6 A. Yes. Company witness Moreland's Testimony in Cause 43114 in late 2006
7 clearly acknowledged the rising costs of coal plant construction commodities.¹⁶
8 But, even more importantly, by 2007, when Cause No. 43114 was being heard by
9 the IURC, Duke Energy had already experienced significantly higher costs at its
10 proposed Cliffside Project coal units in North Carolina.

11 **Q. Please explain.**

12 A. In early 2006, Duke Energy Carolinas announced that its proposed two unit
13 Cliffside coal project would cost approximately \$2 billion. Then, barely six-to-
14 eight months later, Duke reported in October 2006 that the cost of the Project had
15 increased by approximately \$1 billion or 47 percent. By the late winter of 2007,
16 after the project had been downsized because the North Carolina Utilities
17 Commission refused to grant a permit for two units, Duke announced that the cost
18 of building the remaining single unit would be about \$1.53 billion, not including
19 financing costs. However, in late May 2007, Duke announced yet another cost
20 increase – this time 20 percent. Consequently, by May 2007, Duke had admitted
21 that the cost of building only one coal-fired unit at Cliffside would be about the
22 same (\$2 billion) as it had projected one year earlier for building two units.

23 Duke emphasized in testimony filed at the North Carolina Utilities Commission
24 on November 29, 2006, the significant impact that the competition for design and
25 construction resources was having on the costs of building new power plants. This
26 testimony was presented to explain the approximate 47 percent -- that is, the \$1

¹⁶ Testimony of Robert D. Moreland, Cause 43114, at page 15, lines 1-18.

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1 billion -- increase in the estimated cost of the Cliffside Project that the Company
2 had announced in October 2006.

3 The costs of new power plants have escalated very rapidly. This
4 effect appears to be broad based affecting many types of power
5 plants to some degree. One key steel price index has doubled over
6 the last twelve months alone. This reflects global trends as steel is
7 traded internationally and there is international competition among
8 power plant suppliers. Higher steel and other input prices broadly
9 affects power plant capital costs. A key driving force is a very
10 large boom in U.S. demand for coal power plants which in turn has
11 resulted from unexpectedly strong U.S. electricity demand growth
12 and high natural gas prices. Most integrated U.S. utilities have
13 decided to pursue coal power plants as a key component of their
14 capacity expansion plan. In addition, many foreign companies are
15 also expected to add large amounts of new coal power plant
16 capacity. This global boom is straining supply. Since coal power
17 plant equipment suppliers and bidders also supply other types of
18 plants, there is a spill over effect to other types of electric
19 generating plants such as combined cycle plants.¹⁷

20 Duke Energy Carolinas witness Rose further noted in this testimony that the
21 actual coal power plant capital costs as reported by plants already under
22 construction were exceeding government estimates of capital costs by “a wide
23 margin (i.e., 35 to 40 percent).” He also noted that currently announced power
24 plants appeared likely to face another increase in costs (i.e., approximately 40
25 percent).¹⁸ Thus, according to Mr. Rose, the cost of building new coal-fired power
26 plant capital costs had increased approximately 90 to 100 percent between 2002
27 and 2006/2007.

¹⁷ Direct Testimony of Judah Rose for Duke Energy Carolinas, North Carolina Utilities Commission
Docket No. E-7, SUB 790, at page 4, lines 2-14.

¹⁸ Ibid., at page 6, lines 5-9, and page 12, lines 11-16.

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1 **Q. Do you agree with Duke Energy Carolinas assessment that the costs of new**
2 **coal-fired power plants had increased significantly in the period between**
3 **2002 and 2006 and were likely to continue to rise in the future?**

4 A. Yes. Just about every coal-fired power construction project in the U.S. during that
5 period, of which I am aware, experienced a significant cost increase as a result of
6 the factors cited by Duke Energy Carolinas in its testimony to the North Carolina
7 Utilities Commission.

8 **Q. Should Duke Energy Carolinas' experience with its Cliffside Project have**
9 **provided any insights into the expected construction cost of the Edwardsport**
10 **IGCC Project?**

11 A. Yes. DEI should have realized that Edwardsport would be subject to the same
12 risks of significantly higher costs as other coal-fired projects including the
13 Company's Cliffside Project.

14 **Q. You also mentioned, above, that DEI should have expected that Edwardsport**
15 **would be particularly exposed to the risks of rising construction costs due to**
16 **the fact that it was the first-of-a-kind commercial power plant using the**
17 **chosen IGCC technology. Please explain the basis for this conclusion.**

18 A. In proposing to build the Edwardsport IGCC Project, DEI was risking potentially
19 higher construction costs and potential operability and reliability problems as an
20 early adopter of IGCC technology (also called a "First Mover") instead of waiting
21 and learning from the experience of other IGCC projects. There were no plants
22 that had previously been built anywhere else using the GE Reference Design that
23 was being built at Edwardsport. Thus, it was not simply a matter of scaling up an
24 existing plant design, i.e., the design for the Polk IGCC plant in Florida.

25 **Q. Was there a complete detailed design for the Edwardsport IGCC plant back**
26 **in 2006 and 2007 when Cause No. 43114 was being heard by the IURC?**

27 A. No. There was only a conceptual design upon which the original FEED Study
28 was based.

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1 **Q. Was it clear during this time frame (2006-2007) that the design for the**
2 **Edwardsport IGCC Project involved new design features as compared to the**
3 **existing Polk IGCC plant?**

4 A. Yes. A presentation by DEI President Stanley in June 2007 acknowledged that
5 the Edwardsport IGCC plant involved the introduction of multiple new GE
6 products.¹⁹

7 **Q. Did GE acknowledge that there were challenges for a company in investing**
8 **in the first wave of new IGCC plants?**

9 A. Yes. A May 24, 2007 presentation by Bret Scholtes from GE Energy Financial
10 Services listed the following “challenges of investing in the first wave” of new
11 IGCC plants:

- 12 • Substantial development expense
- 13 • Increasing capital costs
- 14 • EPC uncertainty – Limited options at this time
- 15 • Technology – Performance and availability
- 16 • Limited Visibility into the future – Carbon and Greenhouse Gas
17 legislation²⁰

18 **Q. Was DEI aware of the risks, challenges and uncertainties involved in being a**
19 **First Mover, that is, being among the first wave of projects involving new**
20 **IGCC technology?**

21 A. Yes. Duke Energy President Rogers explained to the North Carolina Utilities
22 Commission in late 2006 that the Company had considered but decided against
23 IGCC technology for a new plant in that state because of the expectation that

¹⁹ *Edwardsport IGCC Project Update*, Workshop on Gasification Technologies, Indianapolis, Indiana, June 13, 2007, at slide no. 9. Included as Exhibit DAS-S2.

²⁰ Exhibit DAS-S3.

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1 initial capital costs would be higher and because IGCC was still a developing
2 technology.²¹

3 Duke witness McCollum (Duke Energy's Group Vice President of Regulated
4 Fossil/Hydro Generation) testified in the same North Carolina proceeding that:

5 IGCC is a promising, but still developing technology. From the
6 standpoint of technology, there currently are no IGCC plants larger
7 than 300 MW operating or under construction. There are two IGCC
8 plants currently operating in the United States: Tampa Electric
9 Company's Polk Station, a 250 MW Department of Energy (DOE)
10 demonstration project brought on line in September 1996 and Duke
11 Energy Indiana's Wabash River 262 MW DOE demonstration IGCC
12 plant in Indiana, which was completed in 1995. A number of larger
13 commercial IGCC projects are under development, including Duke
14 Energy Indiana's proposal with GE Energy and Bechtel to evaluate the
15 possible construction of a new 600 MW IGCC plant in Indiana, but no
16 firm commitments have been made. Additional issues such as the
17 higher initial costs, the limitations on load following and cycling
18 capability, and the lack of suitable geologic formations to support CO₂
19 sequestration in Duke Energy Carolinas' service territory, all made
20 IGCC less suitable for Duke Energy Carolinas 2011 baseload needs
21 than pulverized coal.²²

22 Mr. McCollum also testified that IGCC plants involve "some very complex and
23 finicky pieces of equipment" and that, at that time (i.e., January 2007), the
24 Edwardsport project was "still in a conceptual design phase."²³

25 Duke witness Hager similarly told the North Carolina Utilities Commission that
26 while IGCC was a potentially viable commercial technology, even in North
27 Carolina where carbon sequestration was not possible, it could only be considered
28 as a developing technology, not as a viable option at present.²⁴

²¹ North Carolina Utilities Commission Order in Docket No. E-7, SUB 790, at page 25.

²² Direct Testimony of William R. McCollum, Jr., North Carolina Utilities Commission Docket No. E-7, SUB 790, at pages 5 and 6.

²³ North Carolina Utilities Commission Order in Docket No. E-7, SUB 790, at pages 25 and 26.

²⁴ Id., at page 26.

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Q. What did the North Carolina Utilities Commission decide about the viability of IGCC technology as an option for a new power plant?

A. The North Carolina Utilities Commission concluded that:

Duke cannot rely upon IGCC technology to supply its need for additional baseload generating capacity beginning in 2011. IGCC units have yet to be constructed as a large-scale electric generating resource. Even if such units could be built, they would achieve commercial operation at least two years later than the Cliffside project. Given the geology of North Carolina, a cost effective method for carbon sequestration is, at best, an unresolved issue. Further, IGCC may not operate as effectively as its proponents anticipate. Reliability issues and the higher capital costs associated with IGCC may outweigh any advantages in pollution control; it is too early to know at present. IGCC is still a developing technology, and it is not a reliable alternative to the Cliffside project.²⁵

Q. Did DEI present similar testimony to the IURC that IGCC was just a developing technology or that Edwardsport was only in a conceptual design phase?

A. No. In Cause Nos. 43114 and 43114 IGCC-1, the Company presented a very different view of the state of IGCC technology, in general, and of the state of the design of the Edwardsport IGCC Project, in particular.

For example, Company witness Roebel testified in Cause No. 43114 that the technology for the Edwardsport IGCC Project was not unproven technology:

... although the plant will be the first or one of the first IGCC plants in the 600 MW range. I view IGCC technology as a merging of two mature technologies. As Dr. Schilling describes, coal gasification has been practiced for many years. Combined cycle generation is nothing new, and there are a number of combined cycle plants operating on natural gas throughout the country. We now have a very good experience base with the two operating demonstration IGCC plants, Wabash River Repowering and Polk. Although Duke Energy Indiana has not operated the gasification island at Wabash River, we have over ten years experience operating a combined cycle power plant in

²⁵ Id., at page 27.

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1 conjunction with the gasification plant. Subject to stringent
2 confidentiality limitations, engineers from our Edwardsport Project
3 team have had unprecedented access to GE's design effort – we have
4 seen how GE has incorporated lessons learned from prior IGCC
5 projects. It would not surprise me if we have to make some
6 modifications early in the operating life of the Edwardsport Project,
7 but that is not unusual for any new large power plant. In my opinion,
8 overall Edwardsport will be a very good and reliable generating station
9 and will serve our customers well.²⁶

10 Company witness Zupan similarly testified in Cause No. 43114 that the number
11 of Project design changes would be “limited:”

12 As stated above, the FEED Study will provide mid-level engineering
13 and design details for the Project. Prior to making a final decision as to
14 whether, in our view, the Edwardsport Project should go forward, and
15 before beginning construction, we need to perform additional
16 functions such as pursuing a number of value engineering analyses,
17 performing more detailed engineering, contract negotiations and, quite
18 possibly, making commitments for certain materials and equipment.
19 Because of schedule impacts, incorporation of changes to the Project
20 scope after the FEED Study will generally be limited to those that add
21 value.²⁷

22 **Q. Did the Company ever indicate to the IURC prior to the current proceeding**
23 **that the FEED Study was based on a preliminary design with little detailed**
24 **engineering and not on an actual facility that had already been constructed**
25 **and could be used for estimate purposes?**

26 A. Not to my knowledge. Instead, a review of the testimony filed by DEI in Cause
27 Nos. 43114, 43114 S1 and 43114 IGCC-1 suggests that the following testimony
28 by Company witness is typical of what the Company told the IURC about the
29 FEED Study:

30 We expect to begin more detailed engineering for certain components
31 of the Project immediately after the completion of the FEED Study.
32 While the **mid-level engineering from the FEED Study** is critical

²⁶ Rebuttal Testimony of John J. Roebel in Cause Nos. 43114 and 43114 S1, at page 4, lines 1-18.

²⁷ Testimony of Dennis M. Zupan in Cause No. 43114, at page 5, lines 1-8.

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1 and very helpful for analyzing the reasonableness of the Project, it
2 does not provide the level of detail necessary to develop and issue
3 specifications for various components of the plant. Detailed
4 engineering is necessary in order to define equipment requirements
5 and get responsive and useful proposals from vendors. This
6 engineering and design work will be performed by both GE and
7 Bechtel under a technical services agreement. (Emphasis added)²⁸

8 **Q. Did anyone actually warn DEI about the potential for higher capital costs for**
9 **the Edwardsport IGCC than the Company was assuming in 2007 and 2008?**

10 A. Yes. This is not an argument based on “hind sight.” Indiana Industrial Group
11 witness Nicholas Phillips warned in testimony in Cause No. 43114 S1 about the
12 risks of proceeding with an IGCC project. I warned in both Cause No. 43114 S1
13 and Cause No. 43114 IGCC-1 about the potential for higher costs than DEI was
14 then projecting for the Edwardsport Project.

15 For example, I testified in Cause No. 43114 that Duke should anticipate that the
16 cost of the Edwardsport Project would increase above its then-current \$1.985
17 billion cost estimate and, consequently, should examine sensitivities in its
18 modeling analyses that reflected higher construction costs.²⁹ I explained that it
19 was reasonable to assume that the proposed Project could experience cost
20 increases before it was completed:

21 Duke may have to increase the estimated cost of the project once it
22 completes its design and/or the selection of equipment suppliers.
23 Moreover, any number of factors could lead to even higher costs
24 during the remaining years before the proposed IGCC Project is
25 completed, if indeed a Certificate is issued and the Project is allowed
26 to continue. These factors could include the worldwide competition for
27 power plant equipment, commodities and labor, project delays,
28 regulation-related costs, and weather conditions. Thus, there is no
29 guarantee that the current capital cost estimate for the proposed IGCC
30 Project will be the last.³⁰

²⁸ Id., at page 6, lines 9-16.

²⁹ Direct Testimony of David A. Schlissel, Cause No. 43114 S1, at page 34, lines 1-23.

³⁰ Id., at page 33, lines 14-21.

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1 Although Duke had considered the potential for higher construction costs in its
2 modeling analyses of the proposed Cliffside Project in North Carolina, the
3 Company refused to do the same in its modeling of the Edwardsport Project.
4 Indeed, the Company actually contested that it was reasonable to expect that the
5 cost of the Edwardsport Project might increase above its \$1.985 billion estimate.
6 For example, Company rebuttal witness Roebel testified that the \$1.985 billion
7 cost estimate was:

8 ... as reasonable as possible at this time. As I have testified before
9 with respect to the Company's environmental compliance projects,
10 with any multi-year construction project I would expect to see
11 relatively minor changes from ongoing impacts and refinements to the
12 project as a normal part of an ongoing construction program. However,
13 with the completion of the [Front End Engineering Design] FEED
14 Study we have a significant amount of detailed knowledge about the
15 project, more knowledge than normal for this stage of a major project.
16 We were given unprecedented access to the GE and Bechtel teams
17 working on the FEED Study and their work product. As we stated in
18 the FEED Study Report, Bechtel was able to perform take offs from
19 engineering drawings, a much more accurate method for estimating
20 quantities. Bechtel obtained current pricing for over 90% of the bulk
21 quantity materials and equipment from vendors. The estimate was
22 rigorous and performed by seasoned personnel using accepted
23 estimating techniques. In my opinion, the estimate is reasonable.³¹

24 Mr. Roebel also testified that the then current \$1.985 billion estimate was based
25 on very recent quotes and estimates from vendors and suppliers and on pricing
26 data obtained as late as March, 2007.³²

³¹ Rebuttal Testimony of John J. Roebel, Petitioner's Exhibit No. 27 in Cause No. 43114, at page 2, lines 7-20.

³² Id., at page 3, lines 17-19.

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1 **Q. Did you subsequently warn in Cause No. 43114 IGCC-1 in 2008 that the**
2 **Edwardsport’s construction cost could rise above the Company’s new \$2.35**
3 **billion estimate?**

4 A. Yes. Based on industry experience, I recommended that Duke perform a series of
5 sensitivity scenarios in its modeling analyses that would have assumed increases
6 of 20 percent and 40 percent over its then-current \$2.35 billion cost estimate.

7 **Q. Did you present evidence in your testimony in Cause No. 43114 IGCC-1**
8 **regarding the significant cost increases that had been experienced by other**
9 **coal-fired power plant construction projects through mid-2008?**

10 A. Yes.³³

11 **Q. Did Duke prepare any higher capital cost sensitivity analyses in response to**
12 **your recommendation in Cause No. 43114 IGCC-1?**

13 A. No. Despite having been proven to have been wrong about the
14 accuracy/reasonableness of its \$1.985 billion cost estimate in May 2007, Duke
15 again refused to consider in its modeling analyses that there might be further
16 increases beyond its then-current \$2.35 billion estimate. For example, Company
17 witness Womack testified that:

18 I do not believe it is reasonable to assume that the cost of the
19 Edwardsport project will exceed the Company’s current estimate. We
20 are making significant progress toward mitigating the types of market
21 risks referred to by Mr. Schlissel. A deeper analysis of the particular
22 cost elements of the Edwardsport project will illustrate this point...
23 While we cannot guarantee factors beyond our control, such as
24 inflation, based on my specific knowledge of the Edwardsport project,
25 I have not seen any evidence that would lead me to believe that the
26 current estimate should be revised.

27 * * * *

³³ Direct Testimony of David A. Schlissel, Cause No. 43114 IGCC-1, at page 6, line 1, to page 12, line 11.

PUBLIC VERSION – PROTECTED MATERIALS REDACTED

1 Taking everything into account, I have the same level of confidence in
2 the current estimate that I did when it was completed in April of this
3 year.³⁴

4 The Company's Reply Brief similarly expressed total confidence in its \$2.35
5 billion cost estimate and rejected out-of-hand the idea of conducting any
6 sensitivity economic analyses assuming higher capital costs for Edwardsport:

7 The Company could run an infinite number of cost increase (or
8 decrease) scenarios producing an infinite number of potential
9 outcomes. But the Company has chosen instead to confine itself to the
10 facts, and present those facts as evidence in this proceeding. The
11 evidence shows that future cost increases of any magnitude, let alone
12 of the magnitude feared by the CAC, are unlikely. The reasons for this
13 are not blind optimism; rather, the Project is much further along today
14 than it was in 2007, numerous contracts with vendors and equipment
15 suppliers have been finalized and signed, and the majority of the
16 remaining work is of a nature that is much less susceptible to large
17 price increases...³⁵

18 **Q. Did you recommend in Cause No. 43114 IGCC-1 that Duke actually revise its**
19 **cost estimate for the Edwardsport Project?**

20 A. No. As I noted above, I merely recommended that prudent planning required that
21 the Company examine the potential that such further cost increases might be
22 experienced so that it and the IURC would have the best possible information for
23 determining whether completion of the Project was in the public interest.

24 **Q. Did the Company present any specific evidence in Cause No. 43114 IGCC-1**
25 **that should have warned it about the potential for significantly higher**
26 **construction costs at Edwardsport?**

27 A. Yes. Company witness Turner testified in May 2008 that the EPRI range of costs
28 of IGCC projects had increased from \$1.666-\$2.102 billion in 2006 to \$2.325
29 billion to \$3.063 billion for a plant in service in 2012, using a 6 percent escalation

³⁴ Rebuttal Testimony of W. Michael Womack, Cause No. 43114 IGCC-1, August 8, 2008, at page 3, line 8, to page 4, line 9.

³⁵ DEI September 25, 2008 Reply Brief in Cause No. 43114 IGCC-1, at page 12.

PUBLIC VERSION – PROTECTED MATERIALS REDACTED

1 rate.³⁶ Remarkably, the Company cited the fact that its new estimate was within
2 this range as evidence of its reasonableness instead of expressing concern that the
3 new \$2.35 billion estimate was barely above the low end of the range and that the
4 EPRI data showed that the Project's construction cost could be significantly
5 higher. Rather than instilling confidence in its \$2.35 billion estimate, the updated
6 EPRI data presented by Mr. Turner should have flashed a red warning signal to
7 DEI about proceeding without considering the potential for additional cost
8 increases. Unfortunately, it did not.

9 **Q. Did the Company present any testimony in Cause Nos. 43114 IGCC-1,**
10 **IGCC-2 or IGCC-3 describing any major design modifications at**
11 **Edwardsport or the impact that such design modifications was having on the**
12 **Project's cost or schedule?**

13 A. No. The Company's Petition and testimony in Cause No. 43114 IGCC-1 focused
14 on the following factors as the main reasons for increasing Edwardsport's
15 estimated cost from \$1.985 billion to \$2.35 billion:

16 As discussed above, the Company is requesting the Commission revise
17 the approved estimated construction cost for the IGCC Project. The
18 primary reasons for this increased cost estimate are: (1) higher than
19 anticipated contract costs from our major vendors driven in large part
20 by the worldwide demand for engineering and construction services
21 and for construction commodities such as steel and concrete; (2)
22 higher than expected inflationary increases on major pieces of
23 equipment, many of which are only available from overseas firms, also
24 driven by worldwide increases in demand for such equipment; and (3)
25 higher than average expected inflation over the course of the
26 construction period, expected to be reflected in contractors' costs,
27 labor costs, and other equipment costs.³⁷

28 I have seen no evidence of any discussion in the Company's testimony in Cause
29 No. 43114 IGCC-1 of any impact that design modifications were having on the

³⁶ Direct Testimony of James L. Turner in Cause No. 43114 IGCC-1, at page 8, line 20, to page 9, line 3.

³⁷ May 1, 2008 Verified Petition in Cause No. 43114 IGCC-1, at pages 6 and 7.

PUBLIC VERSION – PROTECTED MATERIALS REDACTED

1 Project's cost. There also was no mention of increasing numbers of commodities
2 (i.e., concrete, steel, etc) being used at Edwardsport.

3 The Company's testimony in Cause No. 43114 IGCC-2 in November 2008
4 similarly did not mention any need for significant design modifications due to
5 Edwardsport's being a first-of-a-kind IGCC plant or increased construction
6 commodities. Indeed, Company witness Womack's testimony in that proceeding
7 specifically mentioned that no significant problems had arisen with site activities
8 and that there was no need to change either the Project's cost or schedule.

9 Mr. Womack's testimony in Cause No. 43114 IGCC-3 did discuss a project delay
10 and some scope/cost growth due to the raw water treatment and grey water
11 disposal systems, with a cost impact within the range of \$70 to \$120 million.³⁸
12 He also reported that unexpected issues and market conditions had required the
13 Company to use some of the contingency and escalation allowances identified in
14 the cost estimate.³⁹ However, there was no mention of significant design
15 modifications or significant scope growth beyond the raw water treatment and
16 grey water disposal systems.

17 **Q. How far along was engineering and design work for Edwardsport when Mr.**
18 **Womack filed his testimony in Cause No. 43114 IGCC-3 in May 2009?**

19 A. Mr. Womack testified that engineering and design work was more than 50 percent
20 complete and on track to be 90 percent complete by the end of 2009.⁴⁰

21 **Q. To what factors does DEI now attribute the dramatic increases in the cost of**
22 **the Edwardsport IGCC Project?**

23 A. As explained in the Company's direct testimony in this proceeding, the Company
24 realized in the fall of 2009 that the plant it is building "has significantly more

³⁸ Direct Testimony of W. Michael Womack in Cause No. 43114 IGCC-3, at page 3, line 22, to page 4, line 2.

³⁹ Id., at page 14, lines 12-14.

⁴⁰ Id., at page 3, lines 4-6.

PUBLIC VERSION – PROTECTED MATERIALS REDACTED

1 scope, and is significantly more complex, than the original FEED Study
2 estimated.”⁴¹

3 As Company witness Haviland explained:

4 In the late stages of the engineering and procurement progress (over
5 80% complete), it became apparent that the IGCC Project we are
6 building has significantly more scope than the FEED Study estimated
7 – in other words, the plant is just a bigger plant than we expected.
8 Although a reasonable FEED Study was performed to develop the
9 expected scope and quantities for the IGCC Project, there was, and
10 still is, no existing physical plant of this type and size for the FEED
11 Study to base its estimates upon. This is unique technology and a first
12 of its kind plant of this size. Although there are other gasification
13 plants based on the GE technology, none of them have the latest
14 improvements designed specifically for this plant by GE and none of
15 them are as highly integrated with the power block components as this
16 plant. The fact that the power block is highly integrated with the
17 gasification island and that the power components are tailored for
18 syngas also makes the power block design less similar to a traditional
19 combined cycle plant. As a result, the FEED Study was based on a
20 preliminary design with little detailed engineering and not on an actual
21 facility that had already been constructed and could be used for
22 estimate purposes. GE and Bechtel did refer to the Tampa Electric
23 facility, previously mentioned, for some estimate comparisons. With
24 regards to these estimate comparisons, although we believed that the
25 proper estimating adjustments had been made to account for the
26 differences between Tampa Electric and Edwardsport, GE and Bechtel
27 adjustments were ultimately not adequate to account for the final
28 design growth. Given the age of that facility, smaller size, and design
29 differences, the Tampa Electric plant did not prove to be an adequate
30 reference facility.

31 As final engineering progressed, it was determined that some of the
32 FEED Study estimates were off by a large percentage....⁴²

33 * * * *

⁴¹ Direct Testimony of James L. Turner in Cause No. 43114 IGCC-4S, at page 5, lines 11-13 and page 6, lines 11-13.

⁴² Direct Testimony of Richard W. Haviland in Cause No. 43114 IGCC-4S, at page 5, line 19, to page 6, line 21.

PUBLIC VERSION – PROTECTED MATERIALS REDACTED

1 The end result is a substantial amount of change in scope – some of it
2 normal design development, but primarily driven by the unique plant
3 design. It’s important to note that the increase in scope impacts other
4 aspects of the Project. Because of the increase in scope, we have
5 experienced increased engineering costs, late engineering, increased
6 quantities, schedule compression, schedule extension to relieve some
7 of the schedule compression, late deliveries of equipment, field and
8 shop rework due to compression and late engineering changes, and
9 increased construction costs affected by the aforementioned factors
10 and the fact that we are installing and managing a larger project.⁴³

11 **Q. What did DEI tell the IURC in earlier proceedings concerning the scope of**
12 **the Edwardsport IGCC Project and the numbers of construction**
13 **commodities that would be required?**

14 A. The Company provided very optimistic and confident testimony concerning the
15 design of the Edwardsport Project and even boasted that it would be able to build
16 the new IGCC Project with fewer commodities than were in the original plant
17 design. For example, Company witness Roebel testified in Cause No. 43114 that
18 “As we stated in the FEED Study Report, Bechtel was able to perform take offs
19 from engineering drawings, a much more accurate method for estimating
20 quantities.”⁴⁴

21 Company witness Zupan similarly told the IURC that:

22 For example, as Mr. Moreland explained in Cause No. 42894, GE and
23 Bechtel are developing a reference plant design, or a base design for
24 the major components of a commercial IGCC generating station that
25 will be adaptable to multiple sites. **We believe that GE and Bechtel**
26 **can reduce the overall footprint of their original site layout as it is**
27 **adapted for the Edwardsport site, and significantly reduce the**
28 **length of piping, cable and conduit runs along with associated pipe**
29 **rack steel and foundations.** (Emphasis added)⁴⁵

⁴³ Id., at page 7, lines 12-22.

⁴⁴ Direct Testimony of John J. Roebel in Cause No. 43114, at page 2, lines 16-18.

⁴⁵ Direct Testimony of Dennis M. Zupan in Cause No. 43114, at page 5, line 7, to page 6, line 1.

PUBLIC VERSION – PROTECTED MATERIALS REDACTED

1 **Q. Do you have any comment on DEI’s explanation that it was unaware of the**
2 **design evolution and growth in scope of the Edwardsport IGCC Project until**
3 **the fall of 2009?**

4 A. Yes. The Company’s “explanation” is prima facie evidence of gross
5 mismanagement in that:

- 6 • The Company’s explanation confirms that IGCC is still a developing
7 technology, a state of affairs to which Duke Energy testified before the
8 North Carolina Utilities Commission but not the IURC.
- 9 • DEI did not tell the IURC back in Cause Nos. 43114 or 43114 IGCC-1
10 that Edwardsport was employing a “unique technology” at Edwardsport.
11 Instead, as I have noted, the Company testified to precisely the opposite
12 point – that Edwardsport was merely merging two mature technologies.
- 13 • The very risks of proceeding as a “first mover” in the development of
14 IGCC technology that Indiana Industrial Group witness Phillips warned
15 about in Cause No. 43114 S1 have come to pass.
- 16 • The very risks of higher capital costs that I warned about in Cause Nos.
17 43114 S1 and IGCC-1 (and that DEI refused to acknowledge) have come
18 to pass.
- 19 • DEI knew that GE was incorporating new products (i.e., new design
20 features) in the Edwardsport design back in 2007 and should not have
21 been surprised about such changes in the fall of 2009.
- 22 • DEI did not warn the IURC that the FEED Study, completed in 2007, was
23 “based on a preliminary design with little detailed engineering.”
- 24 • DEI compares the current project design and cost estimate with the FEED
25 Study but does not explain why it was not aware of the changes in project
26 design and the growth in scope until mid-to-fall 2009. In other words, if
27 Mr. Haviland’s explanation is accepted at face value, why wasn’t DEI

PUBLIC VERSION – PROTECTED MATERIALS REDACTED

1 aware that the scope of the project was changing and that the amounts of
2 construction commodities being included in the design and actually being
3 installed in the plant were increasing dramatically? Either DEI was not
4 prudently involved in overseeing the design and construction of the
5 Project or, incredibly, the Company suggests that, perhaps, GE and/or
6 Bechtel were hiding design modifications from it.

7 **Q. Is there any evidence that DEI knew before October 2009 that “first mover”**
8 **risks with cost implications were actually materializing at Edwardsport?**

9 A. Yes, there is. For example, in early October, 2008, DEI “Inside the Boundary
10 Line” Project Director Rex Sears made a presentation at a Gasification
11 Technologies Council conference in which he expressly identified and discussed
12 three major “First Mover Challenges” which were already developing at
13 Edwardsport, including:

- 14 • The terms of the Non-Disclosure Agreements required by GE and Bechtel
15 were so stringent and the proportion of documents to which they applied
16 was so extraordinarily high that their execution and administration were
17 significantly complicating and delaying work by Project subcontractors.
- 18 • The number and importance of the new product designs which GE was
19 introducing at Edwardsport (including not only the plant as a whole but
20 also the radiant syngas cooler, the advanced feed injector, the 7FBH
21 combustion turbines, the refractory, and the Mark VIe distributed control
22 system) required the use of a special “toll gate process” to track and
23 manage these new product introductions and an extended 13-month
24 extended start-up period to accommodate testing and validation of these
25 new products.
- 26 • The change from a “lump sum, turnkey” contracting process to one which
27 included a blend of costing methods, with DEI managing the Project and
28 holding the escalation and warranty risk, was requiring recreation of prime
29 contractor collaboration, technology and engineering design
30 responsibilities, with a resulting need for increased coordination at the

PUBLIC VERSION – PROTECTED MATERIALS REDACTED

1 scope boundaries among four different engineering entities with major
2 scope.⁴⁶

3 **Q. At the same time that DEI was expressing confidence in 2007 and 2008 in its**
4 **increasing cost estimates for the Edwardsport IGCC Project, were other**
5 **companies cancelling their proposed IGCC plants because of rising costs?**

6 A. Yes. A large number of other IGCC Projects were being cancelled or put on hold.
7 For example: Tampa Electric, the owner of the Polk IGCC unit that DEI said it
8 was using for the initial design of Edwardsport, cancelled a proposed IGCC plant
9 in the fall of 2007 due to uncertainty related to CO₂ regulations, particularly
10 capture and sequestration issues, and the potential for related project cost
11 increases. According to a company press release, “Because of the economic risk
12 of these factors to customers and investors, Tampa Electric believes it should not
13 proceed with an IGCC project at this time,” although it remains steadfast in its
14 support of IGCC as a critical component of future fuel diversity in Florida and the
15 nation.

16 Other companies also cancelled proposed IGCC projects in the same time period
17 that DEI was seeking a CPCN for the Edwardsport IGCC Project. Some examples
18 include:

- 19 ▪ In June 2007, the Tondu Corp. announced that it was suspending plans to
20 build a planned 600 MW IGCC facility in Texas citing high costs and
21 other concerns related to technology and construction risks.⁴⁷
- 22 ▪ Xcel Energy announced in October 2007 that it was deferring indefinitely
23 its plans to build an integrated gasification combined cycle plant (“IGCC”)
24 in Colorado because the development costs were higher than the utility
25 originally expected.⁴⁸
- 26 ▪ The Orlando Utilities Commission announced in November 2007 that it
27 was cancelling the coal gasification portion of a 285-megawatt IGCC plant

⁴⁶ *Duke Energy Indiana Edwardsport IGCC Project Update*, 2008 Gasification Technologies Council Conference, October 5-8, 2008, slides 21-24. Included as Exhibit DAS-S4.

⁴⁷ <http://www.reuters.com/article/companyNewsAndPR/idUSN1526955320070615>

⁴⁸ Denver Business Journal, October 30, 2007.

PUBLIC VERSION – PROTECTED MATERIALS REDACTED

1 at the Stanton Energy Center. Construction will continue on the natural
2 gas-fired combined cycle generating unit. The Commission cited the
3 impact of possible federal and state regulations related to future emissions
4 restrictions in the state of Florida as the primary reason for terminating
5 construction.⁴⁹

6 **Q. Were state regulatory commissions expressing concern about the**
7 **uncertainties surrounding IGCC technology and the potential for increasing**
8 **capital costs?**

9 A. Yes. The Minnesota Public Utilities Commission refused in August 2007 to
10 approve an agreement under which Xcel Energy would have purchased power
11 from a proposed IGCC facility due to concerns over the uncertainties surrounding
12 the plant's estimated construction and operating costs and operating and financial
13 risks.⁵⁰

14 In April 2008, the Virginia State Corporation Commission refused to require
15 Virginia ratepayers of Appalachian Power Company to bear any of the costs of a
16 proposed IGCC plant citing uncertainties of costs, technology, and unknown
17 federal mandates.⁵¹ The Commission also found that "... APCo has no fixed
18 price contract for any appreciable portion of the total construction costs; there are
19 no meaningful price or performance guarantees or controls for this project at this
20 time. This represents an extraordinary risk that we cannot allow the ratepayers of
21 Virginia in APCo's service territory to assume."⁵²

22 The Commission also noted the uncertainties surrounding federal regulation of
23 carbon emissions and carbon capture and sequestration technology and costs, and
24 observed that the Company was asking for a "blank check."⁵³ On this basis, the
25 Commission concluded that "We cannot ask Virginia ratepayers to bear the

⁴⁹ <http://www.ouc.com/news/releases/20071114-secb.htm>.

⁵⁰ Order in Docket No. E-6472/M-05-1993, dated August 30, 2007, at pages 16-19.

⁵¹ Final Order in Case No. PUE-2007-00068, April 14, 2008. Available at
http://scc.virginia.gov/newsrel/e_apfrate_08.aspx.

⁵² Id. at page 5.

⁵³ Id. at page 10.

PUBLIC VERSION – PROTECTED MATERIALS REDACTED

1 enormous costs – and potentially huge costs – of these uncertainties in the context
2 of the specific Application before us.”⁵⁴

3 **Q. Is it reasonable to assume that if DEI had accepted your recommendation**
4 **that it assume higher capital costs for Edwardsport, the Company’s**
5 **modeling analyses in Causes Nos. 43114 S1 and 43114 IGCC-1 would have**
6 **shown that completion of the project as an IGCC plant was not the low cost**
7 **option?**

8 A. Yes. The resource plans with the Edwardsport IGCC Project that DEI included in
9 their economic analyses in Cause Nos. 43114-S1 and IGCC-1 had only
10 marginally lower costs, at best, than the plans without the IGCC plant. For
11 example, in the economic modeling analyses that the Company presented in
12 Cause 43114 S1, in the Base Case Scenario, the plan containing 100 percent of
13 the IGCC plant was only 0.24 percent lower in PVRR than the lowest cost plan
14 without the IGCC.⁵⁵ In the scenario with CO₂ costs, the plan that included 100
15 percent of the IGCC Project had only a 0.13 percent lower PVRR than the lowest
16 cost plan without the IGCC unit. It is reasonable to expect, given these marginal
17 benefits, that had DEI looked at scenarios with 20 percent and 40 percent higher
18 capital costs for Edwardsport, the plans with the IGCC Project would have had
19 the higher PVRR.

20 **Q. Why do you believe that DEI refused to model scenarios with higher**
21 **Edwardsport capital costs in Cause Nos. 43114-S1 and IGCC-1?**

22 A. Clearly, with its own analyses showing, at best, marginal economic benefits for
23 the IGCC Project, the Company was afraid that the results of any such higher
24 construction cost sensitivity analyses would show that completing the plant as an

⁵⁴ Id., at page 10.

⁵⁵ Rebuttal Testimony of Diane L. Jenner in Cause 43114-S1, Petitioner’s Exhibit 24, at page 7, lines 17-21.

PUBLIC VERSION – PROTECTED MATERIALS REDACTED

1 IGCC was the more expensive alternative. Instead, it chose to conceal this
2 information from the IURC.

3 **Q. When Duke filed its direct case in this proceeding, did it include any**
4 **sensitivity analyses reflecting cost increase above its current \$2.88 billion cost**
5 **estimate for Edwardsport?**

6 A. No. Remarkably, despite having been proven wrong about the reasonableness of
7 its previous cost estimates in both 2007 and 2008, the Company again failed in its
8 direct testimony in this proceeding to consider the possibility that the cost of
9 building the Edwardsport Project might increase above \$2.88 billion. This failure
10 followed a total increase of 45 percent in the cost of building Edwardsport just
11 since the CPCN was issued in November 2007. Although DEI did include
12 sensitivity scenarios that assumed another 10 percent increase in Edwardsport's
13 capital cost in the modeling analyses discussed in the Rebuttal Testimony of Ms.
14 Hager in this proceeding, it did not include similar sensitivities in the modeling
15 presented in Ms. Hager's Supplemental Settlement Testimony.

16 **Q. When did Duke realize that the Project could not be completed for the**
17 **Commission approved cost estimate of \$2.35 billion?**

18 A. According to the Company's Revised and Supplemental Response to DEI-IG
19 5.13, "During the preparation of the monthly progress report prepared and issued
20 in October 2009 (based on data through the end of September), it became
21 apparent that the forecasted cost to complete the project would exhaust all
22 remaining contingencies and escalation; and thus exceed the \$2.35 billion
23 estimate.

24 **Q. What does the September 2009 Monthly Report that is referenced in Duke's**
25 **response to DEI-IG 5.13 actually say?**

26 A. [REDACTED]
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PUBLIC VERSION – PROTECTED MATERIALS REDACTED

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[REDACTED]

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Q. Did the October 2009 Edwardsport Project Monthly Report identify additional construction cost increases?

A. Yes. The October 2009 Project Monthly Report noted the following concerning the Forecast Project Cost:

[REDACTED]

⁵⁶ Edwardsport IGCC Project Progress Report Number: 16, September 2009, at page 4 of 124.

PUBLIC VERSION – PROTECTED MATERIALS REDACTED

[REDACTED]

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Q. Did DEI reanalyze the economics of continuing with construction of Edwardsport as an IGCC plant when these cost increases became apparent in the early-to-mid fall of 2009?

A. No. Company witness Haviland suggests that DEI was shocked when it realized in the fall of 2009 that the Project had become a “substantially different plant than the FEED Study had estimated.”⁵⁷ However, the Company did not re-examine the economics of continuing with the Edwardsport Project until the preparation of its direct case in this proceeding (filed in early April 2010) despite the evidence of what were without doubt significant cost increases beyond the Commission approved \$2.35 billion estimate. Instead, construction continued at a rapid pace, with the Company investing another [REDACTED] in Edwardsport in the months of November 2009 through March 2010. DEI was clearly attempting to convert to-go costs into sunk costs and, thereby, improve the relative economics of continuing construction versus cancellation or conversion to an NGCC facility.

Q. Was this prudent management?

A. No. Prudent management requires that companies re-evaluate the reasonableness of continuing with projects in light of significantly changed circumstances. Yet

⁵⁷ Edwardsport IGCC Project Progress Report Number: 17, October 2009, at page 3 of 129.

⁵⁸ Direct Testimony of Richard W. Haviland in Cause No. 43114 S4, at page 7, lines 1-2.

PUBLIC VERSION – PROTECTED MATERIALS REDACTED

1 another large increase in the cost of building Edwardsport was such a significantly
2 changed circumstance.

3 In accordance with prudent management principles, DEI should have re-
4 examined the economics of completing Edwardsport as an IGCC plant before
5 continuing to invest [REDACTED] more in the project. By failing to do so,
6 DEI's acted in a manner that represented gross mismanagement. In particular,
7 DEI acted in a manner calculated to make the project a self-fulfilling prophecy by
8 delaying preparation and submittal to the Commission of a significantly increased
9 cost estimate while rapidly reducing remaining to-go costs to a level that would
10 be low enough to induce the IURC into approving continued construction.

11 **Q. Did the Company have reasonable opportunities to reconsider the economics**
12 **of continuing construction of Edwardsport during the period November 2009**
13 **through March 2010?**

14 A. Absolutely. The Company was preparing its 2009 Integrated Resource Plan filing
15 during the summer and fall of 2009 with an originally planned submission date in
16 November, 2009. DEI certainly could have incorporated scenarios with a range of
17 higher estimated costs for Edwardsport in the modeling analyses that it was
18 preparing for the IRP filing before it was finally made in January, 2010.

19 In this context it should be noted that Ms. Hager filed new rebuttal modeling
20 analyses in this proceeding on September 2, 2010, barely one month after I filed
21 my direct testimony. She subsequently filed additional settlement-related
22 modeling analyses several weeks after the proposed settlement agreement was
23 reached and yet another set of supplemental modeling analyses within two weeks
24 of the Court of Appeals decision on the NSR lawsuit. Obviously, Duke has the
25 resources and the expertise to prepare modeling analyses in a fairly short period
26 of time, when it wants to do so.

PUBLIC VERSION – PROTECTED MATERIALS REDACTED

1 **Flaws in the Proposed Settlement Agreement that Leave**
2 **Ratepayers Exposed to Significant Edwardsport-related Risks**

3 **Q. Does the proposed settlement agreement adequately protect ratepayers**
4 **against Edwardsport-related costs?**

5 A. No. The settlement agreement leaves ratepayers significantly exposed to higher
6 costs related to the Edwardsport Project.

7 **Q. Please explain.**

8 A. There are a number of flaws that render the proposed agreement woefully
9 inadequate to protect ratepayers.

10 1. The Company is rewarded for its gross mismanagement by being allowed
11 to include in rate base at least \$2.76 billion of the Project's capital cost
12 (the so-called "soft cap").

13 2. The so-called "hard cap" figure of \$2.975 billion may only be temporary,
14 as Duke's Group Executive for Franchised Gas and Utility Operations in
15 the U.S., Jim Turner, intimated in this exchange with Citigroup Analyst
16 Brian Chin in a September 20, 2010 conference call:

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1 **Brian Chin - Citigroup – Analyst:**

2 Hi. Just one follow-up on Hugh's question about the hard cap. In the
3 long shot event that the cost of the plant goes above the \$2.97 [billion]
4 level, what's sort of the game plan after that? Is there an assumed
5 prudence review on top of that, that comes along?

6 **Jim Turner - Duke Energy Corporation - Group Executive; President**
7 **and COO, US Franchised Electric and Gas:**

8 Well, I'm sure we'll have a conversation about it in the rate case, Brian,
9 under the way we structured the settlement. [B]ut at this point the
10 settlement agreement does not specifically call for a prudence review
11 above the \$2.975 [billion] since we're at risk for those costs that go
12 above that. [B]ut again, I'm confident there will be a number of
13 conversations along the way. So, in the chance we start trending up
14 towards that number, there's going to be full visibility and transparency
15 into it all along the way as we continue to do our every six-month rider
16 updates with the Commission.⁵⁹

17 In particular, the settlement agreement expressly permits recovery above
18 the so-called “hard cap” of an increase in construction costs for the IGCC
19 Project due to a force majeure event beyond the control and without the
20 fault or negligence of Duke Energy Indiana or its suppliers or contractors
21 involved in the Project, such as, by way of example, the following: acts of
22 God, the public enemy, or any governmental or military entity.

23 In addition, the proposed settlement specifically includes a qualifying term
24 that allows DEI to seek to raise the “hard cap” to recover increases in
25 AFUDC “outside of Duke Energy Indiana’s control.”⁶⁰

26 3. As it is currently being built, Edwardsport is essentially a coal plant
27 without any carbon controls. Unfortunately, there is no protection at all for
28 rates in the proposed settlement regarding carbon risks:

29 a. The costs of adding carbon capture and sequestration technology
30 are not included in the settlement figures.

⁵⁹ Final Transcript, Duke Energy Edwardsport Settlement Agreement Conference Call, Sept. 20, 2010, p. 9.

PUBLIC VERSION – PROTECTED MATERIALS REDACTED

1 b. As noted above, even if you accept all of the Company's
2 assumptions, completion of Edwardsport as an IGCC plant is
3 barely the lowest cost option with Duke's new, and dramatically
4 lower, 2010 projected CO₂ allowance prices. Indeed, completion
5 of Edwardsport as an IGCC plant is not the lowest cost option in
6 any scenario modeled by the Company with DEI's 2009 CO₂
7 prices (and actually is the highest cost option in seven of the
8 scenarios with DEI's 2009 CO₂ prices). Thus, ratepayers could be
9 at risk for billions of dollars if actual CO₂ allowance prices are
10 higher than the extremely low prices that Duke has assumed in its
11 new modeling analyses.

12 4. Also as noted above, completion of Edwardsport as an IGCC plant is
13 barely the lowest cost option even if you accept DEI's extremely
14 optimistic assumption that the plant will immediately start off with a very
15 high capacity factor and will continue to operate at approximately 82
16 percent capacity factors each year through 2030. The proposed settlement
17 agreement does not offer any protection for ratepayers against the
18 possibility or even likelihood that Edwardsport, a first-of-a-kind design,
19 will experience significant technical and currently unanticipated problems
20 that will adversely affect its operating performance.

21 5. There is no protection for ratepayers from having to pay for capital
22 expenditures incurred after Edwardsport's commercial operations date that
23 are required to remedy problems related to the mismanaged planning,
24 engineering or construction of the Edwardsport Project or resulting from
25 what the Company now acknowledges is a first-of-a-kind plant with a
26 unique GE design.

⁶⁰ Settlement Agreement, Sept. 17, 2010, § 4.a & fn 2.

PUBLIC VERSION – PROTECTED MATERIALS REDACTED

1 **Q. Do you have any comments on the claimed benefits from the proposed**
2 **settlement?**

3 A. Yes. It is clear that several of benefits are illusory and/or represent deferrals of
4 rate impacts rather than permanent rate reductions:

5 1. The so-called \$65 million economic benefit from deferral of a rate case
6 filing is completely speculative. There is no evidence that DEI actually
7 would have filed a rate increase sometime in 2010. Nor is there any
8 evidence as to the size of the rate increase that the Company would have
9 requested or what increase the IURC would have granted.

10 2. The change in DEI's depreciation rates is clearly a temporary measure to
11 reduce rates by about \$35 million annually for only the next few years.
12 But ratepayers will have to pay any deferred amounts at a later time.

13 **Q. Do you believe that the provision in Section 6 of the proposed settlement**
14 **agreement that allows the Company to retain 40 percent of the jurisdictional**
15 **share of recoveries from vendors is fair?**

16 A. Absolutely not. As part of any agreement for the Commission to include in rate
17 base Edwardsport construction costs in excess of the previously approved \$2.35
18 billion, DEI should be required to show to the Commission that it has
19 aggressively attempted to recover penalties and damages from vendors and
20 subcontractors (i.e., GE, Bechtel and Sargent & Lundy, among others) for design,
21 engineering and construction mismanagement. Such recoveries, actual or
22 imputed, should be deducted dollar-for-dollar from the construction cost included
23 in rate base.

24 **Q. Do you believe that the provision in Section 5 of the proposed settlement**
25 **agreement that would allow DEI to retain “any intellectual property**
26 **commercial benefits related to the IGCC project” is fair.**

27 A. No. Ratepayers are being asked to bear significant costs associated with the
28 construction of Edwardsport IGCC Project and the other risks I have outlined

PUBLIC VERSION – PROTECTED MATERIALS REDACTED

1 above. It would be fair to allow them to share in the benefits if DEI gains
2 monetarily from the sale of the intellectual property rights associated with the
3 Project to other parties.

4 **Findings, Conclusions and Recommendations**

5 **Q. Please summarize your findings and conclusions.**

6 A. My primary findings and conclusions are that:

- 7 1. There is no need for the capacity from Edwardsport to ensure adequate
8 system reliability.
 - 9 • Circumstances have changed significantly since the CPCN was
10 issued in November 2007.
 - 11 • DEI's own exhibits show that the Complete as NGCC and No
12 IGCC scenarios each would provide adequate capacity to provide
13 for a 13.9% reserve margin.
- 14 2. The Cost of the Edwardsport Project has skyrocketed since 2007 with the
15 plant now expected to cost almost \$5,000 per kilowatt.
- 16 3. The results of DEI's economic analyses, including its most recent
17 modeling, have shown, at most, a marginal benefit in some scenarios to
18 completing Edwardsport as an IGCC unit. In other scenarios, completing
19 the plant as an IGCC unit has been, and continues to be, a higher cost
20 option than canceling the project and/or completing it as an NGCC unit.
- 21 4. DEI's modeling analyses are biased by a number of unreasonable
22 assumptions including the following:
 - 23 • The unreasonably optimistic assumption that a first-of-a-kind
24 IGCC plant will have high availability and high capacity factors in
25 all years of the study period.
 - 26 • The assumption that CO₂ allowance costs will be extremely low.
27 The allowance costs in Company's "High CO₂" sensitivity case
28 would be more reasonable as base case scenario.

PUBLIC VERSION – PROTECTED MATERIALS REDACTED

- 1 • The assumption that there will not be any incremental energy
2 efficiency savings after approximately the years 2021 in the base
3 case and 2019 in the high energy efficiency case.
- 4 5. Completing Edwardsport as an IGCC plant is the riskiest option.
- 5 • There is a significant potential for operating problems in first-of-a-
6 kind unit for extended period after the projected in-service date.
- 7 • CO₂ allowance costs could be significantly higher than DEI has
8 modeled.
- 9 • Edwardsport's capital costs could be significantly higher than the
10 Company has assumed if CCS is required to comply with an
11 eventual federal climate change regulatory regime.
- 12 • The Project could experience further cost increases and schedule
13 delays prior to its actual in-service date.
- 14 6. DEI has grossly mismanaged its resource planning for the Edwardsport
15 Project and has failed to fully disclose to the IURC the risks and the
16 significance of higher construction costs.
- 17 • The Company failed to acknowledge to the IURC that "First
18 Mover" risks associated with the engineering and construction of a
19 first-of-a-kind IGCC plant would expose the Project to significant
20 increases in capital costs and delay(s) in in-service date.
- 21 • The Company repeatedly refused in 2007 and 2008 to consider
22 scenarios in its Edwardsport economic analyses with higher plant
23 capital costs.
- 24 • DEI failed in late 2009 and early 2010 to promptly conduct new
25 economic studies after it finally recognized in the fall of 2009 that
26 the project was going to cost more than the \$2.35 billion that the
27 IURC had approved.
- 28 • DEI continued to spend money on construction at a rapid rate
29 between October 2009 and March 2010, turning to-go costs into
30 sunk costs and trying to make the project into a self-fulfilling
31 prophecy.
- 32 7. The proposed settlement agreement is inadequate to address these issues
33 and would leave the Company's ratepayers exposed to very significant
34 risks. Indeed, the proposed settlement would not only reimburse but would
35 reward DEI for huge cost increases associated with the Company's failure

PUBLIC VERSION – PROTECTED MATERIALS REDACTED

1 on a timely basis to acknowledge, reflect in modeling and report to the
2 Commission the economic implications of “First Mover Issues.”

3 **Q. Please summarize your recommendations.**

4 A. In view of my primary findings and conclusions presented above, my principal
5 recommendations are that the Commission:

6 1. Rejected the Settlement Agreement as filed;

7 2. Enter an order which:

8 A. Pursuant to IC 8-1-8.5-5.5 and 8-1-8.7-5, either revokes the CPCN
9 for the Edwardsport Project or modifies it in such a manner as to
10 address the deficiencies I have identified in the Settlement
11 Agreement, especially but not exclusively its failure to adequately
12 limit exposure of DEI ratepayers to additional capital costs in
13 excess of the \$2.35 billion previously approved by the Commission
14 and significant additional operating costs if the plant goes into
15 service and does not perform as assumed by the Company in its
16 economic analyses.

17 B. Pursuant to IC 8-1-2-51, initiates an investigation into (1) whether
18 the Company’s conduct with respect to the Edwardsport Project
19 constitutes fraud, concealment, and/or gross mismanagement
20 within the meaning of the Utility Power Plant Construction Act,
21 and (2) if there has been fraud, concealment or gross
22 mismanagement, the amount of costs incurred to construct the
23 Edwardsport Project that should be disallowed for ratemaking
24 purposes for one or more of these reasons.

25 **Q. Does this complete your testimony?**

26 A. Yes.

STATE OF MASSACHUSETTS)
) SS:
COUNTY OF MIDDLESEX)

David A. Schlissel
David A. Schlissel

STATE OF MASSACHUSETTS)
)
COUNTY OF MIDDLESEX) ss.

On this 12th day of November 2010, before me, the undersigned notary public,
personally appeared David A. Schissel, proved to me through
satisfactory evidence of identification, which were MA Drivers Lic, to be
the person whose name is signed on the preceding or attached document and acknowledged to
me that he signed it voluntarily for its stated purpose.

Notary Public

My commission expires: 9/23/16



DEI 2010		DEI Loads with High EE and 13.9% RM			DEI Loads with Base EE and 13.9% RM			Capacity		Capacity Need (Surplus) with High EE	
Load Forecast (MW)	Inc. Bulb Impacts (MW)	Base Conservation (MW)	Demand Response (MW)	High Conservation (MW)	Base EE and 13.9% RM (MW)	High EE and 13.9% RM (MW)	Capacity (MW)	Base EE (MW)	High EE (MW)		
2010	6674	0	334.0	13.0	7,208	7,206	7162	46	45		
2011	6618	0	367.0	31.0	7,096	7,085	7225	(129)	(140)		
2012	6713	0	401.0	55.0	7,136	7,127	6994	142	133		
2013	6862	52	407.0	84.0	7,247	7,197	7194	53	3		
2014	6973	82	407.0	121.0	7,329	7,247	7130	200	118		
2015	6742	100	407.0	167.0	7,036	6,911	7130	(94)	(218)		
2016	6772	109	407.0	218.0	7,049	6,877	6507	543	371		
2017	6809	113	407.0	275.0	7,078	6,850	6502	576	348		
2018	6877	115	407.0	339.0	7,142	6,852	6485	657	368		
2019	6969	115	407.0	406.0	7,238	6,881	6506	732	374		
2020	7047	112	407.0	402.0	7,321	6,978	6507	814	470		
2021	7129	115	407.0	399.0	7,408	7,071	6493	915	578		
2022	7217	117	407.0	395.0	7,506	7,173	6485	1,021	688		
2023	7292	120	407.0	404.0	7,585	7,245	6494	1,091	751		
2024	7380	122	407.0	403.0	7,683	7,344	6500	1,183	845		
2025	7491	122	407.0	395.0	7,812	7,480	6394	1,419	1,086		
2026	7583	127	407.0	395.0	7,911	7,579	6389	1,522	1,190		
2027	7675	130	407.0	395.0	8,013	7,680	6515	1,498	1,165		
2028	7755	132	407.0	403.0	8,098	7,760	6511	1,588	1,249		
2029	7856	164	407.0	404.0	8,173	7,837	6457	1,716	1,380		
2030	7976	135	407.0	395.0	8,350	8,017	6477	1,873	1,540		



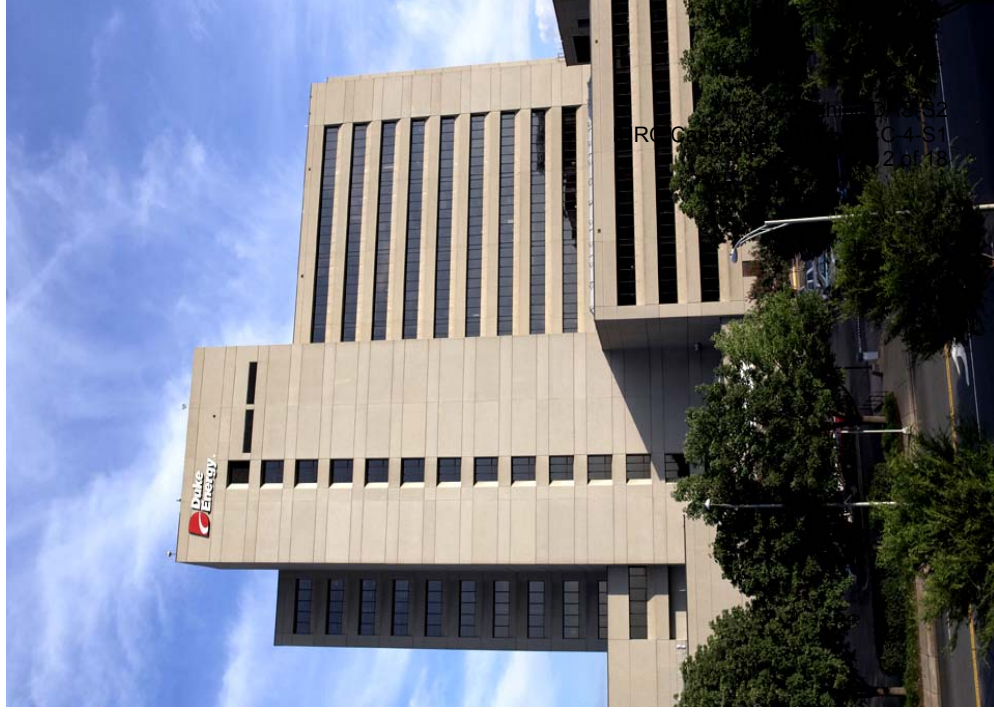
Edwardsport IGCC Project Update

Workshop on Gasification Technologies
Indianapolis, Indiana
June 13, 2007

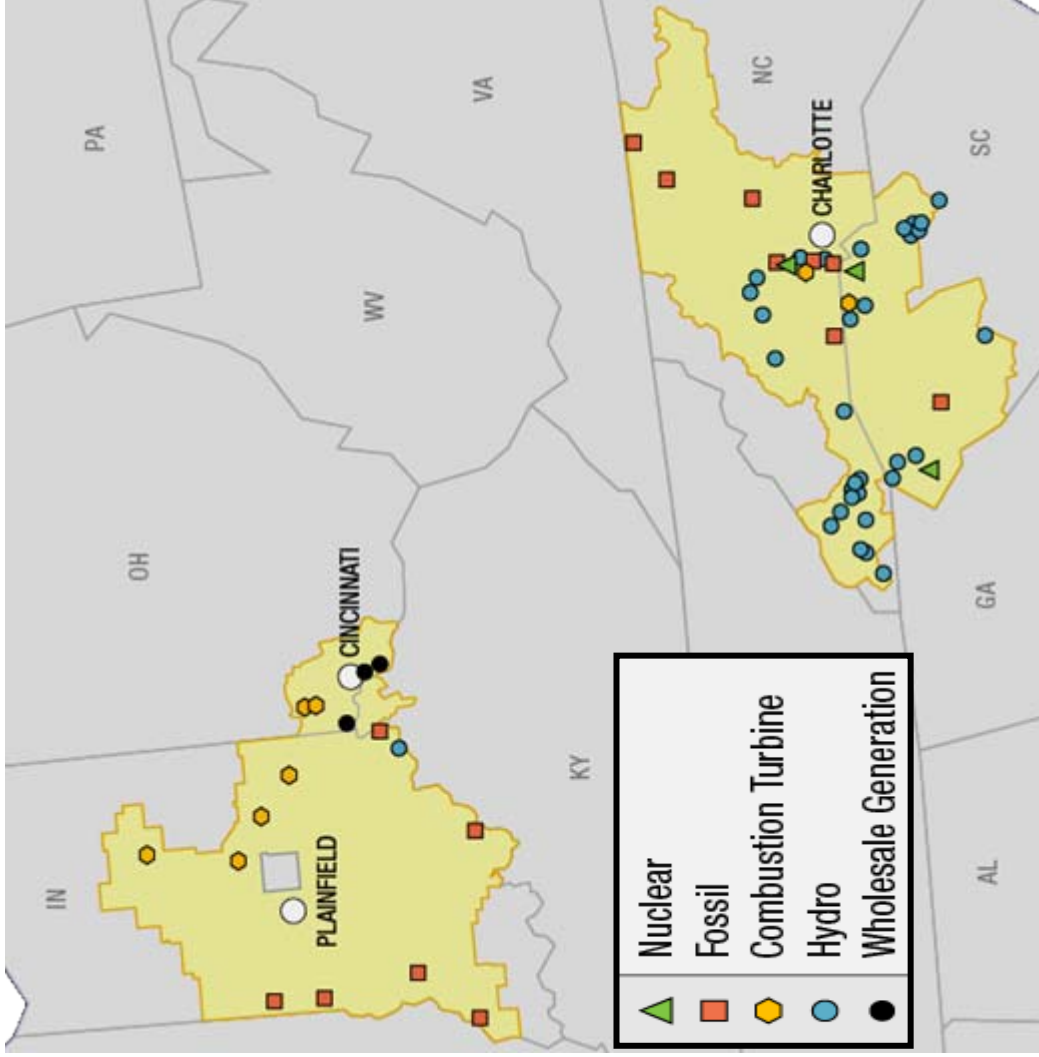
Jim Stanley, President, Duke Energy Indiana

Facts about Duke Energy

- Fortune 500
- Assets over \$68 billion
- Top 5 for U.S. generating capacity
- Over 4,000 MW in Brazil, Argentina, Peru, Ecuador, El Salvador and Guatemala
- 150+ years of service
- Traded on NYSE as DUK
- Stock dividends for 80+ years



US Franchised Electric & Gas

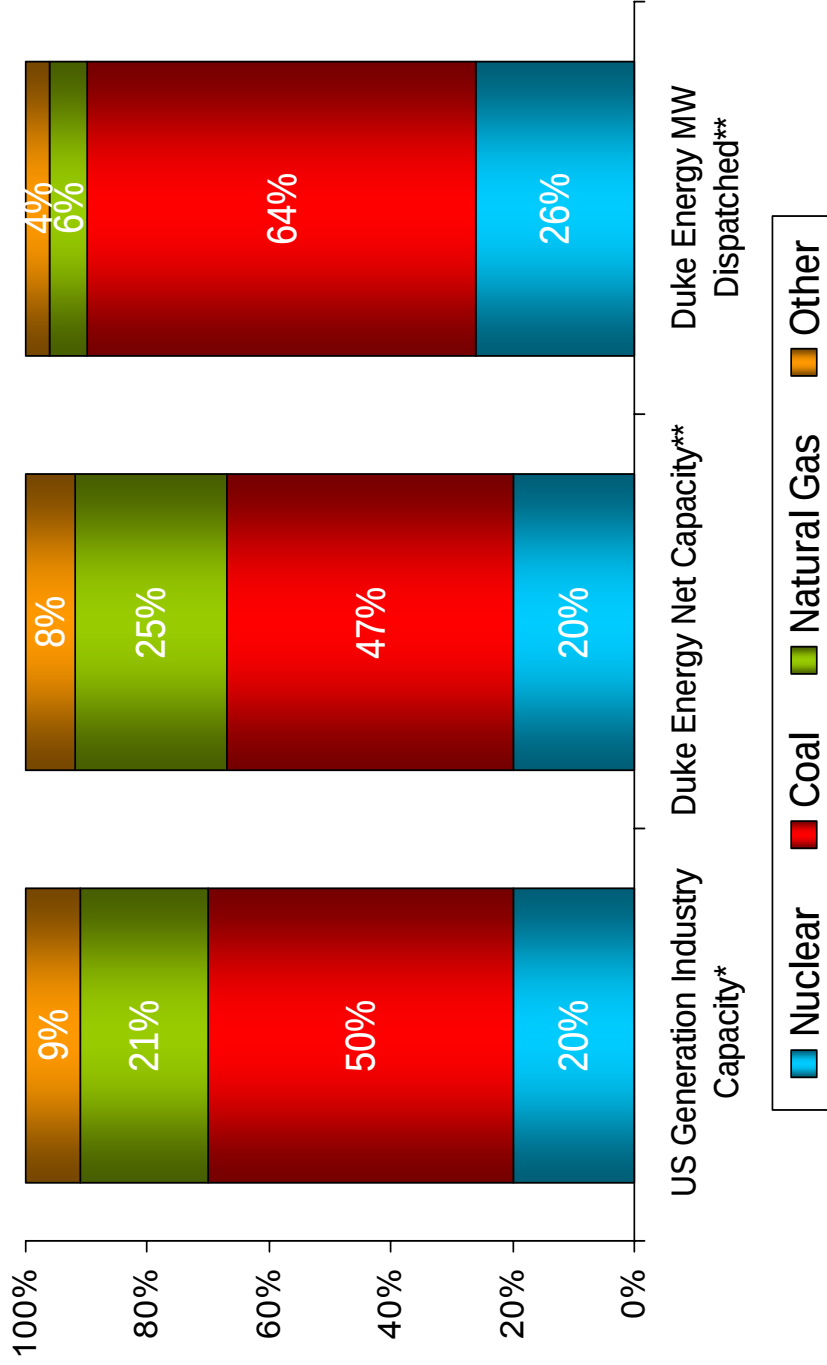


- 5 states: Indiana, Kentucky, Ohio, North Carolina and South Carolina
- 47,000 square miles of service area
- ~28,000 MW
- 3.8 million retail electric customers
- 500,000 retail gas customers

Exhibit DAS-S2
IURC Cause No. 43114 IGCC-4-S1
Page 3 of 18

Comparison of Generation Fuel Mix

Duke Energy's diverse fuel mix mirrors the overall industry mix



*Source: EIA

**Includes DENA Midwest assets, does not include DiscOps assets

Renewables in Indiana

- Duke Energy Indiana entered into a 100 MW wind power agreement from Indiana's first commercial scale wind farm in Benton County, Indiana
- Offer green energy to all customers through a voluntary "GO GREEN POWER" program
- Completed 3 solar demonstrations at Duke customer service centers in Bloomington, Noblesville and Kokomo
- Working with Purdue University on wind and biomass (switchgrass co-firing) research
- Continue to expand our solar school programs in Indiana through the DSM program
 - 10 schools currently involved

Considerations for Choosing Baseload Plant Technology

- Need for new baseload capacity to serve Duke Energy Indiana service territory by 2012-2014 to maintain a 15% - 17% reserve margin
 - Duke Energy Indiana has overall capacity need of at least 850 MWs to 1000 MWs in that timeframe, and baseload need of 300 MWs to 600 MWs in that timeframe
 - Vectren, our potential joint owner, has a need for approx. 125 MWs
- Ability to use abundant and relatively low-cost local midwest coal resources in a more environmentally benign manner
- Commitment to continue to provide reliable, fairly priced electricity for customers
- Need to plan for and comply with increasingly stringent environmental emission limits

4 Major Advantages of IGCC

- Potential to control emissions in a cost effective manner as environmental regulations become increasingly stringent
 - Recent “CAIR/CAMR” rules require reductions in sulfur dioxide, nitrogen oxide and mercury emissions
- Duke Energy Indiana has prior experience with coal gasification technologies – others may not have this advantage
 - 1995: Wabash River Coal Gasification/Repowering Project
- Potential for future capture of CO₂ at a lower cost than conventional PC because CO₂ can be separated from the fuel prior to combustion – far less volume to “clean”
- Potential to tap into future poly-generation capabilities – including production of fertilizer and transportation fuels

Edwardsport IGCC Project Description

- 630-MW integrated gasification combined cycle facility
- To be constructed at existing Edwardsport site in Southwest Indiana
 - Existing 160-MW Edwardsport coal plant (circa 1940s) to be retired
- Superior environmental performance
- Carbon capture ready
 - Adequate space for future carbon capture equipment
 - Initial assessments indicate sequestration possible in the area

Edwardsport IGCC Project

- Basic design
 - 2x2x2x1 - 630MW IGCC “Unit”
 - 2 gasifiers, 2 combustion turbines, 2 HRSGs, 1 stream T/G
 - Natural gas start-up and back-up fuel
 - Physical solvent acid gas removal system
 - GE new product introduction programs
 - Radiant syngas cooler
 - 7FB combustion turbine
 - Reference plant
 - Distributed control system (Mark VI e)

Duke Energy's Proposed Edwardsport IGCC Plant, Knox County, Indiana

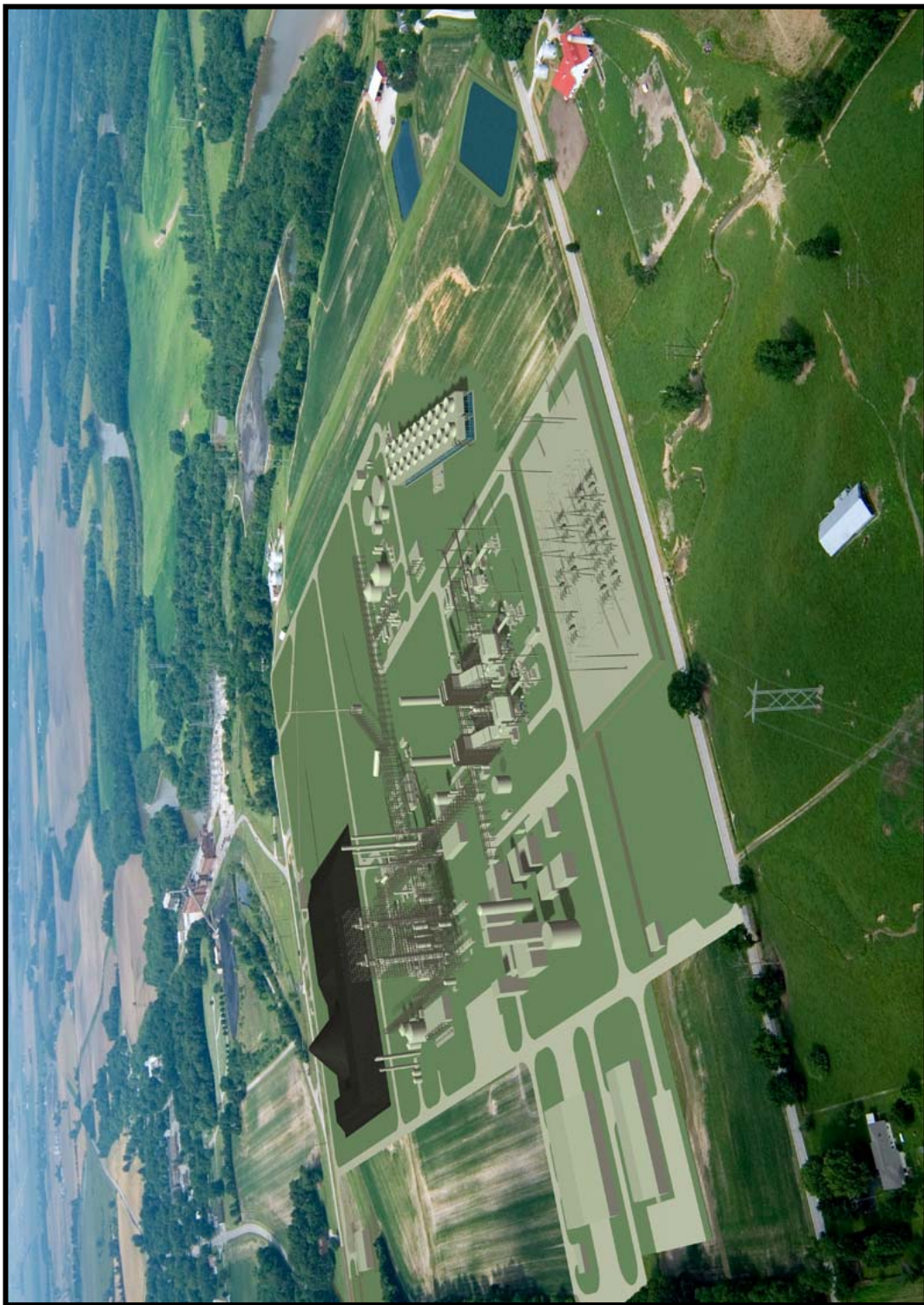
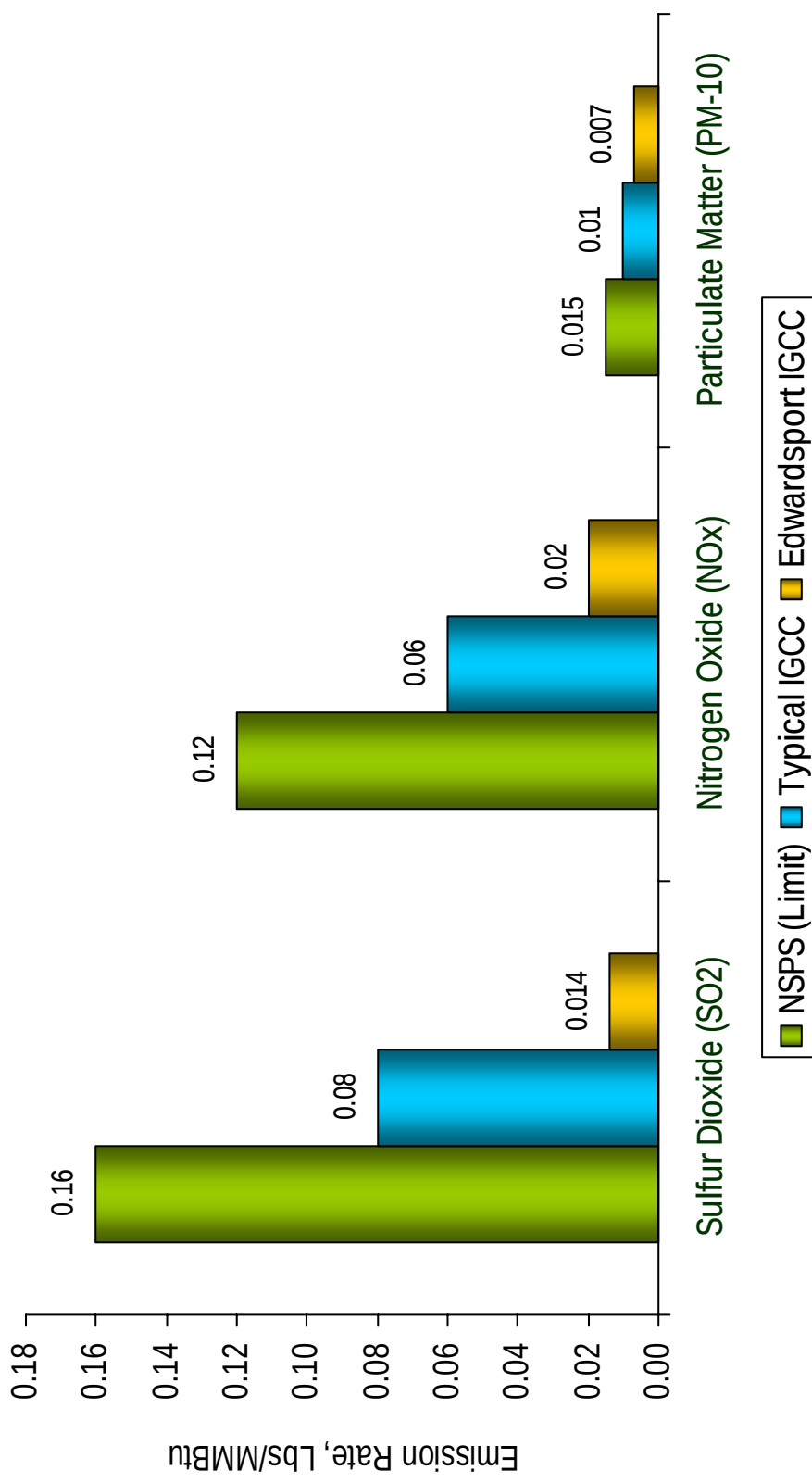


Exhibit DAS-S2
IURC Cause No. 43114 IGCC-4-S1
Page 10 of 18

General Environmental Performance Comparison

New Source Performance Standards (NSPS) vs. IGCC



For Discussion Purposes Only – Approximate conversion of NSPS lb/MWh (gross) to lb/MMBtu for SO2 and NOx. Rates for Edwardsport IGCC reflect preliminary expected performance with SCR in service. Emission permit limits may be greater than that shown for operating margin.

Status of Air Permitting

- Air permit filed with Indiana Department of Environmental Management in August 2006
 - Final permit expected to be issued late in 4th Quarter 2007
- There are net reductions of SO₂ and NO_x from the site, therefore no PSD evaluation or BACT analysis is required for these pollutants
- Malcolm Pirnie, Inc. and Duke EH&S developed the application based on worst case coal data and no SCR for NO_x control
- SCR is not required, but Duke Energy Indiana plans to install SCRs

Carbon Capture and Sequestration

- Potential for geologic sequestration of carbon was included as one of the siting criteria for the project
- Preliminary feasibility study completed by the Indiana Geological Survey in conjunction with the Midwest Geological Sequestration Consortium concluded “there exists a good possibility of significant amounts of sequestration potential within an area below and immediately surrounding the site”
- Additional work needs to be done to assess the technical capability of potential injection formations and cost associated with sequestration
- Space has been left in design to accommodate addition of carbon capture and sequestration equipment in the future

Duke Energy and Climate Change

- Set voluntary goal to reduce 10 million tons of CO₂ equivalents by 2015
- Participating in capture and sequestration R&D
- Member of 3 Department of Energy Regional Carbon Sequestration Partnerships
 - Midwest Regional Carbon Sequestration Partnership
 - Phase II project at East Bend Station
 - Midwest Geological Sequestration Consortium
 - Southeast Regional Carbon Partnership
- Leader in Federal Climate Change Policy debate

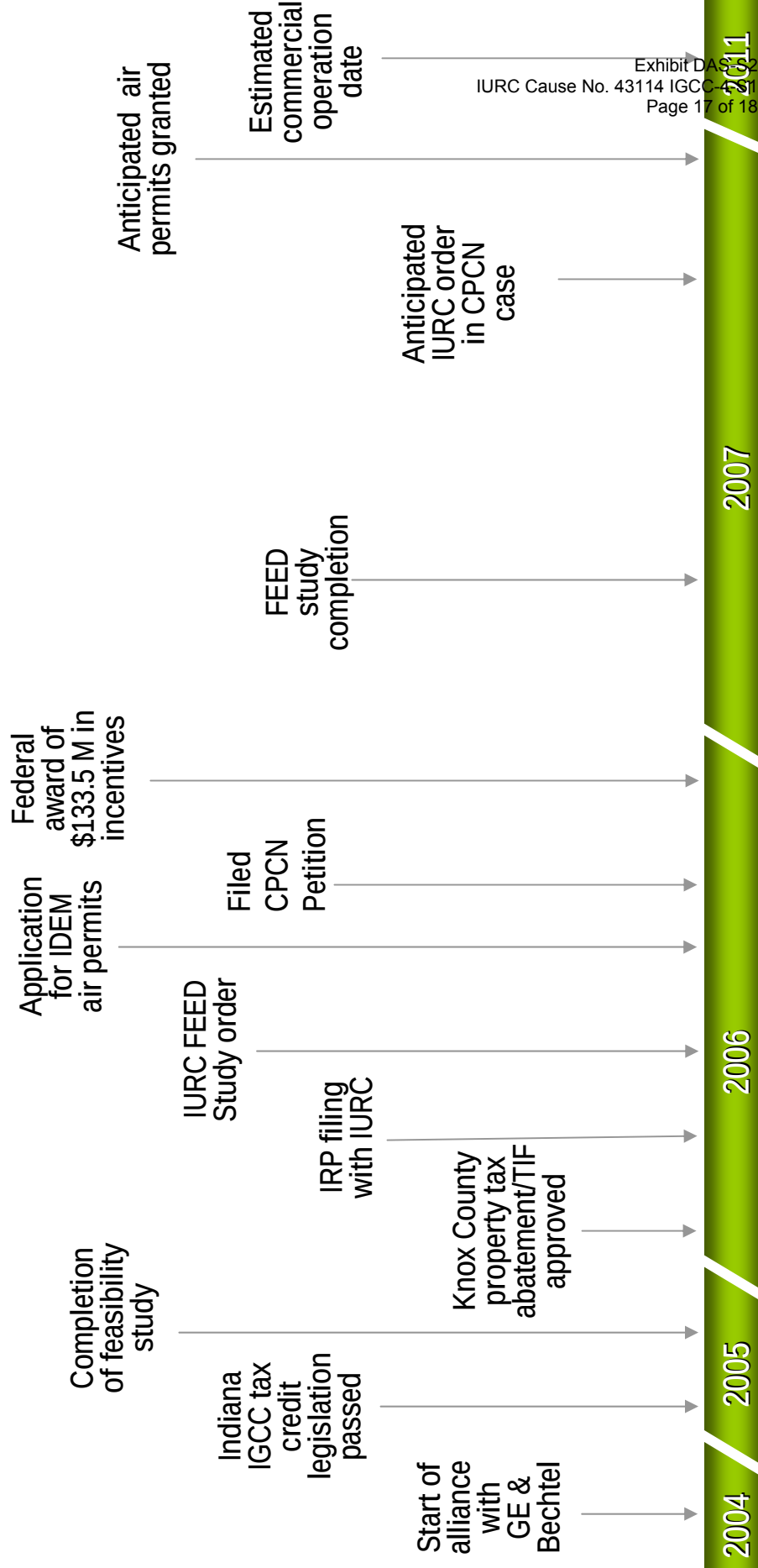
Project Cost Estimate

- Despite commodity and labor cost inflationary pressures, current project estimated cost is within approx 5% of estimated range filed with IURC in October 2006
- Project cost estimate is still within industry estimates (e.g., EPRI based estimated range)
- Current project cost estimate:
 - Approximately \$2 B as spent dollars (before tax incentives)
 - Tax incentives of over \$460 M

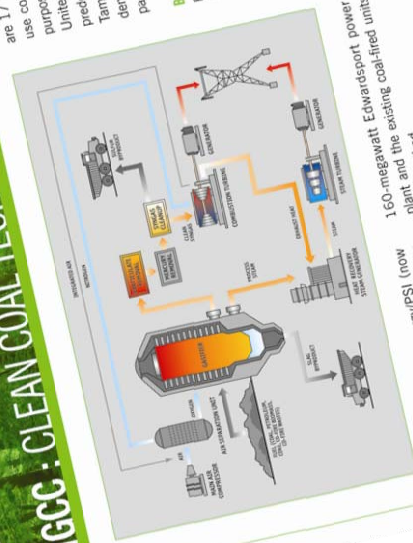
Financial Incentives Key to Deployment

- Industry analysts estimate IGCC may have a 15-20% higher capital cost than a PC plant
- State and local incentives
 - IN SB 29 provides for timely recovery of IGCC construction & operating costs
 - IN SB 378 - investment tax credit of 10% of project cost for the first \$500 M and 5% of the remaining cost
 - Property tax abatement and tax incremental finance district are also available at the local county level
- Federal investment tax credits
 - Maximum amount of \$133.5 M awarded

Edwardsport IGCC Project Timeline



EDWARDSPORT IGCC : CLEAN COAL TECHNOLOGY



are 17 sites worldwide, four of which use coal/petroleum coke for the sole purpose of generating electricity. In the United States, Duke Energy Indiana's predecessor company, PSI Energy and Tampa Electric have been involved in demonstrating the technology over the past 10 years.

BENEFITS FOR INDIANA

- Potential benefits include:
 - Advanced clean air emissions, less plant with lower air emissions, less use of water, less solids generated, and generally higher efficiency coal plant use of a conventional pulverized coal plant with currently required pollution control equipment.
 - Ability to use Indiana and Midwestern coal.
 - The plant will employ an estimated 77-97 people. The majority of the positions would be high-skill/high-pay with an estimated annual estimated income of \$7 to \$9 million. Total estimated jobs include Duke Energy Indiana personnel at the plant site.
 - Construction jobs would average 800-900 during the three-year construction period. During peak construction, the number would increase to approximately 2,000.
 - Increased tax base for local and state economies.
 - Potential for carbon dioxide capture and sequestration in the future.

HOW IT WORKS

IGCC uses a coal gasification system to convert coal into a synthesis gas (syngas) and produce steam. The hot syngas is processed to remove sulfur compounds, mercury and particulate matter before it is used to fuel a combustion turbine generator, which produces electricity. The heat in the exhaust gases from the combustion turbine is recovered to generate additional steam. This steam, along with heat from the syngas process, then drives a steam turbine generator to produce additional electricity. Coal gasification has seen worldwide use in industrial plant applications since the early 1900s. Through U.S. Department of Energy clean coal programs, it was developed for IGCC applications on a larger scale in the 1980s and demonstrated in a commercial setting in the mid-1990s. Currently, the project is constructed, it will be located at the Duke Energy Indiana

Q&A : CLEAN COAL TECHNOLOGY

1. WHY ARE DUKE ENERGY INDIANA AND VECTREN CONSIDERING BUILDING AN IGCC PLANT?

As Indiana's economy grows, so too does the need for energy. Duke Energy Indiana and Vectren customers have been setting records for electric usage. It is estimated that Duke Energy Indiana will need approximately 3,000 megawatts of new base load capacity in the 2012-2014 timeframe. "Base load" is the power provided by Duke Energy Indiana to its customers continuously 365 days per year (without peaks and valleys). Vectren has reported a need to increase its generation capacity in the coming years as well. The IGCC plant, with Duke Energy Indiana owning the majority of the plant and Vectren potentially owning a share of the plant.

2. WHAT IS COAL GASIFICATION?

The coal gasification process converts coal into a synthesis gas (syngas) and produces steam. The hot syngas is processed to remove sulfur compounds, mercury and particulate matter before it is used to fuel a combustion turbine generator. The heat in the exhaust gases from the combustion turbine is recovered to generate additional steam. This steam, along with heat from the syngas process, then drives a steam turbine generator to produce electricity.

3. IS THE TECHNOLOGY PROVEN?

Coal gasification has been worldwide use in chemical plant applications since the early 1900s. Through U.S. Department of Energy clean coal programs, it was developed for IGCC applications on a larger scale in the 1980s and demonstrated in a commercial setting in the mid-1990s. Currently, the project is constructed, it will be located at the Duke Energy Indiana

early 1900s. Through U.S. Department of Energy clean coal programs, it was developed for applications on a wider scale in the 1990s and demonstrated in the early 2000s. Currently, there are 17 sites worldwide, four of which use coal/petroleum coke for the sole purpose of generating electricity. In the United States, Duke Energy Indiana's predecessor company, PSI Energy and Tampa Electric have been involved in demonstrating the technology over the past 10 years.

4. WHAT IS THE IMPACT ON AIR QUALITY?

A new plant would convert coal to a cleaner burning gas. A rough preliminary comparison: The current 1,600-megawatt plant at Edwardsport emits approximately 13,000 tons of sulfur dioxide, mercury, annually, it operates about 30 percent of the time. Preliminary data indicates a 630-megawatt IGCC plant operating 100 percent of the time will emit about 2,200 tons of the same pollutants annually. The carbon dioxide emission rate is lower than the existing plant, although overall carbon dioxide emissions are higher because of the plant's size and operating time.

5. WHY SHOULD THE PROJECT RECEIVE LOCAL TAX INCENTIVES?

The plant will not be built without incentives that might make the IGCC technology a viable economic choice for Indiana customers. The benefits to the local/regional economy include:

- The plant will use 1.5 million tons of coal per year valued at about \$40 million annually, a boost for local and state economies.

6. WILL DUKE ENERGY INDIANA HAVE PARTNERS IN THE PROJECT?

Vectren is exploring joint ownership with Duke Energy Indiana in this project.

7. WHAT APPROVALS ARE NEEDED FOR THE PROJECT?

State and federal permits will be required before the project can be built. These include air, water and solid waste permits, and clearances for such things as endangered species and historic/archaeological sites. We have applied to the Indiana Utility Regulatory Commission for "Certificates of Need" to build the plant.

8. HOW MUCH WATER WILL THIS PLANT USE ON A PER DAY BASIS AND WHERE WILL YOU GET THE WATER?

The proposed IGCC plant will use an average of 11 million gallons of water per day, as compared to the current plant which uses 188 million gallons per day. While it's not yet been decided whether to rely on the river or wells, it will most likely be wells.

- A total investment of approximately \$2 billion.
- Increases in state and local taxes paid.
- Estimated property taxes to be paid in years 1-10 are approximately \$36.4 million.
- Estimated property taxes in years 11-30 total \$85.2 million.
- Estimated property taxes in years 2005 to 2010 and current property tax laws in effect as of 12/31/05.

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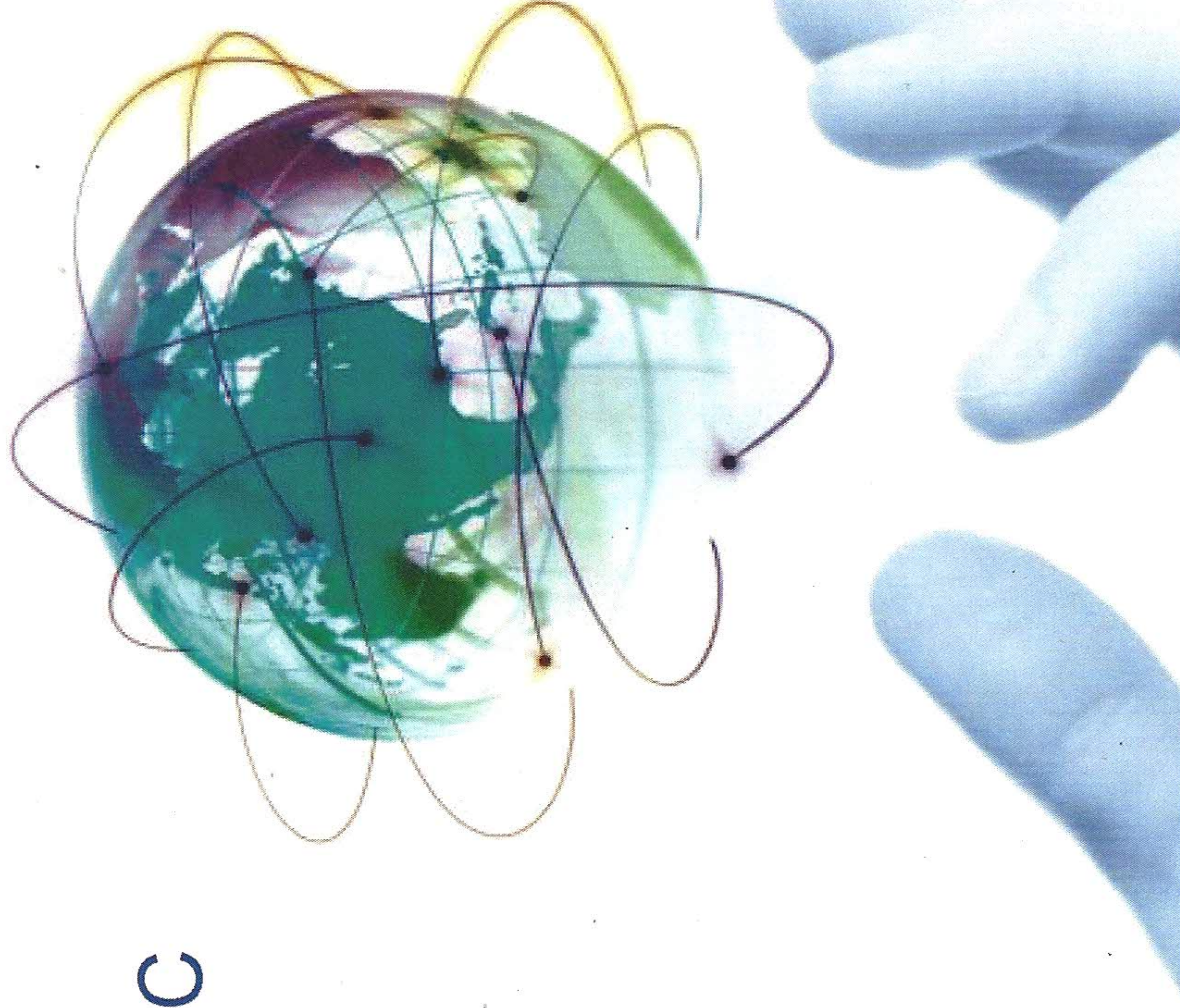
GE Energy Financial Services Investing in the First Wave of Gasification Projects

**North American Advancement of IGCC
Houston, TX**

**Bret Scholtes
May 24, 2007**

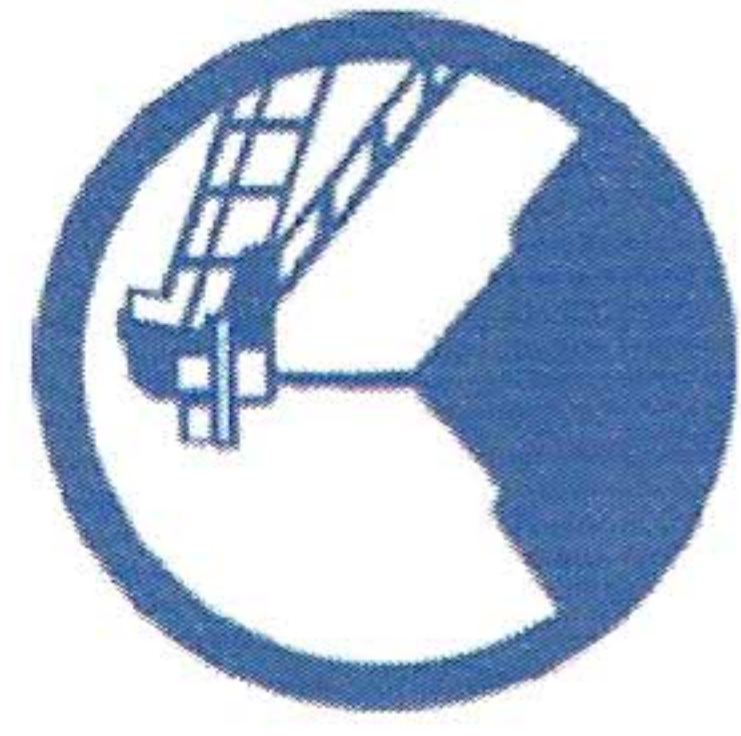
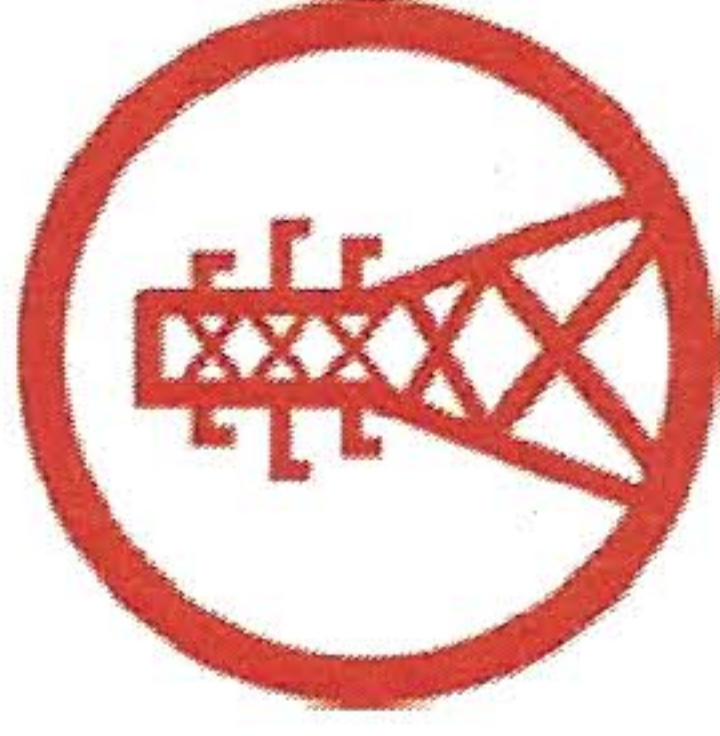


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Agenda

- **Background on GE Energy Financial Services**
- **Market Segments for Investing**
- **Components of a Good Investment**
- **Benefits of Investing in the First Wave**
- **Challenges of Investing in the First Wave**
- **Conclusion**
- **Questions & Answers**



GE- The Right Mix for Growth

- **GE Key Facts/Honors:**

- Founded by Thomas Edison in 1878 as the Edison Electric Co.
- Only company still listed in Dow Jones Industrial Index since 1896
- 6 global businesses operating in more than 100 countries
- 315,000 employees worldwide
- 2006 revenues \$163.4 billion
- AAA Rated
- World's Most Respected Company (1999-2005) Financial Times
- 2007 America's and World's Most Admired Company (#1) Fortune Magazine

GE Infrastructure

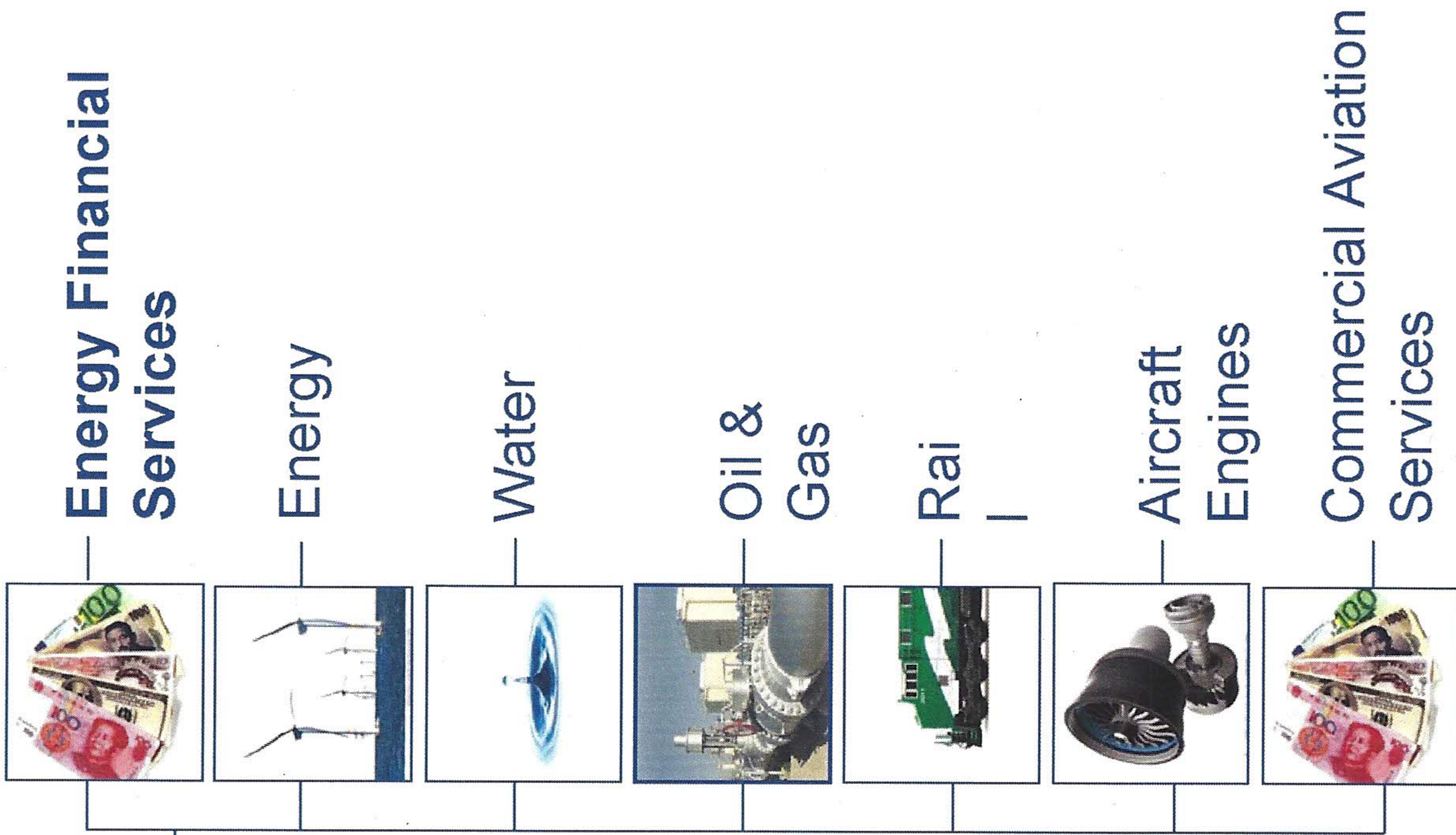
GE Industrial

GE Commercial Finance

GE Consumer Finance

GE Healthcare

NBC Universal



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GE Energy Financial Services' Strengths



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Coal Gasification Future Growth

Power Generation

- U.S. Utilities and IPPs
- European utilities...power with CO₂ capture & EOR

Coal to chemicals such as ammonia and methanol

- Eastman doubling coal to chemicals production
- China..existing (40+) & new coal to ammonia, methanol, oxo-chemicals, etc. All ammonia projects remove CO₂.

Refining and oil sands (Alberta, Canada)

- Supply power, steam, hydrogen; get high quality oil
- Consume low-value products...tar, coke, etc.
- Leverage site infrastructure – OptiCanada upgrader (2007)

Coal to Liquid (CTL) fuels

- Montana, Wyoming, Illinois see CTL as a growth area
- US DOD CTL development program
- Medicine Bow Project in Wyoming

Coal to substitute natural gas (SNG) and CO₂

- Possible locations include Illinois, Kentucky, and



Coal based Transportation Fuels

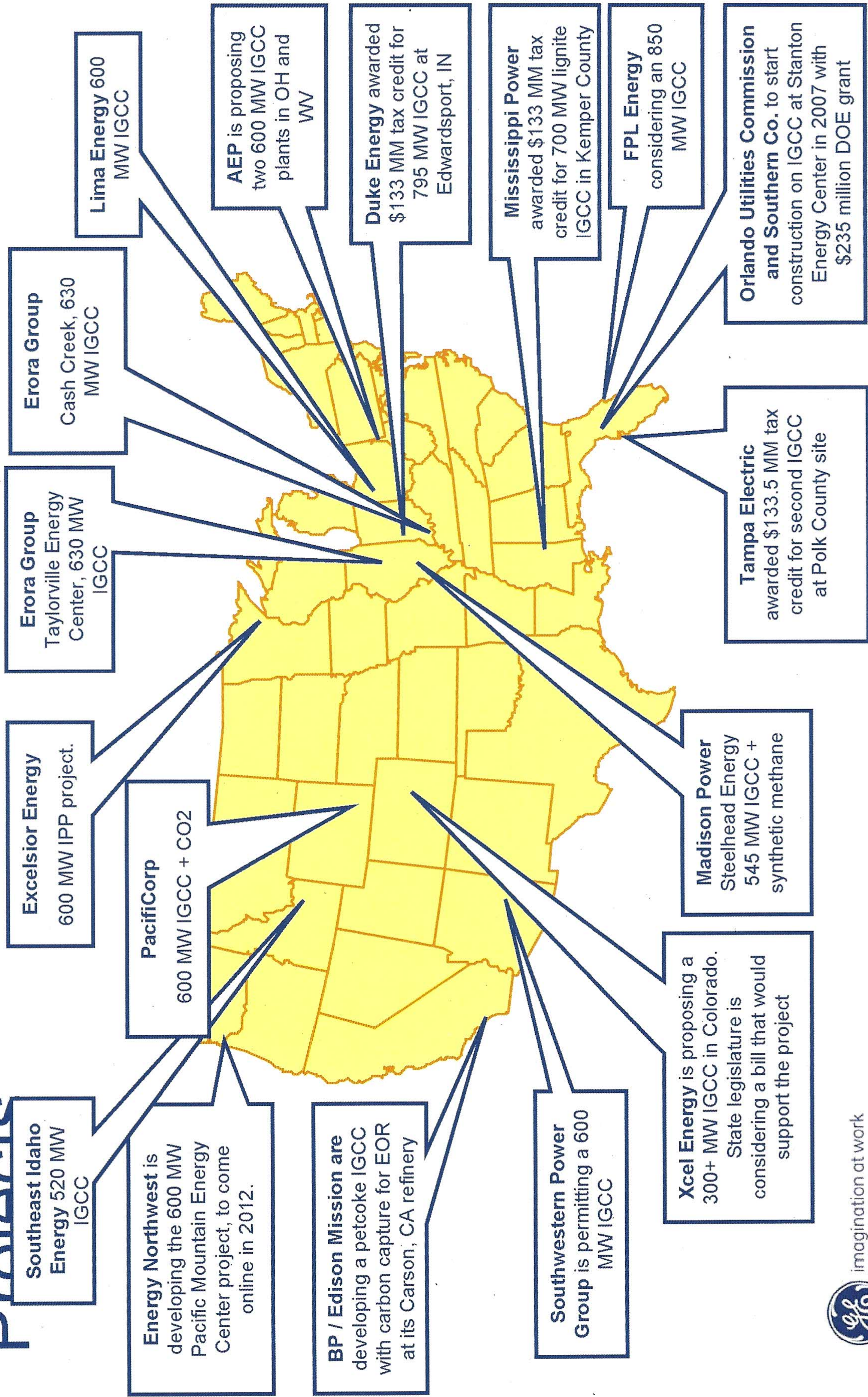


Coal based IGCC (Tampa Electric)

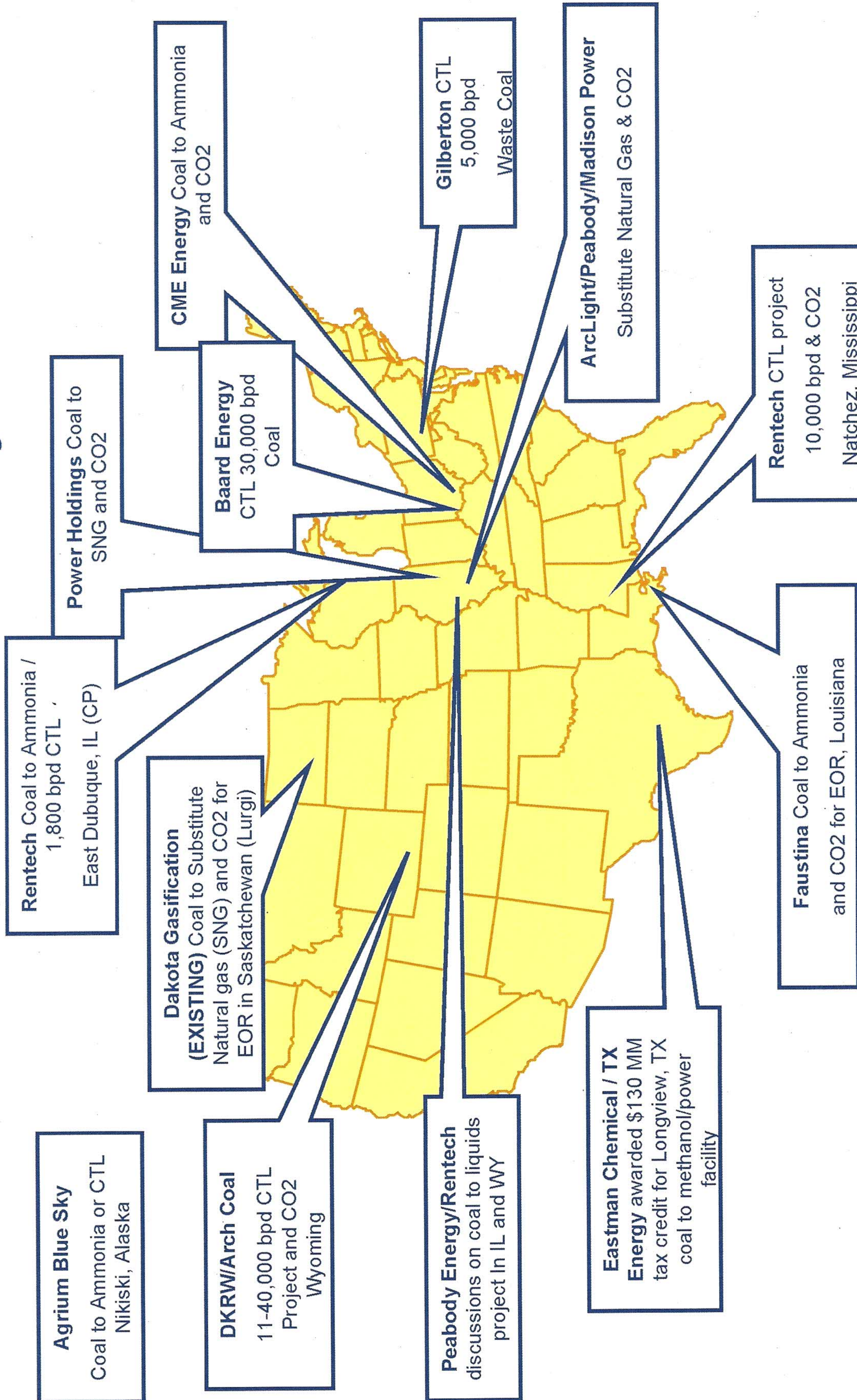


Selected US Coal IGCC Power

Projects

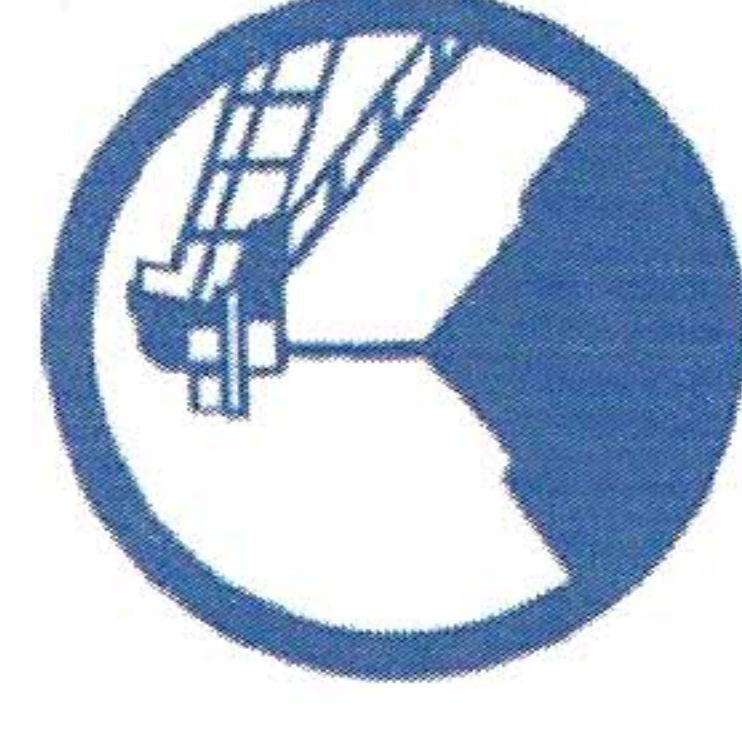
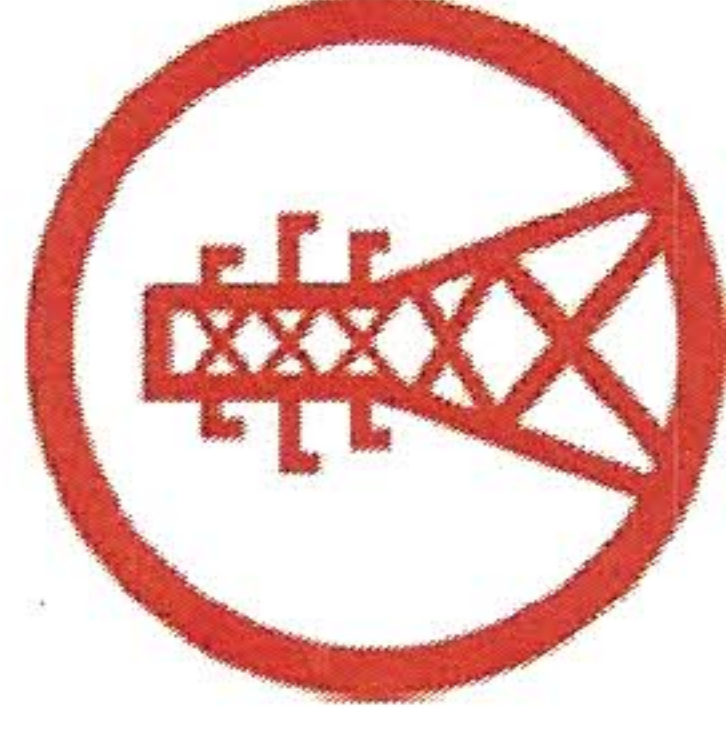


Selected US Gasification Projects



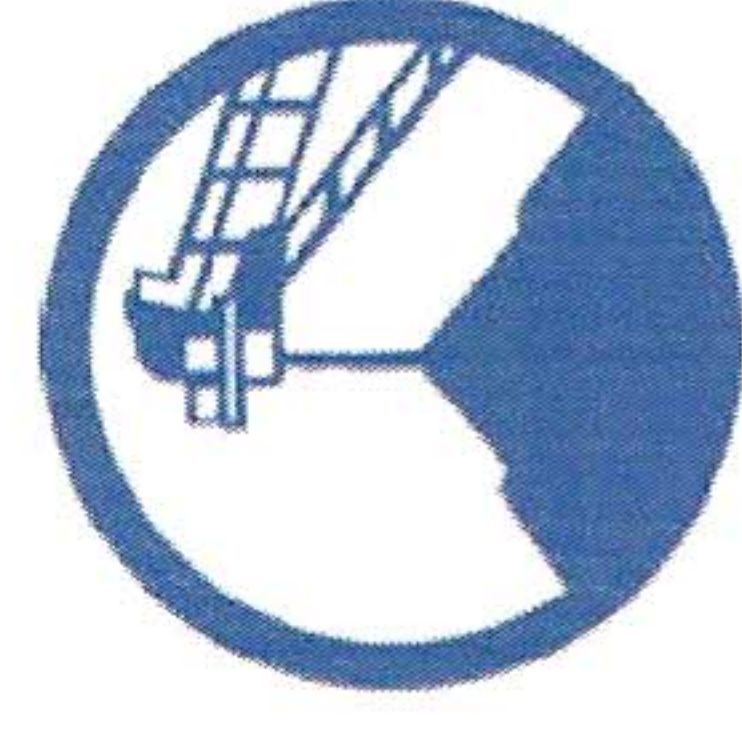
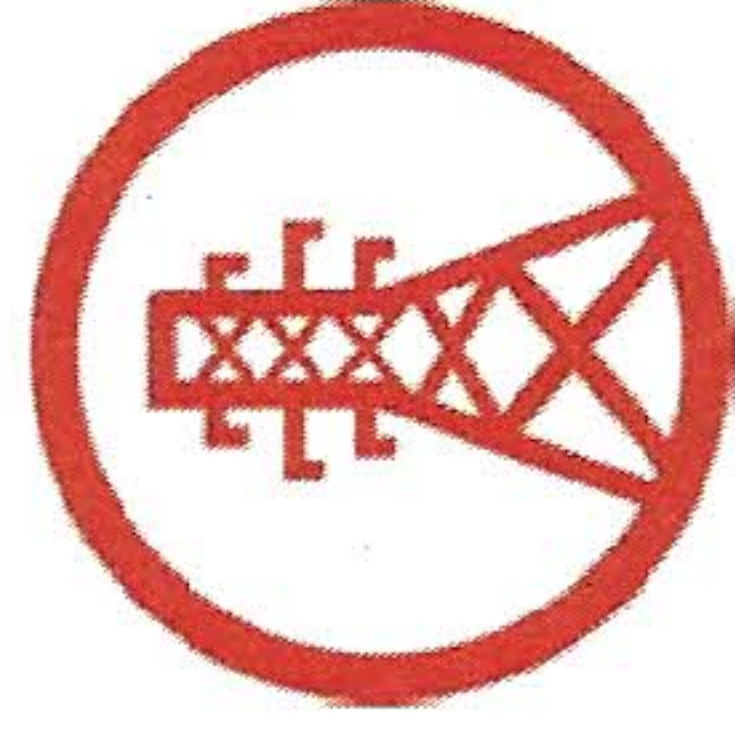
Development Stage Influences Project Risk

- Business model / projected performance and returns
- Site
- Environmental studies
- Permits
- Easements
- Sales agreements
- Coal supply
- Engineering study
- EPC contract
- O & M
- Insurance
- Construction financing



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Factors Influencing Deal Evaluation



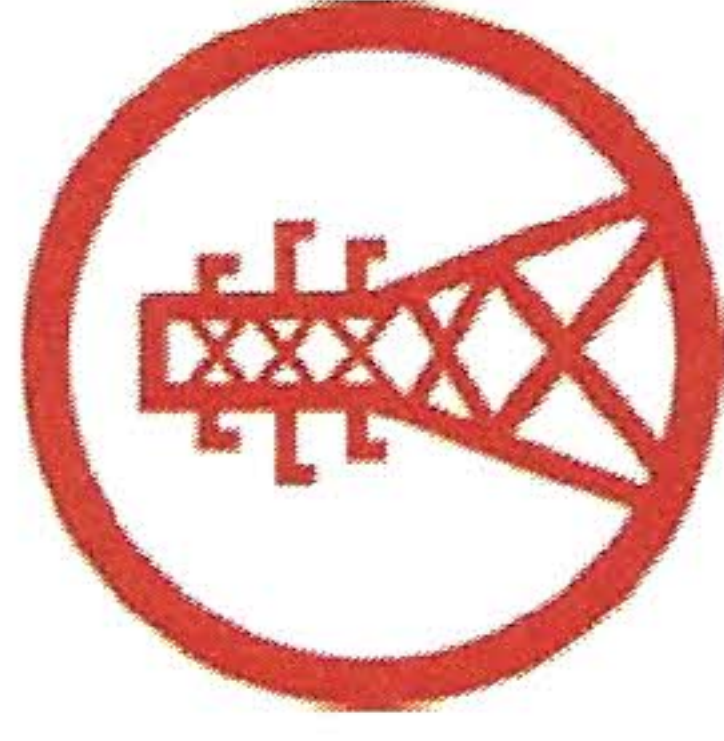
- Development team – how experienced?
- Deal structure
- Risk allocation and management
- Investor commitments
- Distributions
- Board composition
- Board approvals
- Investor rights
- Development fees
- Exit strategy/opportunities



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Benefits of Investing in the First Wave

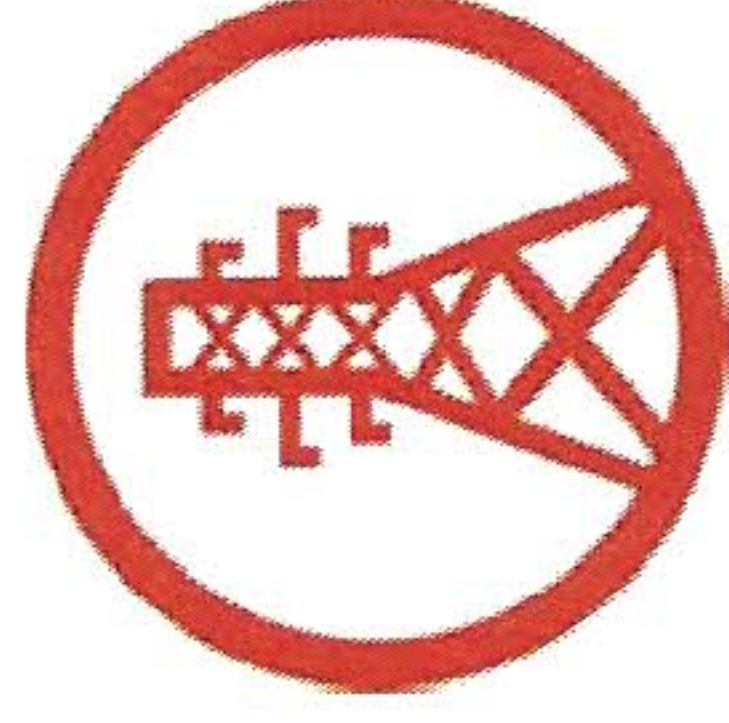
- **First mover advantage for limited resources**
 - Management team
 - O&M
 - EOR opportunities
 - Fuel Supply & product off-take
- **Economics**
 - Maximizing value of product streams
- **Knowledge that can be applied to subsequent investments**
 - Permitting, EPC strategy, etc.
- **Platform for additional investments**



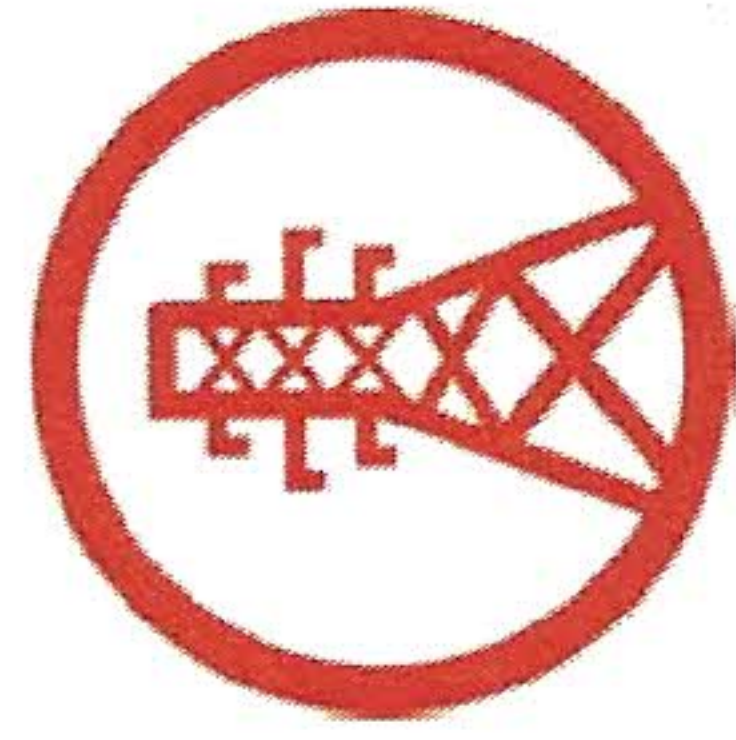
Challenges of Investing in the First Wave



- Substantial development expense
- Increasing capital costs
- EPC uncertainty
 - Limited options at this time
- Technology
 - Performance and availability
- Limited visibility into the future
 - Carbon and Greenhouse Gas legislation



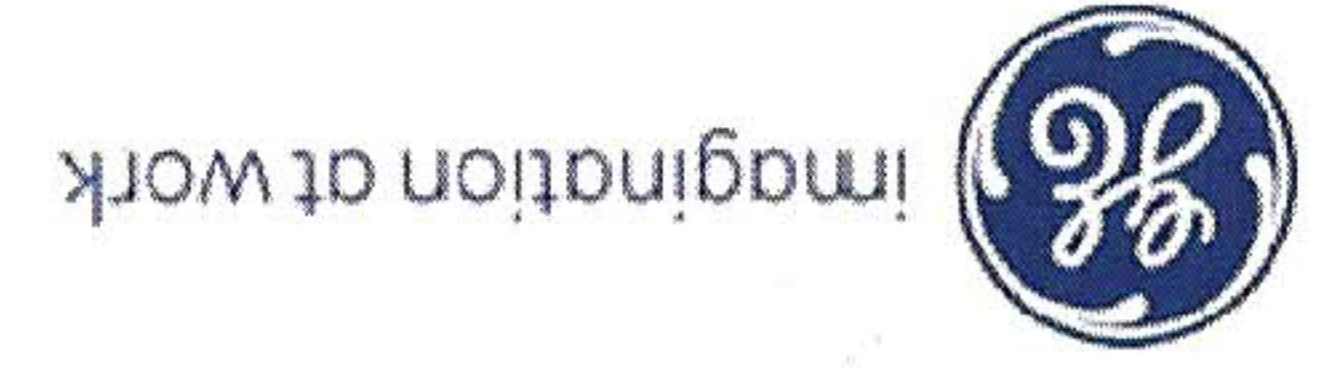
Three Issues Delaying Large-Scale Energy Projects



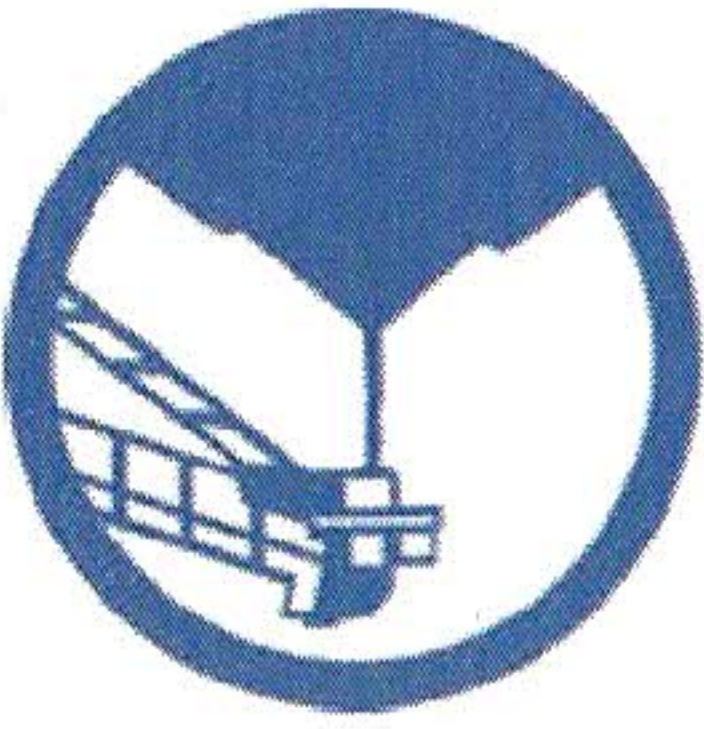
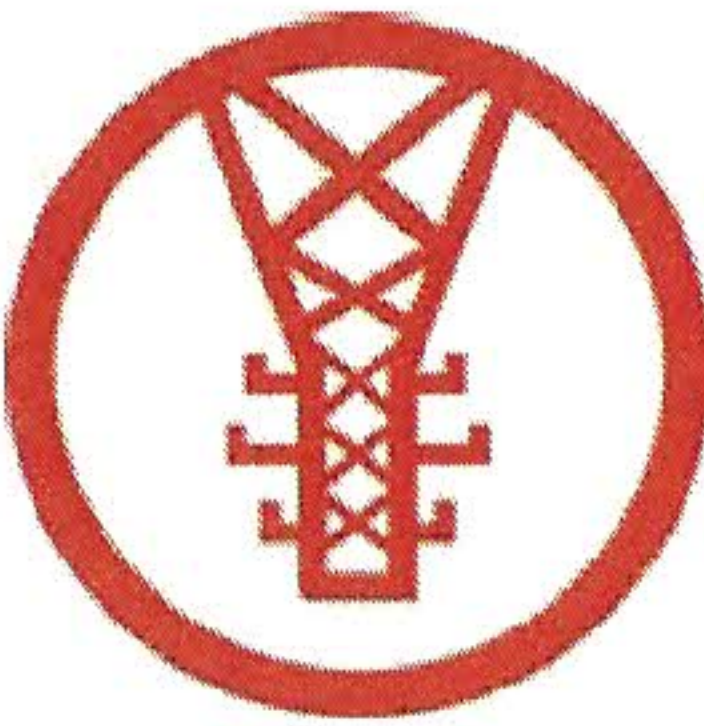
- **Capital cost increases**
 - Capital costs increased 30-50% over the last two-three years
 - “Perfect storm” caused by refinery upgrading, coal plant scrubbers, increasing pricing of commodities (steel, concrete, copper)
 - Competition from construction boom in China and now India
 - When does it end? Will it end soon? Can a project lock in costs?
- **Labor shortage**
 - Increased labor costs and scarcity (above + Katrina rebuilding)
- **Carbon and greenhouse gas legislation**
 - How will this affect project economics?

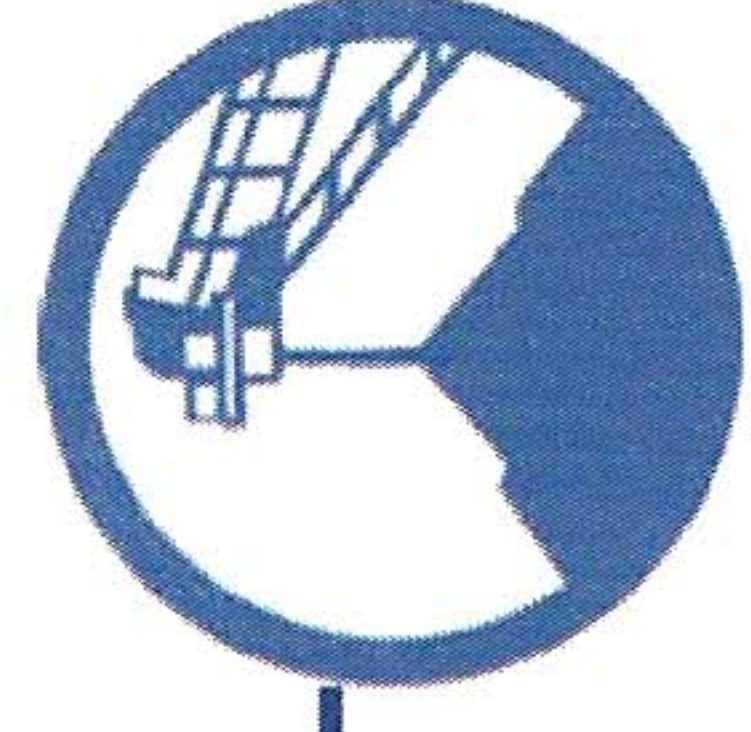
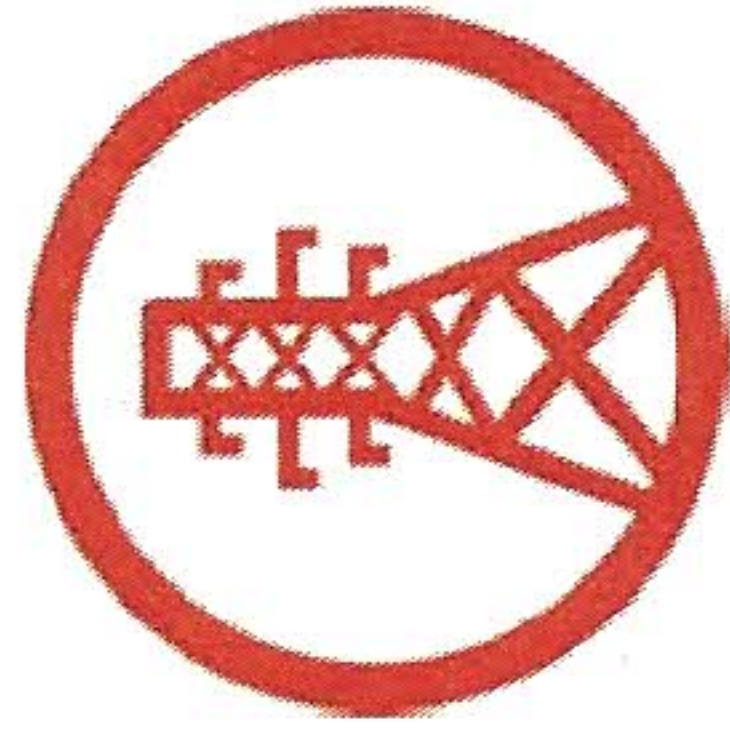


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Summary / Q&A





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Email: Bret.Scholtes@ge.com

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Duke Energy Indiana Edwardsport IGCC Project Update

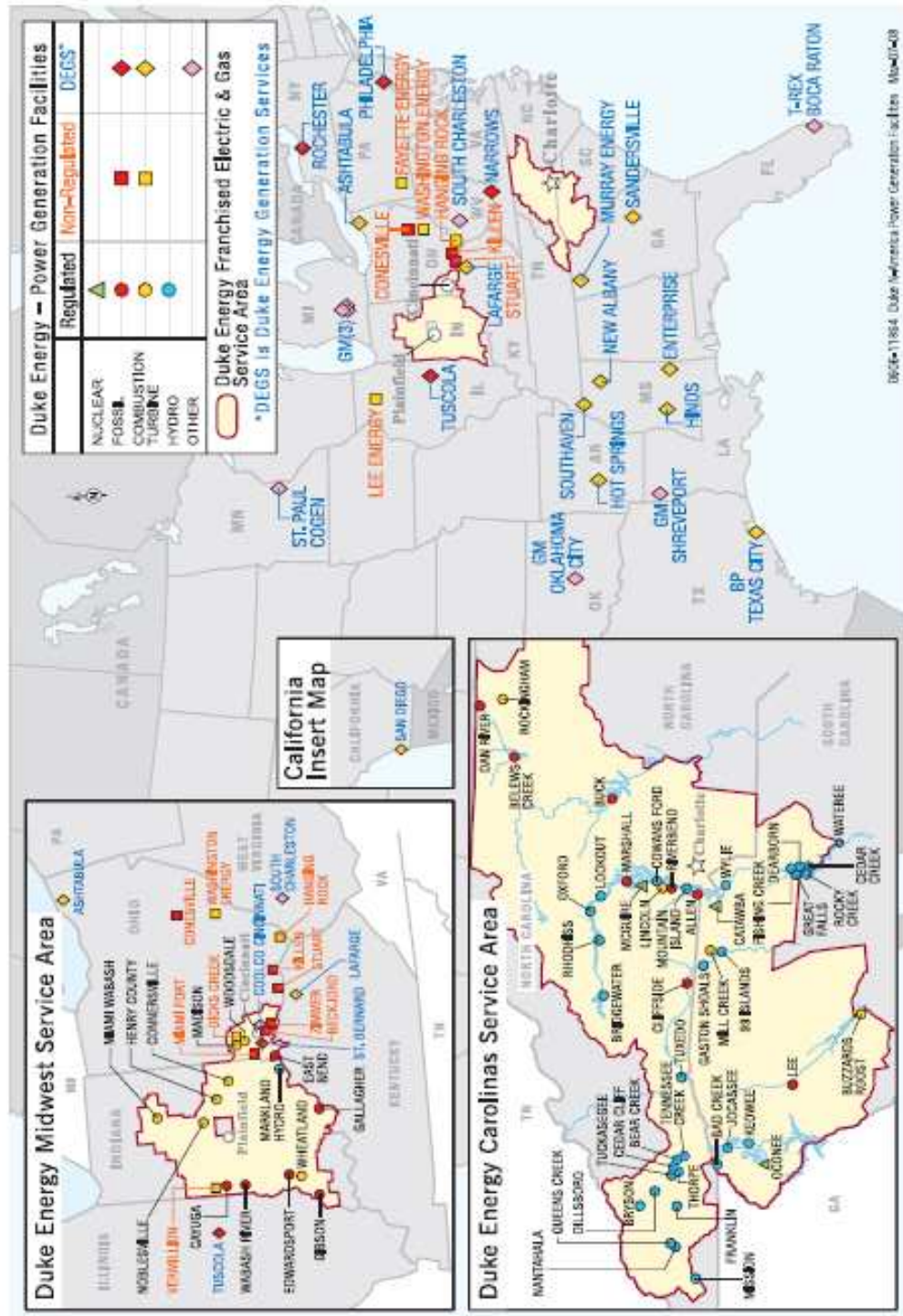
2008 GTC Conference
October 5-8, 2008
Washington, DC
Rex Sears – Project Director, ISBL

Duke Energy Fast Facts

- Headquarters => Charlotte, N.C.
- Employees => 17,800*
- Revenue => \$12.7 billion*
- Assets => \$50 billion*
- Operating Segments:
 - U.S. Franchised Electric
 - Commercial Power
 - Duke Energy International
 - Crescent Resources
- U.S. Generating Capacity => 35,000 MW*

*As of December 31, 2007.

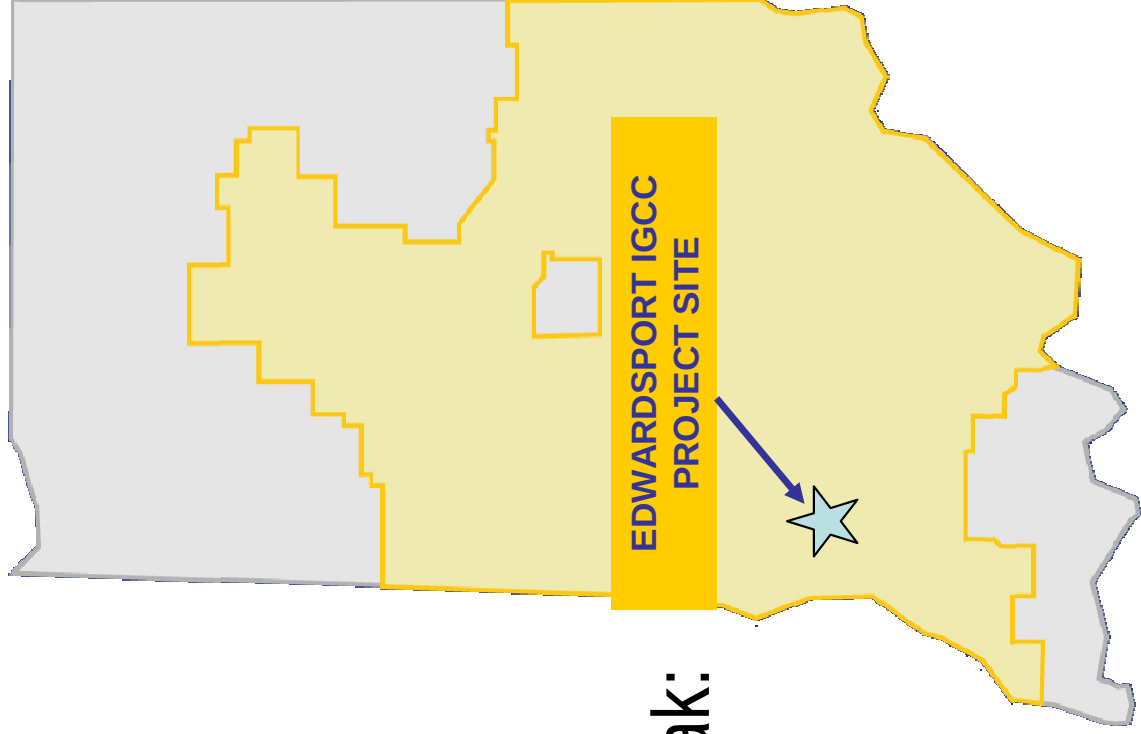
North American Power Generation Facilities



Additional information about Duke Energy can be found at www.duke-energy.com

Edwardsport IGCC Project Location

- State: Indiana
- County: Knox
 - Population 38,500
- Town: Edwardsport
 - Population 348
- IGCC Project Construction Peak:
 - Manpower => ~2,000



Project Development Milestones

- Initiated Project Development – June 2004
- Initiated FEED Study – February 2006
- State and Local Tax Credits Legislation – April 2006
- Filed Air Permit – August 2006
- Filed Petition for a Certificate of Public Convenience and Necessity to construct the Edwardsport IGCC Plant – September 2006
- Received Federal Investment Tax Credit Award (\$133.5 Million) – November 2006

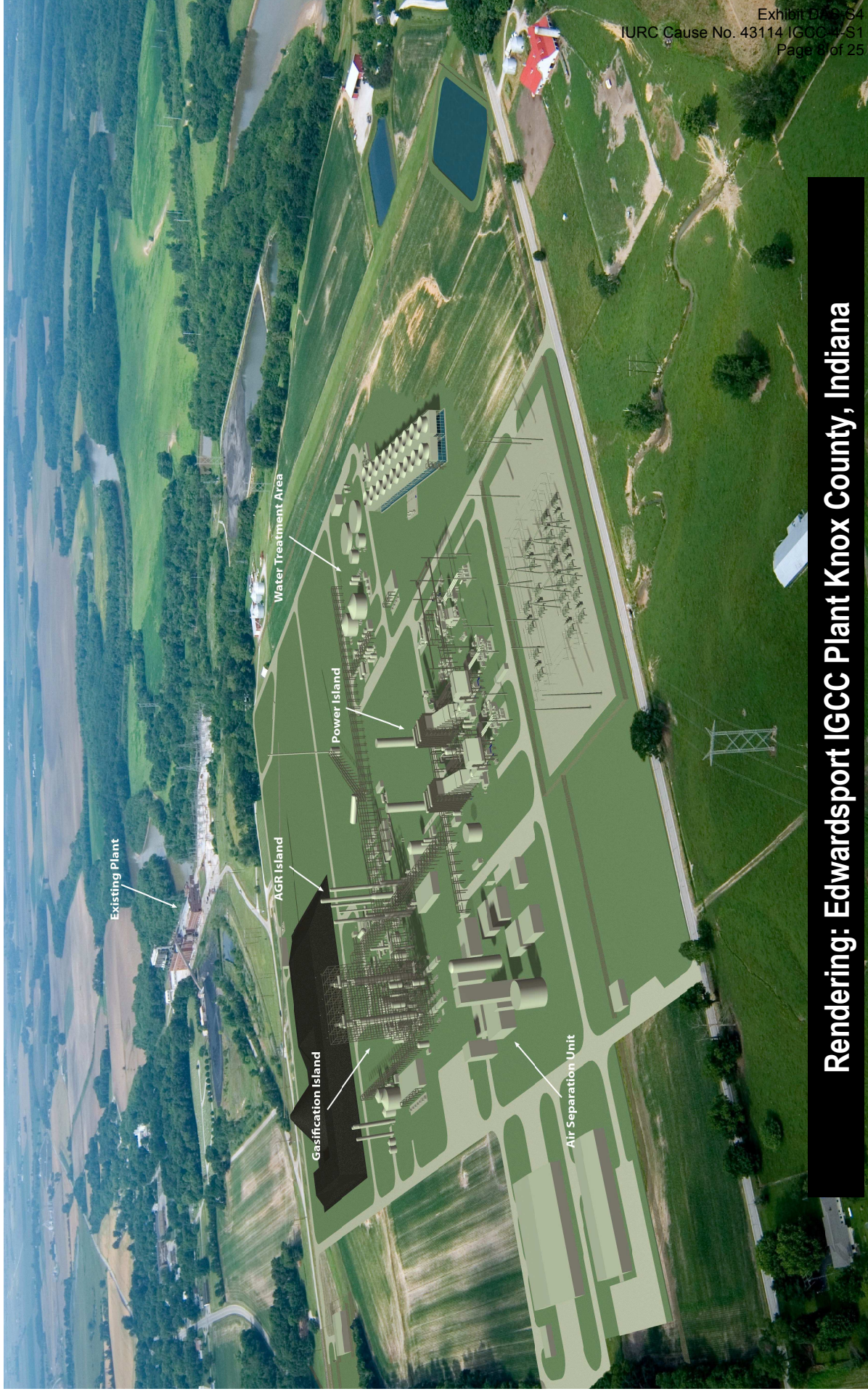
Project Development Milestones

- FEED Study Report submitted to IURC - April 2007
 - Total Installed Cost => \$1.985 billion
 - Schedule => 47 Months FNTTP to substantial completion
- Completed Preliminary Design Reviews => GE Tollgate requirement – September 2007
- Received Duke Energy Board of Director Approval – October 2007
- Received CPCN Order from IURC– November 2007
 - Included condition regarding study of CO2 capture & sequestration

Edwardsport IGCC Project - Highlights

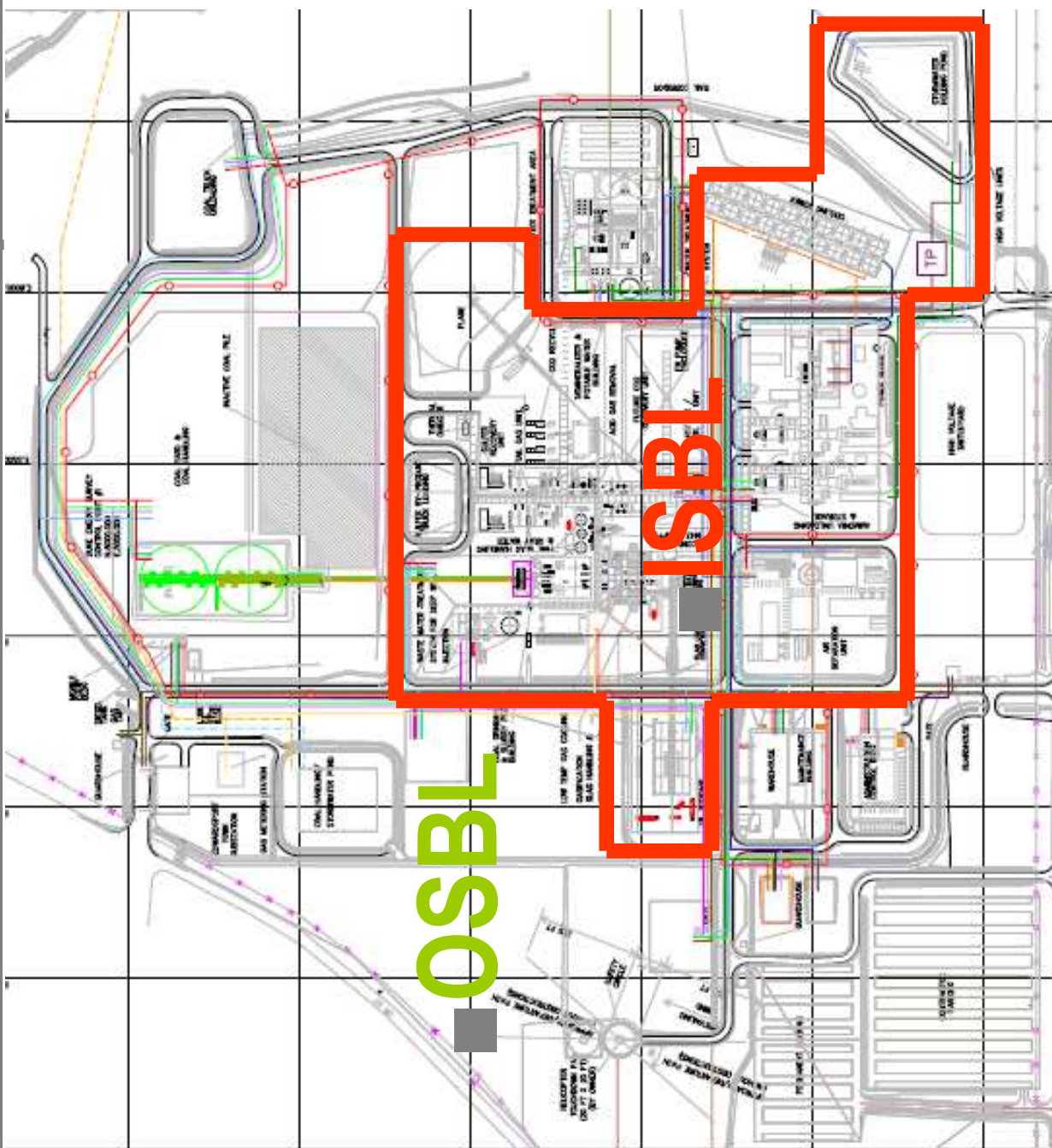
- Net Output: 632 MW
- Heat Rate: < 9,000 Btu/kWH
- Target Availability: 85%
- Low Emissions Profile
- Total Installed Cost: \$2.35 billion
- Bulk Materials:
 - 1MM cubic yards of soil to be moved
 - 70,000 cubic yards of concrete
 - 20,000 tons of structural steel
 - 500,000 linear feet of piping
 - 3MM feet of cable
- Projected Commercial Operation date: Summer 2012

Duke Energy Edwardsport IGCC Layout



Rendering: Edwardsport IGCC Plant Knox County, Indiana

ISBL / OSBL Division of Responsibility



Project Execution Status

- GE Engineered Equipment Package Contract – December 2007
 - Issue for Design Process Design Package
 - Radiant Syngas Cooler Fabrication Initiated
 - ASU Procurement Initiated
- Mine Remediation Completed – January 2008
- Air Permit Issued – February 2008
- CPCN Order Requires 6 Month Updates
 - Submitted update Petition – May 2008
 - Update of cost estimate – Total Installed Cost \$2.35 billion
 - Cost recovery for Study of Carbon Capture, Sequestration, and/or Enhanced Oil Recovery
- IURC Update Hearing – August 2008
 - Ruling Expected – November 2008

Project Execution Status

- Completed Term Sheet and Technical Services Contract for Execution Phase EPCM Services – June 2008
- Gasification Systems HAZOPs Completed – August 2008
- GE Engineered Equipment Package: All Equipment on Order – August 2008
- ASU detail Engineering initiated with completion of P&ID reviews – September 2008

Project Execution Status

- Drilling of Injection Test Well - Ongoing
- Construction of Raw Water Ranney Wells – Ongoing
- Water Treatment Design – Ongoing
- Coal Delivery and Handling Package - Awarded
- Overall Site Grading - Ongoing
- Procurement of ISBL Engineered Equipment - Ongoing
 - Completed bid cycle for 50 engineered equipment requisition packages
 - Completed the evaluate and award cycle for 24 engineered equipment packages

Project Execution Status

- Issue for Design P&IDs - Ongoing
- Gasification 30% 3D Model Reviews- Ongoing
- Finalization of Execution Phase EPCM Services Contract - Ongoing
- Proposals received for Site Piling - Evaluation Ongoing
- Duke Energy Underground Scope Utility Packages Developed and Out For Bid
- Detailed Engineering for ISBL Scope at 18%
 - Engineering Staffing Current => 250, Forecast Peak => 350.

Site Grading



Inside Battery Limit – 3D Model

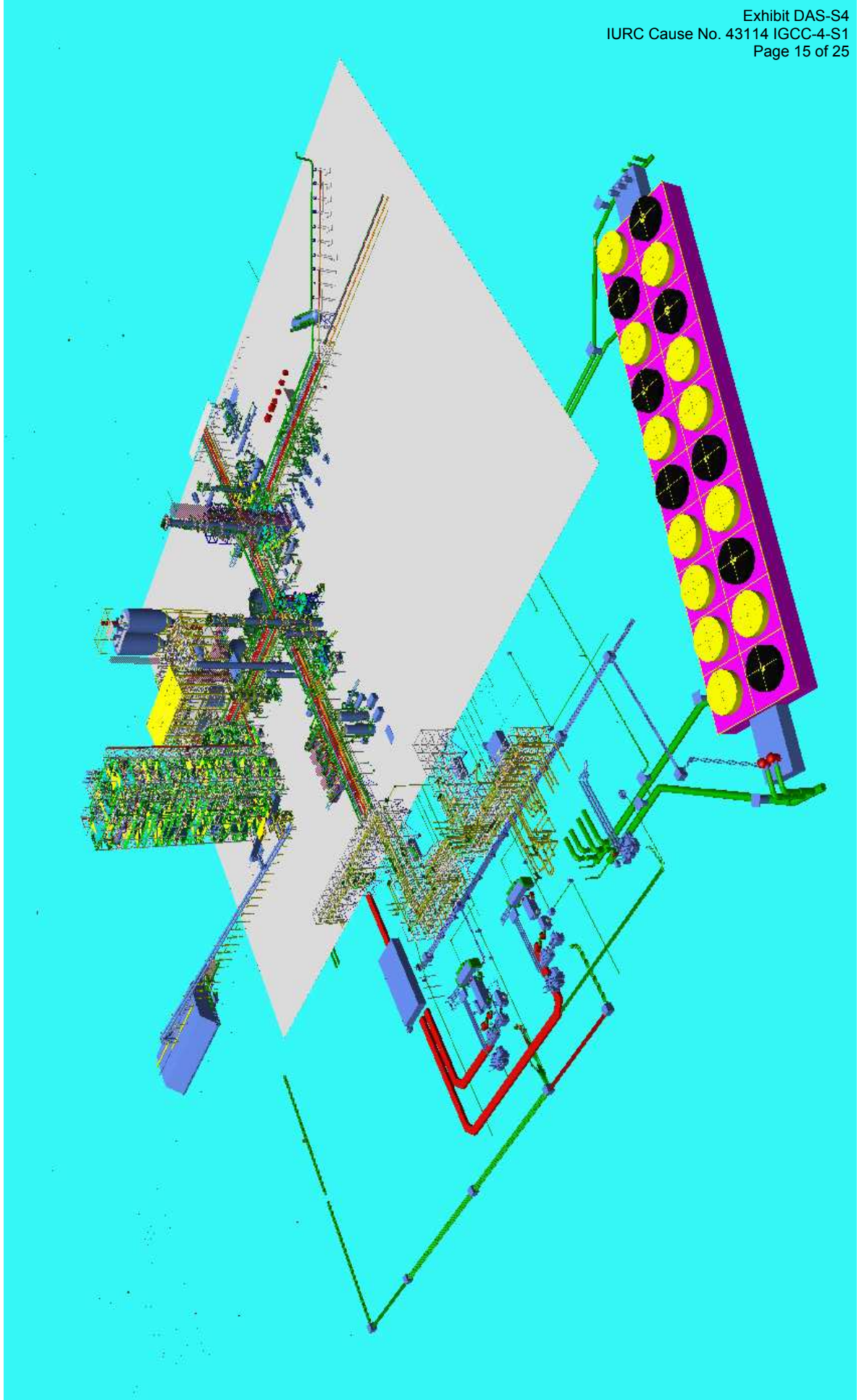


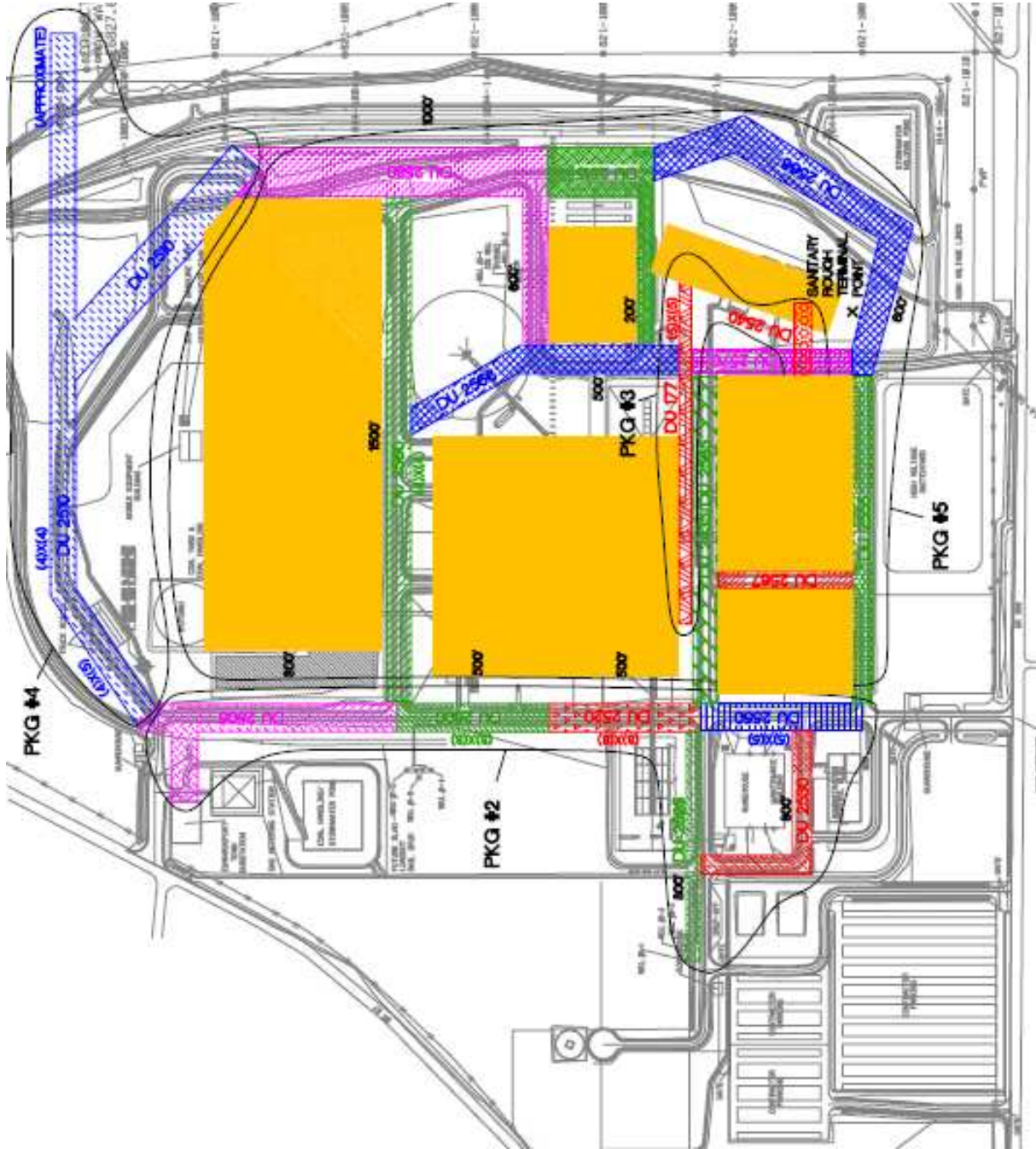
Exhibit DAS-S4
IURC Cause No. 43114 IGCC-4-S1
Page 15 of 25

Power Block – 3D Model



Exhibit DAS-S4
IURC Cause No. 43114 IGCC-4-S1
Page 16 of 25

OSBL Underground Utility Infrastructure Corridors



Project Execution Forecast Activities

- Engineering Activities
 - ISBL Engineered Equipment
 - Technical Specifications for Material Requisitions
 - Technical Evaluations and Recommendations
 - Issue For Design P&IDs
 - 50% 3D Model Reviews
 - 90% 3D Model Reviews
 - Issue For Construction P&IDs
 - Issue For Construction engineering discipline drawings

Project Execution Forecast Activities

- Procurement Activities
 - ISBL Engineered Equipment Awards
 - All purchases on Duke Energy paper
 - ISBL Equipment Awarded to Date
 - Grinding Mills
 - Refrigeration Packages
 - CO2 Compressors
 - Coal and Slag Handling
 - Gasification Pressure Vessels
 - Develop Procurement Process for Bulk Commodities
 - Maximizing utilization of Duke Energy Integrated Suppliers

Project Execution Forecast Activities

- Construction Activities
 - OSBL Underground Utility Infrastructure
 - ISBL & OSBL
 - Piling
 - Foundations & Underground Utilities
 - ASU
 - Piling & Foundations Included in Site Wide Contracts
 - Steel
 - Piping
 - Conduit and Cable

First Mover Challenges

- NDA – Non Disclosure Agreement
- NPI – New Product Introduction
- Non LSTK Execution

Non Disclosure Agreement (NDA)

- Non Disclosure Agreement
 - Major bureaucratic endeavor to administer execution of NDAs
 - GE & Bechtel mark all documents issued to the project as confidential and proprietary which requires all parties that participate to execute the NDA
 - Provisions of NDA are burdensome and some suppliers are balking at participation due to risk of litigation introduced by combination of the terms of the NDA and the extent of the documents marked as confidential and proprietary

New Product Introduction (NPI)

- GE New Product Introduction
 - Reference Plant
 - Radiant Syngas Cooler
 - Advanced Feed Injector
 - 7FBJ
 - Refractory
 - Distributed Control System – Mark VIe
- GE continuing to progress thru NPI toll gate process
 - Track and Manage to ensure Delivery by GE
- Extended Startup period (13 months) to accommodate NPI Testing and Validations

Alternate Contracting Strategy

- Project Developed as Alliance LSTK Offering
 - Not Offered due to Market Conditions
- Transition to Alternate Contracting Strategy
 - Contracting approach applied is a blend of cost reimbursable, target cost, and lump sum pricing, with Duke Energy Indiana managing the Project and holding the escalation and warranty risk
- Challenges
 - Contractual recreation of Alliance Collaboration, and Technology and Engineering Design Responsibilities
 - Interface Coordination at Scope Boundaries
 - Four (4) Engineering Entities with Major Scope



CERTIFICATE OF SERVICE

The undersigned hereby certifies that the foregoing was served by electronic mail or U.S.

Mail, first class postage prepaid, this 12th day of November, 2010, to the following:

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