

LARGE FILING SEPERATOR SHEET

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TRANSCRIPT CONTINUED

1 THE WITNESS: I believe that's also
2 around 2012.

3 Q. And to be clear, the existing plants
4 you're talking about, which plants are those?

5 A. The TECO, Tampa Electric Polk plant, and
6 the Wabash plant are the two existing plants that
7 have been in operation for over 10 years.

8 Q. Do you know if either of those plants use
9 the Selexol?

10 A. No, they do not use the newer, cleaner
11 technology of Selexol for SO2 or SCR for NOx control.

12 Q. If they used Selexol, is it your opinion
13 that they would achieve greater SO2 reductions?

14 A. Yes. And their draft permit or their
15 proposed emission limits reference that and include
16 it.

17 Q. And if they used an SCR, is it your
18 opinion that they would achieve greater NOx
19 reduction?

20 A. Yes.

21 Q. Thank you.

22 Do you remember being asked by
23 Mr. Bentine about the availability of an IGCC plant?

24 A. Yes.

1 Q. And could you tell me what availability
2 is?

3 A. Yes. Availability is the amount of hours
4 during the year that the plant is not available to
5 produce power either for planned maintenance or
6 unscheduled downtime.

7 Q. How does the availability of an IGCC
8 compare with that of a PC plant?

9 MR. BENTINE: I'm going to object unless
10 we specify in this answer whether we're talking about
11 actual operating IGCC plants for electrical
12 generation and actual operating plants that are PCs.

13 A. We are.

14 Q. Why don't we start with -- let's start
15 with actual operating units.

16 A. Okay. Again, the same comparison was
17 made. In the testimony submitted by AMP-Ohio the
18 comparison was made on demonstration plants like the
19 Tampa and the Wabash plant. They were demonstration
20 units funded by DOE to prove the technology. Now
21 it's commercially available.

22 It isn't fair to compare the availability
23 of a plant that was designed 15 years ago to a plant
24 that's being designed for 2012. It's two different

1 time frames. What's fairer is to look at newer IGCC
2 units. Obviously, we can project what the
3 Taylorville might expect from the newer IGCC units,
4 and in one of my exhibits I show that.

5 We have in Exhibit 19 the time of
6 start-up of when these units were started up, so we
7 see Wabash and Tampa were over 10 years ago. Those
8 are the availability numbers AMP-Ohio is using. What
9 I think is far more accurate is to use the newer
10 plants that have come on line more recently because
11 we've obviously learned how to make these plants more
12 reliable.

13 And the two that I want to point out are
14 these two here, the 545-megawatt and the 520-megawatt
15 units. These are in Italy and they have multiple
16 gasifiers, and the reported availability for this
17 plant is 94 percent availability. They have no spare
18 gasifier and they have no stand-by fuel. So just
19 running on an IGCC mode the more recent plants have
20 gotten 94 percent availability.

21 The other three plants all located in
22 Italy have over 90 percent availability; that is a
23 more fair representation of what the technology is
24 capable of. They're in operation, they have been in

1 operation, and the availability numbers are
2 referenced in my text.

3 EXAMINER BOJKO: One minute. Let me
4 follow up on that. I thought you stated previously
5 to Mr. Bentine that, I took my sticky off because I
6 thought you had answered that question, I thought
7 your testimony on page 33 was that they needed to
8 either have a spare gasifier, a backup fuel, or both
9 in order to get the 90 percent availability numbers.
10 Is that not what you're saying now?

11 THE WITNESS: If you wanted to get higher
12 availabilities.

13 EXAMINER BOJKO: Higher than what?

14 THE WITNESS: There's a difference
15 between what a plant may have gotten and what
16 somebody is willing to guarantee. Nobody is going to
17 be willing to guarantee 94 percent availability.
18 Just because somebody did it doesn't mean a
19 manufacturer is going to guarantee it. You're always
20 going to have a lesser value to give you a cushion.

21 EXAMINER BOJKO: What was the period of
22 time that the 94 percent availability was gotten
23 over? Was it a once in a lifetime --

24 THE WITNESS: No.

1 EXAMINER BOJKO: -- achievement?

2 THE WITNESS: No. It was for a year or
3 more.

4 EXAMINER BOJKO: One year or more, or
5 it's continually running at that availability level?

6 THE WITNESS: I believe it's continuing
7 to run at that availability level.

8 EXAMINER BOJKO: So the testimony on page
9 33, you were referencing whether someone could get a
10 guarantee or not?

11 THE WITNESS: Yes.

12 EXAMINER BOJKO: I apologize. Go ahead.

13 THE WITNESS: The guarantee you could get
14 would be at 85 percent without a spare gasifier and
15 without a backup fuel. Now -- and that's a number
16 that I got from General Electric last week. I talked
17 to their chief project engineer for IGCC and he said
18 that they're willing to guarantee 85 percent
19 availability on an IGCC unit if the utility operated
20 it according to their designated maintenance
21 schedule.

22 Q. (By Mr. Fisk) Mr. Furman, with a spare
23 gasifier does that increase the availability of an
24 IGCC?

1 A. Yes, but it normally is not
2 cost-effective for a utility application to have a
3 spare gasifier. The utilities American Electric
4 Power, Duke, and Tampa Electric have all done
5 analysis that show it's far more cost-effective to
6 run on your backup fuel when you want that higher
7 availability.

8 Q. And what can an IGCC achieve with backup
9 fuel? What availability?

10 A. With backup fuel it can provide -- Tampa
11 Electric during their peak season during the summer
12 months with backup fuel obtains 95 percent
13 availability which is greater than what you can get
14 from a PC plant. So the whole thing here, the bottom
15 line is really flexibility, flexibility to allow you
16 to get greater availability out of the plant.

17 A coal plant, a PC plant, doesn't have a
18 backup fuel. If you're down, you're down. You're
19 down and out.

20 EXAMINER BOJKO: You used the caveat
21 if -- you stated that if they run on GE's scheduled
22 maintenance program, then they could guarantee the
23 85 percent. What is that maintenance program?

24 THE WITNESS: We'd have to talk to GE and

1 get all the specifications on that.

2 EXAMINER BOJKO: I thought you knew there
3 was something set because you put that caveat into
4 your answer.

5 THE WITNESS: Obviously, if somebody
6 gives you a warranty on how many miles you're going
7 to get on a set of tires, you're going to have to
8 keep those tires inflated in order to get that.

9 EXAMINER BOJKO: Right, but doesn't the
10 IGCC plant have to be -- have higher maintenance than
11 a PC plant? Do you know the comparison of that?

12 THE WITNESS: In what respect?

13 EXAMINER BOJKO: I don't know. You're
14 using that caveat for your guarantee, I'm just
15 exploring whether IGCC plants have to go down more
16 often for maintenance.

17 THE WITNESS: They have a different
18 maintenance schedule because they're a different
19 process, but the bottom line is what is the unit
20 availability and how much do you have to spend to get
21 that availability?

22 EXAMINER BOJKO: Well, wouldn't scheduled
23 downtime affect the availability for the year?

24 THE WITNESS: Yes. Yes.

1 MR. BENTINE: Your Honor.

2 THE WITNESS: But the availability number
3 includes all of that.

4 EXAMINER BOJKO: Okay. Sorry. I'm only
5 jumping in now as opposed to waiting till the end
6 because I think it might be faster since we're
7 talking about these issues, if you don't mind.

8 MR. FISK: Certainly.

9 MR. BENTINE: Your Honor, I have -- a
10 little late, but I have a motion to strike. I've
11 been sitting here stewing. I think it is wholly
12 inappropriate to let this hearsay in about what
13 General Electric told this gentleman on a telephone
14 call about what General Electric might be willing to
15 do in terms of a guarantee and a warranty after his
16 deposition.

17 I move to strike all the references to
18 what happened and what GE told him, somebody at GE
19 who may or may not have had authority to do so, and
20 explore what in a construction contract can be pages
21 and pages of information about what a warranty and a
22 guarantee is. I move to strike it.

23 MR. FISK: Your Honor, I think this is
24 relevant to the issue at hand and Mr. Furman is

1 testifying to his expert opinion based on --

2 EXAMINER PRICE: How is it not classic
3 hearsay? He's testifying as to what somebody else
4 told him as to the truth of the matter asserted; is
5 he not?

6 MR. FISK: Right.

7 EXAMINER PRICE: Do you have an exception
8 that would apply?

9 MR. FISK: He's forming his opinion based
10 on that testimony and it's proper to form your
11 opinion based on that evidence, and at most it goes
12 to the weight of the evidence, not to whether it
13 should be admitted.

14 EXAMINER PRICE: He testified that he
15 spoke with somebody and that somebody said "Yes, we
16 can do 85 percent if you stick to our scheduled
17 maintenance program."

18 EXAMINER BOJKO: Although I liked my line
19 of questioning, frankly, and my questions, I have
20 to -- I think we both agree with Mr. Bentine that the
21 guarantee language from a GE representative on a
22 phone call yesterday is classic hearsay that doesn't
23 have an exception, and my questions stemmed off that
24 statement, so I guess we're going to have to go back

1 and strike all of it from his statement on what the
2 GE gentleman told him.

3 Could you go back up and read that
4 answer?

5 (Discussion held off the record.)

6 EXAMINER BOJKO: Let's go back on the
7 record. I believe we found the place, that would be
8 everything after or including the word "now."
9 Mr. Furman stated that the testimony on 33 he was
10 referencing with regard to the percentages and
11 requiring a spare gasifier was with regard to a
12 guarantee and there would be a period after that, and
13 "now" would be stricken and everything after it.

14 Okay, Mr. Fisk.

15 MR. FISK: Thank you, your Honor.

16 Q. (By Mr. Fisk) Mr. Furman, can I direct
17 you to AMP-Ohio Exhibit 9, "The Future of Coal"
18 study?

19 A. Yes.

20 Q. Turn to page 34 of that study.

21 A. Yes.

22 Q. Do you recall being asked by Mr. Bentine
23 about Box 3.1?

24 A. Yes, I do.

1 Q. Okay. Do you see the beginning of the
2 second paragraph that starts "The availability"?

3 A. Yes, the availability of --

4 Q. Could you start reading at the second
5 sentence which is, just read the second sentence
6 which starts with "Many"?

7 A. "Many of the problems were design and
8 materials related which were corrected and are
9 unlikely to reappear; others are process related,
10 much like running a refinery, but all eventually
11 proved to be manageable."

12 Q. Do you agree with that statement?

13 A. Yes.

14 Q. And could you explain?

15 A. Yes. I think, and again, this is
16 comparing early-IGCC plants that were meant to be
17 demonstration plants to prove out the technology and,
18 obviously, the availability is going to be lower.
19 Again, just like the emission numbers. I think the
20 fairer comparison is what have recent plants done?

21 Q. So the problems that caused the lower
22 availability of early-IGCC plants have been
23 corrected.

24 A. Yes.

1 MR. BENTINE: Objection. No foundation
2 for that. He has read what is in this MIT study if
3 you want to ask him is the MIT study the basis for
4 that conclusion, but -- that's fine, but there's no
5 foundation that this witness can know that from his
6 own personal knowledge or any information that he has
7 gathered, analyzed, and come to a conclusion, so I
8 object.

9 A. I believe it is from what I have in my
10 written testimony, I've submitted the experience of
11 these newer plants which have higher availability.

12 MR. BENTINE: Did he just overrule my
13 objection?

14 EXAMINER BOJKO: We were trying to lay
15 some foundation to get -- to overrule your objection.
16 I'll give you a little leeway to lay some foundation
17 for that statement, and I assume that's what the
18 witness is doing.

19 Q. Yes, what is the basis of your --

20 EXAMINER PRICE: Mr. Furman, you ought
21 not be responding to a line of questioning that was
22 objected to. You should wait for your counsel to
23 respond to the objections.

24

1 THE WITNESS: Sorry.

2 Q. What is the basis for your opinion
3 regarding the availability of whether the problems
4 with the availability of early IGCC plants have been
5 corrected?

6 A. As indicated on my written testimony on
7 page 32 and shown in this Exhibit 9, the later
8 plants, particularly the ones in -- four plants in
9 Italy have demonstrated availabilities above
10 90 percent.

11 Q. Is the experience with IGCC outside the
12 United States relevant to whether an IGCC plant could
13 be operated here in the U.S.?

14 A. Yes. I don't see any difference that
15 geography introduces.

16 Q. And so with a backup fuel what
17 availability can an IGCC plant achieve?

18 A. Without a spare gasifier and without the
19 backup fuel an IGCC, a new IGCC unit should be able
20 to maintain 85 percent availability. With the backup
21 fuel it should be able to get to up to 95 percent
22 availability.

23 EXAMINER PRICE: Within what time frame
24 of its beginning operation?

1 THE WITNESS: Two years.

2 EXAMINER PRICE: Thank you.

3 EXAMINER BOJKO: And that's based on the
4 existing plants that are already in operation.

5 THE WITNESS: Yes.

6 EXAMINER BOJKO: In Italy.

7 THE WITNESS: Yes.

8 Q. (By Mr. Fisk) Are there other advantages
9 that stem from the fact that an IGCC can use backup
10 fuel?

11 A. Yes.

12 EXAMINER BOJKO: Are there -- I'm sorry,
13 I didn't hear you.

14 MR. FISK: Other advantages.

15 A. Yes. Very many advantages to the
16 flexibility of an IGCC plant. One we mentioned was
17 availability. If your PC plant is 85 to 90 percent
18 available and your IGCC unit is available 90 to
19 95 percent of the time with a backup fuel, then you
20 don't have to call on higher-priced generating
21 capacity during your peak loads. The other is fuel
22 flexibility to respond to changing fuel markets, to
23 make use of lower cost fuels such as petroleum coke,
24 biomass, and waste materials.

1 The flexibility of using multiple fuels
2 is significant. Very much with a coal plant you're
3 limited to certain types of coal; that's not the case
4 with an IGCC unit. Therefore, you have much more
5 fuel flexibility and much -- able to respond to
6 changing economic conditions and fuel availability.

7 Q. Could you please turn to Exhibit RCF-13
8 to your testimony?

9 A. Yes.

10 Q. Just to make sure we're on the same page,
11 what is this exhibit?

12 A. This exhibit is a comparison of the AMP's
13 emission characteristics based on the draft permit
14 versus the range of emission limits for proposed IGCC
15 plants taken from their permit applications, draft
16 permits, and final permits.

17 Q. Do you believe that these numbers, the
18 ranges for the IGCC side of this graph accurately
19 reflect the range of numbers found in RCF-12?

20 A. Yes, I do.

21 Q. Do you have any question about the
22 reliability of these numbers?

23 A. No, I do not.

24 Q. The testimony that you presented in this

1 proceeding, that is your expert opinion, correct?

2 A. Yes.

3 Q. And you're not aware of the full range of
4 opinions of the various citizen groups --

5 A. No.

6 Q. -- here today. And --

7 EXAMINER BOJKO: I'm sorry, I have to
8 interject here. Referencing RCF-13, didn't we
9 already discuss that you said you hadn't verified
10 these numbers?

11 THE WITNESS: I said that I verified
12 about 50 percent of the numbers on Exhibit 12.

13 EXAMINER BOJKO: Right.

14 THE WITNESS: And I didn't find any
15 errors so I stopped my check at that point.

16 EXAMINER BOJKO: Right. But you didn't
17 independently verify the numbers in the range on
18 RCF-13.

19 THE WITNESS: No. Then the question
20 became did I verify that the range that was depicted
21 on 13 accurately depicted all of the numbers
22 represented in 12. And the point was trying to be
23 made did I check on all of the emission time frames
24 involved, whether they were 3-hour, 24-hour, and I

1 tried to indicate that that's a very difficult thing
2 to do because different permit applications present
3 different -- different time bases, so you have to use
4 a judgment factor of whether there's consistency
5 between the time frames or not.

6 EXAMINER BOJKO: Okay. Thank you.

7 THE WITNESS: The data isn't always
8 available on the same basis.

9 Q. (By Mr. Fisk) And you stated just a
10 minute ago that you're not aware of the full range of
11 opinions of the various citizen groups in this
12 proceeding, correct?

13 A. Correct.

14 Q. And the opinions and positions of the
15 citizen groups is outside of the scope of your
16 testimony, correct?

17 A. Yes.

18 Q. You may have -- do you recall Mr. Bentine
19 asking you whether your analysis here was
20 preliminary?

21 EXAMINER BOJKO: I'm sorry, can you
22 reread the question?

23 (Question read.)

24 EXAMINER BOJKO: With regard to what?

1 Isn't he representing the citizen groups' positions
2 in this case?

3 MR. FISK: Whether all of the
4 organizational positions of the various
5 organizations, whether he's testifying to those.

6 EXAMINER BOJKO: Outside the scope of
7 this hearing?

8 MR. FISK: Outside the scope of his
9 testimony.

10 EXAMINER BOJKO: But you're not
11 suggesting that he doesn't represent the citizen
12 groups' opinions with regard to this proceeding, are
13 you?

14 MR. FISK: No. No. I'm just saying he's
15 not -- his testimony does not discuss -- he's not
16 testifying on the full range of opinions that the
17 various citizen groups have.

18 EXAMINER BOJKO: Outside of this
19 proceeding.

20 MR. FISK: Yes.

21 EXAMINER BOJKO: Okay. Please continue.

22 Q. (By Mr. Fisk) Do you recall Mr. Bentine
23 asking you whether your analysis was preliminary?

24 A. Yes.

1 Q. And your answer was?

2 A. My answer was "yes."

3 Q. And what do you mean by that?

4 A. What I mean by that is it could form the
5 basis for AMP-Ohio looking at other options. What
6 I'm trying to show them is other technology options
7 that are available to them that can get lower
8 emissions and still be economically feasible, that
9 would form the basis of them doing a more detailed
10 engineering evaluation or perhaps even a
11 site-specific evaluation which would be the follow-on
12 steps.

13 So when I talk about preliminary, I mean
14 obviously no one would then go ahead and build a
15 plant based on what I've said. We'd want to go the
16 next steps in the process. A preliminary feasibility
17 study and then a detailed engineering study on a
18 site-specific basis, okay? None of these are saying
19 that these are the numbers for the AMP-Ohio site or
20 the coal that AMP-Ohio may select.

21 EXAMINER BOJKO: Just for the record,
22 you're pointing to a chart and the record can't see
23 that you're pointing to a chart, and you're saying
24 "these" and "they" and I think it's a little

1 confusing what you're talking about. Could you
2 please clarify?

3 THE WITNESS: Yes.

4 EXAMINER BOJKO: Would you like her to
5 read your response back?

6 EXAMINER PRICE: I think she just wants
7 you to clarify the "these" and "those" with exhibit
8 numbers, that's all, because you're pointing to it
9 but the Board, when they read the transcript, won't
10 understand what you're saying.

11 EXAMINER BOJKO: No, actually, you said
12 these locations are these, and I think you're talking
13 about all the plants listed on chart RCF-19. Is that
14 correct?

15 Will you read his response back with
16 "these" and "they"?

17 (Record read.)

18 THE WITNESS: I was talking about my
19 testimony in general is not site specific and that
20 would be the next level of detail that somebody would
21 have to go to confirm that that's the path they want
22 to follow.

23 EXAMINER PRICE: So are you recommending
24 that the Board, in considering alternatives, because

1 the Board has to decide whether to approve or not
2 approve AMP-Ohio's application, are you saying that
3 in order for the Board to properly consider those
4 alternatives that they should do full engineering
5 studies on an IGCC plant to compare that with the
6 full engineering studies that were done on the AMPGS?

7 THE WITNESS: I'm suggesting that other
8 alternatives look --

9 EXAMINER PRICE: You have to answer my
10 questions "yes" or "no." Whatever happens with
11 Mr. Bentine, you have to answer mine "yes" or "no."

12 Are you suggesting that the Board do a
13 full engineering study, require AMP-Ohio to do a full
14 engineering study site specific for an IGCC plant in
15 order to compare whether or not that is a minimum
16 environmental impact alternative, an alternative with
17 the minimum environmental impact?

18 THE WITNESS: No.

19 EXAMINER PRICE: Thank you.

20 EXAMINER BOJKO: Go ahead.

21 MR. FISK: Could I take three minutes and
22 look at my notes? I think I'm done, but I want to
23 make sure.

24 EXAMINER PRICE: We've been very

1 disruptive.

2 EXAMINER BOJKO: Let's go off the record
3 for three minutes.

4 (Recess taken.)

5 EXAMINER BOJKO: Let's go back on the
6 record.

7 Mr. Fisk.

8 MR. FISK: I'm done with redirect.

9 EXAMINER BOJKO: Okay. Great. Thank
10 you.

11 Now, Miss Young, it is your opportunity
12 to ask questions on recross.

13 - - -

14 RECROSS-EXAMINATION

15 By Ms. Young:

16 Q. Okay, my questions will be mercifully
17 short. In terms of costs, we heard a lot about
18 financial costs but not really very much about what
19 might be outsourced to the community, and I'm curious
20 if carbon sequestration, focusing on the S that you
21 talked about, the actual sequestration, if that would
22 increase the electricity costs from what we have here
23 on these.

24 MR. BENTINE: I'm going to object.

1 EXAMINER BOJKO: Basis?

2 MR. BENTINE: It's outside the scope of
3 redirect.

4 EXAMINER BOJKO: It can be related. I'm
5 going to give her a little leeway given we didn't let
6 her have an opportunity before.

7 MR. BENTINE: In that case let me
8 withdraw my objection.

9 MS. YOUNG: Okay.

10 Q. (By Ms. Young) I guess I was thinking
11 specifically --

12 EXAMINER BOJKO: Wait. You asked your
13 question. Let him answer.

14 A. I'm sorry, can you repeat the question?

15 Q. Yes. All of these terms --

16 EXAMINER BOJKO: Miss Young, the court
17 reporter can repeat the question, you don't need to.

18 (Question read.)

19 EXAMINER BOJKO: Could you clarify what
20 you mean "on these"?

21 MS. YOUNG: The fix that he was referring
22 to earlier.

23 EXAMINER BOJKO: But are you referencing
24 the AMP-Ohio plant that's proposed or are you

1 referencing carbon sequestration on an IGCC plant,
2 which I think those are the numbers that he's been
3 talking about most today.

4 MS. YOUNG: Well, I guess I was thinking
5 specifically in terms of ensuring public health and
6 safety. I've read where seismic activity has been
7 induced --

8 EXAMINER BOJKO: Let's back up.

9 MS. YOUNG: That's hearsay I guess.

10 EXAMINER BOJKO: No. No. Let's just
11 focus on your question because it's a proper
12 question, let's just clarify it. Are you talking
13 about the increase in costs to do carbon
14 sequestration on the AMP-Ohio plant that's proposed
15 or on the IGCC plant that he's been talking about, or
16 both?

17 MS. YOUNG: Both, in terms of community
18 risk.

19 EXAMINER BOJKO: Let's just answer the
20 cost issue. Okay, could you answer the cost issue,
21 Mr. Furman, please?

22 THE WITNESS: Yes. The cost for
23 capturing CO2 and sequestering CO2 will significantly
24 increase the cost more so for a pulverized coal plant

1 than an IGCC plant as indicated in my testimony.

2 EXAMINER BOJKO: You say "more so." It
3 will also increase the cost for the IGCC plant.

4 THE WITNESS: Correct.

5 EXAMINER BOJKO: Okay.

6 Does that answer your question?

7 MS. YOUNG: It answers part of it.

8 EXAMINER BOJKO: Okay.

9 Q. (By Ms. Young) The other part of that
10 question is that do any of the figures that we saw
11 today that incorporated carbon sequestration costs,
12 did those take into account ensuring public health
13 and safety for things like doing monitoring for
14 seismic activity, things like that, doing things like
15 having an emergency evacuation plan if there would be
16 some type of accident?

17 And I guess I'm saying beyond carbon
18 sequestration, even with Powerspan, even with any of
19 these technologies are public health and safety taken
20 into the cost or would that further increase the cost
21 of either of these technologies?

22 A. We don't know until we go through the
23 steps of the development process to test the geology,
24 put small quantities of CO2 in the ground and test to

1 see if leakage occurs, then assign a probability of
2 whether that short-term test can be extrapolated to
3 long-term results.

4 EXAMINER BOJKO: Mr. Furman, wouldn't or
5 is any cost associated with those studies, those
6 geology studies, and every kind of study that's gone
7 into this sequestration, wouldn't the cost of those
8 studies be considered as part of the cost to have
9 this technology?

10 THE WITNESS: Yes. Yes.

11 EXAMINER BOJKO: Does that help?

12 THE WITNESS: And, of course, they use
13 the basis for developing those costs, how far they'd
14 have to transport the CO2, how far underground they'd
15 have to put it, so there were assumptions made to
16 come up with those costs.

17 Q. Those sounded to me like they were more
18 in terms of installation than in doing additional
19 measures to ensure health and safety. For instance,
20 when they used ammonia scrubbers and SCRs over at
21 Cheshire, which is the village that was purchased
22 near me because of problems with those technologies,
23 initially they had a six-minute evacuation plan for
24 people to get nine miles out of town. Six minutes,

1 nine miles. And so I'm curious if those kinds of
2 studies or if there's any consideration into these
3 costs done beyond mere installation, into actually
4 taking measures to ensure public health and safety.

5 A. How much of that they included in their
6 cost I do not know.

7 Q. Would doing a year of preconstruction
8 ambient air monitoring as required under the Clean
9 Air Act increase these costs?

10 MR. BENTINE: Objection.

11 EXAMINER BOJKO: I'm going to have to
12 agree, now we're getting a little beyond anything
13 we've heard today. So let's try to constrain our
14 questions to the testimony that we've actually talked
15 about today. I'm giving you a little leeway here,
16 but that is well beyond anything we've heard, so --

17 MS. YOUNG: Well, we heard a lot about
18 modeling numbers and average numbers, but I really
19 didn't hear anything about measuring our actual air
20 quality and I was curious if that would increase
21 costs, so that's where I was going with that. Maybe
22 it's not relevant, but . . .

23 EXAMINER BOJKO: I'm not sure this
24 witness can testify to those kind of air quality

1 issues.

2 Can you?

3 THE WITNESS: Yeah, I'm not an expert in
4 that.

5 MS. YOUNG: Okay.

6 EXAMINER BOJKO: Maybe another witness of
7 the company would be better able to answer that kind
8 of question.

9 MS. YOUNG: Okay. Those are all my
10 questions.

11 EXAMINER BOJKO: All right. Thank you.

12 Mr. Bentine, recross? Or Staff. I'm
13 sorry. Oh, no. Yes. Sorry, Mr. Bentine. It's been
14 a long day.

15 MS. MALONE: We don't have any questions.

16 MR. JONES: No questions for Staff.

17 EXAMINER PRICE: Don't speak too soon, it
18 might come up.

19 MS. MALONE: Well, okay, I do have one
20 question.

21 EXAMINER BOJKO: No. No. You're after
22 Mr. Bentine.

23 MS. MALONE: Okay.

24 MR. BENTINE: But you can ask it now,

1 Peggy.

2 MS. MALONE: No, you'll probably ask it,
3 because I'm just confused.

4 MR. BENTINE: Well, I am, too.

5 - - -

6 RECROSS-EXAMINATION

7 By Mr. Bentine:

8 Q. Mr. Furman, do you consider anything you
9 said on your redirect inconsistent with the answers
10 that you gave me in response to my questions during
11 my cross-examination?

12 A. I thought they were more complete.

13 Q. Okay. But not inconsistent.

14 A. No.

15 Q. Okay. Now, maybe starting from the end,
16 I was interested in your discussion of carbon
17 sequestration and the testing on that and what needed
18 to be done. Is that 15 years away as you said
19 Powerspan was?

20 A. Depends on how aggressive we become. I
21 think it's further along -- I think Powerspan is
22 further down the road than sequestration.

23 Q. And also let me ask you this, because I
24 can't resist, let's say for a moment that AMP-O said,

1 "Mr. Furman, by golly, you're absolutely right.
2 We're going to study IGCC. You're right." We go
3 study IGCC, we come back here with an application
4 next week to file with the Board that says we're
5 going with IGCC instead of PC technology down here
6 and since we can't have CCS yet, as we've just talked
7 about, are the folks you're representing going to be
8 fine with us building that 1,000-megawatt IGCC plant?

9 EXAMINER BOJKO: Without CCS?

10 MR. BENTINE: Without CCS.

11 MR. FISK: I'm going to object to that.

12 A. I don't feel qualified --

13 MR. FISK: I'm going to object because
14 that's beyond the scope of his testimony.

15 EXAMINER BOJKO: Oh, I don't think it's
16 beyond the scope. I don't think it's beyond the
17 scope of both Miss Young's questions as well as a
18 couple of yours.

19 MR. FISK: It's beyond the scope of
20 Mr. Furman's testimony.

21 EXAMINER BOJKO: Well, he just spoke to
22 the technology being 15 years down the line and he --
23 the reason why I asked some of my questions of who he
24 is representing in this case is to this issue. Let's

1 ask him if he knows. If he doesn't know, then that's
2 fine.

3 Do you know, Mr. Furman?

4 A. I think I stated what I knew initially in
5 response to your question on each of the three.

6 Q. So it's possible we could be back here in
7 another proceeding in which those folks are putting
8 up witnesses saying that we shouldn't build this
9 plant because we don't have CCS.

10 A. Yes.

11 MR. FISK: Your Honor, I think I'd object
12 once again to --

13 EXAMINER BOJKO: Well, I overrule. He is
14 your witness, he is here to testify about positions
15 of your entities that have intervened in this case.

16 MR. FISK: Right.

17 EXAMINER BOJKO: So if he can speak to
18 the positions that he is here to testify to, then he
19 should be speaking to --

20 MR. FISK: He's testifying to whether or
21 not the standard set forth -- whether or not there
22 are less environmentally damaging alternatives
23 available. He's identified some. He's not
24 testifying to -- his testimony does not describe the

1 specifics of whether or not the specific
2 organizations would agree to something that is not
3 currently being proposed by AMP.

4 EXAMINER BOJKO: He's an expert witness
5 for the citizen groups that is here to testify that
6 the power plant as proposed is not the least
7 environmentally viable option or that there are
8 alternatives out there.

9 MR. FISK: Correct. Yes.

10 EXAMINER BOJKO: Mr. Bentine has proposed
11 an alternative, would he be in the position to
12 support or would the people he is here testifying on
13 behalf of support one of the alternatives that he is
14 recommending, and I think he can answer. If he
15 knows, he can answer that question.

16 Do you know?

17 THE WITNESS: Yes. I think I can give a
18 generic answer that will satisfy both. All right,
19 what has been proposed is the worst environmental
20 alternative using pulverized coal. The next best --
21 so no environmental group is going to like this
22 plant, it has too much emissions and not enough
23 chance to get better.

24 EXAMINER PRICE: Mr. Furman, again,

1 you're pointing to an exhibit. No. No. No. You
2 want to say out loud for the record --

3 MR. FISK: Which exhibit.

4 EXAMINER PRICE: -- which plant you're
5 talking about here.

6 THE WITNESS: The AMP-Ohio plant as
7 proposed is the worst environmental alternative for
8 using pulverized coal because of the high emissions
9 compared to other alternatives. No environmental
10 group is going to agree to a plant with this high an
11 emissions rate. There are some environmental groups
12 that will go with an IGCC plant because it has
13 significantly improved emissions of criteria
14 pollutants. Some environmental groups do not think
15 that's good enough, they think a plant must be built
16 with some carbon capture.

17 Some environmental groups believe that no
18 coal plant should be permitted, that there are other
19 alternatives such as conservation and renewable
20 energy.

21 Q. (By Mr. Bentine) And an example of the
22 last that you mentioned was Sierra Club which is the
23 entity that you are at least partially here on behalf
24 of. And an example of a group that does not want a

1 plant, IGCC or otherwise, that doesn't have carbon
2 capture is the NRDC; is that correct?

3 A. That is probably outside my area of
4 expertise. I'm just trying to tell you what the
5 technology options are, not what the political
6 positions are of the environmental groups. I'm a
7 technology expert, not a policy expert.

8 Q. I think that's probably enough on that, I
9 think we're clear.

10 I want to ask you one quick question
11 about the reference back to AMP-0 9 on page 34, which
12 is the last page of that exhibit.

13 EXAMINER BOJKO: Which page of this?

14 MR. BENTINE: It's the last page of the
15 exhibit, the one with the chart.

16 A. On the MIT study.

17 Q. Yes. I'm sorry.

18 A. Yes.

19 Q. I want to refer you to a little further
20 from the portion that your counsel had you read and
21 it says "Gasifier availability is now 82-plus
22 percent." Do you see that?

23 A. Right.

24 Q. That doesn't say "90," does it? It says

1 "82," correct?

2 A. Correct.

3 Q. It doesn't say "94."

4 A. I think they're referring to the existing
5 older plants that they show in that chart.

6 Q. Okay. The document's going to speak for
7 itself, but to the extent it says that, that says
8 "gasifier availability," that's not plant
9 availability, correct?

10 A. Correct.

11 Q. And plant availability is always going to
12 be, at a maximum, what the gasifier availability is
13 absent alternate backup fuel.

14 A. Correct. And I think the bottom-line
15 number that I think you might want to reference from
16 the MIT report is the fact that for their analysis
17 they used 85 percent availability for the PC plant
18 and 80 percent availability for the IGCC plant.

19 MR. BENTINE: Move --

20 A. So the important number in that is the
21 delta, the 5 percent difference without a stand-by
22 fuel.

23 MR. BENTINE: I'm sorry, I have to move
24 to strike the last portion of that answer as not

1 responsive.

2 EXAMINER BOJKO: Sustained. Strike
3 everything after "Correct."

4 Q. Mr. Furman, I believe you testified that
5 you now think that RCF-6, the DOE study, is a little
6 better than RCF-5. Do you remember that conversation
7 with your counsel?

8 A. Yes.

9 Q. Did you say that in your original
10 testimony?

11 A. No, I did not.

12 EXAMINER BOJKO: Is better?

13 MR. BENTINE: He thought it was more
14 accurate. Better. More reliable.

15 THE WITNESS: More current.

16 Q. More current; we'll take that one.
17 Whatever the distinction was that you made in
18 response to your counsel, that distinction was not
19 made in your testimony originally, correct?

20 A. No. No.

21 Q. Yes, it is correct, no, you didn't. Just
22 so we're clear.

23 A. I did not make that distinction.

24 Q. And you made in your redirect the same

1 point that I think you made in your testimony earlier
2 with regard to we can't compare to the demo plants,
3 we need to compare to these newer IGCC plants, and
4 you went on and talked about and referred us to
5 RCF-19 which was up there on the board. Can you pull
6 that one back up again?

7 Now, you discussed two plants on there
8 and started talking about their reliability. One was
9 the 545 in Sarlux; is that right?

10 A. Yes.

11 Q. And the second was which one?

12 A. ISAB Energy.

13 Q. And that's the 520 one?

14 A. Yes.

15 Q. Neither one of those are coal, correct?

16 A. Correct.

17 Q. And both of those are what we call
18 poly-gens?

19 A. No; they're IGCC.

20 Q. I thought the ISAB said hydrogen/power
21 was --

22 A. They may take a small portion of the
23 syngas and make some hydrogen also, but that doesn't
24 mean it's not an IGCC.

1 Q. Not what I said. It's poly-generation,
2 correct? Is it or is it not?

3 A. Could I define "poly-generation"?

4 Q. I thought we did that early on today, but
5 go ahead and maybe it will be the same, maybe it will
6 be different, it's your risk. Go ahead.

7 A. What makes an IGCC unit an IGCC unit is
8 that it has a gasification system and it also has a
9 combined cycle unit that generates electricity. So
10 you have an IG, integrated gasification, that's one
11 portion, CC, combined cycle. An IGCC is the
12 combination of the gasifier with a combined cycle
13 unit. These are that, and they do produce that
14 amount of electricity. They are an IGCC unit in and
15 of themselves.

16 MR. FISK: Could you clarify which
17 exhibit you're referring to?

18 THE WITNESS: I'm sorry. Actually
19 there's four units in Italy.

20 MR. FISK: Could you clarify which
21 exhibit you're referring to?

22 THE WITNESS: Exhibit 19. RCF-19.

23 Q. Well, I'm trying to stick to two right
24 now because those are the two that you raised with

1 your counsel, so if you want to go to four --

2 A. That's fine.

3 Q. Back on RCF-19, then, I don't see
4 availability on this anywhere.

5 A. No; it's in my testimony.

6 Q. Could you point back to me in your
7 testimony where you had the availability score for
8 these two plants specifically?

9 A. Page 32 starting at line 14.

10 Q. I don't see any reference to either one
11 of those plants there.

12 A. It's included in the reference that I
13 have and in the statement as the report notes, the
14 availability of these plants are between 90 percent
15 and 94 percent. "Source: Refinery IGCC plants are
16 exceeding 90 percent capacity factor after 3 years."

17 Q. What's the difference between an
18 availability factor and a capacity factor?

19 A. The megawatt-hours that you run the unit
20 at.

21 Q. Are availability factors and capacity
22 factors interchangeable?

23 A. No. The availability -- the capacity
24 factor cannot by definition be higher than the --

1 excuse me.

2 The availability -- the capacity factor
3 by definition cannot be lower than the availability
4 number. Would you like me to explain?

5 Q. No; I'm thinking about what you said.
6 You said the capacity factor cannot be lower than the
7 availability factor?

8 A. Yes.

9 Q. I'll take that answer.

10 You have as the source for this 90 to
11 94 percent -- who's Harry Jaeger?

12 A. He's the gasification editor for Gas
13 Turbine World.

14 Q. Okay. And Gas Turbine World is what?

15 A. An industry publication.

16 Q. Okay. Do you know -- can you go to EIA
17 data and make a determination on what the ISAB plant
18 in Mission, Italy, or the Sarlux plant in Sardinia
19 are doing?

20 A. No. He did that. He talked to those
21 plant people and he got their data in order to write
22 this article.

23 Q. Do you know what he did to verify that
24 their data was correct?

1 A. No, I do not.

2 Q. And what did you do to verify that his
3 data was correct based on the data that you don't
4 know whether or not he verified?

5 A. I talked to other experts that have
6 visited those plants and they confirmed these
7 numbers.

8 Q. Other experts confirmed those numbers.

9 A. Yes.

10 Q. And that's nowhere in your testimony, is
11 it? The only citation in your testimony on these
12 availabilities is an article in Gas Turbine World,
13 correct?

14 A. No; I cite the availability from the
15 Tampa Electric plant which came from the plant
16 manager.

17 Q. I'm talking about the two Italian plants
18 that you just talked about on redirect.

19 A. Could you state his question again?

20 Q. I didn't know you were referring to just
21 the Italian plants.

22 MR. BENTINE: Could I have my question
23 reread, please?

24 EXAMINER BOJKO: Yes, please reread it.

1 (Question read.)

2 A. As I said, I've talked to other industry
3 experts who have visited those plants and they
4 confirmed that these numbers of availability are
5 correct. I don't know what else you want me to do
6 other than go to the plant and run the test myself.

7 Q. Well, that would be a start.

8 A. This is what experts have to rely on.

9 EXAMINER BOJKO: Okay, let's --

10 A. They have to rely on data presented by
11 plant personnel.

12 EXAMINER BOJKO: Mr. Furman, and
13 Mr. Bentine, let's confine this to question and
14 answers, please.

15 MR. BENTINE: I apologize.

16 EXAMINER BOJKO: Do you have another
17 question, Mr. Bentine?

18 MR. BENTINE: Yes, I have a couple other
19 questions.

20 Q. Going to Taylorville -- before I go on to
21 that, can you name those experts that you talked to
22 to verify the 90 and 94 percent for those two Italian
23 plants?

24 A. Yes. One of them is John Thompson.

1 Q. And that's the same John Thompson that we
2 talked about that works for the Clean Air Task Force
3 that provided two of your exhibits at least?

4 A. Yes.

5 Q. Okay. And who else?

6 A. Norm Schilling.

7 Q. And who's Norm Schilling?

8 A. Norm Schilling is project manager for the
9 IGCC plants at General Electric.

10 Q. Okay. We've already talked about General
11 Electric and IGCC.

12 A. Who will you believe?

13 EXAMINER BOJKO: Okay, let's -- question
14 and answers.

15 MR. BENTINE: I apologize, your Honor,
16 it's late. It's been a long day for both Mr. Furman
17 and I.

18 THE WITNESS: You're going to make me
19 miss my plane.

20 EXAMINER BOJKO: Could be.

21 MR. BENTINE: Could be.

22 EXAMINER BOJKO: I think at this point
23 it's inevitable, Mr. Furman.

24 Q. (By Mr. Bentine) Let's talk about

1 Taylorville for a second, Mr. Furman.

2 EXAMINER BOJKO: Can we go off the record
3 real quick?

4 (Discussion held off the record.)

5 EXAMINER BOJKO: Back on the record.

6 Q. Back to Taylorville for a second. You
7 were talking about Taylorville potential emissions
8 compared to AMP-Ohio PC. Do you know the specific
9 costs of Taylorville?

10 A. No, I do not.

11 Q. Do you know whether or not there were any
12 rate incentives? And that's Illinois I believe?

13 A. I do not know.

14 Q. Could rate or tax incentives cause one to
15 choose a technology that may be more expensive, but
16 with the rate incentives or tax incentives it becomes
17 less expensive?

18 A. That's possible.

19 Q. Now, you talked about the Gainesville
20 utility. Do you know how much generation Gainesville
21 currently has as compared to its load?

22 A. Probably less than -- how much their
23 generation or load is?

24 Q. No; how much their generation is compared

1 to their load. In other words, if they have a
2 thousand megawatt peak, do they have a hundred
3 megawatts of generation or do they have
4 1,100 megawatts of generation or something in
5 between, if you know?

6 A. I don't know.

7 Q. I believe you did indicate they do have
8 other coal-fired units; do they not?

9 A. Yes. And they're out looking for
10 additional capacity to meet future loads.

11 Q. I believe you indicated earlier, and
12 correct me if I'm wrong, in talking about a PC plant
13 you said -- well, actually I think the context was a
14 question and answer from your counsel when you were
15 talking about the 95 percent summer availability that
16 IGCC reached with alternate fuel. Do you recall
17 that?

18 A. Yes.

19 Q. Okay. And I believe you said something
20 like, and correct me if I'm wrong, a PC plant is not
21 going to be able to do that.

22 A. Correct.

23 Q. So you would be very surprised if we
24 would show you, for example, that a 50-year-old

1 plant, pulverized coal, was able to meet 95 percent
2 or better availability and capacity factor in the
3 summer peak season?

4 A. No. No. Wouldn't surprise me, but
5 you're taking one specific example as opposed to
6 averaging over a representative sample period.

7 Q. And you're not, with your 94 percent and
8 one unit in a summer availability that you've talked
9 to the plant manager about?

10 A. I'm telling you what it's capable of.

11 Q. Okay. You also, in response to questions
12 of your counsel, again, talked about the ability of
13 alternate fuels was a real advantage for an IGCC
14 plant. Do you recall that?

15 A. What was the advantage?

16 Q. The ability to switch fuels.

17 A. Yes.

18 Q. We don't have a shortage of coal in the
19 United States, do we?

20 A. No, but we do have coal strikes and we do
21 have railroad strikes.

22 Q. And would it be your opinion that if
23 there was a particular coal strike, that it might
24 be -- or some other at least regional kind of outage,

1 that it might be able to fire a IGCC on natural gas
2 and you would do that for the time period of the
3 strike?

4 A. You could do that, yes, which allows you
5 greater fuel flexibility, or to go to a petroleum
6 coke, which is lower in cost.

7 Q. Your counsel also asked some questions in
8 which you referred back to RCF-12 and -13; do you
9 recall that?

10 A. Yes.

11 Q. Did you call Mr. Thompson or do anything
12 between when I crossed you and your redirect to make
13 sure about those numbers?

14 A. No.

15 MR. BENTINE: If I might have a moment.

16 Q. Let me verify again. Back on RFC-13 --

17 A. Yes.

18 Q. -- I believe you indicated that the
19 numbers under IGCC were annual numbers; is that
20 right?

21 A. I believe so.

22 Q. And I believe you indicated that your
23 belief was that the numbers under AMPGS were annual
24 numbers as well?

1 A. I believe so.

2 MR. BENTINE: I think we're done.

3 EXAMINER BOJKO: I have some questions.

4 MS. MALONE: Does staff get to go?

5 EXAMINER BOJKO: Do you have recross?

6 MS. MALONE: Just a little.

7 EXAMINER BOJKO: Let's go off the record
8 for one second.

9 (Discussion held off the record.)

10 EXAMINER BOJKO: Okay. Let's go back on
11 the record.

12 Ms. Malone.

13 MS. MALONE: Thank you.

14 - - -

15 CROSS-EXAMINATION

16 By Ms. Malone:

17 Q. Let me ask you to look at RCF-12 and -13,
18 your exhibits that you were just discussing with
19 Mr. Bentine. Just to clarify, I think there was some
20 confusion in discussion about whether the numbers on
21 RCF-13 were annual numbers when we look at the IGCC
22 side.

23 If we look at RCF-12 and we take the
24 first line of information, the SO2 line --

1 A. Yes.

2 Q. Do you have that line in front of you?

3 A. Yes.

4 Q. -- and we look over under the part that
5 says "Application Filed" -- have you located that?

6 A. Yes.

7 Q. -- and you find Taylorville?

8 A. Yes.

9 Q. And what do we find under Taylorville?
10 What's the number?

11 A. .0117.

12 Q. And do you see any other number for SO2
13 looking across that entire exhibit that is that same
14 number?

15 A. Yes.

16 Q. That is .0117?

17 A. Oh. No.

18 Q. Do you?

19 A. No.

20 Q. Yes you do.

21 A. Oh, yes, ERORA Cash Creek.

22 Q. Do you see any other number that says
23 ".0117" in that SO2 column?

24 A. No.

1 Q. Okay. The two numbers that you
2 identified that say ".0117," do they both appear to
3 say "3-hour average" after them?

4 A. Yes.

5 Q. And is the number that we see for SO2
6 range on the IGCC column for sulfur control using
7 Selexol the bottom end of the range, .0117?

8 A. Yes.

9 Q. So if at the bottom end of the range is
10 .0117 as shown on Exhibit 13 and the only SO2 numbers
11 on Exhibit RCF-12 both use that number and use
12 three-hour averages, don't we know that the numbers
13 for IGCC under RCF-13 are, in fact, not annual
14 numbers but three-hour averages?

15 A. Yes, that's true, and that may --

16 MS. MALONE: Thank you. No further
17 questions.

18 EXAMINER BOJKO: Okay.

19 THE WITNESS: That may have been the only
20 number that they submitted.

21 MS. MALONE: There is no question
22 pending.

23 THE WITNESS: So, therefore, that also
24 means --

1 EXAMINER BOJKO: Mr. Furman. Mr. Furman.
2 We need to strike everything after
3 Ms. Malone said "Thank you. No further questions."
4 Mr. Furman, it's getting late, but can we
5 try to just --

6 THE WITNESS: Sure.

7 EXAMINER BOJKO: -- answer questions?

8 THE WITNESS: I thought she wanted all
9 the facts, not just her preferential facts.

10 MS. MALONE: Objection to
11 characterization from the witness. Move to strike.

12 EXAMINER BOJKO: Again, Mr. Furman,
13 unless there's a question posed to you, please do not
14 speak.

15 Strike his last response.

16 - - -

17 EXAMINATION

18 By Examiner Bojko:

19 Q. I have some questions, and my first
20 question I believe is still pending from
21 Mr. Bentine's first question, and that would be what
22 analysis have you done specific to the AMP-Ohio
23 plant? I don't recall ever receiving a response to
24 that question. Have you done any?

1 A. I have taken the results of the permit
2 application numbers and compared them to other
3 options.

4 Q. Are those the permit application numbers
5 or by your own footnote is that from the Staff
6 Report?

7 A. It's the same.

8 Q. But that is the only analysis you have
9 done is reproduced the numbers that were contained in
10 the permit?

11 A. And read the pollution control equipment
12 that they're proposing to use --

13 Q. Okay.

14 A. -- to confirm that there are other
15 plants, other PC plants, that can get significantly
16 lower emission levels using PC technology.

17 Q. Okay.

18 A. Which shows that it's a dirtier
19 pulverized coal plant than other utilities are
20 proposing.

21 Q. Okay, Mr. Furman, it's getting really
22 late --

23 A. Okay.

24 Q. -- I need to get home to my children, as

1 well as I'm sure everybody else does here too, could
2 we just please try to answer my questions.

3 A. Yes.

4 EXAMINER BOJKO: Strike his last
5 statement.

6 Q. On page 1 of your testimony you talk
7 about being a retired consulting engineer and that
8 you volunteer your time, and I'm a little confused
9 about the word "volunteer" that you've used numerous
10 times in this testimony. Is it your testimony today
11 that you are not getting paid?

12 A. I am getting paid.

13 Q. Okay.

14 A. But I also volunteer.

15 Q. Okay. On page 3 of your testimony -- do
16 you have your testimony handy?

17 A. Yes.

18 Q. Most of my question are testimony
19 derived. On page 3 of your testimony on line 20 you
20 start the sentence "My testimony shows how an IGCC
21 plant can provide electricity at a lower cost than a
22 PC plant," and we've talked about this a lot today.
23 What I haven't heard, are you talking about total
24 plant costs? Are you considering capital costs, all

1 of the costs of construction and everything when you
2 make that statement?

3 A. Yes. And I tried to show that by using
4 lower cost fuel like petroleum coke.

5 Q. And in this statement would this plant be
6 with or without CCS? Or doesn't it matter in your
7 sentence?

8 A. Either with or without CCS it would be
9 less expensive than the PC plant.

10 Q. Immediately or over time, and does that
11 include any kind of environmental concerns,
12 regulations, anything of that sort?

13 A. No.

14 Q. You've not taken into consideration this
15 would be lower cost in the long run because of some
16 kind of environmental restrictions or any kind of
17 carbon credits or anything that might have to be
18 purchased that would offset the price or the cost?

19 A. No.

20 Q. Okay. On, for clarification, all of the
21 proposed plants listed on RCF-20, -21, -22, those are
22 all proposed, and -23 and -24, are those all proposed
23 plants, IGCC plants?

24 A. Most of them are IGCC. There are some --

1 a few that do not produce electricity.

2 Q. Okay. And are all those plants, is there
3 a distinction between whether those are industrial
4 plants facilities, or are they used for the
5 industrial sites, or are they operating power plants?
6 Did you make that distinction?

7 A. No, I did not.

8 Q. I thought you made a distinction like
9 that to Mr. Bentine, but it's been so long ago I
10 can't recall.

11 What did you mean, look at page 5 in your
12 statement, lines 19 to 21, when you specifically talk
13 about numerous industrial, nonpower generation
14 gasification facilities around the world.

15 A. I'm sorry, what page?

16 Q. Page 5.

17 A. Yes.

18 Q. Nineteen through 21. Could you explain
19 that sentence to me?

20 A. Yes. The technology for capturing CO2
21 from syngas or from gas in general is a technology
22 that's well developed and being used commercially.
23 When natural gas comes out of the ground, it doesn't
24 come out as just all methane, all natural gas, it has

1 contaminants. One of those contaminants is hydrogen
2 sulfide which is the same contaminant that the form
3 of sulfur takes in syngas.

4 The process -- so a lot of natural gas
5 deposits have to be cleaned of those pollutants.
6 That same technology can and is being used at
7 gasification plants.

8 Q. And when you refer to the, you say
9 numerous facilities around the world, are the
10 facilities that you're referencing in that sentence
11 the same that I just talked about on RCF-20 through
12 -24?

13 A. No, because those are planned and the
14 ones I'm talking about are existing.

15 Q. How many existing? What's "numerous"
16 mean to you? How many existing plants are there?

17 A. Let me refer you to page 31.

18 Q. Of your testimony?

19 A. Of my testimony. Starting at line 4. I
20 think that paragraph clarifies the current situation.
21 "While no existing IGCC plant captures carbon
22 dioxide, industry confidence in the technology is
23 very high. In recent testimony before the Florida
24 Public Service Commission, Tampa Electric described

1 the state of carbon capture equipment from IGCC in
2 these terms," and I quote --

3 Q. Okay. No, that's not really my question.
4 You said there were existing -- numerous existing
5 facilities.

6 A. Yes.

7 Q. How many numerous facilities around the
8 world capture CO2? This statement said there's no
9 IGCC plant that currently captures it; that's not my
10 question. My question is on line 20 of page 5 you
11 use the statement that it is currently being done at
12 numerous industrial, nonpower generation gasification
13 facilities around the world. How many is that? What
14 is "numerous"?

15 A. Probably more than a dozen or two. More
16 than two dozen.

17 Q. Okay. If you could turn to page 8 of
18 your testimony, lines 9 through 13, you're talking
19 about a gasifier and you state that, I'm starting on
20 line 11, that "Since the gasifier operates at higher
21 pressure there is also a much smaller volume of gas
22 that needs to be treated for pollutants and therefore
23 the size of the equipment and capital cost is much
24 smaller."

1 The capital costs that you reference
2 there, are you talking about the capital costs of the
3 gasifier? Capital costs for the total plant? What
4 capital costs are you talking about being smaller?

5 A. It's really for removal of all the
6 pollutants.

7 Q. The equipment that cleans?

8 A. Right. The equipment that cleans the
9 pollutants out of the syngas so that you don't have
10 to clean it after combustion.

11 Q. On page 11 of your testimony, starting --
12 the paragraph starting at line 19, you're talking
13 about the MIT report, "The Future of Coal" in RCF-5,
14 and in that paragraph you make an assertion that to
15 validate their study the MIT report compared their
16 results with other estimates.

17 A. Yes.

18 Q. Is that validation contained in the study
19 or are you speculating to how they arrived at the
20 conclusions that they arrived at?

21 A. No; it's actually -- I included that in
22 my testimony as the Exhibit 5. Exhibit 5 was their
23 comparison with other studies.

24 Q. Do you know exactly what MIT did to

1 validate their study? Do you have personal knowledge
2 of what they did to validate their study?

3 A. They compared it with other studies to
4 see if their conclusions agreed and that's shown in
5 Exhibit 5.

6 Q. Where in Exhibit 5 does it say that? Or
7 are you telling me this was a table taken out of a
8 bigger report, that it says that in this big report,
9 it says it somewhere in there?

10 A. No, this comes from the MIT report. This
11 is their document. These are their numbers, stated
12 as MIT. MIT evaluated these technology options, came
13 up with these costs of electricity.

14 Q. Maybe I'm struggling with the word you
15 used, validate. You're just saying in RCF-5 that
16 they are showing you a chart comparing COE estimates
17 with three other sources. Was that sentence just
18 meant to describe this chart?

19 A. And the purpose that MIT used this chart
20 for. They compared their results with other
21 organizations' studies.

22 Q. Compared what results?

23 A. Let's take the --

24 Q. Okay. Do you think this MIT, that they

1 took these numbers and compared with these GTC, AEP,
2 and GE? That's the point of that sentence, you're
3 just saying they took their resulting numbers and put
4 them in this chart to compare them with these other
5 three numbers?

6 A. Yes.

7 Q. Okay. On page 14 starting line 7 through
8 11 you talk a lot about future requirements and IGCC
9 plants will be less expensive to operate in the
10 future, and the net result of selecting the IGCC
11 plant rather than a pulverized coal plant is lower?
12 Environmental impact now and lower-cost electricity
13 in the future. What future time period are you
14 talking about in this paragraph? You used the
15 "future" word three times. Are we talking a year
16 from now? Ten years from now?

17 A. Five to ten years.

18 Q. In all three "future" words you meant
19 five to ten years?

20 A. Yes.

21 Q. And specifically for requirements on
22 emission limits you're just, I mean how do you know
23 that it's specifically going to be five to ten years
24 that those new requirements will come out?

1 A. I can only give you an example. As an
2 example, the Clean Air Mercury Rule requires sources
3 to meet a certain emission level which AMP-Ohio will
4 just meet, but also part of the Clean Air Mercury
5 Rule is also that each state has a cap that they're
6 going to have to meet, so the state may well have to
7 come back to each of the sources and say "We don't
8 meet that cap in the state, therefore, we're going to
9 have to put on more stringent emission requirements
10 for your plant than presently exists."

11 Q. Okay. But you don't know, there's no
12 pending legislation of the states, I mean, you don't
13 know for sure when that's going to happen, do you?

14 A. I can give you an example in another
15 state where that presented a real problem.

16 Q. I don't need another example. I mean,
17 this is just your best guess, right? I mean, you're
18 not telling me that there's some legislation out
19 there pending that's going to put on a more
20 stringent, and actually I was really focused on the
21 future requirements to capture CO2. I mean, you
22 don't know when that's going to happen for sure, do
23 you?

24 A. No one does.

1 Q. You're just estimating in five to ten
2 years some of these things might pop up?

3 A. I would put a higher probability on it
4 than "might." I would tend to think that they're
5 probable and likely.

6 Q. Okay. I think you answered this question
7 today; on page 15, line 24, you talk about an IGCC
8 plant utilizing petcoke as a lower-cost alternative
9 and, again, you're specifically talking about the
10 fuel type being lower cost.

11 A. Yes.

12 Q. Okay. If you look at page 22, line 5
13 specifically, if you recall a long time ago this
14 morning, probably about 10:30 I would say,
15 Mr. Bentine asked you to define for him what you
16 meant by "proposed PC plants" and I believe you guys
17 came to an agreement that you were talking about the
18 AMP-Ohio two units. Do you recall that conversation?
19 Don't look at page 22 yet. Do you recall that
20 conversation --

21 A. Right.

22 Q. -- with Mr. Bentine?

23 A. Yes.

24 Q. I guess I'm trying to clarify the

1 "proposed PC plants" in line 5 on page 22. That's
2 clearly not the same definition that you had earlier
3 for proposed PC plants. The proposed PC plants here
4 is not the AMP-Ohio units; is that right? I just
5 want to make sure our terminology is clear throughout
6 your testimony.

7 A. Which line are you referring to?

8 Q. Line 5. Because you say "RCF-15 compares
9 the proposed permit emission rates of the AMPS-Ohio
10 plant with two other recently proposed PC plants."

11 A. Yes.

12 Q. Earlier you defined "proposed PC plants"
13 as the proposed AMP-Ohio units. That's not the
14 definition in this sentence, right?

15 A. This sentence is correct. The other
16 sentence incorrectly referred to the two units as
17 plants rather than individual units. Now I probably
18 confused you more.

19 Q. No. No. I'm perfectly clear. I'm
20 trying to make the record clear. You defined the
21 phrase "proposed PC plants" to Mr. Bentine as meaning
22 the proposed AMP-Ohio two units.

23 A. Right.

24 Q. At like 10:30 this morning.

1 A. Correct.

2 Q. And that is not the definition of
3 "proposed PC plants" for purposes of this sentence;
4 am I right? Actually, this whole section from lines
5 4 to 17 on page 22.

6 This isn't a trick question. I'm not
7 trying to confuse you, I just want to make sure that
8 the definition you defined earlier for Mr. Bentine
9 does not carry through to page 22.

10 A. No, it does not.

11 Q. Okay.

12 A. For clarification, the AMP-Ohio plant,
13 singular, consists of two units, plural.

14 Q. Right.

15 A. I mistakenly on page 5 referred to it as
16 plants, plural. These -- my reference to "these
17 proposed plants" is plural. They are two separate
18 plants.

19 EXAMINER BOJKO: Mr. Bentine, do you have
20 the citation of the first one that you clarified?

21 MR. BENTINE: Yes. Yes, your Honor, it
22 is on page 5.

23 EXAMINER BOJKO: This is really just
24 meant to be a clerical clarification in the record.

1 MS. MALONE: I have another approach that
2 might work.

3 MR. BENTINE: It was on page 3, line 19.

4 EXAMINER BOJKO: He defined this phrase
5 and I need to make sure that this defined phrase is
6 not carried through the entire testimony.

7 I'm sorry, what, Mr. Bentine?

8 MR. BENTINE: Actually, it starts on page
9 3, line 19, and it shows up then on line 20 of page
10 4, line 12 on page 4.

11 Q. (By Examiner Bojko) Page 3 is where we
12 first find it.

13 A. Yes.

14 Q. Page 3, line 19, the same phrase,
15 "proposed PC plants," you agreed with Mr. Bentine
16 that that definition was -- that that meant, the
17 equivalent term was "AMP-Ohio plants" meaning the two
18 units at AMP-Ohio. Now, I want to make sure that
19 that definition is not the same definition on page 22
20 of the phrase "proposed PC plants."

21 A. No. Mr. Bentine was correct in making
22 that correction that on line 19 the word should have
23 been "units." If we change the word "plants" to
24 "units," then everything is correct.

1 Does Mr. Bentine agree with that?

2 Q. Are you with me? Are you looking at the
3 testimony? The phrase on page 3, line 19 is
4 "proposed PC plants."

5 A. What page are you on now?

6 Q. Page 3, line 19.

7 A. Yes.

8 Q. You used the phrase "proposed PC plants."

9 A. Right.

10 Q. And now look at page 22, line 5, that
11 same phrase "proposed PC plants" is there. I want to
12 make sure that it's not a term of art and that you
13 don't mean page 22, line 5 to be the AMP-Ohio units
14 because on page 3 with Mr. Bentine you defined that
15 phrase as being a term of art to mean AMP-Ohio's
16 proposed units. Is this right?

17 A. Yes.

18 EXAMINER BOJKO: Okay. I have no further
19 questions. Now, at this time --

20 MR. BENTINE: Your Honor, in response to
21 a question that the Bench raised this witness
22 indicated that AMP's plant was just going to meet
23 Clean Air Mercury Rule.

24 EXAMINER BOJKO: I believe didn't we

1 strike that because he wasn't answering responsive to
2 my question?

3 MS. MALONE: I'm not sure we struck it.

4 EXAMINER BOJKO: Okay.

5 MR. BENTINE: Just to be clear, our
6 position is we're well under Clean Air Mercury Rule.

7 EXAMINER BOJKO: Would you like to
8 respond?

9 MR. FISK: Well, your Honor, there's no
10 redirect, and at this point the witness is done
11 and that would be argument to be made by their
12 experts, not here by --

13 EXAMINER BOJKO: Let's address it in
14 brief.

15 MR. BENTINE: I will certainly --

16 EXAMINER BOJKO: Or by your own witness.

17 MR. BENTINE: Yes, I will take Mr. Fisk
18 up on that, our witness will address that.

19 EXAMINER BOJKO: Okay. At this time --

20 MS. MALONE: I, unfortunately, have
21 something else.

22 EXAMINER BOJKO: Okay.

23 MS. MALONE: But it happened and I -- I'm
24 afraid that in the reference to either the footnotes

1 on RCF-14 or -15, I think at some point, but I'm not
2 sure whether it was the witness or your Honor, the
3 reference to footnote 1 was spoken about in a manner
4 that made it seem like it was in the Staff Report in
5 this case, which is of course not what's indicated on
6 the exhibit.

7 EXAMINER BOJKO: I apologize. That was
8 probably my doing because I read "staff
9 determination" and I asked if it was in the Staff
10 Report and I thought his response was "yes."

11 To clarify, we're looking at RCF-15, the
12 first footnote says "Staff determination for the
13 application to construct under the prevention of
14 significant deterioration regulations for American
15 Municipal Power Generating Station Letart Falls,
16 Ohio," so the column in 1 was not in the Staff
17 Report; is that correct, Mr. Furman?

18 THE WITNESS: I believe it was in the
19 staff determination. Is that the same thing?

20 EXAMINER BOJKO: No. Was it in the Staff
21 Report?

22 MS. MALONE: I'll just get up and testify
23 then you'll be either unhappy or we'll fix it. The
24 staff determination is a term of the art which refers

1 to the document which Ohio EPA, see the note that
2 indicates it's from Ohio EPA, issues as part of its
3 review of an air permit. It is not something that is
4 issued by the staff of the Power Siting Board. It is
5 not a reference to the Staff Report.

6 EXAMINER BOJKO: Okay. I'm sorry, that
7 was my error. With that clarification, do you agree
8 with that --

9 THE WITNESS: Yes.

10 EXAMINER BOJKO: -- Mr. Furman?

11 THE WITNESS: Definitely.

12 EXAMINER BOJKO: Thank you for that
13 clarification.

14 At this time, actually let's take these a
15 bit out of order. Well, we've already moved and
16 admitted Rose Exhibit 1, Miss Young's witness,
17 correct, for the day?

18 Now would the citizen groups like to move
19 their exhibit?

20 MR. FISK: Yes. Mr. Furman's testimony,
21 yes, we would like to move this as Exhibit 1, Citizen
22 Groups' Exhibit 1.

23 EXAMINER BOJKO: And that is Mr. Furman's
24 testimony.

1 MR. FISK: Yes.

2 EXAMINER BOJKO: It's so moved. Does
3 Mr. Bentine on behalf of AMP-Ohio have any objections
4 to the admission of this exhibit?

5 MR. BENTINE: Yes, your Honor, with
6 certain portions of the exhibit.

7 EXAMINER BOJKO: Okay. And for the
8 record, to clarify, we've already excluded -- RCF-7
9 has already been included on a motion to strike, as
10 well as well as the corresponding portion of the
11 testimony --

12 MS. MALONE: Page 14, line 12 through 24.

13 EXAMINER BOJKO: Thank you.

14 With that clarification, do you object to
15 the admission of Citizen Groups' Exhibit 1?

16 MR. BENTINE: Yes, your Honor. Certain
17 portions of it. The motions I will make have to do
18 with certain exhibits that I went through with the
19 witness, to the extent those are granted there would
20 be corresponding portions of the testimony that would
21 no longer be supported that should be moved out as
22 well to the extent that any of these are granted.
23 Care for me to go forward?

24 EXAMINER BOJKO: Yes. Please.

1 MR. BENTINE: First is Exhibit RCF-4
2 which was a source to someone else but modified for
3 reasons that were stated on the record, and I think
4 that makes it inappropriate and move to strike.

5 EXAMINER BOJKO: Response?

6 MR. FISK: Your Honor, we believe this
7 exhibit should be admitted. The change to the
8 exhibit does not affect what Mr. Furman was using the
9 exhibit for. The change doesn't go to the
10 reliability of the exhibit. The part that was
11 removed is not relevant to this proceeding and so we
12 believe that what is there is relevant and a reliable
13 exhibit that should be admitted.

14 EXAMINER BOJKO: The motion to strike is
15 granted.

16 MR. BENTINE: The next one, your Honor,
17 is RCF-8, it's got nothing to do with this proceeding
18 and I believe the cross-examination supports that.

19 EXAMINER BOJKO: Response?

20 MR. FISK: This is clearly relevant to
21 this proceeding. It is a representation of one of
22 the advantages of an IGCC plant which is at issue
23 here and directly relevant to Mr. Furman's testimony,
24 specifically whether through the use of different

1 types of fuels an IGCC plant can achieve lower costs
2 than a pulverized coal plant, and this is an exhibit
3 demonstrating that that can occur.

4 EXAMINER BOJKO: Is the title of the
5 exhibit true and accurate, that it is a Cost of
6 Electricity Comparison Chart for Florida?

7 MR. FISK: Yes, it is, and we believe
8 that that experience in other states can be relevant
9 here and at most the fact that it's from a different
10 state would go to the weight given to that evidence,
11 not to whether or not it's admissible as relevant.

12 EXAMINER BOJKO: The motion to strike
13 based on relevance is granted.

14 MR. BENTINE: Next item, your Honor, is
15 RCF-11. I believe the testimony and
16 cross-examination on this showed that it's just about
17 double unreliable in terms of hearsay. You'll recall
18 there was the reliance on someone else's reliance on
19 someone else.

20 EXAMINER BOJKO: I'm sorry, you trailed
21 off.

22 MR. BENTINE: I'm sorry. This was one in
23 which the Tampa Electric Company person did something
24 with some environmental stuff and we don't know

1 exactly what he did from the environmental footprint
2 source to come up with those numbers, and
3 Mr. Carpinone is not here to testify, and I don't
4 think that this witness stood cross-examination on
5 where these numbers came from and how they were
6 calculated.

7 MR. FISK: Your Honor, I believe these
8 numbers came, and I believe the testimony shows that
9 these actual numbers are from the U.S. EPA's
10 environmental footprint report and that Mr. Carpinone
11 simply added some explanation regarding those numbers
12 and this is the type of information -- so, therefore,
13 there's no evidence that it's not from a reliable
14 source and it's a type of information that an expert
15 can rely on in forming the basis for their opinion
16 and the basis for Mr. Furman's opinion regarding the
17 various environmental impacts and emission reductions
18 that can be achieved for an IGCC versus other type of
19 coal plants. He has the expertise to review these
20 sorts of numbers and conclude that they are relevant
21 to his testimony.

22 EXAMINER BOJKO: I'm going to grant and
23 deny the motion to strike. I believe that the
24 numbers, top portion of the exhibit, are from an EPA

1 report which is a hearsay exception. I think that
2 the notes on the bottom of the exhibit, which are
3 testimony of Mr. Carpinone, is hearsay and, thus, we
4 will strike the Note section with the source of the
5 testimony to a Tampa Electric Company case in
6 Florida.

7 MR. BENTINE: We can take the last two
8 together, your Honor, Exhibits 12 and 13. I think
9 it's been clearly demonstrated that Mr. Thompson is
10 not someone that is generally relied on by others and
11 that these numbers were not done by this witness,
12 half of them may have been verified, but the other
13 half were not, and as pointed out in my cross as well
14 as staff counsel's cross, some of the numbers are
15 curious.

16 So we believe that on the basis that
17 there's really no foundation to let these in and the
18 basis that they are really Mr. Thompson's make them
19 inappropriate to be admitted in this proceeding.

20 EXAMINER BOJKO: Mr. Fisk.

21 MR. FISK: Your Honor, we believe these
22 should be admitted. Looking at RCF-12, there's no
23 evidence that these numbers are incorrect.
24 Mr. Furman has testified that he reviewed 50 percent

1 of them and concluded that they were accurate, and I
2 believe it's within his expertise and appropriate for
3 him to rely on the rest of that table, therefor. You
4 know, he's also testified that he has no reason to
5 question the reliability of those numbers after
6 having confirmed at least half of them.

7 And the numbers on RCF-13 regarding the
8 IGCC reflect the ranges presented in RCF-12. They,
9 therefore, are overall consistent with those and
10 reflect those ranges, and clearly both of these are
11 relevant and in Mr. Furman's expertise to conclude
12 that that is what IGCC plants can achieve.

13 EXAMINER BOJKO: The motion to strike
14 will be granted with respect to both RCF-12 and -13.
15 These are clearly hearsay, they do not fall within
16 the two hearsay exceptions that they could fall
17 within, and I don't believe that the testimony
18 clearly verified or the statement that you just said
19 was accurately reflected in the testimony today.
20 They are hearsay. They're not normally published,
21 and they're not public records.

22 Mr. Bentine?

23 MR. BENTINE: I do have one more, I've
24 been reminded. RCF-15. Now, on the basis of

1 relevance, the Glades plant is cancelled, the Taylor
2 Energy Center is cancelled. I think it's irrelevant
3 to compare our emission rates to PC plants that are
4 not going to be built. Clearly not going to be
5 built.

6 MR. FISK: Permit applications for air
7 permits are clearly relevant to the question of what
8 levels AMP-Ohio can achieve. Both of these --
9 there's no evidence those air permit applications
10 were rejected. Mr. Furman's testimony showed that
11 these two plants referenced in this exhibit were
12 rejected by the state public service commissions, and
13 we believe that it is appropriate for Mr. Furman to
14 use his expertise to review and rely on these two
15 permit applications as examples of what an IGCC
16 plant -- or I mean a PC plant can achieve and to
17 compare those to what AMP has proposed in their draft
18 permit.

19 EXAMINER BOJKO: The motion to strike
20 Exhibit RCF-15 is denied. This was compiled by
21 Mr. Furman himself. It's not a hearsay issue so --
22 and it is relevant, so it will remain.

23 MR. BENTINE: Your Honor, I don't know
24 exactly how you want to handle this. Should we come

1 back in the morning and give you something in writing
2 on the portions that we think would be stricken in
3 the testimony that are consistent with this and these
4 folks can have a chance to respond?

5 EXAMINER BOJKO: I think that would be a
6 wonderful idea. I think putting it in writing so
7 everybody can look at pages and line numbers would be
8 most helpful and then you can respond to each one at
9 that time as opposed to us all trying to find the
10 line numbers and page numbers here tonight.

11 With that said, I am going to -- actually
12 we are going to hold off admitting Citizen Groups'
13 Exhibit 1 until we get the full testimony of what
14 will remain in the record and we need to rule on the
15 further motions to strike regarding the text of the
16 testimony. So we will let that table until the
17 morning.

18 Mr. Bentine, anything further?

19 MR. BENTINE: Yes. We would go ahead and
20 move AMP-O Exhibits 5, the Tampa Electric press
21 release I discussed with the witness, AMP-O Exhibit
22 6 --

23 EXAMINER BOJKO: Let's do one at a time.

24 MR. BENTINE: Okay.

1 EXAMINER BOJKO: Do you have any
2 objection to AMP-Ohio Exhibit No. 5?

3 MR. COLANGELO: No, your Honor.

4 EXAMINER BOJKO: Moved and now it will be
5 admitted.

6 (EXHIBIT ADMITTED INTO EVIDENCE.)

7 MR. BENTINE: AMP-O 6 which is the
8 economic scoping study for aqueous ammonia by the
9 National Energy Technology Lab.

10 EXAMINER BOJKO: Would you like to move
11 that at this time?

12 MR. BENTINE: Yes, your Honor, I move
13 that at this time.

14 MR. COLANGELO: No objection, your Honor.

15 EXAMINER BOJKO: Any objection?

16 MR. COLANGELO: No objection.

17 EXAMINER BOJKO: Okay. So admitted.

18 (EXHIBIT ADMITTED INTO EVIDENCE.)

19 MR. BENTINE: The next item is the AEP
20 news release on the chilled ammonia test by RWE,
21 Alstom, and AEP.

22 EXAMINER BOJKO: Would you like to move
23 that?

24 MR. BENTINE: I would move that at this

1 time, your Honor.

2 EXAMINER BOJKO: Any objections?

3 MR. COLANGELO: We do object, your Honor.
4 The witness testified he had never seen it before,
5 it's hearsay, it's a printout of an AEP press release
6 that was printed off the internet this morning, it
7 has not been authenticated, and there's no
8 foundation, and the only testimony from the witness
9 about it is that he's never seen it before, so we do
10 object.

11 EXAMINER BOJKO: Motion to strike is
12 denied. The Tampa news release was admitted and the
13 AEP news release will be admitted as well. It was
14 publicly released and it speaks for itself.

15 MR. BENTINE: The next item, your Honor,
16 we could move for the admission of AMP-O 8 which is
17 the tracking of new coal-fired power plants which was
18 both referred to by the witness in his testimony and
19 used in my cross-examination.

20 EXAMINER BOJKO: I'm sorry, before we go
21 to 8 I'm going to admit, just so the record's clear,
22 admit AMP-Ohio Exhibit 7. I denied the motion to
23 strike, but I didn't admit it into the record.

24 (EXHIBIT ADMITTED INTO EVIDENCE.)

1 EXAMINER BOJKO: Now you are moving
2 admission of Exhibit 8?

3 MR. BENTINE: Yes, your Honor.

4 EXAMINER BOJKO: Do you object to the
5 admission of Exhibit 8?

6 MR. COLANGELO: No objection, your Honor.

7 EXAMINER BOJKO: AMP-Ohio Exhibit 8 will
8 be admitted.

9 (EXHIBIT ADMITTED INTO EVIDENCE.)

10 MR. BENTINE: Next, your Honor, AMP-Ohio
11 Exhibit 9, which was portions of "The Future of Coal"
12 study referred to by this witness in his testimony
13 and also others in other testimony, but I
14 cross-examined him on those portions, those portions
15 are in this AMP-O 9, not the entire several-hundred
16 page report.

17 EXAMINER BOJKO: You're moving --

18 MR. BENTINE: I move that, yes.

19 EXAMINER BOJKO: Just the excerpt; is
20 that correct?

21 MR. BENTINE: Just the excerpts, yes,
22 your Honor.

23 EXAMINER BOJKO: Do you oppose?

24 MR. COLANGELO: No objection.

1 EXAMINER BOJKO: Okay. AMP-Ohio Exhibit
2 9 will be admitted into the record.

3 (EXHIBIT ADMITTED INTO EVIDENCE.)

4 EXAMINER BOJKO: Mr. Bentine, anything
5 further?

6 MR. BENTINE: Only what time we're going
7 to start in the morning.

8 EXAMINER BOJKO: Do you have anything
9 further, either Mr. Fisk or Mr. Colangelo?

10 MR. COLANGELO: We don't have anything
11 further. We do have one suggestion on scheduling,
12 but we can do that off the record if that's all
13 right.

14 EXAMINER BOJKO: Okay. We are adjourned
15 until tomorrow morning when we will continue this
16 hearing, and we will go off the record at this time.

17 (Thereupon, the hearing adjourned at 6:33
18 p.m.)

19 - - -

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1 CERTIFICATE

2 I do hereby certify that the foregoing is a
3 true and correct transcript of the proceedings taken
4 by me in this matter on Tuesday, December 11, 2007,
5 and carefully compared with my original stenographic
6 notes.

7 *Maria DiPaolo Jones*
8 Maria DiPaolo Jones, Registered
9 Diplomate Reporter and CRR and
Notary Public in and for the
State of Ohio.

10 My commission expires June 19, 2011.

11 (MDJ-3112)

12 - - -

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October 04, 2007 08:30 AM Eastern Time

Tampa Electric Defers Use of Clean Coal Generating Unit Beyond 2013 Needs

Company Cites Financial Risk to Customers, Shareholders from Uncertain Carbon Requirements

TAMPA, Fla.—(BUSINESS WIRE)—Tampa Electric today announced that it no longer plans to meet its 2013 need for baseload generation through the use of integrated gasification combined-cycle technology, or IGCC. Primary drivers of the decision announced today include continued uncertainty related to carbon dioxide (CO₂) regulations, particularly capture and sequestration issues, and the potential for related project cost increases. Because of the economic risk of these factors to customers and investors, the company believes it should not proceed with an IGCC project at this time.

The company remains steadfast in its support of IGCC as a critical component of future fuel diversity in Florida and the nation, and believes the technology is the most environmentally responsible way to utilize coal, an affordable, abundant and domestically produced fuel. Tampa Electric is recognized as the world leader in the production of electricity from IGCC. The company also believes that IGCC technology offers the best platform to capture and then sequester CO₂. Once public policy issues regarding long-term sequestration are resolved, demonstration projects can be conducted that will lead to a better understanding of the science, technologies and economics of sequestration.

President Chuck Black said, "We believe there is a role for IGCC in Tampa Electric's future generation plans, but with the uncertainty of carbon capture and sequestration regulations being discussed at the federal and state levels, the timing is not right to utilize it for a baseload facility needed by 2013. We are not prepared to expose our customers and shareholders to that risk."

"We sincerely appreciate the \$133.5 million in federal tax credits awarded for this project, but with regulatory uncertainty and related potential cost increases, we are concerned that IGCC may not be the most cost-effective technology to use at this time," said Black. "We're going to take a step back and reevaluate how best to meet our 2013 needs."

While technology exists for carbon capture, there remain many uncertainties about carbon sequestration to be resolved before a significant investment like the IGCC unit can occur. As the owner of the first and largest commercial IGCC generating facility, Tampa Electric anticipates that its Polk Unit 1 could be a central part of the research needed to advance the technology, in partnership with government agencies and others.

Peak demand for Tampa Electric is expected to continue to grow by 150 megawatts per year over the next 10 years, taking into consideration strong average annual customer growth of 2.3% and average annual energy sales growth of 2.5%.

With the deferment of the IGCC plan, the company will further study how it plans to meet its needs for more than 600 megawatts of generation in early 2013, evaluating other technologies and fuel options, including natural gas, as well as the impact of expanded energy-efficiency and conservation programs and renewable resources.

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Tampa Electric expects to continue to make significant investments to reliably serve its growing customer base. The company's capital spending for other infrastructure needs, excluding any generation expansion, is unchanged at an annual average of approximately \$400 million through 2011. Tampa Electric's parent company, TECO Energy, remains committed to its debt retirement plans.

Black expressed gratitude to Governor Charlie Crist, the state legislature, environmental organizations like National Resource Defense Council, Audubon of Florida, the Florida Wildlife Federation and the Clean Air Task Force, for supporting the IGCC advanced cost recovery legislation passed by the legislature earlier this year, and restated his belief that this technology can benefit the state in terms of fuel diversity and lower fuel costs to customers in the future.

"There is a good, healthy debate on climate change issues, and once that debate produces clearer requirements, significant investments can be made with greater certainty – and lower risks – for customers and investors," added Black.

Tampa Electric Company is the principal subsidiary of TECO Energy, Inc. (NYSE:TE), an integrated energy-related holding company with core businesses in the utility sector, complemented by a family of unregulated businesses. Tampa Electric Company is a regulated utility with both electric and gas divisions (Tampa Electric and Peoples Gas System). Other subsidiaries are engaged in waterborne transportation, coal and synthetic fuel production and independent power.

Note: This news release contains forward-looking statements, which are subject to the inherent uncertainties in predicting future results and conditions. Actual results may differ materially from those forecasted. The forward-looking statements are based on the company's current expectations and assumptions, and the company does not undertake to update that information or any other information contained in this news release, except as may be required by law. Factors that could impact actual results include: Tampa Electric's peak demand needs and the available alternatives for meeting those needs; general economic conditions in Tampa Electric's service area affecting energy sales; weather variations and changes in customer energy usage patterns affecting sales and operating costs at Tampa Electric and the effect of extreme weather conditions. Additional information is contained under "Risk Factors" in TECO Energy, Inc.'s Annual Report on Form 10-K for the period ended Dec. 31, 2006.

Contacts

Tampa Electric, Tampa
Rick Morera (Media), 813-228-4945
or
Mark Kane (Investors), 813-228-1772

At A Glance

TECO Energy, Inc.

Headquarters: Tampa, FL
Website: <http://www.tecoenergy.com>
CEO: Sherrill Hudson
Employees: 5,000
Ticker: TE (NYSE)
Revenues: \$3,010,100,000 (2005)
Net Income: \$254,700,000 (Non-GAAP) (2005)

Source: via Business Wire
Updated 12/18/2006 by company

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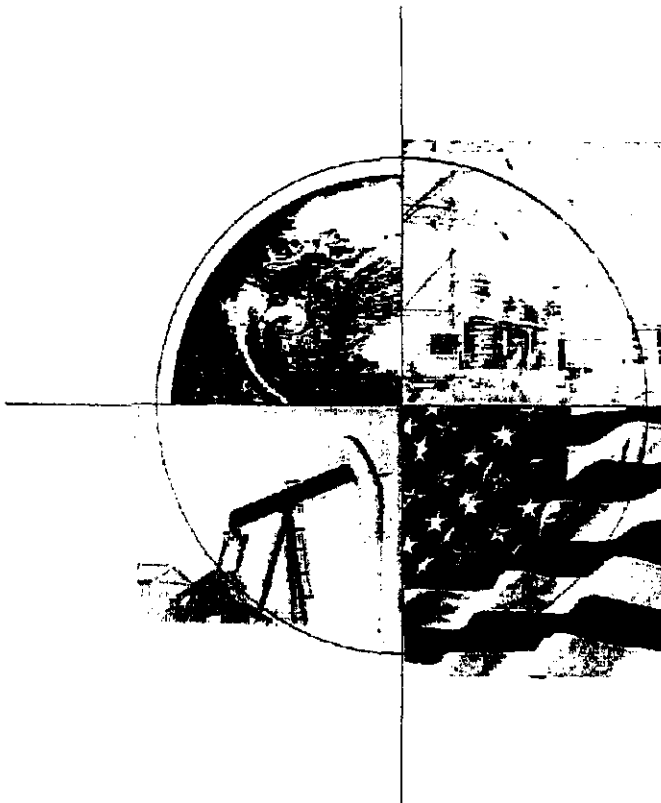
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EXHIBIT

An Economic Scoping Study for CO₂ Capture Using Aqueous Ammonia



Prepared By:

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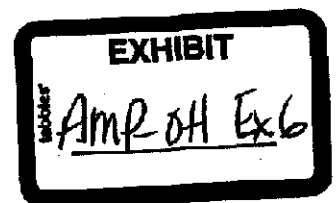
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Revised February 2005



CWS02057

An Economic Scoping Study for CO₂ Capture Using Aqueous Ammonia

Executive Summary

This technical and economic scoping analysis compares CO₂ capture from flue gas using an aqueous ammonia (AA) chemical sorbent to state-of-the-art amine technology. The analysis is based on research into AA-based CO₂ capture conducted at NETL's Carbon Sequestration Science Focus Area. CO₂ capture is considered as a part of a multi-pollutant control system applied to a grass-roots coal-fired power plant.

Like amine, the AA system is a liquid chemical sorbent, but AA technology has two key advantages. First, aqueous ammonia is less expensive than amines (\$0.30/lb CO₂ carrying capacity versus \$3.8/lb CO₂) which will lower chemical make-up costs. Second, AA has a lower heat of reaction for regenerating the chemical sorbent (262 Btu/lb CO₂ captured versus 825 for mono-ethanol amine). Assuming similar benefits from heat integration between the two CO₂ capture processes, the aqueous ammonia process is estimated to use 500 Btu of steam per lb CO₂ captured compared to 1,621 Btu for amines.

It is estimated that aqueous ammonia technology can reduce the heat rate of a PC power plant equipped for CO₂ capture from 11,896 Btu/kWh (amine capture) to 10,140 Btu/kWh. The CO₂ compression load is nearly the same in both cases, but the parasitic consumption of steam is 67% less in the AA case. The capital cost is reduced from \$2,231/kW to \$1,800/kW, partially due to the cascading effect of improved efficiency. AA also offers lower net cost for SO₂, NO_x, and mercury control that benefits the economics of a multi-pollutant system. Fertilizer by-product offers net revenue of 0.50 cents/kWh and the reduced cost for capturing mercury, negligible for AA and \$7,000/lb mercury for a carbon adsorbent system provides 0.04 cents/kWh of savings.

In a supercritical power plant with a multi-pollutant control system, aqueous ammonia has the potential to provide a net cost of CO₂ capture of \$14/metric ton of CO₂ emissions avoided (a 21% increase in COE compared to a pulverized coal power plant without CO₂ capture). However, in an ultra-supercritical steam cycle, aqueous ammonia has the potential to provide a net cost of CO₂ capture of \$13/metric ton of CO₂ emissions avoided with only an 18% increase in COE. The current cost of CO₂ capture using amines is \$47/metric ton of CO₂ emissions avoided (a 67% increase in COE relative to a PC power plant without CO₂ capture). Research challenges include accommodating the flue gas temperature of 130°F, which is hotter than optimal for aqueous ammonia capture, and minimizing ammonia loss in the absorption tower and ammonia slip out the stack.

Background: Analysis Goals and Methodology

The Carbon Sequestration Program at NETL has set the following goals for technologies developed under its CO₂ capture research portfolio [1]:

- Technologies for CO₂ capture from combustion-based steam power plants should capture at least 90% of CO₂ emissions while increasing the cost of electricity by no more than 20%
- Technologies for CO₂ capture from gasification-based systems should capture at least 90% of CO₂ emissions while increasing the cost of electricity by no more than 10%.

This analysis is one of several being conducted to determine the degree to which selected CO₂ capture technologies have the potential to achieve the program goals and to establish a framework for evaluating

progress toward the goals. The aqueous ammonia concept is being pursued within NETL's Carbon Sequestration Science Focus Area [2].

Research on aqueous ammonia use for CO₂ capture is at a very early stage, and a detailed system analysis at this time is not possible. Instead, an economic scoping study has been conducted to quantify the potential benefits of this technology. Our methodology is to develop a heat and material balance for a base case pulverized coal (PC) fired plant with amine-based CO₂ capture, using data from published studies [3, 4]. Then, the performance of the new technology is compared to that of the amine system by developing a heat and material balance and an estimate of the differences in capital and operating cost relative to the base case amine. Where possible, design heuristics (i.e. rules of thumb or guidelines from published papers) were used to estimate flows and sizes of equipment. However, some sizing and costing algorithms are employed for specific equipment such as CO₂ compressors and gas/liquid contact towers. For this initial assessment, a rigorous modeling of unit operations was not performed. This is an area for later work as development of the technology progresses.

Figure 1 shows the system boundary used for this analysis. In estimating the impact of CO₂ sequestration on the cost of electricity, the cost and energy consumption of pipeline transport for 10 miles and injection into a saline formation 1,500 ft below the surface was included. The CO₂ transport and storage performance/economics were based off data presented in a recent DOE/TVA study entitled, "Economic Evaluation of CO₂ Storage and Sink Enhancement Options" [16]. The revenue from by-products, which is an important consideration in the aqueous ammonia analysis, was also assessed and incorporated into the economics.

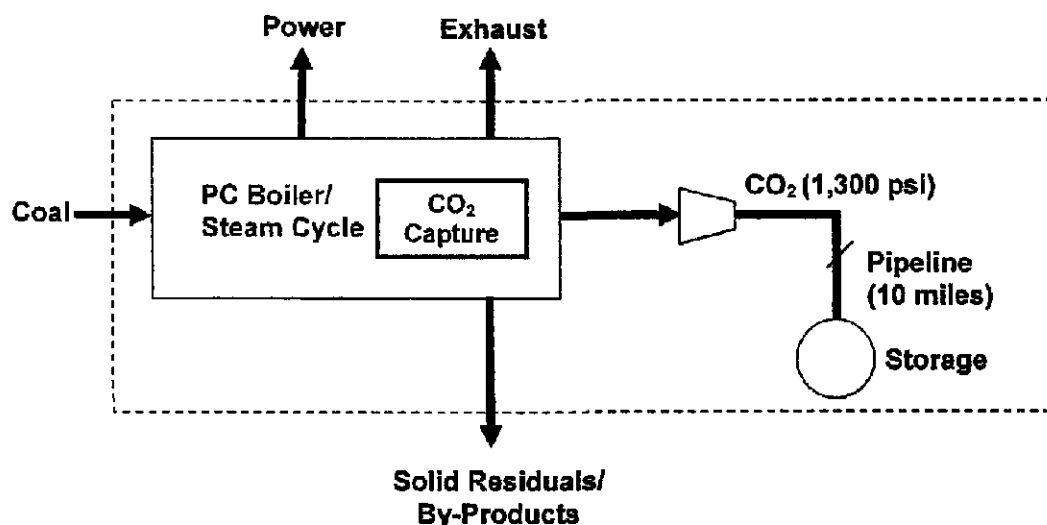


Figure 1. Analysis Boundary

Base Case PC Plant with Amine-based CO₂ Capture

Aqueous ammonia capture of CO₂ is compared to a base case PC plant using conventional amines. A spreadsheet model was developed that is consistent with a previous DOE/EPRI study (Case 7A from [3]) extrapolated to 400 MW net power output. The DOE/EPRI study is based on a supercritical pulverized coal boiler with a net amine reboiler steam consumption of 1,621 Btu/lb of CO₂ captured. Figure 2 and Table 1 show outputs from the model's amine capture case. Parasitic or auxiliary load, shown as 92 MW in Figure 2, is the electric power used to operate pumps, compressors and other equipment in the power plant.

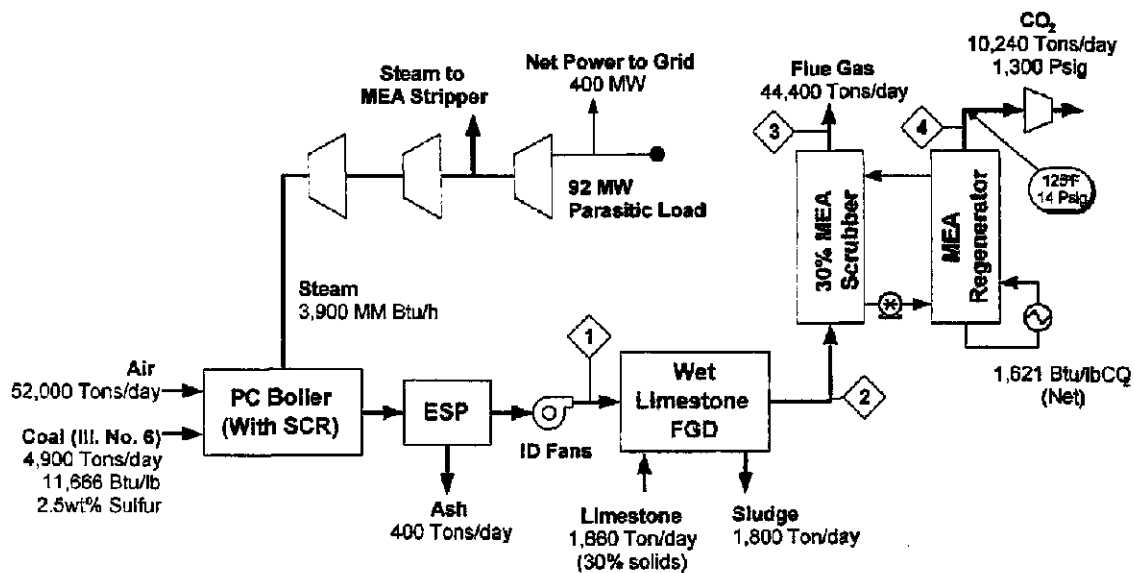


Figure 2. PC Power Plant with Amine CO₂ Capture (DOE/EPRI Case 7A [3])

Table 1. Selected Process Flow Rates and Compositions

		1	2	3	4
		Boiler Effluent	Absorber Inlet	Flue gas Exhaust	CO ₂ Product
Temperature, °F		281	131	136	125
Pressure, psia		14	17	14	1,500
Volume %	CO ₂	14%	12%	2%	100%
	O ₂	3%	3%	4%	0%
	N ₂	74%	70%	77%	0%
	H ₂ O	8%	14%	16%	0%
	SO ₂	0.2%	4.1 ppm	0%	0%
	Argon	1%	1%	1%	0%
Molar flow (lbmoles/hr)		153,383	153,068	133,790	19,500
Vol. flow (10 ⁶ ACFM)		1.57	1.05	1.12	0.0011
Mass flow (tons/day)		55,346	54,602	44,424	10,240

Figure 3 presents a more detailed look at the amine capture system. The size and cost of the absorber tower are functions of the actual volumetric flow rate of flue gas (1.05 million scfm) and percent CO₂ removal (90%). CO₂ in the flue gas is reduced from 14 vol% to 2 vol%. The size and cost of the CO₂ stripper are primarily functions of the amine solution volumetric flow rate, which is calculated from the concentration difference between the rich amine solution (30 wt% MEA, 9.7 wt% CO₂) and the lean amine solution (4.3 wt% CO₂) [5, 6, 7]. The steam load for the amine stripper reboiler is large and pulls steam from the low-pressure turbine as shown in Figure 2. The reboiler provides the net sensible heat required, the heat of reaction, and the heat for stripping steam. The reported 1,621 Btu/lb of CO₂ is the enthalpy change in the steam across the reboiler.

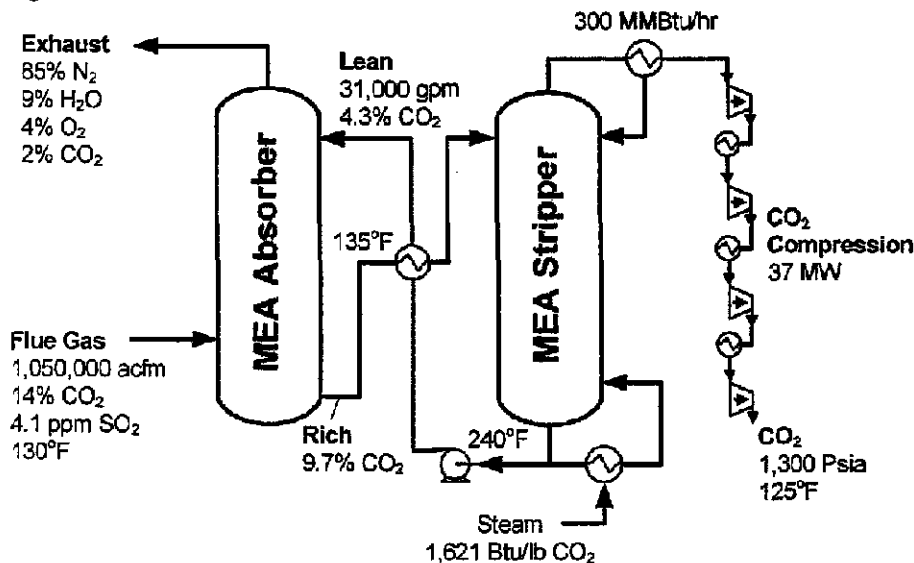


Figure 3. Amine Capture System used in the PC Base Case

Figure 4 shows the size of the CO₂ capture equipment relative to the boiler. This gives a sense of the magnitude of impact that CO₂ capture will have on a PC power plant.

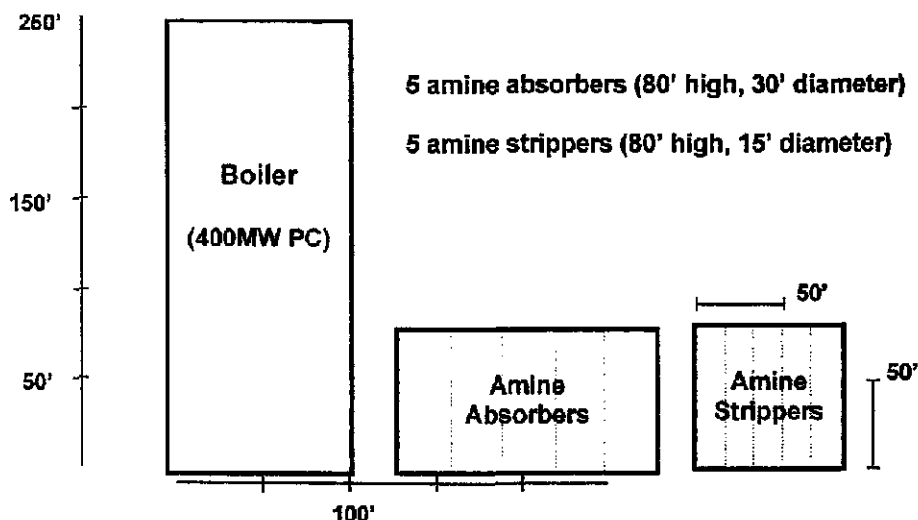


Figure 4. Amine CO₂ Capture Relative Equipment Sizing

A discounted cash flow model was developed that inputs the capital expenditures for a 400 MW PC power plant, variable operating costs including coal use and chemical makeup, fixed operating costs, and by-product revenues. Using a plant economic life of 20 years and a capital charge factor of 14.8%, a cost of electricity that balances expenditures and revenues was calculated. Table 2 shows the results from the cash flow analysis, which closely replicates the results from the DOE/EPRI study [3]. The cost of electricity goes from 4.6 cents/kWh in the no-capture case to 7.6 cents/kWh in the MEA capture case, a 67% increase.

Table 2. Economic Results

		No CO ₂ Capture	MEA CO ₂ Capture
CO₂ Capture	Base Plant (\$/kWe)	1,072	1,460
	Gas Cleanup (\$/kWe)	197	239
	CO ₂ Capture (\$/kWe)	-	310
	Compression (\$/kWe)	-	122
	Total (\$/kWe)	1,270	2,132
	Capital COE (¢/kWh)	2.68	4.50
	Variable COE (¢/kWh)	1.90	2.91
	Total COE (¢/kWh)	4.58	7.41
	\$/tonne CO ₂ Avoided	-	43
Including CO₂ Transportation and Storage*			
Total	Total Capital (\$/kWe)	1,270	2,231
	Total \$/tonne CO₂ Avoided	-	47
	Total COE (¢/kWh)	4.58	7.64
	Increase in COE	-	67%
Basis: 90% CO ₂ Capture, 80% Capacity Factor, 2003 Dollars, Coal \$28/ton			
*CO ₂ Compression to 1,300 Psig, Transport 10 miles and Stored in Saline Formation 1,500 ft			
Sources: NETL Carbon Sequestration Economic Model; Evaluation of Innovative Fossil Fuel Power Plants with CO ₂ Removal, DOE/EPRI, 1000316			

The overall performance for both cases is presented in Table 3. As shown, the current state of amine CO₂ capture is very energy intensive requiring an additional 56.5 MW for capture and compression (an additional 1,415 ton coal/day and approximately 30% decrease in efficiency).

Table 3. Power Plant Performance

		No CO ₂ Capture	MEA CO ₂ Capture
Total Gross Power (MWe)		425	492
Auxiliary Load (MWe)	Base Plant	22.1	28.1
	CO ₂ Capture	-	21.3
	CO ₂ Compression	-	35.2
	NO _x and SO _x	3.1	4.2
	Transport & Storage	-	2.7
	Total	25	92
Net Power		400	400
Coal Flowrate (ton/day)		3,480	4,895
Net Heat Rate (Btu/kWh, HHV)		8,453	11,896
Efficiency		40%	29%
Energy Penalty		-	29%
Energy Penalty: Percent decrease in power plant efficiency due to CO ₂ capture			

PC with Aqueous Ammonia CO₂ Capture

AA is used in commercial applications to capture SO₂ from power plant flue gas. Marsulex and Alstom Power both offer commercial processes for SO₂ removal using ammonia. Powerspan Corp. recently conducted a commercial-scale demonstration of an AA-based multi-pollutant control technology called "ECOTM" for scrubbing SO₂, NO_x, and mercury from flue gas.

The following advantages of the aqueous ammonia process compared to conventional amines have been identified: (1) reduced steam load, (2) more concentrated CO₂ carrier, (3) lower chemical cost, and (4) multi-pollutant control with salable by-products. The impact of each is discussed below.

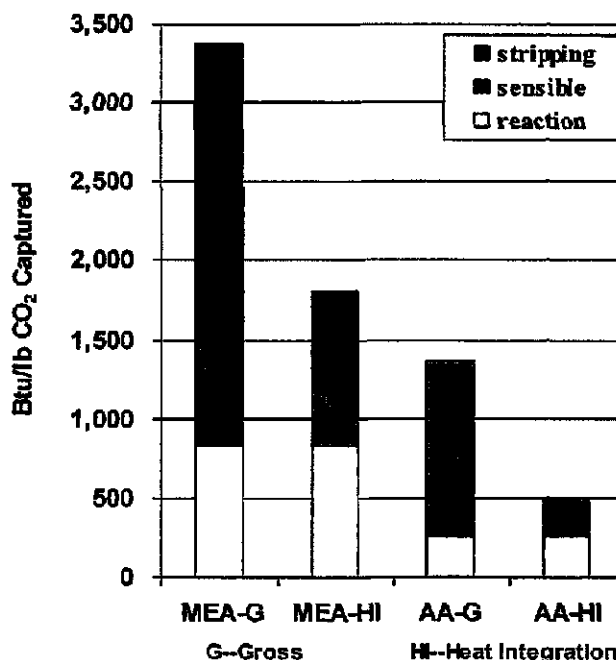
1) *Reduced steam load.* In a system that captures and releases CO₂ by cycling between carbonate and bicarbonate, the heat of reaction is reduced to 262 Btu/lb CO₂, which is much less than the 825 Btu/lb CO₂ needed with MEA [Appendix A]. Also, it is possible that the carbonate/bicarbonate system will exhibit a higher CO₂ carrying density than MEA (carrying density is the delta in CO₂ weight percent between rich and lean solutions), reducing sensible heat requirements. Finally, it is possible the carbonate/bicarbonate system may require little or no stripping steam for regeneration, compared to one mole steam per mole of CO₂ captured typical of amine systems. Figure 5 compares the heat requirements for an MEA CO₂ capture system versus one using aqueous ammonia. The total heat requirement

is divided into heat of reaction, sensible heat, and stripping steam. Figure 5 shows that heat integration enables significant reduction in the net heat requirement for the amine system. The gross heat requirement for an aqueous ammonia system was calculated, and heat integration savings similar in magnitude to those achieved by the amine were assumed. For example, the gross turbine heat rate for the MEA-HI CO₂ capture is estimated to be 9,672 Btu/kWh, and for the AA-HI CO₂ capture the estimate is 8,482 Btu/kWh, a 12% improvement in gross turbine heat rate.

2) *More concentrated CO₂ carrier.* In addition to affecting sensible heat, the CO₂ carrying density also affects the size of the CO₂ absorber and the circulation pump size and load. Laboratory data from NETL indicate the carbonate/bicarbonate system could exhibit a carrying capacity of 0.068 lb CO₂ per lb solution versus 0.054 for amines. Based on cost and sizing heuristics, the reduced liquid flow lowers the stripper cost from \$36.4 to \$25.2 million (four strippers in parallel vs. five) and reduces the circulation pump power requirement from 1.8 to 1.2 MW.

3) *Lower chemical cost.* Amine costs are estimated to be \$1,360/ton (\$1.5/kg), which is high compared to anhydrous ammonia at \$263/ton (\$0.29/kg). The calculations below show that ammonia is roughly a factor of ten less expensive per unit of CO₂ absorption capacity.

Figure 5. Heat Requirements for CO₂ Capture



Mono-ethanolamine Cost:

$$\left(\frac{\$0.6803}{\text{lbMEA}} \right) \times \left(\frac{0.3 \text{ lbMEA}}{\text{lbSolution}} \right) \times \left(\frac{\text{lbSolution}}{0.054 \text{ lbCO}_2} \right) = \frac{\$3.78}{\text{lbCO}_2}$$

Aqueous Ammonia Cost:

$$\left(\frac{\$0.1315}{\text{lbNH}_3} \right) \times \left(\frac{0.15 \text{ lbNH}_3}{\text{lbSolution}} \right) \times \left(\frac{\text{lbSolution}}{0.068 \text{ CO}_2} \right) = \frac{\$0.29}{\text{lbCO}_2}$$

The cost of the absorbent is particularly important for coal-fired power plant applications, where residual SO₂, SO₃, and other species cause solvent degradation. For amines, the attrition was estimated from the following heuristics: general loss of 3.2 lb MEA/ton CO₂ (1.6 kg MEA/tonne CO₂), and SO_x loss of 2 mole MEA/mole SO_x in absorber inlet [7]. Based on normal limestone scrubber operation removal (98%), amine make-up costs could be \$60/ton CO₂ captured. A \$7.5/CO₂ was assumed for aggressive limestone scrubbing (4.1 ppm SO₂ in the effluent), recognizing that flue gas treatment options to reduce SO_x upstream from the CO₂ absorber may be cost effective. A detailed analysis to accurately estimate ammonia attrition has not been performed. Instead, it was assumed that it will be similar on a molar basis to amine and that the total cost will be less because of the lower cost of ammonia. Furthermore, the reaction by-products can be sold as fertilizer, so there is no ammonia penalty for their production; however, there are expected to be small ammonia losses in the exhaust gas.

4) *Value-added by-products.* The use of ammonia-based systems to react NO_x and SO_x in flue gas to form fertilizer (ammonia sulfate, (NH₄)₂SO₄ and ammonia nitrate, NH₄NO₃) has been demonstrated at commercial scale. A comparison of an amine system plus an SCR (Selective Catalytic Reduction) unit and limestone scrubber to an aqueous ammonia system in which ammonia is used for NO_x, SO_x, and CO₂ control was made. Table 4 compares the aqueous ammonia process to a limestone scrubber. It has advantages if there is a market for the byproduct fertilizer, which is primarily ammonium sulfate (AS). The domestic market for ammonium sulfate is roughly 2 million tons/yr [8]. One 400 MW coal-fired power plant with AA SO₂ control will produce about 100,000 tons AS per year. Therefore, twenty power plants could supply all the AS currently used by the domestic market. However, as domestic SO₂ emissions have been reduced, the need for additional sulfur fertilizer has grown, and this trend is likely to continue. The domestic and international markets for nitrogen fertilizers are 12 and 83 million tons per year [9] respectively, so the worldwide potential for the aqueous ammonia fertilizer byproduct is significant. Also, at the right price, ammonium sulfate could displace urea or other forms of nitrogen fertilizer.

Table 4: Aqueous Ammonia versus Limestone Scrubbers for SO_x Control

	Limestone Scrubber	Aqueous Ammonia
Parasitic Load (MWe)	4-7	4-7
Reactant Consumption (\$/ton SO₂)	22	136
By-Product Revenue (\$/ton SO₂)	0	314
Net Material Revenue (\$/ton SO₂)	-22	178
Basis: Limestone at \$13/ton [3, 10], Anhydrous ammonia \$255/ton [12], no market for FGD sludge, Ammonia sulfate at \$152/ton [12]		

Capturing NO_x is more difficult than capturing SO₂. In order for aqueous ammonia to react with NO_x, NO, which is 95% of the NO_x, must be oxidized to NO₂. This requires another unit operation or use of an oxidant, such as ozone. The NO oxidation process represents a significant cost. However, when NO is oxidized, some elemental Hg in the flue gas will also be oxidized, enabling it to be captured in the aqueous ammonia solution and removed from the flue gas. The aqueous solution containing mercury, ammonium nitrate and ammonium sulfate would be run through a carbon adsorbent bed to remove the mercury so that it does not contaminate the fertilizer. The current cost estimate for carbon-based mercury capture in flue gas is estimated at between \$50,000 and \$70,000/pound [14]. This analysis assumes that mercury control will be required and that there is a 10 percent increase in removal efficiency with the ECOTM process compared to conventional technology. Therefore, a credit of \$7,000/lb Hg removed was allocated to the aqueous ammonia process.

Table 5 shows the relative operating cost impact of the by-products. The first thing to note is that the flow rate of CO₂ is very large compared to the other species. Even if revenues from one of the by-products is high on a per pound basis, it is low on a per ton of CO₂ captured basis. At this time, the value of the avoided cost of mercury control is highly uncertain.

Table 5: By-product Flows and Revenues for Multi-Pollutant Control Using Aqueous Ammonia

	Production Rate (lb/kWh)	Value (\$/ton)	Feedstock Cost (\$/ton)	Operating Revenue (\$/ton)	Operating Revenue (cents/kWh)	Revenue (\$/ton CO ₂ captured)
Ammonium Nitrate	0.0016	175	90	85	0.009	0.10
Ammonium Sulfate	0.091	152	66	86	0.483	5.3
Mercury	5.9E-8	14E+6	0	14E+6	0.038	.45
Carbon Dioxide	1.70	—	—	—	—	—
Basis: 80% Capacity Factor						

Aqueous Ammonia Multi-pollutant Capture System

Figure 6 shows outputs from the spreadsheet model for the aqueous ammonia multi-pollutant capture case. This analysis assumes NO_x and elemental mercury are oxidized by the reactor in the ECOTM system after exiting the particulate filter [14]. The flue gas is contacted with aqueous ammonia to form ammonia nitrate, ammonia sulfate, and a non-gaseous mercury specie. The solution is then passed through an activated carbon bed for mercury removal before passing to a crystallizer and granulator for solid fertilizer production. CO₂ is removed from the flue gas in an ammonia scrubber, and then compressed to 1,300 psi for injection.

The boiler island and power cycle shown in Figure 6 are those of a supercritical steam cycle system, modeled from Cases 7A and 7C presented in a recent DOE /EPRI study [3]. The gross turbine heat rate using MEA to capture CO₂ (Case 7A) is 9,672 Btu/kWh compared to 7,951 Btu/kWh for the no capture case (7C). The 1,721 Btu/kWh increase in turbine heat rate is attributed to steam used for MEA regeneration. Due to less regeneration steam required for AA regeneration, the gross turbine heat rate was estimated to be 8,482 Btu/kWh (12% lower than the MEA case). An analysis using AA on an ultra-supercritical steam cycle (USC) was also carried out using Cases 7B and 7D of reference [3]. The USC cycle efficiency combined with a lower steam requirement for AA regeneration (compared to MEA)

Process Flow Diagram: Coal-Fired Ammonia Plant

Inputs:

- Air: 43,700 Tons/day
- Coal (Ill. No. 6): 4,200 Tons/day, 11,666 Btu/lb, 2.5wt% Sulfur

Process Flow:

- PC Boiler:** Receives Air and Coal. Produces Steam (3,900 MM Btu/h) and Flue Gas (38,000 Tons/day).
- Particulate Filter:** Receives steam from the PC Boiler.
- ECO™ Reactor:** Receives steam from the Particulate Filter. Produces Net Power to Grid (400 MW) and 82 MW Parasitic Load.
- Ammonia Contactor:** Receives steam from the ECO Reactor. Produces Ammonia Scrubber (125°F, 14 Psig) and Ammonia Regenerator (125°F, 14 Psig).
- Ammonia Scrubber:** Receives steam from the Ammonia Contactor. Produces Ammonia Regenerator (125°F, 14 Psig).
- Ammonia Regenerator:** Receives steam from the Ammonia Scrubber. Produces Steam (125°F, 14 Psig) and Aqueous NH₃ (Aq. 7wt. %).
- Aqueous NH₃ (Aq. 7wt. %):** 1,300 Tons/day.
- Activated Carbon:** Receives steam from the Ammonia Contactor. Produces Mercury (0.45 lbs/day).
- Crystallizer:** Receives steam from the Ammonia Contactor. Produces Ammonium Nitrate and Ammonium Sulfate.
- Granulator:** Receives steam from the Ammonia Contactor. Produces Ammonium Nitrate and Ammonium Sulfate.
- Dryer:** Receives steam from the Ammonia Contactor. Produces Ammonium Nitrate and Ammonium Sulfate.

Outputs:

- Ammonium Nitrate: 443 Tons/day
- Ammonium Sulfate: 443 Tons/day

Base Plant:

- H Supercritical Steam Cycle
- H Case 7C of Reference [3] with steam rate adjusted for AA

Table 6. Power Plant Performance

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Results

The overall performance for the supercritical and ultra-supercritical cases is presented in Table 6. As shown, the current state (Case 2) of amine CO₂ capture is very energy intensive, requiring 57 MW for capture and compression (an additional 1,415 ton coal/day and approximately 30% decrease in efficiency). The benefits of higher CO₂ capacity and lower heat of reaction (compared to MEA) using aqueous ammonia results in a 15% decrease in parasitic load (from 92MW to 78MW) and 15% decrease in net power plant heat rate for Case 3. The same proportional amount of energy savings is also obtained in the ultra-supercritical cases (5 and 6) with the use of aqueous ammonia.

Table 7 presents the results of a cash flow analysis of the no-CO₂-capture, amine, and aqueous ammonia cases. Capturing only CO₂ using aqueous ammonia (Cases 3 and 5) has potential advantages over the amine case, but the multi-pollutant system with revenue from the sale of fertilizer is needed for aqueous ammonia to approach the NETL program goal of only a 20% increase in COE.

Table 7. Economic Results

Case		1	2	3	4	5	6
Sorbent		None	MEA	AA	AA	AA (USC) ¹	AA (USC) ¹
Component(s) Removed		None	CO ₂	CO ₂	CO ₂ , SO _x , NO _x , Hg	CO ₂	CO ₂ , SO _x , NO _x , Hg
CO ₂ Capture	Base Plant (\$/kWe)	1,072	1,460	1,218	1,225	1,157	1,164
	Gas Cleanup (\$/kWe)	197	239	288	215	277	215
	CO ₂ Capture (\$/kWe)	-	310	187	188	178	179
	Compression (\$/kWe)	-	122	108	108	103	103
	Total (\$/kWe)	1,270	2,132	1,801	1,736	1,715	1,661
	Capital COE (¢/kWh)	2.68	4.50	3.80	3.66	3.62	3.51
	Variable COE (¢/kWh)	1.90	2.91	2.36	1.67	2.24	1.73
	Total COE (¢/kWh)	4.58	7.41	6.16	5.34	5.86	5.24
Including CO ₂ Transportation and Storage ²							
Total	Total Capital (\$/kWe)	1,270	2,231	1,890	1,824	1,800	1,748
	Total \$/tonne CO ₂ Avoided	-	47	27	14	23	13
	Total COE (¢/kWh)	4.6	7.6	6.4	5.5	6.1	5.4
	Increase in COE	-	67%	39%	21%	32% ¹	18% ¹

Basis: 90% CO₂ Capture, 80% Capacity Factor, 2003 Dollars, Coal \$28/ton
¹USC—Ultra-Supercritical Steam Cycle
²CO₂ Compression to 1,300 Psig, Transport 10 miles and Stored in Saline Formation 1,500 ft
 Sources: NETL Carbon Sequestration Economic Model; Evaluation of Innovative Fossil Fuel Power Plants with CO₂ Removal, DOE/EPRI, 1000316

The cost of the multi-pollutant gas cleanup system (NO_x and SO₂ to fertilizer) estimated for Cases 4 and 6 are lower than conventional NO_x and SO₂ controls (SCR and Wet Limestone FGD). However, to reach the DOE's program goal of 20% increase in COE, the operating revenue from the sale of the ammonium sulfate/nitrate fertilizer is necessary; decreasing the current CO₂ capture COE from 67% (amine scrubbing) to 21%. The cost associated with CO₂ transport and storage increases the CO₂ avoided cost by \$3/tonne and COE by 4-6 percent.

Figure 8 shows the breakdown of the parasitic load for each case. The results show that since CO₂ is produced from a low pressure system, the largest power requirement is for CO₂ compression. Therefore, any technology that has the potential to recover CO₂ at a higher pressure will have a large impact on the overall efficiency and cost of electricity.

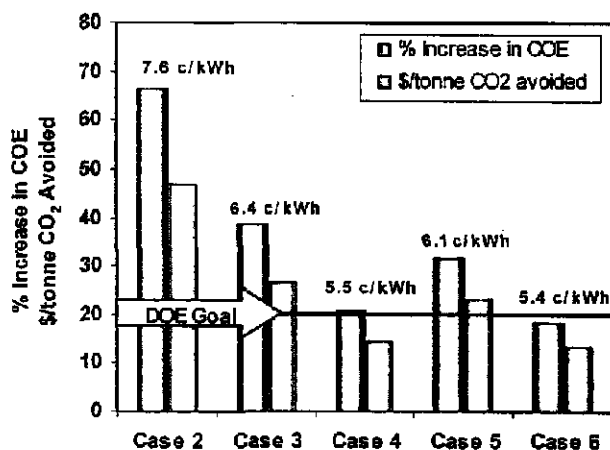


Figure 7. Economic Results

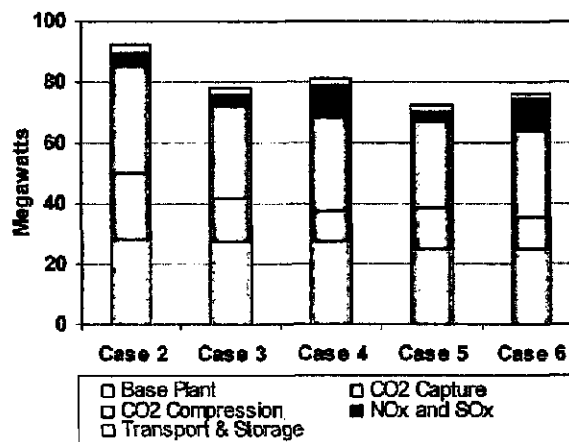


Figure 8. Auxiliary Power

Recommendations for Future Work

This initial analysis shows that aqueous ammonia technology has the potential to achieve the goals of NETL's Carbon Sequestration Program, but challenges remain. The temperature of the flue gas is hotter than is optimal for carbonate/bicarbonate absorption. Researchers are investigating options to accommodate this higher temperature. Also, ammonia may vaporize in the absorption tower, due both to high temperatures and operational transients. Ammonia loss would hurt the economics directly and may require costly tail gas control. Laboratory-scale testing and more rigorous process analyses and modeling to address these issues is recommended.

References

1. Carbon Sequestration Technology Roadmap and Program Plan, DOE/NETL, April, 2004
2. K.P. Resnik, J.T. Yeh, and H.W. Pennline, *Aqua Ammonia Process for Simultaneous Removal of CO₂, SO₂, and NO_x*, Int. J. Envr. Tech. Mgmt, 4(1/2), pp. 89-104, 2004.
3. *Evaluation of Innovative Fossil Fuel Power Plants with CO₂ Removal Report* U.S. Department of Energy – Office of Fossil Energy, Germantown, MD and U.S. Department of Energy/NETL, Pittsburgh, PA, EPRI, Palo Alto, CA,; 2000. 1000316
4. "Gas Purification", Arthur Kohl, Richard Nielsen, 5th Edition, Gulf Publishing Company, Houston, TX.
5. Cost algorithms developed by Howard McIlvried at SAIC
6. Max CO₂ loading taken from "Small Hydrogen Plant News" Rick Birnbaum of Dow Chemical sets 0.45 mole CO₂ / mole MEA as a maximum
7. *Recovery of CO₂ from flue gases: Commercial Trends*, G. Chapel, C. Mariz, J. Ernst, 1999. page 9 defines the delta as "approximately one quarter mole CO₂ per mole solvent"
8. Final Technical Report, "Engineering Development of FGD-Gypsum Conversion to Fertilizer and PCC," M. Chou, Illinois State Geological Survey, ICCI Project Number 98-1/3.2A-2
9. International Fertilizer Association Webpage, IFA Databank, cell AP29, total N 2001/2002 <http://www.fertilizer.org/ifa/statistics/IFADATA/DATA/world.xls>
10. FGD Technologies Achieving SO₂ Compliance at the Lowest Lifecycle Cost, P Rader, J. Augeli, S. Aham of Alstom Power, presented in the CEPSI 2000, 23-27 October in Manila, Philippines.
11. Chemical Marketing Reporter "Ammonium Sulfate Market Relatively Stable" 7/21/2003 Ammonium Sulfate average of regional mid-ranges in the article
12. Chemical Marketing Reporter as of January 23, 2005
13. "Does AN have a future?" Nitrogen and Methanol 9/1/2003
14. DOE Fossil Energy web page updated August 2, 2004
http://www.fossil.energy.gov/programs/powersystems/pollutioncontrols/overview_mercurycontrols.html
15. http://www.boc.com/news/article_175_31oct01.asp
16. *Economic Evaluation of CO₂ Storage and Enhancement Options*, U.S. Department of Energy—National Energy Technology Laboratory, Pittsburgh, PA., Tennessee Valley Authority (TVA), Muscle Shoals, AL., EPRI, Palo Alto, CA., December 2002, 1005250
17. DiPriest, W., Pope, F., *Economic Evaluation of a Multi-Pollutant Control Approach for Ameren UE's Sioux Plant*, Sargent & Lundy, 2004.

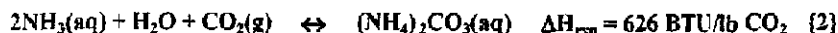
Appendix A.

I. Assumptions

Financial structure				
Capital Cost Year Dollars	2001		Federal Tax Rate	34.0 (%)
Project Book Life (n)	20 (years)		State Tax Rate	4.2 (%)
Projected Tax Life	20 (years)		Federal & State Tax Rate	38.2 (%)
Design/Construction	2.5 (years)		Investment Tax Credit	0 (%)
Inflation rate (e _i)	3.0 (%)		Property Tax Rate	1 (%)
Real Escalation Rate (e _r)	0.7 (%)		Insurance Tax Rate	1 (%)
Real Escalation Rate (O & M)	0.0 (%)		Initial Tax Depreciation Rate	0.075 (%)

Capital Structure					
	% of Total	Current Dollar		Constant Dollar	
		Cost (%)	Return (%)	Cost (%)	Return (%)
Debt	45	9.0	4.1	5.8	2.6
Preferred Stock	10	8.5	0.9	5.3	0.5
Common Stock	45	12.0	5.4	8.7	3.9
Discount rate (cost of capital)		Before Tax	10.30		7.09
		After Tax	8.75		6.09

II. Chemistry of CO₂ Capture with Aqueous Ammonia



III. Solvent Steam Load Requirements

$\text{Total}_{\text{regen energy}} = Q_{\text{sensible}} + Q_{\text{reaction}} + Q_{\text{strip}}$

Q sensible

MEA: 1,750 Btu/lb CO₂ vs. AA: 1,100 Btu/lb CO₂

Q reaction

MEA: 825 Btu/lb CO₂ captured vs. AA: 262 Btu/lb CO₂ (via Rxn #3)

Q stripping

MEA: 800 Btu/lb CO₂ (1 mole steam/mole CO₂) vs. AA: assume no stripping steam required

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RWE to join AEP in validation of carbon capture technology

COLUMBUS, Ohio, Nov. 8, 2007 – American Electric Power (NYSE: AEP) announced today that RWE AG, one of the world's leading power producers and the largest electricity producer in Germany, will collaborate with AEP and Alstom during a planned validation of commercial-scale application of carbon capture and storage technology on an existing AEP coal-fired power plant.

AEP and RWE, who have signed a memorandum of understanding (MOU) on the collaboration, are leaders in clean-coal technology and efforts to address greenhouse gas emissions from coal-fired generation. Greenhouse gases like carbon dioxide (CO₂) are believed to contribute to global climate change.

AEP has more than 38,000 megawatts of generating capacity in the U.S., with 67 percent fueled by coal or lignite. RWE has more than 43,000 megawatts of generating capacity in Germany, Great Britain and other countries, with 60 percent fueled by coal or lignite.

"We're extremely pleased that RWE will join us in this important step toward commercialization of carbon capture technology," said Michael G. Morris, AEP's chairman, president and chief executive officer. "Both AEP and RWE have long histories of innovation and engineering excellence for coal-fired generation and we have worked closely with RWE on other issues in the past. By combining our engineering and operational expertise, I'm confident we can address any technological challenges presented by this project."

RWE will join a project AEP announced in March when it signed an MOU with Alstom, a worldwide leader in equipment and services for power generation and clean coal, for post-combustion carbon capture technology using Alstom's Chilled Ammonia Process. RWE will also participate in an associated project for deep geological storage of captured CO₂.

"Climate protection is a global challenge that requires global solutions. Therefore, we seek to expand our technological leadership in the field of CO₂ avoidance techniques in collaboration with our American partners," said Dr. Johannes Lambertz, Member of the Executive Board of RWE Power in charge of fossil-fuelled power plants.

The Alstom technology will be installed on AEP's 1300-megawatt Mountaineer Plant in New Haven, W.Va., where it will capture CO₂ from a slipstream – or portion – of flue gas from the plant. The slipstream will be equivalent to 20 megawatts of generation, an increase from the 10 megawatts included in the March announcement. The Alstom chilled ammonia system is expected to capture up to 200,000 metric tons of CO₂ per year, which will be injected for geological storage in deep saline aquifers at the site.

Battelle Memorial Institute, a global science and technology enterprise and a leader in carbon storage research, is serving

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as the consultant for AEP on geological storage. In 2002, Battelle, AEP, the U.S. Department of Energy and others sponsored the world's first site-specific investigation of carbon storage capabilities at the Mountaineer plant. During the investigation, an approximately 9,000-foot exploratory well and seismic studies determined that the site was suitable for deep geological storage of CO₂.

The validation project at Mountaineer will begin in 2009, or after successful completion of a small-scale pilot demonstration of the technology by Alstom and the Electric Power Research Institute on a Wisconsin plant.

Once commercial viability of the technology is validated at Mountaineer, AEP plans to install Alstom's chilled ammonia technology on one of the 450-megawatt coal-fired units at its Northeastern Station in Oologah, Okla. Plans are for this commercial-scale system to be operational at Northeastern early next decade. It is expected to capture about 1.5 million metric tons of CO₂ a year. The CO₂ captured at Northeastern Station will be used for enhanced oil recovery.

In addition to this carbon capture and storage collaboration agreement, AEP and RWE are members of the e8, a non-profit international organization composed of the nine leading electricity companies from the G8 countries. The e8 promotes sustainable energy development through electricity sector projects in developing nations worldwide.

RWE AG is one of Europe's leading electricity and gas companies. RWE's major power generation, sales and trading markets are in Germany, the UK and Central Eastern Europe. This is where 20 million electricity customers and 10 million gas customers rely on RWE's products – and a high degree of supply security. RWE has more than 43,000 megawatts of generating capacity in Germany, Great Britain and other countries. The Group's proprietary gas and oil production operations in Europe and North Africa are making an increasingly important contribution to securing future energy supplies.

American Electric Power is one of the largest electric utilities in the United States, delivering electricity to more than 5 million customers in 11 states. AEP ranks among the nation's largest generators of electricity, owning more than 38,000 megawatts of generating capacity in the U.S. AEP also owns the nation's largest electricity transmission system, a nearly 39,000-mile network that includes more 765 kilovolt extra-high voltage transmission lines than all other U.S. transmission systems combined. AEP's transmission system directly or indirectly serves about 10 percent of the electricity demand in the Eastern Interconnection, the interconnected transmission system that covers 38 eastern and central U.S. states and eastern Canada, and approximately 11 percent of the electricity demand in ERCOT, the transmission system that covers much of Texas. AEP's utility units operate as AEP Ohio, AEP Texas, Appalachian Power (in Virginia and West Virginia), AEP Appalachian Power (in Tennessee), Indiana Michigan Power, Kentucky Power, Public Service Company of Oklahoma, and Southwestern Electric Power Company (in Arkansas, Louisiana and east Texas). AEP's headquarters are in Columbus, Ohio.

This report made by AEP and its Registrant Subsidiaries contains forward-looking

statements within the meaning of Section 21E of the Securities Exchange Act of 1934. Although AEP and each of its Registrant Subsidiaries believe that their expectations are based on reasonable assumptions, any such statements may be influenced by factors that could cause actual outcomes and results to be materially different from those projected. Among the factors that could cause actual results to differ materially from those in the forward-looking statements are: electric load and customer growth; weather conditions, including storms; available sources and costs of, and transportation for, fuels and the creditworthiness and performance of fuel suppliers and transporters; availability of generating capacity and the performance of AEP's generating plants; AEP's ability to recover regulatory assets and stranded costs in connection with deregulation; AEP's ability to recover increases in fuel and other energy costs through regulated or competitive electric rates; AEP's ability to build or acquire generating capacity (including AEP's ability to obtain any necessary regulatory approvals and permits) when needed at acceptable prices and terms and to recover those costs through applicable rate cases or competitive rates; new legislation, litigation and government regulation including requirements for reduced emissions of sulfur, nitrogen, mercury, carbon, soot or particulate matter and other substances; new legislation, litigation and government regulation including requirements for reduced emissions of sulfur, nitrogen, mercury, carbon, soot or particulate matter and other substances; timing and resolution of pending and future rate cases, negotiations and other regulatory decisions (including rate or other recovery for new investments, transmission service and environmental compliance); resolution of litigation (including pending Clean Air Act enforcement actions and disputes arising from the bankruptcy of Enron Corp. and related matters); AEP's ability to constrain operation and maintenance costs; the economic climate and growth in AEP's service territory and changes in market demand and demographic patterns; inflationary and interest rate trends; AEP's ability to develop and execute a strategy based on a view regarding prices of electricity, natural gas and other energy-related commodities; changes in the creditworthiness of the counterparties with whom AEP has contractual arrangements, including participants in the energy trading market; actions of rating agencies, including changes in the ratings of debt; volatility and changes in markets for electricity, natural gas and other energy-related commodities; changes in utility regulation, including the potential for new legislation in Ohio and membership in and integration into regional transmission organizations; accounting pronouncements periodically issued by accounting standard-setting bodies; the performance of AEP's pension and other postretirement benefit plans; prices for power that AEP generates and sells at wholesale; changes in technology, particularly with respect to new, developing or alternative sources of generation; other risks and unforeseen events, including wars, the effects of terrorism (including increased security costs), embargoes and other catastrophic events.

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Tracking New Coal-Fired Power Plants

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National Energy Technology Laboratory
Office of Systems Analyses and Planning
Erik Shuster



October 10, 2007



Tracking New Coal-Fired Power Plants

This report is intended to provide an overview of proposed new coal-fired power plants that are under consideration. This report may not represent all possible plants under consideration but is intended to illustrate the potential that exists for new coal-fired power plants.

History has shown that public announcements of new coal-fired power plant development do not provide an accurate representation of actual new operating power plants. Actual plant capacity commissioned has been significantly less than new capacity announced.

This report focuses on those power plant projects with the most potential to achieve significant progress toward completion, to support more accurate assessment of the ability of this segment of the power generation industry to provide adequate new electricity capacity in various regions of the United States.

The Department of Energy does not warrant the accuracy or suitability of this information.



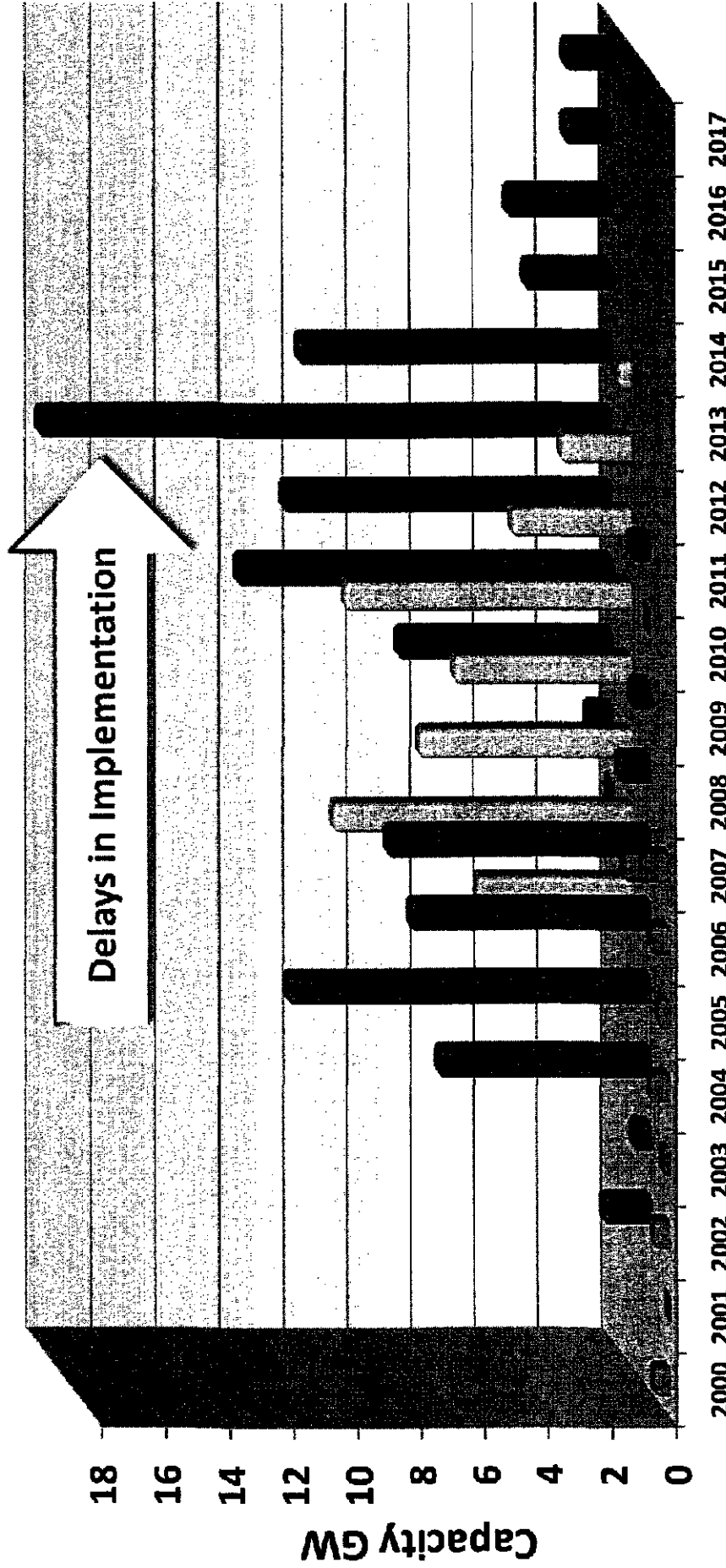
Tracking New Coal-Fired Power Plants

- The purpose of this report is to provide a perspective of coal-fired power plants that are currently under development, with a focus on those displaying significant progress toward commercial operation
- The status of the proposed projects ranges from project announcements to those under construction
- Project announcements do not necessarily lead to a new operating coal-fired power plant and can be a misleading indicator of capacity additions
- Although the number of cancellations can be significant, announcements that are cancelled before or during the permitting phases are not unusual and thus less meaningful
- Plants that are permitted or under construction reflect actual progress and offer a better perspective of what new capacity may be possible by region
- Halted or deferred project development may result in insufficient electricity capacity growth, which could impact regional economic growth



Past Capacity Announcements vs. Actual

Figure 1



Historically, actual capacity has been shown to be significantly less than proposed capacity. For example, the 2002 report listed 11,455 MW of proposed capacity for the year 2005 when actually only 329 MW were constructed.

■ Actual ■ 2002 Report ▨ 2005 Report ■ October 2007



Historic Capacity Additions by Years

Refer to Figure 1

- Actual plant capacity, commissioned since 2000, has been far less than new capacity announced. Year 2002 report of announcements reflected a schedule of nearly 12,000 MW to be installed by 2005, whereas only 329 MW were achieved
- The trend over several years has reflected the bulk of power plant proposals shifting to the right due to delays and project uncertainty



Current Coal-Fired Capacity Additions

Table 1

<i>General Status</i>	<i>Number of Plants</i>	<i>Capacity (MW)</i>
<i>Under Construction</i>	24	12,506
<i>Near Construction</i>	8	4,565
<i>Permitted</i>	13	6,169
SUB TOTAL	45	23,240
<i>Announced (early stages of development)</i>	76	48,440
TOTAL	121	71,680

Progressing Projects

Uncertain Potential and Timing

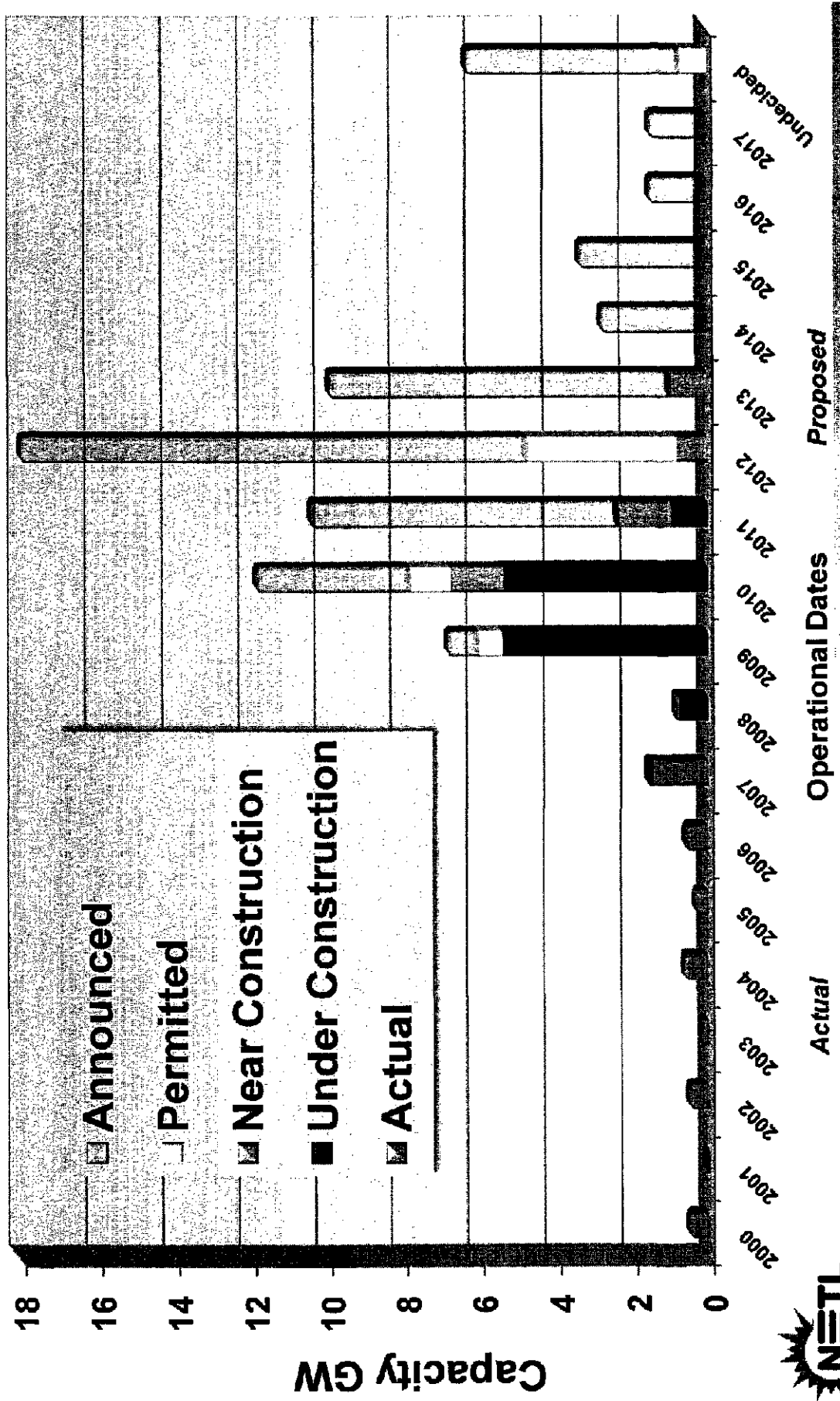
<i>Status Listing</i>	<i>Description</i>
<i>Under Construction</i>	Project is under construction
<i>Near Construction</i>	Project has been approved; majority or all permits are obtained. Sponsor is contracting vendors and Engineering, Procurement and Construction (EPC) contractors. Site preparation has begun.
<i>Permitted</i>	In the permitting phase. Two or more permits approved or fuel or power contracts have been negotiated.
<i>Announced</i>	Early stages of development to filing for permits. May include a feasibility study.



Source: Global Energy Decisions – Velocity Suite

Current Capacity Additions by Years

Figure 2



Source: Global Energy Decisions - Velocity Suite

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Current Capacity Additions by Years

Refer to Table 1 and Figure 2

- **Figure 2 is the graphical representation of Table 1**
- **Progressing plants are those projects with status that is either permitted, near construction, or under construction**
- **Progressing plants have a higher likelihood of advancing toward commercial operation, however there is still a degree of uncertainty in these projects**
- **EIA currently projects the need for an average of 6,000 megawatts per year for 23 years through 2030.**



Current Capacity Additions by Years

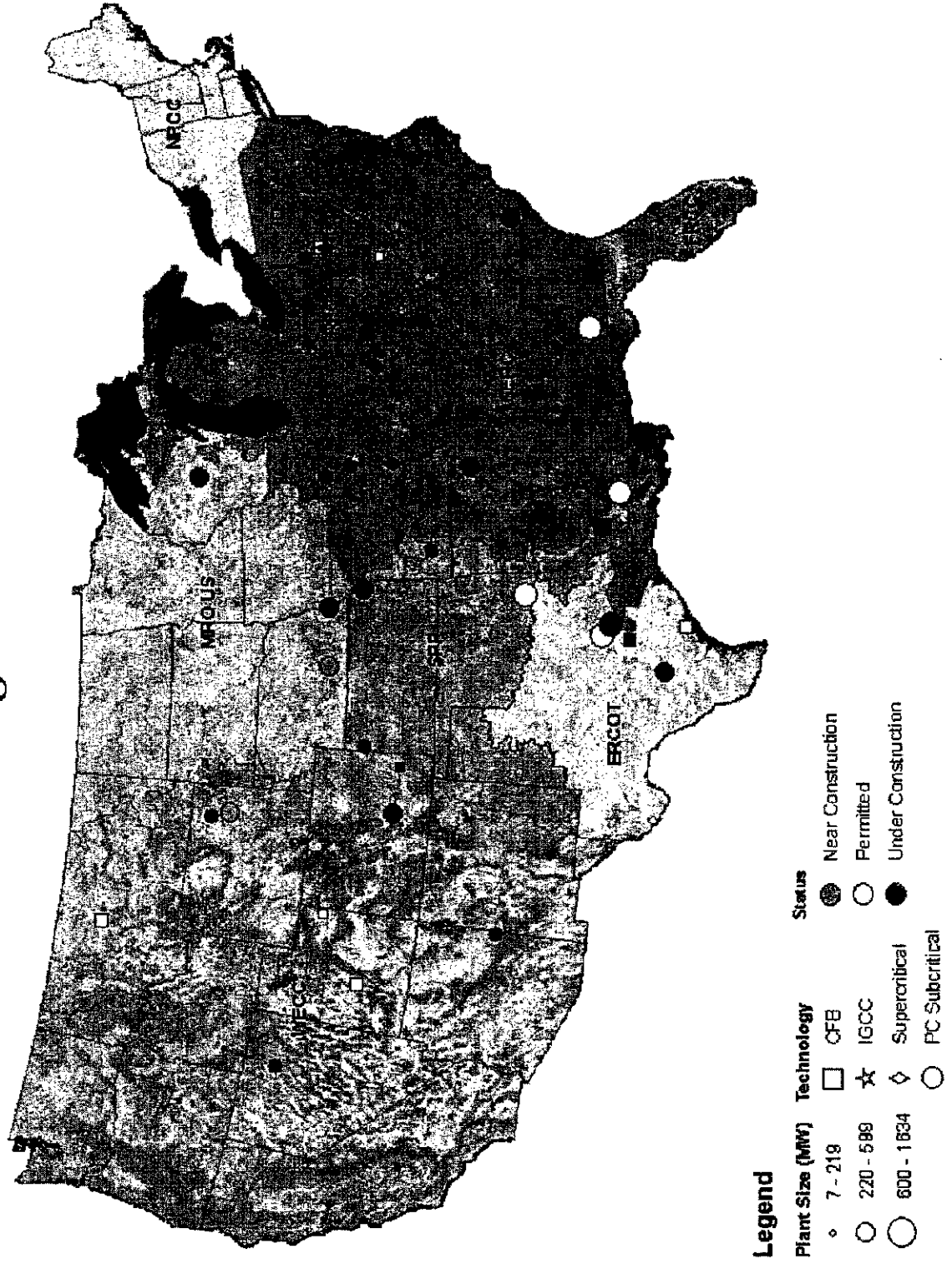
Refer to Table 1 and Figure 2

- Actual plants commissioned, from 1997 through 2006, have averaged 293 MW per year; this has influenced the levels of skilled human resources available to perform currently projected developments
- The 2,400 MW of new added capacity installed in the last three years (~800 MW per year) is only about 16% of the 15,000 MW of progressing plants that are proposed to be operational in the next three years.
- Recognizing current concerns regarding availability of skilled labor for power plant engineering, procurement, and construction activities, further investigation into the viability of current schedules is warranted.



Geographical Map by NERC Regions: Coal-Fired Plants (Permitted, Near Construction, and Under Construction)

Figure 3



Proposed Capacity Relative to NERC Regions

Table 2

NERC Region	Progressing Projects					Announced	Grand Total
	Under Construction	Near Construction	Permitted	Sub Total			
ASCC	Capacity (MW)	-	-	-	0	300	300
	Plants	-	-	-	0	2	2
ERCOT	Capacity (MW)	2,965	-	1,200	4,165	4,100	8,265
	Plants	3	-	2	5	4	9
FRCC	Capacity (MW)	315	-	-	315	1,382	1,697
	Plants	1	-	-	1	2	3
MRO US	Capacity (MW)	1,163	275	-	1,438	4,305	5,743
	Plants	2	2	-	4	9	13
NPCC	Capacity (MW)	-	-	-	0	1,020	1,020
	Plants	-	-	-	0	3	3
RFC	Capacity (MW)	2,197	1,850	1,524	5,571	7,558	13,129
	Plants	3	3	4	10	12	22
SERC	Capacity (MW)	2,550	2,120	1,975	6,645	7,698	14,343
	Plants	6	2	2	10	15	25
SPP	Capacity (MW)	1,832	-	750	2,582	1,535	4,117
	Plants	4	-	1	5	3	8
WECC	Capacity (MW)	1,484	320	720	2,524	19,667	22,191
	Plants	5	1	4	10	24	34
N/A	Capacity (MW)	-	-	-	0	875	875
	Plants	-	-	-	0	2	2
Total Sum Capacity (MW)		12,506	4,565	6,169	23,240	48,440	71,680
Total Count of Plants		24	8	13	45	76	121

Source: Global Energy Decisions – Velocity Suite

Evaluating Added Capacity on a Regional Basis

Refer to Figure 3 and Table 2

- **A realistic view of new capacity additions is important to establish the electricity capacity margins necessary to support economic growth on a regional basis**
- **Further evaluation of project status is needed to provide a comprehensive outlook for the nation's coal-fired power fleet development status by region**
- **Additional evaluation should take into consideration NERC's forthcoming 2007 Long Term Reliability Assessment**



Proposed Technologies of New Plants

Figure 4

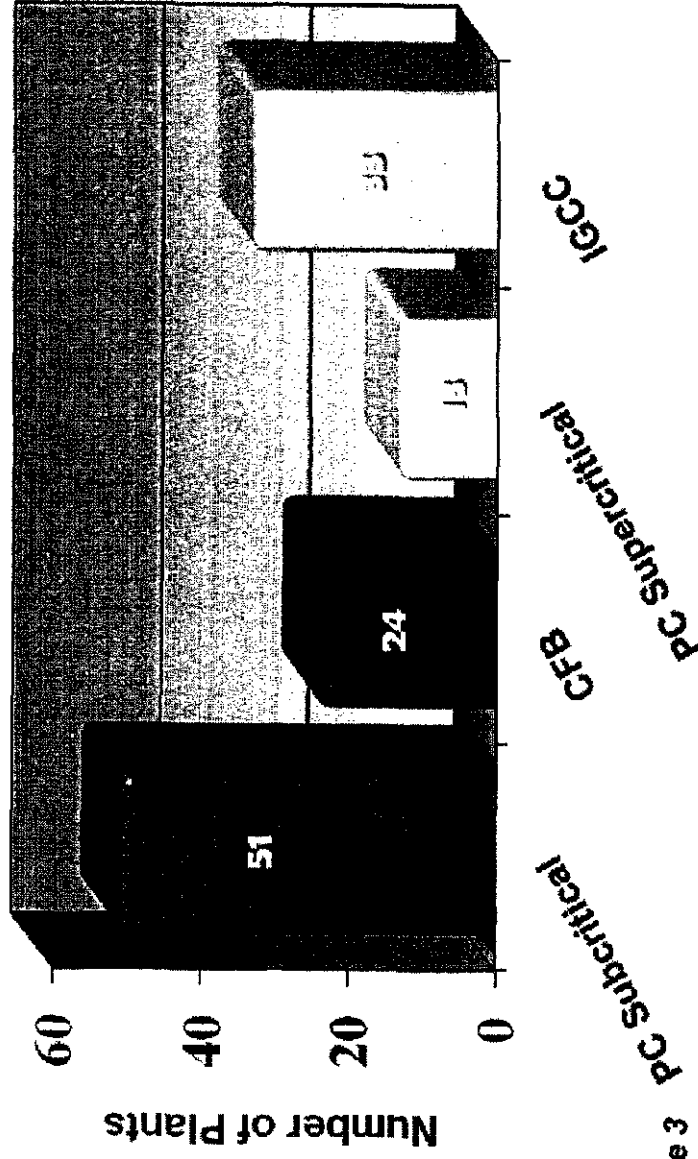


Table 3

Technology Listings	Operational (Since 2000)	Progressing (Permitted, Near-, and Under Construction)	Announced	Total Proposed
PC Subcritical	10	25	26	51
CFB	8	12	12	24
PC Supercritical	1	4	9	13
IGCC	1	4	29	33

Source: Global Energy Decisions – Velocity Suite

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Proposed Technologies of New Plants

Refer to Figure 4 and Table 3

- **Conventional technologies, such as subcritical PC and CFB, will continue to play a significant role in providing new capacity**
- **A substantial number of IGCC plants are beginning to be proposed, which is indicative of their high efficiency, clean environmental profile, and ability to capture CO₂ should GHG emission control be necessary**
- **A smaller fraction of advanced technologies proposed, such as supercritical PC and IGCC, have made it through the permitting stage as these technologies reflect more recent trends in development activity**



New Coal-fired Power Plant Development

Few Near-term Alternatives Exist

- Following several years of delay, new coal-fired generation is increasingly required for maintaining minimum regional electricity capacity margins
- Forecasts of North American natural gas supply to U.S. are flat to declining by 2030; added gas-fired generation needs to rely on imported liquefied natural gas (LNG) or new higher efficiency plants
- Nuclear power is increasingly recognized as an option but meaningful added capacity remains beyond the timeframe of this analysis
- ERCOT study: 6,300 MW of wind had same load carrying capacity as 550 MW of thermal generation (i.e. 8.7%, due to unreliability of wind generation when power demand is highest)
- Potential carbon legislation introduces need for large incremental power demand for carbon capture and storage; will require equivalent replacement capacity and more in order to support economic growth



Summary

- Historically, new coal-fired power plant development announcements are not valid indicators of actual new capacity installations
- Current power plant development status indicates that approximately 1/3 of announced megawatts have progressed through permitting and/or into construction
- The current schedule for commissioning of plants may not be achievable, considering the implicit capacity reflected by actual recent plant completions by the industry – a situation requiring more investigation
- If the timely completion of coal-fired power plants cannot be attained, this may lead to inadequate regional capacity additions to support electricity demand and economic growth – NERC's 2007 Long Term Reliability Assessment will provide important perspective
- Advanced technology developments, such as supercritical and IGCC, lag in progress as they have been more recently announced and may also be anticipating legislative support related to climate change



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Coal

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The Future of Coal

OPTIONS FOR A
CARBON-CONSTRAINED WORLD

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est reserves of oil and gas. In particular the United States, China and India have immense coal reserves. For them, as well as for importers of coal in Europe and East Asia, economics and security of supply are significant incentives for the continuing use of coal. Carbon-free technologies, chiefly nuclear and renewable energy for electricity, will also play an important role in a carbon-constrained world, but absent a technological breakthrough that we do not foresee, coal, in significant quantities, will remain indispensable.

However, coal also can have significant adverse environmental impacts in its production and use. Over the past two decades major progress has been made in reducing the emissions of so-called "criteria" air pollutants: sulfur oxides, nitrogen oxides, and particulates from coal combustion plants, and regulations have recently been put into place to reduce mercury emissions. Our focus in this study is on approaches for controlling CO₂ emissions. These emissions are relatively large per Btu of heat energy produced by coal because of its high carbon content.

We conclude that CO₂ capture and sequestration (CCS) is the critical enabling technology that would reduce CO₂ emissions significantly while also allowing coal to meet the world's pressing energy needs.

1. This carbon charge may take the form of a direct tax, a price imposed by a cap-and-trade mechanism, or some other type of regulatory constraint on CO₂ emissions. We shall refer to this charge as a tax, price, penalty, or constraint interchangeably throughout this report and the use of one form or another should not be taken as an indication of a preference for that form unless so stated.

To explore this prospect, our study employs the *Emissions Predictions and Policy Analysis* (EPPA) model, developed at MIT, to prepare scenarios of global coal use and CO₂ emissions under various assumptions about the level and timing of the carbon charge¹ that might be imposed on CO₂ emissions and the cost of removing CO₂ from coal. The response of the global economy to placing a price on CO₂ emissions is manifold: less energy is used, there is switching to lower carbon fuels, the efficiency of new and existing power plants is improved, and new carbon control technologies are introduced, for example CCS. In characterizing the CO₂ emission price, we employ a "high" price trajectory that starts at \$25/tonne-CO₂ in 2015 and increases thereafter at a real rate of 4% per year. The \$25 per tonne price is significant because it approaches the level that makes CCS technology economic.

We also examine a "low" price trajectory that begins with a CO₂ emission price of \$7/tonne in 2010 and increases at a rate of 5% thereafter. The key characteristic of the "low" price is that it reaches the initial "high" price level nearly 25 years later. Other assumptions studied include the development of nuclear power to 2050 (limited or expanded) and the profile of natural gas prices (as calculated by the model or at a lower level).

Our conclusion is that coal will continue to be used to meet the world's energy needs in significant quantities. The high CO₂-price scenario leads to a substantial reduction in coal use in 2050 relative to "business as usual" (BAU), but still with increased coal use relative to 2000 in most cases. In such a carbon-constrained world, CCS is the critical future technology option for reducing CO₂ emissions while keeping coal use above today's level. Table 1 shows the case with higher CO₂ prices and applying the EPPA model's reference projection for natural gas prices. The availability of CCS makes a significant difference in the utilization of coal at mid-century regardless of the level of the CO₂ prices (not shown in the table) or the assumption about nuclear power growth. With CCS more coal is used in 2050 than today, while global CO₂ emissions from all sources of energy are only slightly higher than today's level and less than half of the BAU level. A major contributor to the global emissions reduction for 2050 is the reduction in CO₂ emissions from coal to half or less of today's level and to one-sixth or less that in the BAU projection.

Table 1 Exajoules of Coal Use (EJ) and Global CO₂ Emissions (Gt/yr) in 2000 and 2050 with and without Carbon Capture and Storage*

	BUSINESS AS USUAL		LIMITED NUCLEAR 2050		EXPANDED NUCLEAR 2050	
	2000	2050	WITH CCS	WITHOUT CCS	WITH CCS	WITHOUT CCS
Coal Use, Global	100	448	161	116	121	78
U.S.	24	58	40	28	25	13
China	27	88	39	24	31	17
Global CO ₂ Emissions	24	62	28	32	26	29
CO ₂ Emissions from Coal	9	32	5	9	3	6

* Universal, simultaneous participation, High CO₂ prices and EPPA-Ref gas prices.

The “low” CO₂ price scenario reaches the level where CCS becomes economic some 25 years later than under the higher price case. As a result coal consumption is higher in 2050 relative to the high CO₂ price scenario and, in addition, the contribution of CCS is much lower, thus leading to substantially higher CO₂ emissions.

Today, and independent of whatever carbon constraints may be chosen, the priority objective with respect to coal should be the successful large-scale demonstration of the technical, economic, and environmental performance of the technologies that make up all of the major components of a large-scale integrated CCS system — capture, transportation and storage. Such demonstrations are a prerequisite for broad deployment at gigatonne scale in response to the adoption of a future carbon mitigation policy, as well as for easing the trade-off between restraining emissions from fossil resource use and meeting the world’s future energy needs

Successful implementation of CCS will inevitably add cost for coal combustion and conversion. We estimate that for new plant construction, a CO₂ emission price of approximately \$30/tonne (about \$110/tonne C) would make CCS cost competitive with coal combustion and conversion systems without CCS. This would be sufficient to offset the cost of CO₂ capture and pressurization (about \$25/tonne) and CO₂ transportation and storage (about \$5/tonne). This estimate of CCS cost is uncertain; it might be larger and with new technology, perhaps smaller.

The pace of deployment of coal-fired power plants with CCS depends both on the timing and level of CO₂ emission prices and on the technical readiness and successful commercial demonstration of CCS technologies. The timing and the level of CO₂ emission prices is uncertain. However, there should be no delay in undertaking a program that would establish the option to utilize CCS at large scale in response to a carbon emission control policy that would make CCS technology economic. Sequestration rates of one to two gigatonnes of carbon (nearly four to eight gigatonnes of CO₂) per year by mid-century will enable appreciably enhanced coal use and significantly reduced CO₂ emissions.

What is needed is to demonstrate an integrated system of capture, transportation, and storage of CO₂ at scale. This is a practical goal but requires concerted action to carry out. The integrated demonstration must include a properly instrumented storage site that operates under a regulatory framework which includes site selection, injection and surveillance,

A second high-priority requirement is to demonstrate CO₂ capture for several alternative coal combustion and conversion technologies. At present Integrated Gasification Combined Cycle (IGCC) is the leading candidate for electricity production with CO₂ capture because it is estimated to have lower cost than pulverized coal with capture; however, neither IGCC nor other coal technologies have been demonstrated with CCS. It is critical that the government RD&D program not fall into the trap of picking a technology "winner," especially at a time when there is great coal combustion and conversion development activity underway in the private sector in both the United States and abroad.

Approaches with capture other than IGCC could prove as attractive with further technology development for example, oxygen fired pulverized coal combustion, especially with lower quality coals. Of course, there will be improvements in IGCC as well. R&D is needed on sub-systems, for example on improved CO₂ separation techniques for both oxygen and air driven product gases and for oxygen separation from air. The technology program would benefit from an extensive modeling and simulation effort in order to compare alternative technologies and integrated systems as well as to guide development. Novel separation schemes such as chemical looping should continue to be pursued at the process development unit (PDU) scale. The reality is that the diversity of coal type, e.g. heat, sulfur, water, and ash content, imply different operating conditions for any application and multiple technologies will likely be deployed.

Government support will be needed for these demonstration projects as well as for the supporting R&D program. Government assistance is needed and should be provided to demonstrate the technical performance and cost of coal technologies with CCS, including notably IGCC. There is no operational experience with carbon capture from coal plants and certainly not with an integrated sequestration operation. Given the technical uncertainty and the current absence of a carbon charge, there is no economic incentive for private firms to undertake such projects. Energy companies have advanced a number of major projects and all have made clear the need for government assistance in order to proceed with unproved "carbon-free" technology.

The U.S 2005 Energy Act contains provisions that authorize federal government assistance for IGCC or pulverized coal plants containing advanced technology projects with or without CCS. We believe that this assistance should be directed only to plants with CCS, both new plants and retrofit applications on existing plants. Many electric utilities and power plant developers who are proposing new coal-fired electricity generating units are choosing super-critical pulverized coal units because in the absence of charges on CO₂ emissions, the bus bar cost of generating electricity (COE) from pulverized coal (PC) power plants is lower than IGCC and its availability is higher. These prospective new plants, as well as the existing stock of coal-fired power plants, raise the issue of the future retrofit of coal-fired power plants that are in existence at the time when a carbon charge is imposed. This problem is distinct from that of the technology to be chosen for the new power plants that will be built after a carbon charge has been imposed. Pending adoption of policies to limit CO₂ emissions, if federal assistance is extended to coal projects, it should be limited to projects that employ CCS.

It has been argued that the prospect of a future carbon charge should create a preference for the technology that has the lowest cost of retrofit for CO₂ capture and storage, or that power plants built now should be "capture-ready," which is often interpreted to mean that new coal-fired power plants should be IGCC only.

From the standpoint of a power plant developer, the choice of a coal-fired technology for a new power plant today involves a delicate balancing of considerations. On the one hand, factors such as the potential tightening of air quality standards for SO_2 , NO_x , and mercury, a future carbon charge, or the possible introduction of federal or state financial assistance for IGCC would seem to favor the choice of IGCC. On the other hand, factors such as near-term opportunity for higher efficiency, capability to use lower cost coals, the ability to cycle the power plant more readily in response to grid conditions, and confidence in reaching capacity factor/efficiency performance goals would seem to favor the choice of supercritical pulverized coal² (SCPC). Other than recommending that new coal units should be built with the highest efficiency that is economically justifiable, we do not believe that a clear preference for either technology can be justified.

2. Pulverized coal plants can be subcritical (SubCPC), supercritical (SCPC) or ultra-supercritical (USCPC). For simplicity, we refer to the latter two as SCPC except when, as in Chapter 3, a specific comparison is made. There is no clear dividing line between SCPC and USCPC.

Moreover, retrofitting an existing coal-fired plant originally designed to operate without carbon capture will require major technical modification, regardless of whether the technology is SCPC or IGCC. The retrofit will go well beyond the addition of an "in-line" process unit to capture the CO_2 ; all process conditions will be changed which, in turn, implies the need for changes to turbines, heat rate, gas clean-up systems, and other process units for efficient operation. Based on today's engineering estimates, the cost of retrofitting an IGCC plant, originally designed to operate without CCS so as to capture a significant fraction of emitted carbon, appears to be cheaper than the retrofit cost of a SCPC plant. However, this characteristic of IGCC has not been demonstrated." Also, even if the retrofit cost of an IGCC plant is cheaper, the difference in the net present value of an IGCC and SCPC plant built now and retrofitted later in response to a future carbon charge depends heavily on the estimate of the timing and size of a carbon charge, as well as the difference in retrofit cost. Essentially, there is a trade-off between cheaper electricity prior to the carbon charge and higher cost later.

Opportunity to build "capture ready" features into new coal plants, regardless of technology, are limited. Other than simple modification to plant layout to leave space for retrofit equipment such as shift reactors, pre-investment in "capture ready" features for IGCC or pulverized coal combustion plants designed to operate initially without CCS is unlikely to be economically attractive. It would be cheaper to build a lower capital cost plant without capture and later either to pay the price placed on carbon emissions or make the incremental investment in retrofitting for carbon capture when justified by a carbon price. However, there is little engineering analysis or data to explore the range of pre-investment options that might be considered.

There is the possibility of a perverse incentive for increased early investment in coal-fired power plants without capture, whether SCPC or IGCC, in the expectation that the emissions from these plants would potentially be "grandfathered" by the grant of free CO_2 allowances as part of future carbon emissions regulations and that (in unregulated markets) they would also benefit from the increase in electricity prices that will accompany a carbon control regime. Congress should act to close this "grandfathering" loophole before it becomes a problem.

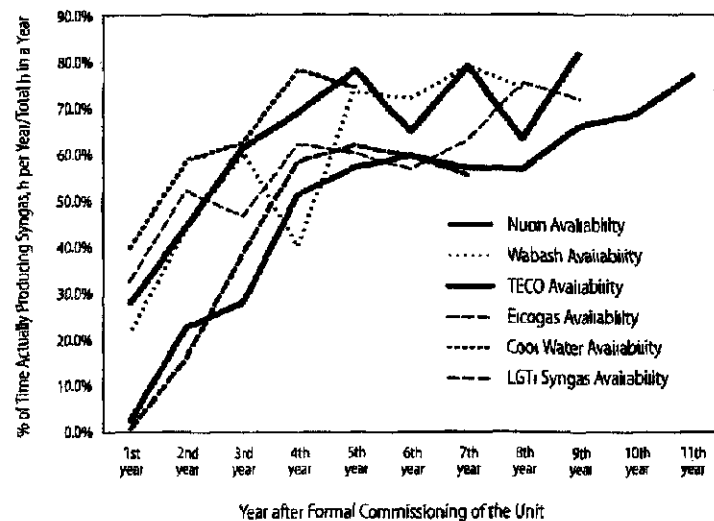
The DOE Clean Coal program is not on a path to address our priority recommendations because the level of funding falls far short of what is required and the program content is not aligned with our strategic objectives. The flagship DOE project, FutureGen, is consistent with our priority recommendation to initiate integrated demonstration projects at scale. However, we have some concerns about this particular project, specifically the need

BOX 3.1 IGCC DEMONSTRATIONS

The Cool Water Project sponsored by Southern California Edison in cooperation with GE and Texaco pioneered IGCC with support from the Synthetic Fuels Corporation. This plant demonstrated the feasibility of using IGCC to generate electricity. The plant operated periodically from 1984–1989, and cost over \$2000 /kW_e. The project was eventually abandoned, but it provided the basis for the Tampa Electric Polk Power Station. The DOE supported the 250 MW_e Polk Station commercial IGCC demonstration unit, using a Texaco gasifier, which started up in 1996. The total plant cost was about \$1800/kW_e. Since it was the first commercial-scale IGCC plant, several optional systems were added, such as a hot-gas clean-up system, which were never used, and were later simplified or removed. When these changes are taken into account, the adjusted total plant cost has been estimated at \$1650/kW_e (2001\$). This experience has led to some optimism that costs will come down significantly with economies of scale, component standardization, and technical and design advances. However, price increases will raise the nominal cost of plant capital significantly.

The availability of these early IGCC plants was low for the first several years of operation due to a range of problems, as shown in the figure. Many of the problems were design and materials related

Figure Box 3.1 IGCC Availability History (excluding operation on back-up fuel



Graph provided by Jeff Phillips, EPRI (24)

which were corrected and are unlikely to reappear; others are process related, much like running a refinery, but all eventually proved to be manageable. Gasifier availability is now 82+%, and operating efficiency is ~35.4%. DOE also supported the Wabash River Gasification Repowering Project, an IGCC demonstration project using the Dow E-gas gasifier. This demonstration started up in late 1995, has 262 MW_e capacity, and an efficiency of ~38.4%. Start-up history was similar to that of the Polk unit. LGT provided the basis for Wabash.

IGCC: WITH PRE-COMBUSTION CO₂ CAPTURE

Applying CO₂ capture to IGCC requires three additional process units: shift reactors, an additional CO₂ separation process, and CO₂ compression and drying. In the shift reactors, CO in the syngas is reacted with steam over a catalyst to produce CO₂ and hydrogen. Because the gas stream is at high pressure and has a high CO₂ concentration, a weakly CO₂-binding physical solvent, such as the glymes in Selexol, can be used to separate out the CO₂. Reducing the pressure releases the CO₂ and regenerates the solvent, greatly reducing the energy requirements for CO₂ capture and recovery compared to the MEA system. Higher pressure in the gasifier improves the energy efficiency of both the separation and CO₂ compression steps. The gas stream to the turbine is

now predominantly hydrogen, which requires turbine modifications for efficient operation.

The block diagram with key material flows for a 500 MW_e IGCC unit designed for CO₂ capture is shown in Figure 3.13. For CO₂ capture, a full-quench gasifier is currently considered the optimum configuration. The overall generating efficiency is 31.2% which is a 7.2 percentage point reduction from the IGCC system without CO₂ capture. Adding CO₂ capture requires a 23% increase in the coal feed rate. This compares with coal feed rate increases of 27% for ultra-supercritical PC and 37% for subcritical PC when MEA CO₂ capture is used.

Figure 3.14 illustrates the major impacts on efficiency of adding CO₂ capture to IGCC. CO₂ compression and water gas shift each have

EXHIBIT

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BEFORE THE
OHIO POWER SITING BOARD

2007 DEC 26 AM 9: 37

In the Matter of An Application by)
 American Municipal Power-Ohio, Inc.)
 Certificate of Environmental Compatibility)
 And Public Need for an Electric Generation)
 Station and Related Facilities in Meigs)
 County, Ohio)

PUCO

Case No. 06-1358-EL-BGN

Notarized statement from Meigs County land and farm owner, Guy Rose

I will be 72 this winter and my family has lived and farmed here since before the Civil War. Our family is of German descent and came here from Pennsylvania, we bought the first 40 acres from the Ohio Land Company while her husband was serving in the Civil War. He served most of his service in Virginia, and my family has been here ever since.

I'm concerned about the pollution in the air, our hay and crops being polluted. This year when I was cutting the hay at my neighbor's, the Varneys, there was dust and a black and silver substance stirre up from the ground got on the hay bine and into my lungs while I was mowing the hay. It caused a sore throat and burning in my nostrils, and made my eyes run. I had never seen that substance before. My neighbor, Keith Bentz, told me that they were also seeing this substance as far out as the Chester area. I don't have proof or studies to show that this is coming from the industry around us, but it is not a natural substance, and nothing that I have ever seen in my lifetime here. Adding another industry would only worsen the situation.

I had one cow that was also exposed to this dust when it was grazing and it developed cancer in its eye. Had to shoot it and put it out of its misery. Because it was not healthy, I lost the profit I would have made from the sale, and my family was not able to eat the beef either.

Whatever this cow was exposed to, it went into it's blood stream, and the calf she gave birth to also had cancer in both eyes. When I had the vet out, said that the white faced herfords were more likely to get the cancer around their eyes. They have a weakness and pick it up more. Causes damage more frequently in the herfords than in the dark cows, like Angus. Dr. Grueser, our veterenarian said he is seeing these cancers more frequently and that even his own cattle are getting sick, as well as the vet across the river, Dr. Shocky.

While some people had encouraged me to sell this diseased cow at market, the market won't accept them, and it would put anyone who ate the beef at risk of eating contaminated meat, and potentially becoming sick, which I was not willing to do.

A year ago, Bill Osborn, a neighbor of mine near Bashan, who also runs cattle here near the power plants had a cow that got the same kind of cancer.

I also had a cat and a dog that got cancer, I am seeing a lot of people in the area whose breathing is affected. They have coughing, sinus problems, and I personally believe that the existing power plants have are affecting our health. I have lived here all my life and in the last 20-25 years I've seen this become worse. Having another power plant here would make it worse.

I 100%, completely object to having AMP-Ohio construct and operate another power plant here.

I wonder what AMP is going to do with the outfall from the power plant, and what they will do to keep our water from becoming more contaminated.

Used to we could use the water off our roofs, cisterns, and even the snow. Now when the snow comes down it has black particles in it. There was an article in the paper a few years ago saying not to use the snow to make ice cream. We used to be able to use the winter snow, add milk to it and enjoy ice cream. We can't do that now.

If it ruins our water supplies what will be left? Our food and gardens are bound to pick up a percentage of the toxins that are landing on us from the fallout, the same as they would pick it up from the ground if we spread fertilizer.

The fish are also effected. We can no longer eat the fish from the streams and river because of the contamination.

In Bill Osborn's pond, the fish died off. If the little bit of rain we get mixes with the toxins coming out of the power plants or waste, and goes into the ground and surface water like our farm ponds, then the fish and livestock are not fit to eat.

I have heard that AMP wants to make fertilizer from the power plant waste. My concern with using this type of fertilizer is nitrate poisoning, which can get into water. The vets say that nitrate poisoning causes loss of calves, deformities, and still births. I witnessed this in one of my neighbors who experience this directly when he solely used too much nitrate fertilizer. The calves were deformed, he lost calves, others born with crippled joints. When he stopped the nitrate fertilizer there was a gradual improvement. I do not want to have a fertilizer factory here. The dust off that goes into your lungs even when you are loading fertilizer bags onto a truck and affects you. Having a fertilizer factory here would add that much more chance of injury to our lungs and our drinking water.

Our drinking water wells are along the Ohio River. If the contamination, including the nitrates, filters through the ground and water over time into our drinking water wells, springs, and streams, and the water from the rain is not drinkable, what will we have to drink that is safe?

If they build another power plant here, and open the coal mine to fuel them, it will destroy the whole area. All the new houses going up will be destroyed if the land slips and subsides. We will be paying higher taxes on a worthless property, and worthless homes.

Our cemeteries are at risk, our farms, homes, water and air are at risk.

I would like to see more windmills put up, because it's a cleaner system, a cleaner way to go. I would like to see more hydro power, which I think would also be a cleaner system. If its true about the research on systems using the ocean water currents to capture and generate electricity and we have a chance to make electricity that will not poison us, and we still invest in more coal-fired power plants knowing what the risks are, then there has to be something the matter with our system in this country.

It would be an advantage to us, and the younger generation's health if we could get clean generated electricity. Even if we have to pay more for it up front, we would be further ahead in the end.

Guy A. Rose 12-3-2007
Signature Date

Elisa Young 12/3/07
Witness/Signature Date

Linda S. Conant
Notary Public, State of Ohio
Recorded in Meigs County
My Commission Expires 6/26/12