UNITED STATES DEPARTMENT OF ENERGY

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TRANSCRIPT OF THE
NATIONAL COAL COUNCIL MEETING

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Thursday, May 1, 2008

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Hilton St. Louis
1 South Broadway
St. Louis, Missouri

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ATTENDEES

ROBERT A. BECK
National Coal Council

FREDRICK D. PALMER

Senior VP
Government Relations
Peabody Energy

MIKE MILLER
AmerenUE

HOLLY KRUTKA, PhD
Research Scientist
ADA-ES
JANET GELLICI, CAE
CEO, American Coal Council

JANINE L. MIGDEN-OSTRANDER
Office of the
Consumers' Counsel

ATTENDEES (CONT.)

ROGER H. BEZDEK, PhD
President,
Management Information

Services

FRANK BURKE, PhD

Energy and Environmental

Consultant

ROLAND OTTE

Comptoir

Balland-Brugneaux

LARRY GRIMES

Secretary

National Coal Council

JAY BRAITSCH

Department of Energy

I-N-D-E-X

P-R-O-C-E-E-D-I-N-G-S

(10:00 a.m.)

I. INTRODUCTION

MR. PALMER: Let's call the meeting to order. My name if Fred Palmer and I am Chair of the Coal Policy Committee and this is an official Coal Policy Committee meeting and it is hereby called to order.

Today we will conduct the business of the Coal Policy Committee and that is to review the Draft Report requested from the National Coal Council by Secretary of Energy, Samuel Bodman, by letter dated April 12, 2007. And our representative from DOE this morning is Jay Braitsch, who is joining us by telephone from Washington, D.C. Welcome, Jay.

Before we start, I would like to state that the meeting is being held in accordance with the Federal Advisory Committee Act and the regulations that govern the Act. Our meeting is open to the public, as well as representatives of our members. I would like



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to welcome any guests we have from the public here today; but I do not believe that there any. However if there are and the representatives from the public or members care to offer comments during the meeting they are welcome to do so. At the end of our discussions we will also have an opportunity for any closing comments people would like to make.

Before we begin our work on review of the draft report, why do we not go around the room and identify who is present and who they are with, starting down here.

MR. OTTE: I am Roland Otte and I am representing a Comptoir Balland-Brugneaux.

MR. BURKE: I am Frank Burke; I'm a Consultant.

MR. BEZDEK: Roger Bezdek with Management Information Services, Inc.

MS. GELLICI: Janet Gellici, American Coal Council.

MS. KRUTKA: I am Holly Krutka and

I am with ADA-ES.

MR. BECK: And sitting at the far end of the table, where she stepped out for a minute is Janine Migden-Ostrander, who is a member of the Council and represents the Ohio Consumers' Energy Counsel. And I am Bob Beck, staff of the National Coal Council.

MR. PALMER: And I am Fred Palmer with Peabody Energy and Chair of the Coal Policy Committee.

MR. BECK: And for the record, we have the Secretary of the National Coal Council, Larry Grimes, on by telephone, and we also have Jay Braitsch the federally designated official from the Department of Energy, also on by phone.

Mister Chairman, normally the Secretary fills this role, but as he is not actually in the room, I would submit that we do have a quorum and we can do the business of the Coal Policy Committee today. Our quorum numbers are available for folks if they want



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to check that, but we have sufficient representation today.

MR. PALMER: Thank you very much. I appreciate that. We will now get into the Study, and before we go to a review chapter by chapter for comments on what we have, I would like to make a couple of opening comments, both with respect to the procedure that we will follow in completing this for our presentation date to the Secretary of Energy on May 22, in Washington, D.C.

And I would also like to thank the people for the hard work that has gone into getting the Study into the shape that it is in right now, and I want to compliment you on the work that has been done. It is clear from the document that is coming together nicely, that a lot of very careful consideration and deep thought has gone into this and I know we will produce a valuable document for the Secretary.

At the same time, just to give you an idea of how we are going to bring this to



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closure, we will leave here today with a document that we have all commented on. And I am going to use the chairmanþs prerogative and give this to Frank Clemente who has done such yeomanþs work for us in the past in connection with the 2006 National Coal Council Study that was produced to bring this into shape. And at the same time the Executive Summary will be redone and I would like to discuss that right now and to give some thoughts on where I think we need to go with this and what needs to be put into it.

In 2006 when we did the "Coal: Americaþs Future," Study, the price of oil was $47.00 a barrel. And in 2006 when we did that study the price of natural gas was $7.00 an MCF or thereabouts. We have gone two full years since then and there has been a lot of controversy surrounding energy policy in the country. Congress has acted twice on energy legislation. The most significant thing that has happened has been in the position of



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biofuels mandates. The President has opined on energy. We have had a lot of developments with respect to progress or lack of progress in terms of coal-based electricity generation in the country, all of which leads us to today in an environment where we have extremely expensive energy, which looks to be going higher from here, extremely expensive food that is linked both to the congressional enactments with respect to mandates and also to the increasing cost of energy. Some of these factors were identified in our 2006 Study. We did not claim specifically at the time that peak oil was here, but we gave a clear warning. We did not claim at the time that natural gas was going to go from $7.00 to $11.00 an MCF, but we identified growing use of natural gas for electricity generation and for ethanol production, which is the largest new user, and we warned of ever increasing electricity prices. And the full brunt of that will be felt for the first time I think



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this summer by the American people when we get into the air conditioning season.

And I think the introduction needs to firmly set forth energy reality as it exists today, based on the experience that we have had in the last couple of years. And in thinking about what we might call this document, I am struck with the proposition that we have an urgency in front of us and I would like to suggest something like "The Urgency of Sustainable Coal".

The technology path, of course, is what renders coal sustainable in terms of its use. And the intro to this, the Executive Summary; and we have Executive Summary Strawman on this Page 1 today as it exists, will go through these metrics, the metrics of oil, the metrics of natural gas, the metrics of ever increasing electricity prices which is tied to the price of natural gas, the increasing demand for natural gas use for electricity generation and ethanol production,



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the lack of action with respect to advancing us forward on putting in the needed base load generation of both coal and in other arenas. And also a review of where we stand with respect to some of the positive things that have happened in the context of carbon capture and storage, the excellent work that DOE is doing through metal and the regional partnerships; but also some of the setbacks that we have had in certain arenas; Future Gen being an example of that.

So, all of this would be in the context of letting Frank Clemente take a cut at this in terms of setting out these metrics and submitting them to the Policy Council for consideration probably, -- looking at a May 22 date, I would think that the best that we could do would be seven days in advance, -- no later than seven days in advance.

MR. BECK: Yes, I think that is fair enough from a logistics standpoint if you backed up from the twenty-second, which is a

Thursday and took a shot at somewhere in the neighborhood of the eighteenth, nineteenth, twentieth, something like that. I think that is something from a staff standpoint we can certainly work with and get the revised version out to people and those kinds of things.

I would just like to back up and let the record show that Mike Miller has joined us as well from Ameren, and Mike is the Vice Chairman of the overall Council, for those of you who had forgotten that and we are pleased to have him here.

But yes, I think the timing, we would be fine with that Fred.

MR. PALMER: Okay. That would be my introductory comment with respect to the Strawman and I would open it for any reactions or discussions on the points.

MR. BECK: If I could just make a couple of logistical comments as to how we got to where we are. As Fred mentioned in his



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opening remarks, initially the Council wrote a letter to the Secretary dated August the 15th of last year, 2007, suggesting that might do this kind of a study. His response back approving that was October the 12th. And then for this particular meeting the Secretary approved the meeting on April the 7th of 2008. So, from the standpoint of FACA (phonetic), I wanted to make sure that that was on the record and we were adhering to the policies there.

And in terms of the Executive Summary Draft, the Strawman, what was done here is that each of the chapter team leaders basically took their chapters and excerpted from them and we just dropped it in to the Executive Summary. The introduction and overview as Fred has mentioned in relatively thin; and I think that is being polite. And Frank Burke had a different description of it this morning, which probably need not be repeated.



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MR. BURKE: It was off the record.

MR. BECK: It was off the record, that is true. But it was meant to spur activity and to get peopleþs creative juices flowing as it were. And I think, Fred, that while it may be a little slower than normal, we are at that point and folks I think are going to start to engage more strenuously and more actively in the next week or so.

So, with that, Mr. Chairman, from a staff standpoint I just wanted to make all those things clear for the record and we can move forward.

MR. PALMER: Okay, terrific. Thank you. Any comments on anything that has been discussed to date or so far? Does this sound like a reasonable way to proceed and be comfortable with the theme?

MS. MIGDEN-OSTRANDER: Are we proceeding by going through the Executive Summary and then moving further back?

MR. PALMER: Yes. First of all,



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the Executive Summary on its face say it is a Strawman, which means is not operative. And I was just describing what I thought ought to go in the Executive Summary and Frank will take a cut at doing a draft. But we want to hit those seams in there. But it all has to be in the context of sustainability, which means we have to deal with carbon and we understand that, and that will be an essential inherent part of it. We do not talk anymore about coal without talking about carbon; nor did we really before. But to the extent that people thought we did, we do not. So, that will be an inherent part of it. But I just think it is so important to take this as a opportunity to let not only the Secretary know our views with respect to where energy stands, but the broader public in terms of this is not new; these things have been discussed and these trends have been in motion for a while and we have not done anything and they are worse. And if we continue to not do anything



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they are going to be worse yet. It is just that, that is really the theme.

MS. MIGDEN-OSTRANDER: Yes. No, I agree with what you stated there. And I guess my question was going more towards, in the Executive Summary there is a number of recommendations, are we going to be walking through those recommendations? That is my question.

MR. PALMER: I gotcha. And those are really a summary of the chapter recommendations.

MS. MIGDEN-OSTRANDER: Right. Exactly.

MR. PALMER: So, yes absolutely.

MS. MIGDEN-OSTRANDER: Okay. Thank you.

MR. PALMER: But I would suggest we do it, -- maybe we could come back and after we go through the chapters, talk about it then and see what is left.

MR. BECK: Yes. I think that



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might be a good approach, Fred. We have a number of the chapter leaders here and people that have worked on them. I think if we would just very quickly go through the chapters themselves and sort of give a good overview and talk about how we got to where we are; because I think the body of the report is pretty well completed. There are some things that are going to be added, I know, in Chapter 5, in the Underground Coal Gasification stuff. We are fine tuning that with a couple of experts with Janineþs help and a couple of other experts in the field. We are going to be refining, I think, pieces of Chapters 2, 6, and 7 as well. But in terms of the body of the work, I do not know that there is going to be anything really dramatically new that is going to be added.

So, if we could summarize where we are on a chapter by chapter kind of a basis and then come back to the Executive Summary discussion after that, I think that might put



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everybody on a more equal footing to kind of allow that to happen. So, that is what I would suggest we do if that sounds like a plan.

MR. PALMER: Are you all comfortable with that?

MR. BURKE: I think that is wise because the findings of the recommendations have to be supported by material that is in the chapter. So I think we need to look at what is in each chapter there, --

MR. PALMER: They cannot just have them be stand-alone.

MR. BURKE: That is right. And make sure that we have covered all the bases we that wanted. Because the mission we want to cover is in the overview and the summary and if they are not covered in the chapters, then perhaps we need to do some additional work there.

MR. PALMER: Yes. Okay. And what I am talking about in terms of the discussion



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in the Executive Summary would not be recommendations, but and overview of where we are and how this fits and why there is an urgency to adopting a context for the recommendations that are made. So, let's advance in that spirit.

MS. GELLICI: I think it is a great idea. As we go through the process on the all of these studies it seems like we keep going back to previous studies saying well let's, -- that is exactly what we have said in that study, bring it forward once again. I like the urgency part of it, because we do just keep reiterating what it is that we have said on a lot of things. We bring some fresh things to the studies that we are doing, but again, it is just, --

MR. PALMER: Thank you. You have got it.

MR. BECK: Mister Chairman, I will, -- because I have been involved in all of the telephone calls and conference calls



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and a couple of face to face meetings and we have had people participate in most of those, as the staff person I have been more or less the constant there. So, I think if I could just lead that walk through, we will start with Holly. If you could just in a general way sort of summarize all of the good stuff in Chapter 1 in terms of all of the efficiencies and technologies and things like that, then we will work our way through the chapters.

II. CHAPTER 1

By Holly Krutka, PhD

MS. KRUTKA: Okay. This is an overview and if you want to stop me just go ahead. Chapter 1 is called "Carbon Management Technology Options". Basically this focuses on all the technology options we have to manage carbon from coal-fired power plants.

So, the first thing that we went through, -- well, before I get started I just wanted to tell you that we had quite a few people helping with this job, so I do not want

to take all the credit. We had really good help actually. Yohnos Spear (phonetic), was very helpful and submitted quite a bit of material and Mike Durham and John Novak. Now, I am going to feel bad about forgetting about everyone; Sai Ali (phonetic), and many, many others. So, I think this is a really strong chapter. And if there is anything you see on how we can improve it I am happy to work on it more.

So, we go through a brief introduction to basically power generation, just from a lay person's standpoint. Basically you cannot burn coal or any fossil fuel without making CO2. And we have a figure with conventional a coal-fired station.

And then we go into a short discussion of what can be done to manage carbon emissions. We focused completely in this on the demand side, but here we do mention that there is efficiency improvements to be made on the supply side. But we do not



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deal with that in this report. And we do mention the strengths of coal and especially the existing capacity, the load following capability. And we talk about, -- well, I will just start going through it.

So, we basically divided this chapter up into two sections. The first section is for existing power plants and the second section is for new power plants. And the very first section under existing power plants is efficiency improvement And we deal with this in quite a bit of detail. We make sure to emphasize that if you want to do something about CO2 tomorrow, efficiency improvements are the best way to do it. We did mention a little bit about legislation and new source review and how that affects efficiency improvements or lack thereof.

MR. BECK: And Holly, if I can just interrupt for a second, that is tied into a discussion of the legal ramifications back in Chapter 6 as well, and this is the basis



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for recommendations that we have made in the past as Janet mentioned before, as well as the recommendations we are going to make in this report for streamlining the review process. If you are going to preach that energy efficiency is going to be the policy of the country, we think that the policy of the country ought to positively support methods of efficiency and those kinds of efficiencies.

MR. PALMER: Can I ask a clarifying question here? I took the efficiency to be in the context of making the existing fleet more efficient, as opposed to being more efficient in the way we use electricity, is that right?

MS. KRUTKA: Right, that is right. This is all supply side.

MR. PALMER: Right, this is all supply side? Okay.

MR. BURKE: I think that the point probably ought to be made certainly more clearly in the summary, because for example

the second bullet says,

"Improvements in efficiency must play an important role in both near and longer-term CO2 emission reductions.þ

MS. KRUTKA: In the Executive Summary?

MR. BURKE: Yes.

MS. KRUTKA: Okay.

MR. BURKE: In the findings and recommendations.

MR. PALMER: On Page 9.

MS. KRUTKA: Okay.

MR. BURKE: Taken out of context, I think you run into the question of what I am talking about, generating efficiency or a new efficiency and specifically the chapter supports the argument for generating efficiency.

MS. KRUTKA: I agree completely. I think in Chapter 1 we came out and said



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that, but it did not get transferred to you; that finding. So, I think we should definitely make sure that we are talking about the supply side efficiency. Okay. So, I am on Page 23 now.

MR. PALMER: (23)?

MS. KRUTKA: Yes.

MR. PALMER: Can I go back?

MS. KRUTKA: Sure.

MR. PALMER: Thank you. Options for new power plants?

MS. KRUTKA: Uh-huh (positive utterance.)

MR. PALMER: You have

> "The potential 45 gigawatts, new coal-based electricity generation.þ

MS. KRUTKA: Uh-huh (positive utterance.)

MR. PALMER: Is that a planned or under construction or under construction or, -- you know that number has bounced around a



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lot?

MS. KRUTKA: That is planned. And I think, --

MR. PALMER: And what is the time frame for them? Is that a near term potential?

MS. KRUTKA: I do not think so. If you look at the IEA or MIT Report, -- I would have to look it up in that reference. But if you like, I could, --

MR. PALMER: I think it is important to be specific about this as to if we are making a judgment, why we are making the judgment and what the database is. For example there was a, -- Associated in Missouri announced they were going to go put in base-load natural gas in lieu of their coal plant; that was four weeks ago. I assume that is not captured in that. On the other hand, Municipal in Iowa yesterday announced it was going ahead with a coal plant. So, this is definitely a moving target.



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DR. KRUTKA: Right.

MR. PALMER: There is no doubt it is a reduced number from when we were sitting here in 2006, but it is still a significant number and there is a time frame. There are all these assumptions when you go out ten years or beyond that may or may not be true, but there are things that are going on right now. So, I would talk about it in terms of both the existing fleet and the likely new plants, which we estimate to be þbam,þ with a quote to that.

MR. BECK: Fred, we could amplify that because it is a moving project in the press release and cover letter which is not going to be written until right before the study is actually released. So, we can say in the study we give a snapshot of time up to a certain day or we could reference the EIA Report, whichever it is and then try to bring it as up to date and as current as we possibly can with the press release and the cover



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letter. That is a way of handling it.

MR. BURKE: One of the things that confused me a little bit was when I was looking through this initially after the Executive Summary you start with Chapter 1 and there is about a six page summary of Chapter 1. Then we get into the findings and recommendations for Chapter 1. Then we have the findings and recommendations for a couple of the other chapters and then we actually get to Chapter 1. So, as I was reading through this the first time I was noting kind of the same confederacy, there were a lot of statements that were made in this initial summary part that I could not find any support for, but I guess they are back here. As I realized later that Chapter 1 was actually later in the report. There were a lot of the discussions and of course points that were made later in the report. So, I think there is a question of organization as far as why there is like a six page summary of Chapter 1



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at the beginning of the report, rather than just going directly to findings and recommendations, with this summary for the chapter being part of the chapter itself.

MR. BECK: That is correct, it is an organizational issue.

MR. PALMER: You know what we might do is revisit how we organized the 2006 Study, which I do think ended up being clearer. I think we had recommendations by chapter in the Executive Summary and then we went to the chapters, as opposed to making factual statements in the summary, which just sort of hang there.

MR. BECK: That is exactly what we did Fred with Americaþs Energy Future Study. And the idea, -- the concept, was that the format would be very close, if not identical, in terms of how that 2006 Study reads and is laid out, because it is very easy to grasp, very simple.

MR. PALMER: This is not a



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criticism of anything that has been done on this. This is just a, --

MR. BECK: No, it is just more work that needs to be done on this.

MR. PALMER: Right. And that's why if we plug Frank into this, he could do that right.

MR. BURKE: There are two other things and I will comment on them because they are, I think, really significant to this. One is, we have power plant costs in here in various places and we are talking about IGCC at $1,800.00 a kilowatt for example; the D.C. Plant at $1,600.00 a kilowatt. Those numbers are really pretty like off the meter, I think. You know we have seen the $3,500.00 a kilowatt numbers for A.P. and Duke and others.

MS. MIGDEN-OSTRANDER: More like $4,000.00 a kilowatt. That is what they have said in Ohio, is $4,000.00.

MR. BURKE: I mean I know it is always a struggle to come up with numbers, so



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you try to do a comparison. And I understand the context. But there is always problems, -- it is more of a problem nowadays, because by the time you write this thing the cost has gone up by another; Lord knows, 16 percent. So, I think it needs to be either, -- my first suggestion would probably be to at least put in some discussion here about these numbers that you are talking about. You know reflect what the current understanding is of the actual cost.

MR. PALMER: How would you document that?

MR. BURKE: Regulatory rulings, agency submissions that is probably the best place. In North Carolina and Indiana, A.P.þs the submissions they have made to the regulatory agencies to get approval, -- certificate of, -- those numbers are out there.

MR. PALMER: I think it is really important that in the summary and as we go

through this, is to capture that and just say hey, guess what, this stuff is going up from here big time. What we did at Prairie State over here in Southern Illinois was a $3,000.00 number and it started with a $1,500.00 number for a supercritical PC And then when you put all the guts and feathers and chickens and everything in the bundle it starts getting up towards four. But that includes transmission and things like that. And that is a lot different, -- you know that gives you a lot different number than $1,500.00.

MR. BECK: And that is what we struggled with. We actually Frank, had discussed this at that the March 27th meeting of what do those number mean? Where do they start and where do they end? And we pretty much decided that you are right, a sixteen, eighteen hundred dollar number is probably obsolete and it is closer to thirty-five hundred or four thousand or whatever; a much bigger number. I think probably what we need

to do is better define what the sixteen and eighteen hundred dollar numbers are. They are just a plain, and that is, I think, where we came out, --

MR. PALMER: I think Frank is saying they are not just the plain anymore.

MR. BECK: Okay. I am comfortable with that. I do not disagree with that, but if we are going to do that then what we need to do is be consistent with our prescription of what the numbers mean.

MR. PALMER: I think we probably could use a band and just say in the literature people still talk about this, in bio-links (phonetic) we get this, or you have got this $1,500.00 or $3,000.00 KW or two thousand to four.

MS. MIGDEN-OSTRANDER: I am sorry, I did not mean to interrupt.

MR. PALMER: Go ahead.

MS. MIGDEN-OSTRANDER: In the legislative debate we just had in Ohio, my



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office put together a chart in which we showed the cost of pulverized coal and the cost of IGCC based upon U.S. DOE numbers with carbon capture and sequestration and without carbon capture sequestration, and then we had another column which showed here is what the utilities are saying it is going to cost. I would be happy to share that chart if that would be helpful.

MR. PALMER: I think it would be really helpful, maybe even use it.

MS. MIGDEN-OSTRANDER: Feel free to use it. Well, the chart also has a comparison of coal with wind, with biomass, with nuclear and energy efficiency, just to show the range of cost for various technologies.

MR. PALMER: What was the context? Is it for a new plant?

MS. MIGDEN-OSTRANDER: This was in the context of comprehensive energy legislation in Ohio where we were debating

energy efficiency and renewable portfolio standards and trying to show the spectrum and also trying to develop advanced coal technologies. So, showing the spectrum of what was involved.

MR. BURKE: How did the DOE numbers compare to what we've heard?

MS. MIGDEN-OSTRANDER: Lower. It was is lower. But I think the DOE numbers were also more dated, more disrecent. So, I can go ahead and send that to you.

MR. BECK: Yeah Janine, why don't you email that to me and probably to Mike and Holly out of ADA.

MS. MIGDEN-OSTRANDER: I will need emails.

MR. BECK: Okay, thanks. That is easy enough.

MS. MIGDEN-OSTRANDER: Okay.

MR. BECK: You can send it to me and I can send it to them.

MS. MIGDEN-OSTRANDER: Yes.



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Alrighty.

MR. BURKE: The other comment I had that kind of correlates, you have got numbers in here for the MIT Study or the cost to do the demonstration to bring these technologies to fruition. And these numbers are, -- in the case of the MIT numbers those were $3,005.00 and they are even low, $2,005.00, but they are nominal, they are costs per dollars. I think they are low by another factor too, at least, -- for the same reason we just talked about. We are talking about building large demonstration facilities here, essentially for a power plant where we are doing large demonstrations and the cost of a demonstration with a commercial plant they would run it by the same factors that we were just talking about. But, if these are the numbers they have presented, then I think that at least the context should say you know these numbers are nominal at $2,005.00; talk about the escalations seen in costs based on



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commercial projects. It is likely that these numbers are underestimated by similar kinds of factors. And we really need to think about these not in terms of constant year dollars, but in actual nominal as spent dollars, which as you know very well, from (inaudible) Future Gen, was you know thinking about these things in terms of constant year dollars, as opposed to the money that would actually have to be spent in terms of nominal dollars.

MR. PALMER: But in that context, -- and the point also needs to be made that if we are to have the same result on these plants, for example as a Future Gen, we do not like the price tag anymore we are not going to do it, then we are really in trouble.

MR. BURKE: That is why we have got to know the real price. That is really my point, Fred. It is if we do not have the right number in there for what this is really going to cost, in terms of real cash dollars in the year in which we spend it, we run the



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risk of making the same mistake that I think we made with Future Gen, which is essentially low-balling the estimate. Not just because costs has escalated, but because we quoted the cost in constant year dollars not in real estimate dollars.

MR. BEZDEK: The problem with doing that is, -- especially when it involves the future, you have to estimate according to what inflation is going to be that year. That is the reason why all the analysis are always in constant year dollars; þ05, þ06 and þ07; and especially when you are talking three, four, or five years out in the future, inflation 1 percent a year; 2 percent a year; 3 percent a year, compounded, --

MR. PALMER: That is true. What we have right now people will just quote what is in the literature, which tends to be dated and there is all sorts of anecdotal stuff around as spent dollars today that are hell of a lot different than the numbers that are in



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here or anywhere else you look.

MR. BURKE: If power plants costs are increasing just at the rate of inflation, then I think well, you've probably got a good argument. But they are not, they are increasing much more than, --

MR. BEZDEK: So, do you think the components are overall inflation, --

MR. BURKE: The thing that I think is going to hurt us most, it was not just the way dollars are moving; it is not just the inflation, it is that these kinds of costs are escalating much faster than the rate of inflation.

MR. PALMER: And driven not by things here, but by things abroad.

MR. BURKE: Yes, and for a variety of reasons. But that is why I think these numbers, like the MIT numbers; and EPRI's got some similar, --

MR. PALMER: Okay, we'll do that.

DR. BURKE: -- about a billion



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dollars a year.

MR. PALMER: I have another question on the new power plant. You have 1000 gigawatts worldwide number, what is the genesis of that?

MS. KRUTKA: What page are you on?

MR. PALMER: It is on five again, in the Executive Summary.

MS. KRUTKA: Oh, you are in the Executive Summary.

MR. PALMER: Yeah. You have "45 gigawatts of new U.S. and 1000 gigawatts worldwide.þ

MS. KRUTKA: I am going to have to look it up. We did not have the references in the front, but we do have them in Chapter 1.

MR. PALMER: That is a real number that is in here somewhere? I mean it is from like a plant or, --

MS. KRUTKA: If I put it in there, it is referenced from something.

MR. PALMER: Okay. Okay. I will

leave that to work out with Frank. Okay.

MS. KRUTKA: Let me highlight it and make sure that it gets checked and addressed. I will say as far as the costs, you may have noticed that, -- I think it is on Page 45, we were worried about the costs that we were discussing not meaning anything before this was even printed. So, one way we addressed that was by non-dimensionalizing by the subcritical fleet, existing fleet. And so like the cost of electricity it was normalized by subcritical plant. Oh, this is for a new subcritical plant. And so you can just see the cost of electricity of other plants. So, we did not put an exact number for the cost of electricity, we just said how much it would increase over a subcritical plant if you were to do a supercritical or ultra-supercritical or something like that. So, in some places we might want to, --

MR. BURKE: Except in the footnote, you did do it.



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MS. KRUTKA: Well, you have to tell them something, but at least, --

MR. BURKE: No, I understand the problem.

MS. KRUTKA: So, we did think of that. We tried to address it the best we could.

MR. BURKE: And I think that is a good way to approach it. And I realize the problem is to somehow provide a basis for those numbers. And the basis for those numbers is somebodyþs estimate of cost from the estimate in general. I believe it is now substantially lower than what real world costs are.

DR. KRUTKA: Right.

DR. BURKE: You know at least some, -- a little bit of knowledge into that and the graph, by quoting some of these numbers here, show what people really are talking about when they are building plants.

MS. GELLICI: How do we want to



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deal with the projected planned new coal-fired? I mean the numbers that I have seen in here are from the MIT Study primarily, which is a year or so old now. How do we want to address that?

MS. KRUTKA: Is anyone aware of anything more recent? MIT is so comprehensive.

MR. BECK: There has not been anything newer that has dealt with that question, Janet. If there were other references out there we could obviously incorporate them and use them. You have got to figure out how you want to do it, but what I would suggest is that if we go ahead and use the MIT stuff, reference the fact that it is two or three years old; that there have been many changes; some plants have been removed from the list, but as Fred mentioned just yesterday, in Iowa they have committed to move forward. So the number will change. But in terms of an overall kind of a scope of what we



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are talking about, I think this at least gives people an idea of what could be done.

MS. GELLICI: EIA does a quarterly update. I do not know peopleþs feelings on how accurate that is. But in the past what we have done is we have gone back to some publicly available information.

MR. BURKE: UE keeps a, -- UE, -- I think they do it twice a year, --

MS. GELLICI: That's what I meant.

DR. BURKE: -- a power plant database showing the status of different projects in terms of announced projects, permitted construction and so forth.

MS. GELLICI: They are doing updates quarterly now.

MR. BURKE: They stopped doing that. They used to that independently, now, they are using a commercial service for it. So, they are no longer reporting it by the individual plant, but they are still reporting the total gigawatts in each one of these



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categories. And I think that is probably, -- I have looked at their data; we get similar sort of data from, -- I don't know if they use the same service or a different one, but we have got another commercial service that we use to get the same kind of information and they are fairly similar. So, that will show you plants that are at the point where they are, -- by the time plants have been permitted it is probably pretty likely to go into construction or if it is in construction, operation. And it shows the distribution by those categories and I think there is about 25 gigawatts.

MR. BRAITSCH: Hey Frank?

DR. BURKE: Yeah.

MR. BRAITSCH: This is Jay Braitsch. I just thought that I would throw in that this whole issue has managed to bubble itself up to the secretarial level in the past few days, because there is a lot of different numbers floating around and he wanted to say



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something in a speech. And part of the problem is that Nelor (phonetic) uses this energy velocity database, proprietary database and we think it is pretty good. These guys sort of make a living on keeping track of things that have been announced and how far along they are. But part of the problem is I think we probably have some restrictions on what we can say publicly on that. But it might be worth checking with those guys, because the Nelor guys have put together some pretty good charts to try to paint the picture.

And part of the reason the picture is so confusing is that only about a quarter of the plants that are announced ever get built, at least in the experience over the last decade and people do not really tend to understand what is going on here. They take it as kind of a sigh that things are really going badly for coal. They actually sort of are, but I think people misinterpret it from



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that data. So, I think you just have to be kind of careful what you use in that thing. I mean if you really wanted to get a rise out of people you could go with the NERC (phonetic) numbers on those, which are probably like a factor of four higher in terms of the amount of coal capacity that needs to be built. So anyway, this is a very controversial topic right now.

MS. GELLICI: And that will cite for a new power plant and coal plant.

MS. KRUTKA: Okay.

MR. BURKE: I think the guy, -- the name of the guy that keeps track of that is Eric Schultz (phonetic). Is that right, Jay?

MR. BRAITSCH: Yes. I am not sure. Ken Kearns (phonetic) runs the group that that comes out of.

MR. BURKE: Okay.

MR. BRAITSCH: So, you are right, there is a guy there who, --



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MR. BURKE: Yes. I have dealt with them. He has sent me stuff before. I think that would be helpful to look at and see what they could provide as far as plants that are in permit, in construction.

MS. GELLICI: It would be more current.

MR. BURKE: There are dozens of plants out there that, -- you know people make a big deal about the fact that plants are announced and they are never built. But these are 100 gigawatts faster; we could not build them all. We do not have a need for them.

MS. KRUTKA: Okay. I think it seems like a better number anyway, the plants that are in permitting and construction just because it is hard number. It is not just kind of a 45 gigawatts. You know it is estimation, but I like that idea.

MR. BURKE: And that is a number you can get.

MS. KRUTKA: Okay. So, we will go



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back to Chapter 1. So, I was around, -- let's go to Page 23. We were just going through technical means to improve efficiency in the existing fleet. And we divided that up into basically how much capital investment is required and just discussed what kind of efficiency improvement you can expect from different types of modifications to your plant. We go through steam side changes, deposit treatment, coal quality, coal preparation, coal upgrading and drying and coal treatment.

And the next big section is oxycombustion. I am sure everyone is familiar with that. And we just basically described the technical process, the other benefit such as
NOx reduction and we also discussed the large scale demonstrations that are going on right now. And since the whole point of oxycombustion is basically for carbon capture and sequestration we included a figure and

this is from the MIT Report showing decrease in efficiency due to implementation of carbon capture and sequestration.

And the next section is CO2 management using biomass. The first area is co-firing with biomass. Basically, we talk about how there is no net release of CO2 or there is minimal net release of CO2 when you co-fire biomass. And then we talk about how much of this is going on; what the issues are and the problems, such as slagging and fouling in the boiler; the availability of biomass; competition of biomass with land needs, such as food production, fly ash problems and then we list the U.S. plants currently firing biomass.

And then we discuss biochar, which is one of the only carbon negative technologies you can implement where you actually are taking CO2 out of the atmosphere when you implement this technology. And then we just basically discussed the issues and

technical hurdles for implementing biochar as an option.

MR. BECK: If I could interrupt again, Holly. We have been in contact with the American Forest and Paper Association's technical staff and they have reviewed this chapter on biomass co-firing with coal. For the most part they are very supportive, but they do have some concerns that we would potentially be taking some of their actual product and turning it into fuel. And so they want to make sure that they are not losing a lot of timberlands and things like that from the standpoint of co-firing all biomass with coal.

They have supplied us with some comments on the section that you just walked through. I just got those yesterday here in St. Louis, and so it is in my computer but I have not had a chance to download it, take a look at it, and see. But they have done some commenting on this section and provided a

couple of recommendations that I will forward to you tomorrow when you get back. I do not think, according to Jerry Schwartz, their technical staff guy, I do not think they have done a whole lot of major surgery to it. I think it is just a little bit of redlining and they have added a couple of things. So, I think it will work out well. But that will be coming and we can kind of figure out a place and a way to work that into the chapter.

MS. KRUTKA: I am more than happy to have experts helping me with that part.

MR. BECK: Yeah, I thought it would be a good idea to ask those guys.

MS. KRUTKA: Okay. So, the next section is post-combustion capture and we basically go through what is being done. There is a ton of research in this area and so we just kind of did a big overview.

The first one are Amine Scrubbers, just because that is basically the standard that CO2 capture technologies are judged by.

And we just described the process. And I am sure, as you have all heard, NEA captures; if we wanted to implement that it is very expensive today. Bob, I am sorry I have noticed a lot of the lines are messed up in here, have you seen that yet?

MR. BECK: Oh, they are? You're talking just the format? What page is it on?

MS. KRUTKA: (36). Well, I am noticing it as I go through. I don't know if something happened to it.

MR. BECK: Oh, I see what you are saying. It is a spacing issue.

MS. KRUTKA: Okay.

MR. BECK: Yeah, we will clean that up.

MS. KRUTKA: I just want to make sure nothing got deleted or anything like that.

MR. BECK: We will scrub it real good and make sure.

MS. KRUTKA: Okay.



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MR. BECK: Not intentionally, let us put it that way.

MS. KRUTKA: Okay. And so we just discussed the issues related to NEA capture of CO2 and discussed what improvements may be possible to lessen the cost of that.

Then we move to the ammonia based systems. And basically there is two big groups. They are getting to the point where we are doing large scale demonstrations now and that is the chilled ammonia. So, we discussed Alstomþs process and where they are and at what point their development is. And then we do the multi-pollutant control with power span. I think it was important to mention these just because they are showing very fast development of CO2 capture technology and these processes look like they are going to be substantially cheaper than MEA. So, they are very promising and exciting for those of us in that area.

Then we move to dry sorbents.



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These are much less developed than the liquid solvents. So, we just kind of give a general overview just saying how do sorbents work for CO2 capture and what are the possible advantages and what are the obstacles for implementation.

And then we just have a short paragraph about membranes, which are still basically in the lab scale development. And just a little bit more discussion of a few other general technologies.

And I think in the last paragraph of this section, we point out that many of these are still in the early stages of development and that they will need proper support to continue development and to accelerate technology development, which is a theme you will see throughout this chapter. So, now those are all the options for existing power plants. And then the next section is, -

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MR. BURKE: I think the content



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is, -- no question; no problem with that. In the findings, the third finding says, -- this is on Page 9.

"The greatest potential for reducing the emissions of carbon dioxide occurs in the development of retrofit technology that would be applied to the existing fleet of coal-fired boilers generating 320 gigawatts of power.þ

MS. KRUTKA: Which one? Oh, number 3.

MR. BURKE: Third, number 3. I think one of the things that this chapter does that is really good is to point out that there is tremendous potential there for improving efficiency and for potentially retro-fitting existing boilers; and that is a target of opportunity. I guess what I am questioning is the word greatest. I guess I am not clear if that term is correct. We are saying that on other hand



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we have options for new power plants that have carbon capture and storage with existing plants, greatest in comparison to what?

MS. KRUTKA: Well, improving the efficiency is not going, -- carbon capture, theoretically we can get 90 percent of CO2 out.

MR. BURKE: Oh, so the greatest potential to reduce carbon dioxide comes from, -- for existing plants, comes from retro-fitting, --

MS. KRUTKA: Right. I mean efficiency improvements can only take you a few steps. Carbon capture and sequestration is where huge reductions can be made.

MR. BURKE: Oh, okay, okay. That ought to be written then to say the greatest potential for reducing carbon dioxide emissions from the existing fleet of power plants, --

DR. KRUTKA: Okay. It just needs to be reworded.

DR. BURKE: -- occurs through the development of retrofit technology. Okay, that makes sense. That is fine.

MS. KRUTKA: Okay. So, options for new power plants. The first subsection is "High Efficiency PC With Related Costs and Efficiencies for CCS". So, we just go through these tables and all the information from these tables are either from the MIT Report or a paper that Yohnos Spear wrote.

So on Table 1.3 it lists the new types of power plants, how we can increase seam temperature and pressure to get better efficiencies. And then the second table, I think it is the very last row, I really think this is interesting. It shows what the CO2 reduction is versus the existing capacity. So, if you had just the average power plant today subcritical unit, how much CO2 can you reduce, but make the same amount of electricity by increasing the efficiency. So, you can see there is actually some fairly



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dramatic CO2 emission reduction. So, I thought that was really interesting.

MS. GELLICI: So, did we think maybe there is significant potential for reducing emissions, is that a better way to phrase that then?

MR. BURKE: I think there are two questions here. One is, if you are going to reduce emissions from existing power plants what is the best way to do it? And you can do it through improving efficiency. But I think what Holly is saying is that, -- or the report is saying, is that the greatest potential to reduce emissions would be if you were to retrofit these plants with carbon capture specific devices.

MS. KRUTKA: Or maybe we should say that the means for the greatest reductions is going to be capture and sequestration.

MR. BURKE: Right. The greatest potential to reduce coal natural emissions is probably to build new power plants that have

carbon capture and storage integrated into them as replacement for existing capacity. But that is not going to happen quickly. That is going to take a long time to get to.

MS. KRUTKA: I think we have that exact sentence in here somewhere.

MR. BURKE: But the way it was written it sounded like you were saying the greatest potential for this overall global emission reduction is existing plants and that is not what they were saying.

MS. KRUTKA: No. I will reword that. It is supposed to say the greatest potential for the existing fleet.

Okay. So, now I am on Page 44. And for all these new plants there is an associated efficiency reduction for the implementation of carbon capture and sequestration. So, these three figures from the MIT Report just shows for different types of plants where we are going to lose that efficiency and what the final efficiency will

be approximately.

Then we have our Table 1.5, which as I said we did normalize the cost of electricity and it does have the cost of electricity at the bottom; but the table itself is I think a good way of doing that.

Then we just tried to emphasize the plant cost versus the efficiency in the next two tables and then how that curve changes with the implementation of carbon capture and sequestration.

The next section is "The Gasification of Coal" and we are discussing IGCC plants here. So, we give a brief introduction to IGCC; the types of efficiencies we can obtain by using these power plants. In theory this is kind of a skeleton figure to describe exactly what happens in an IGCC plant and then discuss the implementation of carbon capture with that. And we go into costs.

And once again, on figures 1.15



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and 1.16 we did non-dimensionalize the costs by a PC subcritical plant. So, that was how we were trying to make this figure relevant for more than a day.

Then we go into discussion of fuel cells with IGCC, and gasification of biomass with coal. So, just kind of co-firing except for IGCC plants.

Then we discussed the "Advanced Turbine Program for High Efficiency and Carbon Sequestration". And this is a Program from the U.S. Government and just kind of the new turbine types that they are doing research on. So, there is hydrogen turbines, low swirl combustion turbines and oxy-fueled.

The next section is "Carbon Compression". This is not too detailed, but we wanted to give some general numbers so that you could put something in context with how much the CO2, once it has been removed from the flue gas needs to be compressed before it can be sequestered. And because this is still

pretty expensive we discussed the possible improvement to novel methods of compression.

We also added a section on the beneficial use of the captured CO2. So, some plants will not have access to geological sequestration sites and that is a real problem. So, we added this section and some of those plants will have other options. Growth of algae for biofuels is an interesting area that we discuss.

Then we went into a section on carbon off-sets from use of coal combustion byproducts. And we spent quite a bit of time discussing fly ash and how much energy can be saved by the use of fly ash and the CO2 emissions related to that, and how using fly ash, -- it saves quite a bit of CO2 emissions.

Then we got into the RD&D funding needs and started this table, Table 1.6. This is from the MIT Study, I believe, -- yeah, I think it is from the MIT Study. And we had quite a bit of debate because a lot of people

did not like these numbers. So, after that, we added that this is good for the research, but there also needs to be, in addition to this, between five and fifteen full scale sequestration demonstration projects funded through a public/private partnership to prove that the sequestration side is possible and safe. And I think at one point someone wanted to throw in the cost of a billion dollars per project, but I did not have anything to back that up. So, it is not in there.

MR. BURKE: I think this is where it would be worth making a couple of points you made earlier. These processes tend to be dated. They tend to be in constant year dollars. And given the escalation and construction costs recently it is likely that these are significantly low. So, when you make the point that by any measure these estimated costs are substantial and, -- would this be the appropriate place to say even though they are substantial, even these



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numbers are big, they are likely to be low for these reason.

MS. KRUTKA: Okay.

MR. BURKE: I do not think trying to give an actual estimate will make any friends anyway.

MS. GELLICI: This entire section, you refer to the EPRI-CURC Road Map, DOE Road Map, --

MS. KRUTKA: Uh-huh (positive utterance.)

MS. GELLICI: -- is that incorporated in some of the newer things that CURC has been working on? Because they have got some near-term, -- I know that that is a standard the EPRI-CURC DOE Road Map. Are you familiar, --

MR. BURKE: Yes. This road map just takes it through RD&D, it does not do deployment. The Near-Term Program that they have proposed is for deployment, but things could be done in the shorter term. So, it



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does include some of the stuff you talk about in here; efficiency improvements for existing plants. It talks about incentives for carbon capture and storage, but not at 90 percent carbon capture and storage, it talks about incentives for 30 percent or 50 percent that could be done sooner.

MS. GELLICI: But they also have a long-term component.

MR. BURKE: But really CURC does not so much have a long-term. They have a deployment incentive program, but I do not think they have a program or a concept or anything that is out there that takes it to full deployment. So, the road map itself is a research development demonstration. The Near-Term Deployment Plan is for deployment either through efficiency improvements for existing plants or through carbon capture and storage, but not at the scale you have to get to, ultimately, for the long-term.

MS. GELLICI: I have not drilled

down into that information. If you think that there is anything of value there that might be incorporated here?

MR. BURKE: Well, since this talks really about the R&D funding I think the road map portion would be relevant to us. I think the deployment portion of it is probably not relevant here because we are talking the demonstration side.

MS. GELLICI: But it might be worth a look?

MR. BURKE: Yes. On the next page there is a ridiculous graph that shows the hump in the middle, research, development and demonstration. So, this first three, up to the yellow bars, is what is covered in the CURC's road map. The deployment part of it is partly covered by the Near-Term Program, but it is not complete.

MS. GELLICI: And the only reason I raise it too Holly, is that that is getting some attraction I think in D.C. and people are



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talking about that a lot. And if our study is not including that, -- I think it would reinforce what other groups are saying. It would lend some credibility.

MS. KRUTKA: We could arrange it. I would be happy to do that. Okay. So, then we go into R&D time-lines and we break this out by technology efficiency improvements, CO2 capture, new plant efficiency and the projected timing for all these technologies to come on line from IGCC.

And then we have the section "Need to Address Multiple Approaches", where we just explain that this is not a one fit all technology, or there is not a one fit all solution to CO2, so we are going to need to pursue several different avenues.

Then we have our findings and our recommendations, which I do not know how the numbering go messed up, but these are all in the Executive Summary. So, I think we have talked about them already or we will go back



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to the Executive Summary.

DR. BURKE: I had a question on a couple of them. We have talked about number two and three. The seventh one, which is here the seventeenth one?

MS. KRUTKA: Uh-huh (positive utterance.)

MR. PALMER: It talks about the availability of these technologies could result in a savings of a trillion dollars by 2050. Is that number actually in the report anywhere?

MS. KRUTKA: I do not know.

DR. BURKE: It did not jump out and I looked through there for it.

MS. KRUTKA: Honestly, somebody added that and it was not me. So, I will have to find out where that came from. But no, that is not in the actual text anywhere.

DR. BURKE: Okay. If it is not, if there is a way to write a support for it, do that.



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MS. KRUTKA: Okay. I will email the Chapter Group and see who put that there and where they got it.

MR. BRAITSCH: You might want to check the PN&L folks, who do the hundred year modeling, the jasmines and FH. They have got real big numbers for that kind of stuff. I can give you a contact on that if you need it.

MS. KRUTKA: Yes, that would be great. Okay.

MR. PALMER: Is that it?

MS. KRUTKA: That is it.

MR. PALMER: Okay. Frank, did you write out your thoughts on this?

MR. BURKE: I think I have given Holly everything.

MR. PALMER: And Holly, you have those written down?

MS. KRUTKA: Yes.

MR. PALMER: The procedure we will follow will be to Bob and then to Frank Clemente.



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DR. KRUTKA: Okay.

MR. PALMER: And I am sure he will set up some kind of a conference call among the various chapter authors, to straighten out points that have been made here. Very positive discussion. Who is Chapter 2? Bob is not in the room.

MR. BECK: Just one second. We are going to take a five minute break.

[Whereupon the meeting recessed at 11:15 a.m. to reconvene at 11:20 a.m.]

MR. PALMER: We will begin with Chapter 2 and I will turn it over to Bob.

## III. CHAPTER 2

By Robert Beck

MR. BECK: Thanks Fred. Chapter 2 was actually drafted by, -- or the Chapter Leader, I should say, was Ray Rayfield, and he had a lot of help from the coal gasification folks at Eastman and Shell and other places like that.

Basically what he did, he



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referenced our March 2006 Study, the "Coal: Americaþs Energy Future Study," reporting as we did in that study, that by 2025, you could use coal to convert it into something like 4 trillion cubic feet of gas on an annual basis and that that was still accurate and a very laudable goal to pursue. And he basically walks through all of the technologies that are available.

The presentation is such that they are commercially available. ConocoPhillips, GE, SASOL, Siemens, a lot of different corporations are doing this around the world. And he talks a little bit about the quality of the product that you get; which after some discussion we decided to call substitute natural gas. So, that is why you will see that substitute natural gas phrase. And he frankly said he has still got a lot of work to do on this and he is continuing to work on it; he is continuing to look at recommendations that could be offered.



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MR. PALMER: Who is this?

MR. BECK: Ray Rayfield.

MR. PALMER: And what is the time line?

MR. BECK: Well, he knows that the time line was today and he called and said he should have something by the first part of next week.

MR. PALMER: It is expanded? Is it cost figures? Do you know what he is coming up with?

MR. BECK: I do not know Fred, specifically. I think that it is going to be more along the lines of how much coal would we need to make how much substitute natural gas, because that is the piece that is really missing from this particular chapter. He does talk about the technologies, but you need to take it the next step and say that now that these technologies are there, it is kind of a so what? Now, what do we do? Well, what we would like to do is change coal to natural gas



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and that is the piece that is missing. He knows that and he has promised to be working on that. I will give him a call tomorrow.

MR. PALMER: Watch the time.

MR. BECK: Yes, I understand that. And I would suspect that he is spending a lot of time with the 2006 Study to look at the numbers that were involved.

MR. PALMER: Is Paul involved in this at all?

MR. BECK: No. Paul is involved in it, I cannot speak to the extent to which he is involved in it. I do know that in the initial meetings and phone calls that that group had, Paul was very much involved in it and I can double back with him as well.

That is really all that I care to offer, only because I am not really qualified to get into any detail. It is just not my area of expertise and it is only nine pages, it is very readable.

MS. MIGDEN-OSTRANDER: He is going

to provide some cost data comparing the cost of coal gasification with other energy sources such as liquefied natural gas and oil and those kinds of things. Is that expected then?

MR. PALMER: Is he doing that? I doubt it.

MR. BECK: I doubt it.

MS. MIGDEN-OSTRANDER: Because that would be, I think, very useful to take a look at it from an economic standpoint and say okay what is the cost of this as compared to other technology.

MR. PALMER: I would agree with that. I think he is the position to have the best cost numbers, but I doubt that they will go into that. You can ask him.

MR. BECK: Yes, I agree, Janine with your point. And Fred, obviously, I doubt that he is going to get into that. And if he does, it is probably not going to be in any really great detail. But we certainly can check.



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MR. PALMER: Yes. Did Ohio look at the economics of coal to substitute natural gas at all?

MS. MIGDEN-OSTRANDER: No.

MR. PALMER: Did you look at life cycle CO2 emissions from LNG versus, --

MS. MIGDEN-OSTRANDER: No. I mean the reason I put together what I did, was part of a Comprehensive Regulatory Energy Bill in terms of regulation versus de-reg and whether we were going to do energy efficiency standards and renewal portfolio standards. And then there was an advanced energy piece that was not very well defined. And this report will help define what is considered advanced energy for use in Ohio.

MR. PALMER: The cost aspects of SNG are like CTL. If you look in the CTL discussion in that broader chapter next, the construction cost increase from 2005 has basically doubled. CERA (phonetic), is that their graph?

DR. BURKE: Yeah.

MR. PALMER: And that is everything. So, when people were looking at these CGG plants, coal to gas, I think we may have used a $6.00 number in the 2006 Study. Now I promise you that is not $6.00 anymore. And when you put carbon capture and sequestration in it, it gets right up to where the cash costs are, which are more than $10.00 today.

The fear though, -- I mean the risk to the society is stepping back from who is doing what, in what state? That LNG is the incremental source of natural gas supply, because the U.S. production is flat. And if that gets priced on oil; and it has been that way, it would be more than $15.00 today or 50 percent higher than it is on a permanent basis. Depending on what happens to oil, you can get a twenty to $25.00 increase for MCF.

So, in that context LNG is obviously a bad idea. And then from a carbon



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standpoint; Carnegie-Mellon did their study on the full life cycle of carbon footprint LNG, is a lot higher than the carbon footprint of SNG with carbon capture and sequestration, because that basically gives you a natural gas instead of a natural gas footprint. But LNG you have got all the divination, methane leakage and then the gasification process and, -- or the faction process and then the re-gasification process and then the transfer process.

So, I think those specifics need to be in here somehow. I am not sure who is going to go do that. I think though we can get Frank Clemente to put some of this stuff in here. I think the cost, -- I do not know how you would get there? Grey Point (phonetic) claims on their web page $5.00 gas.

MR. BURKE: It is easy when you have not built one.

MR. PALMER: Well, it is a process that is not as complicated as the Conoco degas



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process and it is inherently more economical because there is less going on. But they have not proven it either.

MR. BURKE: Yeah, I am always skeptical of those kinds of plans.

MR. PALMER: But they raised 150 million dollars. So there are some people, including Kleiner Perkins and Al Gore is a partner in that.

MR. BURKE: There you go.

MR. PALMER: And Jim Carrey.

MR. BURKE: It has got to be true.

MR. PALMER: Anyway. But I think the specifics of these things, -- the more specific we would be, the better. But how and whether we are able to do that or not? I would push him harder for specifics.

MS. MIGDEN-OSTRANDER: Yes, especially in light of what you just said in terms of pointing out that this could be a much lower cost option than LNG and everybody seems more focused on LNG. That sort of makes

the economic case for sort of switching gears a little bit.

MR. PALMER: I think in the preface in the Executive Summary we ought to put that LNG stuff right up front saying, here is our path. If we do not use coal we are going to use this stuff, and if we use this stuff and it gets priced off oil, here it is. And by the way the carbon footprint is worse than coal to SNG with carbon capture. We just put that right up front.

MS. MIGDEN-OSTRANDER: Well, the other thing that I sometimes discuss in terms of why we need to look at other solutions, is the fact that when you rely on LNG you are also competing with Europe, you are competing with India, and you are competing with China, and you are getting your sources of gas from countries that the United States may not have the best of relationships with. And that also goes to the whole idea of energy independence and security.

MR. PALMER: That is very impressive and the reason it is, is because I gave that speech today myself.

MS. MIGDEN-OSTRANDER: I promise you I was not there.

MR. PALMER: I am just kidding.

MS. MIGDEN-OSTRANDER: Like minded, we are like minded on it, yes.

MR. PALMER: Could we ask you what you concluded in your cost review for these various alternatives?

MS. MIGDEN-OSTRANDER: Well, what I concluded was that energy efficiency; demand side management, was the least cost option, costing $400.00 a kilowatt, as compared with all other technology. And that is including allowing the utility to recover their program cost and incentive payment and lost revenues associated with incenting them to not sell their product. And so we used that in getting a 22 percent by 2025 Energy Efficiency Standard passed in Ohio.



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MR. PALMER: How do you define efficiency? What is the baseline to compare that to? Is it appliance? It is an appliance specific method?

MS. MIGDEN-OSTRANDER: No. Basically, what we are saying is that if you take a look at the utility companyþs entire load for the past three years and you do an average and determine a baseline. And then every year they have to reduce that baseline by a certain amount. It starts off at .3 percent and so forth. And what you do is you have the utilities implement Energy Efficiency Programs for customers. For example, one program could be a rebate program where a utility will give a customer a rebate for buying an Energy Star refrigerator or Energy Star air conditioning or it could be a light bulb change out program. It could be an entire HVAC system for an industrial customer or motor change out. But you come up with programs that pass what is referred to as a

total resource cost test, meaning that the benefits of the program exceed the cost and then you follow up with monitoring and evaluation periodically to measure those savings.

MR. PALMER: What happens if the utility load grows?

MS. MIGDEN-OSTRANDER: I am sorry?

MR. PALMER: What happens if the utility load grows? If the demand in their system grows for the utility?

MS. MIGDEN-OSTRANDER: Well, if the growth in demand is due to new businesses locating in the service territory, you try to account for new growth, because you do not, at the same time want to inhibit economic development. So, you have to factor that into your entire equations of what that baseline is.

MR. PALMER: That would apply to expansions as well?

MS. MIGDEN-OSTRANDER: Yes, yes.

Obviously, like in a State like Ohio, which is in great need for economic development, you do not want to have the energy efficiency impede that.

MR. PALMER: Okay. So, efficiency was the first, then what were the others?

MS. MIGDEN-OSTRANDER: Well, I can pull up the chart right now. Then I think came wind and biomass, followed by, I think natural gas. But let me pull that up and I can give you exactly. If you give me two seconds here, I can pull this up for you. Here is my nice little colored, -- for whoever can see it. Here is my energy efficiency at 400, wind at 1,480, biomass as 1,510, central station solar at 3,149, natural gas combined cycle at 1,172, nuclear is projected at 7,810, and that is based upon Florida facilities, and then IGCC with carbon capture sequestration based on DOD numbers is 2,496, and the latest projection using AEP and Duke is 4000, and then

pulverized coal supercritical with carbon capture is 2,635.

MR. BURKE: Does capacity approximate use for wind?

MS. MIGDEN-OSTRANDER: I can tell you in a moment by going to the other chart, but we take into account the fact that wind does have a low capacity factory.

MR. PALMER: But the numbers you gave us are installed capacity costs?

MS. MIGDEN-OSTRANDER: Yes.

MR. PALMER: Not all in operating costs?

MS. MIGDEN-OSTRANDER: Right, right. And the thing is, you do not have the kinds of operating costs and fuel costs associated with the, -- obviously the energy efficiency or the wind. Okay. Your question with regard to wind, let me look here. This is based on the Annual Report of U.S. Wind Installation Cost and Performance Trends 2006. DOE figures are capacity weighted averages and



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include a federal production tax credit of .2 cents per KWH.

MR. PALMER: Okay, yes 2 cents, okay. On the natural gas, did you have carbon capture and sequestration as part of it?

MS. MIGDEN-OSTRANDER: On the natural gas combined cycle?

MR. PALMER: Yes.

MS. MIGDEN-OSTRANDER: I do not believe so.

MR. PALMER: On the pulverized coal IGCC, do you do that based on turning it into a natural gas emission footprint from a combined cycled unit or is it more aggressive than that?

MS. MIGDEN-OSTRANDER: I am sorry. Let me answer your question with regard to the natural gas combined cycle, because I am looking at the note here. It says, the natural gas combined cycle as with the IGCC has an average of three IGCC designs, cost and performance baseline for fossil fuels. So, I

think there is some accounting for that. I would have to get back to you on that. What was your next question?

MR. PALMER: I guess what I am talking about is it really apples to apples? Obviously natural gas has carbon?

MS. MIGDEN-OSTRANDER: Yes, but our calculations show numbers with, -- the more detailed chart shows, -- which I have just emailed to Holly and Bob, and I would be happy to email to you, shows with and without carbon capture sequestration.

MR. PALMER: For natural gas? For all of them?

MS. MIGDEN-OSTRANDER: Yes, for all of them, with and without. We have a price without carbon capture, it is $554.00. With carbon capture it is $1,172.00

MR. PALMER: Okay. So, that is the high end?

MS. MIGDEN-OSTRANDER: Yes.

MR. PALMER: All right. I gotcha.



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Thanks, that is really helpful. It is not actually a digression when you are talking about coal to natural gas. So, in that space you are just producing the fuel. So, if we are going to require the natural gas units, -- basically, you take the natural gas units to where the pulverized coal units used to be at $1,200.00 a megawatt, with carbon capture and sequestration.

MS. MIGDEN-OSTRANDER: Yes. So, the numbers that are on that chart that I read off to you before, was with the carbon capture.

MR. PALMER: I have always thought and do think, that the sweet spot in all of this at the end of the day; particularly given all the combined cycle units sitting out there that are not used today and given where the public is on carbon, is coal is a substitute natural gas with carbon capture and sequestration. Because everything is already there, you do not have to go recreate the

wheel it terms of nutrients and things like that. But you have got a lot of capacity that is not being used, it is just sitting there. That answered my question. So, are we done with Chapter 2?

MR. BECK: Yes, we are.

MR. PALMER: We are on to, --

MR. BECK: We are on to three.

IV. CHAPTER 3

By Roger H. Bezdek, PhD

MR. BEZDEK: How do you want to do this? Do you want me to run through it quickly or go page by page?

MR. BECK: Quickly would be better than page by page.

MR. PALMER: Actually my major concern in this area is cost. And we have got numbers in there that we know are not right; the MIT stuff.

MR. BEZDEK: And the DOE stuff.

MR. PALMER: And the DOE stuff. So, I am just not sure that is useful. I



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would ask you to revisit the whole cost question and to use, -- you have done your own calculations, and use the anecdotal things that you have heard, and then to give a number based on those calculations. For the group and for the record, I think the numbers that Roger has produced were between $100,000.00 and $125,000.00 per barrel installed capacity of CTL. And anecdotally we have heard numbers as high as $200,000.00 a barrel of installed capacity; that is U.S. China is different, the whole rest of the world is different because of capital costs, which are a fraction of that.

MR. BEZDEK: Okay then, do you want me to read the discussion of the MIT Study from 2006 or the MEA Study from 2007?

MR. PALMER: Well, you might discuss them in saying here is where it was, but we know it is not there now and here is the impact of the cost; by the ramp in CAPEX numbers. So, it comes back to the Future Gen



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kind of, as an example. If you sit in a corner and quiver and say this stuff is too expensive, we are not going to do anything. Then energy will truly get, -- it is already expensive, it will be scarce, because people will not make the investment.

On the other hand, if you put these things out there and you go okay, at $150,000.00 a barrel and we are a 30,000 barrel a day plant and you take the 2006 ERL (phonetic) that we put out there, -- what was it, a million barrels a day? I think 2.6 million barrels a day.

MR. BEZDEK: 2025.

MR. PALMER: By 2025, and you say this is the CAPEX; here is all the cost with carbon capture and sequestration and we meet the needs of aviation anyway; you know for transportation, different deal, but you have got heavy duty trucks, railroads, coal mining, aviation, we have very high priority national necessities that we need CTL for, if it is a



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peak oil world. And then you go to other modes of transportation through corn based ethanol, cellulosic, plug-in hybrids, that whole gambit of things. And so that is how I think on this. But I do not think it takes that much work. I think the Chapter itself, is excellent. But I think these cost numbers could be realistic.

MR. OTTE: I would like to comment on the whole Chapter myself and start basically by looking at Page 103. And I would like to underline the statement that says,

> "It is likely that CTL plants built in the U.S. for the foreseeable future will utilize indirect liquefaction.þ

I really would like to question that comment and see that the other technologies indirect liquefaction would have equal exposure in this chapter.

MS. GELLICI: Where are you? I am sorry.



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MR. PALMER: He is on Page 103 at the top. There is a discussion about the likely path for CTL in the U.S. is indirect and that is a challenge to that conclusion. And indirect is Fischer-Tropsch and then direct is, --

MR. OTTE: H-Co (phonetic).

MR. PALMER: And I think that's, -- do you have a response to that?

MR. BEZDEK: Well, everyone else that we have talked to on this chapter has agreed with that statement.

MR. PALMER: That is not a response. Everyone else agreeing is not a response. Do you have a response on the substance?

MR. BEZDEK: On the substance, I believe that that statement is correct, that the future lies in indirect.

MR. PALMER: And is that because of the economics or the product?

MR. BEZDEK: Economics and



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environmental considerations.

MR. PALMER: And what are those specifically?

MR. BEZDEK: Direct liquefaction is much more environmentally intrusive. And do you use, -- do the same people actually investing money in direct liquefaction plants in the near future, in the U.S?

MR. OTTE: Yes. We have been working on a system.

MR. PALMER: Here, Roger on this point. A conclusory statement by itself, if challenged, there has to be specifics as to why you reached this conclusion. And if there is actual real world ongoing direct liquefaction development then that by its definition needs to be known, and what people see in that versus indirect.

MR. BEZDEK: Could you send me information on what is going on with direct liquefaction?

MR. OTTE: Sure.

DR. BEZDEK: Because as far as we could determine there is no action going on in that area. If there is, I would like to know.

MR. OTTE: Yes, I would be happy to.

MR. PALMER: But we are obviously agnostic in terms of, -- and should be and will be agnostic in terms of what is being done. I think a discussion of the considerations in each sphere is in order.

MR. OTTE: It is just that we started in January using the technology.

MR. BEZDEK: It generally is in China.

MR. OTTE: Right. I understand that. But, as I said, we are two weeks away from completing the physical study.

MR. PALMER: In the U.S.

DR. BEZDEK: Yeah, I would appreciate any information you can send me that is non-proprietary. Does the Council want me to include another couple of



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paragraphs into more depth on the direct liquefaction process, that we covered only very briefly and cut off in this chapter?

MR. BECK: Yeah, that probably would be a good thing. Especially if Roland can supply some information; maybe you can, -- just a lift queen and place kind of thing (sic). And it is like Fred said, you know we are not in the business of trying to differentiate big winners and losers and which one is best or whatever. But, by the same token, if one is a thousand dollars at some price and another one is at three thousand dollars, I think that is the kind of information we want in there. And then people can draw their own conclusions as to which way they want to go. But if we do have something; if you can provide that Roland, that would be helpful. And if you have already got it mapped out where it ought to go that should be kind of easy to get that.

MR. OTTE: I would be happy to.



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MR. PALMER: Would you have them to elaborate on that; the separate section on, -- did you have a Fischer-Prob's (phonetic) discussion?

DR. BEZDEK: Yeah, we can pick up a section on, --

MR. PALMER: Where we have, -- not make conclusory statements and have a separate section on indirect, that would be great.

MS. GELLICI: I think it would be fair to say that, --

DR. BEZDEK: Because there is already a section in there directly and indirect liquefaction, I'll just expand that, just an additional couple of paragraphs on direct liquefaction.

MR. PALMER: We need to stay away from the conclusory stuff.

MS. GELLICI: I think it probably would be fair to say that most of the activity to date has been around the indirect liquefaction, without then avoiding that



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declaratory statement.

MR. PALMER: But the reality is there has been nothing, -- there's no steel for indirect.

MS. GELLICI: Yeah, nowhere. So let's keep it open.

MR. PALMER: So cost, and then more agnostic treatment; different methods. And to the extent we can get cost estimates, that would be wonderful.

MS. GELLICI: The other thing I thought was perhaps, absent from this report or this section, was what's going on from the consumer perspective. I know FedEx has been very involved and supportive of coal to liquids. We have had some conversations with them. And we talk a lot about commercial aviation. We talk a lot about DOD.

DR. BEZDEK: That's discussed in here.

MS. GELLICI: So is the industrial, --

MR. PALMER: Well the reality is right now, the biggest difficulty of all of this is (inaudible). And we have been involved with that for three years, with this CAAFT (phonetic) that they call it; Commercial Air, Alternative Fuels Technology, -- whatever the acronym stands for. And while the airlines and the big users are equally exposed, nobody has stepped forward and said this is the path we want to go. That has not happened. The Air Force is pushing it. Senator Domenici actually introduced a Bill today, calling for a CTL mandate of 7 billion gallons, -- almost 400,000 barrels a day you know which is not ethanol level, but it is a mandate. And that is really a first from, -- a new order in terms of that kind of concept.

The problem has been, and is, on these projects with the CAPEX numbers and the uncertainty surrounding the price of oil and also natural gas in the SNG. And also the costs profiles that tend to follow crude and

natural gas prices. So, it's never, -- it's the way Shell Oil has (inaudible) talking about that in the '80s.

MS. GELLICI: I think it strengthens our position, -- I mean the commercial aviation sector thing to me was just, -- really reinforced the need for this. And that is what I am struggling to find something, -- because you hear a lot of feedback from folks; well, without the DOD component or without another federal government support, this thing does not make economic sense. And to me, to be able to make the argument that there is other sectors of the economy that are heavily dependent on these transportation fuels from the industrial perspective, not just the commercial aviation, but you know the FedEx(s) and the BS(s) of the world who are also, I think, stepping up and standing up on this a little bit. Are we missing an opportunity to reinforce our position here on that, by not including

something to that effect?

MR. PALMER: You mean in terms of highlighting their interest or, --

MS. GELLICI: Yeah, interest.

MR. PALMER: I would not be adverse to it if there was something concrete.

MS. GELLICI: Yeah. And I don't know if there is. And I would be happy to do some rooting around on it.

DR. BEZDEK: Fred Smith is interested in energy efficiency and hybrid structural carry outs and speaking on replacement fuels I am not sure Deverick (phonetic) made a sworn statement in terms of, -- in favor of CTL. He is generically in favor of anything that would reduce the price of liquid fuels for his ground vehicles and airplanes.

MS. GELLICI: What I would be happy to do is just root around a little bit and see if there is something else that we can add that would support that.



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MR. PALMER: That would be really helpful.

MS. GELLICI: And then my other major point on Section 2 is we seem to use greenhouse gases and CO2 interchangeably and I think we need to go through and decide if, in fact, those references to greenhouse gas emissions are the same in fact as CO2 emissions. And it is something that I think we need to be cautious about, because those are two different things.

MS. MIGDEN-OSTRANDER: Something similar to that is that in reading through the document, especially in the Executive Summary where we use acronyms, we do not always identify what that acronym is the first time it shows up. And so that is something that needs to be cleaned or done. Because you read through something and then it is like sometimes they are not at all identified or they are identified on a subsequent page. And so it would be helpful to make sure we do that



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the first time it is mentioned.

MR. BECK: Yeah. And that's an editorial issue that we can clean up.

We go around on CO2 versus greenhouse gases all the time and we just need to make sure that we are clear when we are referring to the, -- you know be accurate. If it's CO2, it's CO2; if it's all greenhouse gases, then it's all greenhouse gases. And I think again, that is an editorial issue that we can work on.

MS. GELLICI: Maybe not. I mean maybe some of the references are there. You know if we are pulling references to other things it might in fact be a greenhouse gas. So I would just kind of caution the editor. And I think it is incumbent on the section chairs to go back and make sure that when they use greenhouse gases they in fact want to use GHG instead of CO2.

DR. BEZDEK: Well in some cases the two can be mentioned.



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MS. GELLICI: Let's make sure that when we are doing that, -- I was just kind of confused about that at a couple of places. I just was not sure.

MR. BECK: No problem.

MR. PALMER: Did you do the closing, --

MR. BECK: No, Frank Burke did that.

MS. GELLICI: Are we going back to the recommendations then?

MR. BECK: We are going to go back to the recommendations at the end of the, -- unless Mr. Chairman, if you want to get into them now, that's fine.

MR. PALMER: Well, we are not quite through.

MS. GELLICI: I didn't know if you were doing it section by section or, --

MR. PALMER: No, we were going chapter by chapter and then coming back to the recommendations.

MS. MIGDEN-OSTRANDER: So a comment with regard to recommendations on this section I should hold until we go back?

MR. PALMER: You can say it now or, -- I won't do anything to you if you want to say it now.

MS. MIGDEN-OSTRANDER: All right. Well then I will just go ahead and put this on the table.

On page 139 there is a recommendation to exempt initial CTL facilities from new source review and national ambient air quality standard to offset requirements. I think by putting that in there, --

MR. PALMER: I agree. That's out.

MS. MIGDEN-OSTRANDER: Thank you. And I had my arguments all lined up and you shut me up. That works.

MR. BECK: Well, we have gone on record Janine, over and over again, saying that we would like to have things streamlined,



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but not done away with or not, -- I agree.

MS. MIGDEN-OSTRANDER: Yeah, I think you know, you have to go into legislation and you're opening up a can of worms.

MR. PALMER: Nobody is going to argue for that. These things are going to have to get fully bedded and go through the regulatory process and there is just no question about that.

There actually I think, was a National Coal Council Study that argued for that and talked about picking up, -- I think Steve Leer (phonetic) was Chair of this, wasn't he

Bob, --

MR. BECK: Yeah.

MR. PALMER: -- in the early, -- what, about five years ago now?

MR. BECK: 2001. It was a May 2001 Study I think.

MR. PALMER: And identified low



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hanging fruit of 40,000 megawatts of capacity I think if that were done. But that would not have worked.

MR. GRIMES: Bob, are you talking about the third bullet on page 139?

MR. BECK: Yes indeed, Larry. That would be the third bullet on page 139.

MR. GRIMES: That's just out?

DR. BURKE: That has been deleted, yes. I have a general question. And particularly, in finding the recommendation that is starting on page 133, 134, 135, up to the R & D part on 136. Most of these deal with very specific legislative issues. And the recommendations really are not to DOE, they are really policy changes that would have to be made at a congressional level. Is that something that the National Coal Council, --

MR. PALMER: We have always done that.

DR. BURKE: Well we haven't always done it. There was an issue on this in the



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past and I know that we had a problem, --

MR. PALMER: Well we did it in the 2006 Study.

DR. BURKE: Specific policy recommendations when we are making recommendations to the Secretary of Energy and they are outside of his, --

MR. BECK: Right. I understand what you're saying. What we have done in the past is, -- and I'll just, -- since I am looking at page 139, I am going to stay on page 139. There is a recommendation that starts out, "The Federal Government should develop". What we have done in the past is, if we truly mean the Federal Government we will say "The Secretary of Energy, working in conjunction with his fellow cabinet members, should develop," kind of thing. So we make the recommendation directly to the Secretary, but we make it in a way that we know perhaps DOE is not the lead Agency on it; that they have to work with EPA. Or if it



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does require legislation then we say "The Secretary, with the understanding that this would take legislative change," or something to that effect. But we caveat it that way, because you're right Frank, you know our job is to make recommendations to the Secretary. He is our one and only customer, so to speak. Although, we are talking in terms of a much broader audience I think for a lot of this kind of stuff.

DR. BURKE: I guess my suggestion was going to be to segregate these into two categories. Ones that are specific recommendations to the Secretary. Because some of them, like the R & D Recommendations are specific recommendations to the Secretary. And then have a second set that says you know in addition to these clear recommendations there are some policies that would certainly help to be addressed and then list those as policy issues, but segregate them somehow from the considered recommendations.



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MR. PALMER: What we will do is take, -- we addressed, -- I mean we came up with a method for dealing with that in the 2006 Study and we will follow that. Because we do understand that the Secretary of Energy does not have the ability to give you tax credits. So, we understand that. But at the same time we asked for 100 percent expensing for depreciation, for tax credits, for the whole deal. And it was done in the context of, -- I can't remember.

MR. BECK: You're right. You're right, Frank. There is a correct way to do that and stay within our Charter. Because we cannot just blanket say, -- I mean it gets back even to the NSR discussion; we cannot recommend that the Secretary do anything on NSR, because he does not have any authority to do anything on NSR. It has got to be done by EPA if it is a regulatory issue and by the Congress if it is a legislative issue.

So, what we recommended to the



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Secretary in that 2001 Report that we were just talking about is that the Secretary, in conjunction with the Administrator of the EPA and other elected officials, streamline, -- and then we went on from there. But there is a way to do it and we have a format for doing it. But thank you for bringing it to our attention, to make sure that we do scrub it and make sure that that is done correctly.

MR. GRIMES: Bob, I believe we have effectively used the word support in the past; the Secretary should support this or support that?

MR. BECK: Yes, exactly. We have got three or four different ways of saying it Larry, because we get tired of saying the same thing over and over again; it sounds redundant. So I mean we do not want to sound like we are singing a litany here, we want to make sure that at least it is a report that people can stand to read. So yeah, we've done that.



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And you know we will spend a great deal of time over the next two weeks I'm sure, going back through all of this stuff and scrubbing it to make sure that with Frank Clemente's help we do get this all correct in terms of greenhouse gases versus CO2, versus what we can ask the Secretary to do, versus what we need to ask the Secretary to support or work with his colleagues about.

MR. PALMER: Okay, where are we?

MR. BECK: We should be at page 142, looking for Frank Burke to talk about Chapter 4.

MR. PALMER: Good job, Frank.

## V. CHAPTER 4

By Frank Burke, PhD

DR. BURKE: Okay. I don't know that we need to go through the text obviously, but let me just give you the thread of it.

The PHEV is plug-in hybrid electric vehicles or a way to get coal into the transportation market. I think it is

really interesting to look at the analyses that they have done on the MaCainlen Bill (phonetic) and the Warren Bill (phonetic). The transportation sector does very little, because the price never gets high enough that people stop driving cars. And so there is very strong resistance to change. But there has been some adoption of hybrid vehicles; there seems to be some, -- at least public acceptance of that. And so one way as an alternative to coal to liquids, to get electricity, -- or get coal into the transportation market, is through electrification of the fleet. So, we talked about it here and there are a couple of advantages. And there was a good report that was done by EPRI last year, which I relied on fairly heavily here. And John Novack of EPRI helped me work on this. Where they go through and they look at life-cycle emissions for conventional cars, hybrid cars, plug-in hybrid vehicles. And even without carbon capture and



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storage, using a state-of-the-art coal-fired facility the carbon emissions from a plug-in hybrid vehicle are less than for a conventional vehicle and comparable to a hybrid.

With carbon capture and storage the emissions are substantially less than for either hybrid; certainly less for conventional vehicles. The other thing obviously is that by using electricity from coal to make, -- as a transportation fuel, we displace petroleum and again relying on EPRI's analysis, the potential for that is pretty substantial. So, in concept, this is a really good idea. The problem is that these vehicles are not commercially available at this time and to have a major impact, -- oh, I guess one other point I will make too is because these vehicles operate; a substantial part of their duty cycle on electricity alone, there is no emissions for SOx, NOx, VOC(s), anything else. So in addition to the CO2 benefit it has



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benefit in terms of precursors to the ozone in particular. And again, the analyses all are pretty consistent showing that.

The problem is that there aren't any of these around right now. GM has announced that they are going to begin to market these in perhaps, 2010. And Toyota and some of the others have indicated that they are interested in this too. The big problem is cost. EPRI says that at maturity it is going to cost two to three thousand bucks more than an HEV, which in turn costs maybe two to three thousand more than a conventional vehicle. And this is offset by lower fuel costs. Electricity as it turns out is a lot cheaper than gasoline to drive cars; even at the current prices. But that payback period is fairly substantial, it could be as long as ten years. And people have generally been reluctant to invest in the higher price up front for fuel cost savings over time.

So the difficulty then is to see

how the price of these can be brought down to the point where either consumers are different or provide an incentive so that they are willing to buy a plug-in hybrid vehicle as opposed to buying a conventional vehicle or a conventional hybrid.

The other issue here is electricity demand. And as we discuss in here, actually the electricity demand is fairly modest. EPRI estimated that it would only require about an 8 percent increase in electricity demand in 2050 to replace 60 percent of the light/medium duty fleet with hybrid vehicles. Which just goes to show that really, the size of our electricity is pretty large. So it is very modest, the increase, over time, to be able to accommodate this. And in fact, for the foreseeable future in the next couple of decades even with substantial penetration of PHEV(s) there is enough spare capacity to be able to accommodate them without really any major command on new build.



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Particularly if people would recharge at night when demand is relatively low. There has been a debate about that. There is some feeling that people would want to charge it during the day like when they drove it to work. And that is discussed, we go into a little bit more detail than that.

But finally it comes down to the question of cost. Would people be willing to buy these more expensive vehicles? And there are two ways to approach it. One is to bring down the cost through research and development; a principal cost element in battery technology. There is a lot going on right there, -- on this right now, but that is probably the principal difference between a hybrid and a plug-in hybrid is the battery technology. If we can bring the cost of that down it has a big impact.

And then the second issue is whether or not there could be an incentive, financial incentive. There is a financial



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incentive now for conventional hybrids, but Congress limited that to a very small number of vehicles; 60,000 vehicles per manufacturer, just to put the total cost of this in line. So we looked at that; looked at that existing incentive and then did an analysis. And I got suggestions and help from a guy at CMU on this to say what it would cost for an incentive for a certain number of vehicles; 10 million vehicles, to bring the cost to compare with a hybrid electric vehicle and what that would cost over time. And the total price tag is very expensive, but that was sufficient to then result in the reduction of a substantial number of hybrid vehicles along the line for this forecast, the actual cost of the incentive is really pretty low. It turns out to be a few dollars, three to five dollars (inaudible) under the assumption that by incentivizing the introduction of this fairly large number of vehicles the technology takes off (inaudible) time.



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So, the winner here is a combination of a incentive to adopt a large number of electric vehicles, along with the commercialization of carbon capture and storage. And it turns out that the timing for those two things is fairly consistent. We are probably looking at large scale adoption of carbon capture and storage, particularly from new facilities in the 2020, 2030 time frame. And to get electric vehicles introduced into the fleet in large numbers, just the time it takes to turn that over, is a similar sort of time frame. So, the recommendations here are really threefold.

(1) Continue the research and development on coal based electricity generating, including CCS, so that we have technology available in the future to be able to apply this incremental electricity generation that we need from low carbon emitting coal based sources.

(2) The second is continue to



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research, -- and there is a program and we discuss it in here, on improved battery performance. And that obviously is a high priority and commands I think, the attention of the Secretary to ensure that that program moves along effectively.

(3) And then the third, -- and here is the recommendation that we made along the lines that we talked about earlier, the Secretary working with other agencies and Congress to evaluate the timing, the structure and incentives for deployment, so that we can move carbon capture and storage coal based technologies along in coordination with hybrid electric vehicles.

MS. GELLICI: That's whimpy. Sorry Frank. One of the questions I had there, -- I mean the thing that struck me about, --

DR. BURKE: When you say whimpy, you mean that in the kindest possible sense, right?



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MS. GELLICI: I do. I do. With all due respect. One of the things that struck me as I was reading; and I did not know anything about PHEV(s) before I read this, so this is definitely from a neophyte perspective, was the timing issue, bringing on the new fleet and the availability of low cost, you know hopefully coal based generation to do that. And one of the things that concerns me is not getting some of the generation in place now and when these moratoriums on coal and some of the cut backs on coal generation; and some of that understandable, but is there an issue there that we might run into some availability? I did not feel that really strongly. Maybe it's because there is not a significant amount of additional generation there?

DR. BURKE: Those two studies that I cite in there, one was by EPRI and the other was by, -- maybe there was three studies. I can't remember exactly. One was Pacific

Northwest Lab and they looked at the amount of incremental generated capacity that would be necessary for a certain number of vehicles. And it turns out that in the EPRI Study to replace 60 percent of the light/medium vehicles in 2050, which is larger number vehicles than now, would require an 8 percent increase in the generating capacity relative to what was projected in 2050. And in the near term the amount of excess capacity that is available now, is sufficient to be able to accommodate a fairly large fleet.

So they looked at that in a very detailed manner, comparing what the demand would be over time versus the potential introduction of vehicles over time and they modeled that to see what impact it would have on incremental generating capacity.

MS. MIGDEN-OSTRANDER: If I could add something to that, which is that if, --

DR. BURKE: But the conclusion was that it really did not pose much of a problem



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in the near term, but there would be a need for some additional capacity in the long term.

MS. MIGDEN-OSTRANDER: I'm sorry, I thought you were done. The other issue is that utilities today; and the electric institute is pushing towards this whole concept of the smart grid and going more towards smart metering and time of use rates. And so if we send the proper price signals there would be a larger number of customers who will probably be using this technology, plugging in their car at night. And at that point you have capacity that is available to off-peak capacity. And so that is also going to help a lot; you know it is going to help the electric industry as well to sort of levelize their loads.

So when you are looking at incremental increases to the extent that people are plugging them in during the day, then you have to be concerned about, -- you have to be more concerned about incremental

sources of generation than if they are doing it at night. And of course, there will be some that will be doing it at various times of day, but also if we start sending customers the right price signals in terms of what it is going to cost them to do it in the middle of the afternoon, as opposed to overnight, that is going to influence behavior for a lot of people.

MR. BECK: Yeah Frank, isn't this pretty much, -- I mean I don't know that there is anything much that is really new in this particular discussion.

MR. PALMER: It's new to us.

MR. BECK: I'm sorry?

MR. PALMER: It is absolutely new to the National Coal Council, --

MR. BECK: Well no, no, no, I understand that. I am talking about, -- yeah, that I agree. I am just talking about in the general discussion of electric vehicles hasn't the problem always been the cost of the

vehicle of itself, the distance that the vehicle can go, because the electricity industry, going back, -- way back in my old days at EEI, we were saying the same thing that Janine just said. We could charge them at night; you don't have to build new power plants; yeah, you've got to make more electricity, but you don't have to build more power plants to fuel them. And I think it seems to me like what we're saying here is that we will stand ready to do this, to provide the electricity needed; that coal can play a major role in doing that, it's not, -- and this gets to Janet's whimpy statement, it's not really our call. I mean we are not the ones that ought to be promoting or trying to sell electric vehicles. That is, in fact, GM, Toyota, et cetera.

MR. PALMER: Well stop. Stop. Stop. Stop. The electric vehicle component of this is every bit as important as the coal to liquid component. What we are talking



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about is a broader use of coal to meet national needs and one is transportation. This discussion of plug-in hybrids goes only to if you create, -- if you do X, Y, Z, you are going to need this much new generation. It does not try to sell them, but it points out societal benefits from using coal in lieu of using oil for transportation through the vehicle, a plug-in hybrid. It is no different than the CTL discussion or any other discussion.

DR. BURKE: Just a point. Really, the difference here is that this is the way of dealing with the CO2 issue on the transportation side that if electricity comes from coal-fired power plants that have carbon capture and, -- it deals with three issues. It deals with an energy security issue, because the electricity is coming from plants that have carbon capture, -- they come from coal. It deals with the environmental issue in two ways, because carbon capture and



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storage is dealing with carbon emissions from the transportation sector, which is very hard to get. That was the point I was making earlier. These analyses show that you don't do much on the transportation side because you cannot put anything on the tailpipe of the car. And even efficiency improvements helps, but it is a very slow position. And it deals with the economic issue because electricity is a hell of a lot cheaper as a transportation fuel power source than gasoline. Even gas at $3.00 and now it is up to $3.60 or whatever, so. It is about a third less expensive to drive your car on electricity, -- about a third of the cost to drive your car on electricity as it with gasoline.

So really, the only problem with it is, as you said, there are transportation applications where this just does not work; you cannot run an airplane on electricity. Not far.

MS. GELLICI: Up; you can go up.

DR. BURKE: And they would still lose your bags. You know, they would, trust me. And you cannot do ships and you cannot do long haul trucks and diesel. There are things that are suitable for electrification and this is a way to get at that. I think that's what, --

MR. PALMER: Turn to page 148; and I think this is an important point. And there is a chart in there on the carbon footprint of plug-in hybrids, based on four scenarios. And the top one is a new coal plant without any carbon capture or sequestration. And then you see there is a substantial reduction of carbon emissions below a conventional vehicle powered by gasoline. And it goes to this whole, -- it underscores the point of beneficial electrification, which that electricity, in and of itself, is a good thing, because it is more efficient at the point of use. And it applies, by the way, not just to autos, it applies to a lot of other things. And this is



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an example where more power plants are a good thing from a carbon standpoint, even without carbon capture and sequestration. If you were devoting that electricity for transportation to meet carbon concerns, you get a lower carbon footprint.

So that is totally germane to what is going on today. And then, of course, if you use carbon capture and storage, you get basically a third or 40 percent of the total carbon emissions. And there is nothing wrong with a new power plant as such. What we are talking about is what comes out of it from an emissions standpoint and the cost of the electricity. And in this state to make a major penetration of electricity in the transportation sector would be nothing but good for the United States. There is nothing to be concerned about in that context.

MS. MIGDEN-OSTRANDER: May I make another suggestion with regard to something that I think might help with the argument.

Now, I don't know to what extent this can be done, but if you're looking at the cost of comparing a plug-in hybrid with a conventional car, you say okay, it is about ten, eleven thousand more, based upon your charts. But if we looked at projections of what is going to be the price of gasoline over the next ten years when these cars would be in operation, versus you know what is going to be the cost of electricity to charge that car over that same period of time; looking at a projection of where the prices are going, and then factor that into the overall costs, so that you are adding in sort of the fuel cost component in the comparison.

DR. BURKE: That is what is on page 154 and 155.

MS. MIGDEN-OSTRANDER: Okay. I did not fully get that. Maybe I missed something.

DR. BURKE: That's the break-even price analysis. So it looks at it, --



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MS. MIGDEN-OSTRANDER: Oh, I see. Yeah, I see what you're saying.

DR. BURKE: And there were two cases here. There's the base case where we've got conventional vehicle, the hybrid, -- the plug-in hybrid, with the low capital costs and a plug-in hybrid, -- there's a dispute about what it costs to build a hybrid and I am not surprised. EPRI's got a number that is kind of a low number; Pacific Northwest Lab had a number that everything is just way too high. But I thought that for the purposes of this study you know rather than pick between them, just show both of them.

But the curves show the number of years it takes at the current fuel and gasoline/electricity prices for the cumulative cost of each one of those vehicles to break-even. So, for example, -- you get the idea. The purple line is conventional vehicle at current fuel prices. If you have the low price PHEV, you know the one that costs two



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thousand to three thousand more than a hybrid electric vehicle, they cross over about six years out. Which means that the break-even time for the fuel cost to pay back the cost of capital is about six years.

If you look at the graph on the right hand side; this assumes that gasoline prices are $5.00 a gallon, it also assumes electricity prices went up in propositions. So, I think electricity prices I think were like .9 cents kilowatt hour in the base case and they were .14 cents or something like that, in this case. So they all went by the same ratio. And that brings the break-even period back to about three and a half years, if you have the lower price PHEV.

So, this says two things; one is obviously, higher fuel prices actually make this a better story, even if the electricity price goes up at the same rate of gasoline prices, which we have not seen and probably do not expect. And that is purely and



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assumption. But the other thing it says is that if you look at that red line, that's the higher priced PHEV, there is a real incentive to get the cost of the vehicle down. But that is what this is intended to show is that there is a break-even. And is it really relatively a short period of time, if you can bring the cost of the vehicle down. That's a key point. And that is why one of the whimpy recommendations is that the Secretary ought to continue to work on bringing, -- research and development to bring that, --

MR. PALMER: And I think we ought to, -- in the summary, make a big point of this.

MS. MIGDEN-OSTRANDER: Yeah, I think that needs to be highlighted more.

MR. PALMER: And GM is for sure, pursuing this both, car/auto, in a major way and they are going to roll it out currently this fall and bring it to market within two years.



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DR. BURKE: Well they had a car out last year, but they did not have a battery in it, as I understand.

MR. PALMER: Yeah, they have got a working prototype.

DR. BURKE: They've got a working prototype. They are working; they've been around for awhile. Again, the problem is energy density, you know getting a battery, --

MR. PALMER: You know it is another example of in a peak-oil world everything, everywhere, all the time. You need alternatives and this is an important one.

DR. BEZDEK: Let me ask a question here. I've heard it called the metric for hybrid vehicles on something like this, the battery pack will last about fifty or sixty thousand miles, at which time that has to be replaced at a cost of five or six thousand dollars. Therefore, negating virtually all of the money you've saved on gas the previous



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five years. Is that your understanding as well?

DR. BURKE: No. These analyses are based on the assumption that the battery technology develops to the point where you can get 100,000 miles over the life of the car out of the battery. I did not get into it here, because there is a lot of that kind of stuff. And I don't think the intention of this is a treatise on plug-in hybrids. But the assumptions are that this vehicle will run for 100,000 miles with the battery. That is one of the concerns you know the de-cycling that it goes through and whether or not you can actually develop a battery; whether the battery, -- actually what it would cost to develop a battery that does that. But that is part of the disparity between this INEL number, -- or PNL, which is substantially higher than EPRI's number.

MR. PALMER: But you said that is a documented number?

DR. BURKE: Yes, it is heavily referenced.

MS. GELLICI: So, I guess my point was I got real excited about the chapter; one, because I did not know anything about it and secondly, it just seemed like a real win on a lot of points which you make. Then when I got to the findings and recommendation section there was something that, -- I just kind of lost air on. And maybe there isn't anything there that we really want to step up on. It is a very new thing for the Council; kind of the first time that we have addressed it.

DR. BURKE: It seemed to me Janet, that for the National Coal Council, -- it kind of goes back to what people were saying, the real key element here for us is, -- I mean the issue here is really to have this vehicle developed commercially, which is not a National Coal Council thing. But you know that is where, -- and the primary issue there is battery technology. And so there is a



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recommendation to the Secretary, because there is a program and they are working on that. So that was the reason for that recommendation.

I think for the National Coal Council the key thing is to ensure that we can continue to provide coal-based electricity in the future to be able to meet this. Replacing plants to be incremental to, --

MR. PALMER: It is the use of coal in transportation and it is conceptually no different than coal to liquid.

DR. BURKE: Right.

MR. PALMER: So, we are quite free to go ahead and make recommendations with respect to driving the bus, -- in terms of trying to get this stuff, --

DR. BURKE: Well, I think from a coal perspective the issue is no different than it is for any other coal used in the future; to have carbon capture and storage technology commercially available so we can build these coal plants to provide electricity



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for any use. And in this case, the electricity demand is going to be increased because of presence of the hybrid electric vehicle. So, that is what it came down to.

MS. GELLICI: Yeah, and I understand that.

DR. BURKE: And then the incentives idea was well, you know it makes some sense. There is an appetite out there for incentives, and give an analysis of what an incentive program would look like and what it might cost. And as a recommendation for the Secretary it wasn't, --

MR. PALMER: Well, we will look at that recommendation to the Secretary, -- the aspect of that.

DR. BURKE: I mean if somebody's got a, -- I would be happy to have somebody else write it.

MR. BECK: Your idea Janet, was just to beef this up to the extent we can?

MS. GELLICI: We can talk about it



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a little bit more on the, -- but I was kind of just, -- and it may be, -- you know I understand why you made the recommendation. They are great recommendations, it's just can we be stronger on, -- like this is something that we really, really need to pursue.

MR. PALMER: Okay. Is this a good time to break for lunch?

MS. MIGDEN-OSTRANDER: I just have one quick comment. On Recommendation Number 2, is that something within the Secretary's jurisdiction or is that really something more within the Department of Transportation?

MR. BECK: It's in DOE.

MS. MIGDEN-OSTRANDER: It's in DOE?

MR. BECK: Yeah. That's the Idaho Renewable Energy Lab, they have a program.

MS. MIGDEN-OSTRANDER: Okay. Great. Great. I just wanted to make sure we were not slipping on, --



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MR. BECK: Oakridge, they have a program.

MS. MIGDEN-OSTRANDER: Okay, thanks. This is exciting.

MR. PALMER: Okay. We will break for lunch and just eat right here and when everyone is done we'll open up.

[Whereupon, at 12:00 p.m. the meeting was recessed, to reconvene this same day at 12:30 p.m.]

MR. PALMER: Bob did the next chapter.

VI. CHAPTER 5

By Robert A. Beck

MR. BECK: Chapter 5 is Underground Coal Gasification. And to say that it got off to a slow start is probably an understatement. And Jay Braitsch was kind enough to send me a 120 page document that was put together by three people, Elizabeth Burton, Julio Freidmann and Robbie, -- I am going to slaughter this poor guy's name; U-P-



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A-D-H-Y-E. Anyway, they are at Lawrence Livermore National Lab and they have done; and have been working on, best practices in underground coal gasification for quite some time.

I finally took that 119 pages and tried to summarize it, shrink it down basically through a cut and past operation. Got it out to Janine. Janine looked at it and actually shared my summary with Julio Friedmann, who said that they have an updated version and he would be happy to provide some comments and update it. So, that is exactly what he has done. Unfortunately, that is not the version that you are looking at, because he just sent that to me again, yesterday. And on top of that, I think Janine is going to add some more comments to it as well. But, I think we are at a point now where we do, in fact, have the experts engaged and we will get the comments that Mr. Friedmann has sent and get them incorporated into this. We will get



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the proper reference to that study and give them the proper credit, because actually it is their work. Which is not unusual, it is what we do. You know we take other people's work and put it into our stuff and reference it. So that is kind of a brief summary of the who on this.

The factual part of it; as you recall, our agreement was to give an overview of the technology, since it's being studied and to some degree, implemented in various stages and places for about the thirty years. And there is quite a bit of history. There is a lot of work being done in the United States, but more predominantly I think, overseas, especially in China and India and Australia, the former Soviet Union, all of those countries are active in various phases of it. So, that is basically what we talked about.

Obviously, the attractiveness of the technology is that it traps all of your emissions underground while you are gasifying

the coal insitu. As I've said often, it always amazes me that you start a fire in a coal mine on purpose, when usually that is the last thing you want to have happen. But this is a little different situation. It would, in fact, make available otherwise un-minable coal scenes and coal supplies and expand dramatically, the coal resource base, if in fact we can implement these technologies here in the United States, as well as worldwide.

That is sort of where we are at. The recommendation, -- it is hard to make recommendations to the Secretary about research and development on this stuff, because it has got a long track record and a long history. But that is, in fact, what Julio Friedmann is going to put together, some recommendations that we can deliver. Obviously, the carbon management aspect of it is attractive, in that again, it can trap all of that already in the ground and it stays there and you just bring up the fuel that you



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produce.

So, that is kind of a thumbnail overview. Janine, if you would care to amplify, add to or whatever.

MS. MIGDEN-OSTRANDER: A couple of quick things. One of the factors about the up-to-date is going to focus, -- there is going to be an addition about what is going on in the United States. Wyoming has, -- in Wyoming Gas Tech has announced plans to build and begin a UCG pilot. So that is something new, where we've got something actually happening in the United States. So that is also referenced in this study.

And then the biggest change, in addition to just updating the various sections is to talk about is to increase the recommendations, asking for more funding for research and development of these technologies and outlining what is necessary to do that. Engaging in more field demonstration projects. Developing standards for citing and operation

of new CG projects.

And the final thing is a comment that insitu gasification has a potential to dramatically reduce the cost of syngas production and thereby, carbon capture and sequestration. And trying to follow through on that and look at how we can bring down the overall costs of gas, -- coal gas, through this technology.

And a final recommendation would be develop materials for out-reach and education since there is very little familiarity in the United States about this technology. We need to do some work on letting people know about it and educating them about it.

MR. BECK: And on the timing, I think that we will have the input from Friedmann by Tuesday or so of next week. So, fairly quickly.

MS. MIGDEN-OSTRANDER: Probably by tomorrow.



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MR. BECK: Okay. So, it will be coming very quickly, so it will be easy enough to factor into the next draft.

MR. PALMER: Here is a comment, -- it's so interesting though, just to see how quickly the world changes and moves. On page 167, you see a reference to China. "China uses over 1.9 billion tons of coal each year and emits over 3.5 billion tons of CO2." That's of 2004. This year they will produce over 3 billion tons of coal in China. So, in four years they have added the U.S. production base to China. In four years. You have to stop and think about that.

DR. BURKE: Yeah. There is an article in USA Today saying in 2006 it's now generally agreed that China passed the U.S.

MR. PALMER: In 2006.

MS. MIGDEN-OSTRANDER: Do you have specific information Fred that you can give me and we can update that section to include that?



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MR. PALMER: Yes. Actually, I think probably the World Coal Institute web page would have that.

MS. MIGDEN-OSTRANDER: Okay.

MR. PALMER: And I will look at it too.

DR. BURKE: One thing I would suggest adding to the recommendations; and maybe it is in there somewhere, but I did not catch it. Do a fairly, -- well, a more detailed engineering and economic analysis of the technical requirements and costs. Because what I have seen so far is pretty rudimentary, I guess I would say.

MR. PALMER: It's cursory.

DR. BURKE: And I have seen some numbers that suggest that it is substantially less expensive, -- and maybe it is, I am not arguing that. And given what we know about the cost for surface plants now going up so high that maybe it's even more of a, -- but I think that is something that probably demands



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a little more attention.

MS. MIGDEN-OSTRANDER: So, engineering on, --

DR. BURKE: Engineering and economic analysis of underground coal gasification.

MS. MIGDEN-OSTRANDER: I don't know if that can be done for this report, but I'll, --

DR. BURKE: No, put it as a recommendation to be done.

MS. MIGDEN-OSTRANDER: Oh, as a recommendation?

MR. BECK: There is a recommendation in here on increasing modeling capability for siting.

DR. BURKE: That's probably more technical, --

MR. BECK: But I don't think there is a specific recommendation Frank, on what you are talking about. But I think there is enough in the body that we could make that



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recommendation.

MS. MIGDEN-OSTRANDER: Can I read, -- do they have the updated recommendation, -- they don't have it. Can I read to you one recommendation and tell me if that captures your thoughts? If you don't mind.

DR. BURKE: Okay.

MS. MIGDEN-OSTRANDER: "Renewed Research Program.

The U.S. disbanded is research program in 1989, since then no government agency has sponsored scientific research in to UCG processes or products. The number of outstanding technical issues, including cost and economics, process engineering, subsurface process monitoring and control risks and hazards and synergies with carbon management remain unexplored. Improved simulations are also needed for gasification



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formation of a cavity, the flow and transfer of contaminants and subsidence, in order to better define the boundary conditions for practice and to decrease the learning curve. A substantial research program; less than 5 million per year for five years, for a total of 25 million is recommended. That includes participation of research institutes, universities and companies."

DR. BURKE: That is really the research. I think what I am asking is a recommendation specifically to look at the engineering and economic analysis.

MS. MIGDEN-OSTRANDER: Okay. Because they do mention costs and economics, process engineering.

MR. BRAITSCH: Bob, this is Jay Braitsch. I am not sure, -- I have not looked



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at that chapter yet, but one thing that would probably be interesting to DOE is if you do do this and you do have the combustion products trapped, do these un-minable themes generally come with a seal or is the CO2 likely to come bubbling to the surface sooner or later?

MR. BECK: That is a good question Jay. I don't know. I mean Frank, I think that is what you are talking about; that's engineering and, --

DR. BURKE: Well yeah. What I have seen on this is sort of a cursory kind of analysis of the economics, -- design and economics for an underground coal gasification facility. And what I am suggesting is a recommendation for more detail of the engineering and economic analysis.

MS. MIGDEN-OSTRANDER: Okay.

DR. BURKE: I don't know if it is covered in here or not, but the other thing that would be interesting would be, -- there is a discussion in there on the research side



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about trying to do a better job of characterizing sites as potential candidates for this. I think some quantification of the total amount of coal that would be available, particularly if you could differentiate from the coal that would be otherwise un-minable, what that would do to increase out economically recoverable resources would be really interesting.

MR. PALMER: Yes, it would.

DR. BURKE: That's why the unions are interested in it, particularly the Chinese, because they've got a lot of coal that can be released if you get to the seams and they cannot mine it. So, you know this is an attractive way for them to get at it. We have got a lot of coal resources that currently appears to be un-minable and that would be a really interesting number.

MR. PALMER: Well I see the reference in here to China, what does it say, over 100 trillion tons of coal? So, I would

think the U.S. resource base would be similar to that.

MR. BECK: In the first paragraph there's a reference to a 300 to 400 percent increase in recoverable coal reserves in the U.S. could be possible. So, at least they've taken a stab at it.

DR. BEZDEK: What page are you on?

MR. BECK: Page 160, right in the first page of the chapter under the highlighted part. If you look at Summary and Overview the second to last sentence in that paragraph; "A 300 to 400 percent increase in recoverable coal reserves in the U.S. is possible".

DR. BURKE: That number on page 167 says 114 trillion; that should say billion.

MS. MIGDEN-OSTRANDER: On page 16, --

DR. BURKE: Page 167.

MS. MIGDEN-OSTRANDER: Where are



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you at?

DR. BURKE: The first sentence in the second paragraph. "China has huge reserves of coal of every rank, estimated at 114," -- it should be billion.

MS. MIGDEN-OSTRANDER: Okay.

DR. BURKE: U.S. coal resource is 4 trillion tons. The resource is all the coal, every bit of carbon. Our demonstrated reserve base is 250 billion tons. And that is the estimated coverable reserve if mined out at the current price. The 114 number for China is in billions. It is probably wrong, but then that is the number that they put out.

DR. BEZDEK: Bob's point is well taken. A three to four hundred percent increase in coal reserves, that is a significant number.

MR. BECK: Yeah. Especially if you can trap everything down there while you're at it.

DR. BEZDEK: Where is that number



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Bob? What page?

MR. BECK: It is on page 160. The first paragraph of the Summary and Overview. The second to the last sentence.

MS. MIGDEN-OSTRANDER: Are you saying it is significant because you think it is significant or are you saying you think the number is wrong?

MR. PALMER: No, he thinks it's significant.

DR. BEZDEK: I think it's very significant.

DR. BURKE: It might be wrong, but it's significant.

DR. BEZDEK: Well divide by (2) it's still significant. What's interesting, there have been a couple of studies over the past year saying that the world's coal reserves are way over estimated. This tends to refute that.

DR. BURKE: Yeah. That's the resource versus reserve argument.

MR. PALMER: You know when you talk to these guys that know Asia (inaudible) and they talk about China, they say there is coal out there that nobody has any idea.

DR. BURKE: I did this National Coal Council Study, -- Research Council Study rather and we looked at world coal reserves and this number that you've got for China is probably right, it's 114 billion tons. They are mining 3 billion tons a year; they are trying to go to (4). And says then we've got enough coal for another twenty or thirty years. That is not true. They have a lot more coal than that, in my opinion. But that's my opinion.

MR. PALMER: It just has not been identified.

DR. BURKE: It's just that they have it put it into their estimated reserve number. But it is almost certain to be substantially higher than that number. The U.S. Coal Resource is 4 trillion tons, but we



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only count 265 billion of that as a recoverable reserve. So, about 8 percent of our resource we actually count as recoverable reserve. Those numbers were generated in 1972 when coal was selling for about $10.00 a ton.

MR. PALMER: What's the aggregate number of total resources?

DR. BURKE: The total resource is 4 trillion tons, but that does not count Alaska either. So Alaska could add another couple of trillion right there.

DR. BEZDEK: We submit that on page 93.

DR. BURKE: Yeah, that's the one. That is the U.S., -- that dates back to 1972 and it hasn't really been updated since then.

MR. BECK: Anyway, we think we've got Chapter 5 up and running and in good shape. And in very short order a revised draft of this, --

MS. MIGDEN-OSTRANDER: Maybe it will be Monday.



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MR. BECK: Well, very short order like I said, Monday or Tuesday of next week. And it should be a pretty easy cut and paste operation to get it in there.

MS. MIGDEN-OSTRANDER: I'll circle back with Julio regarding those comments and send you an updated.

MR. BECK: Okay, that would be great.

VII. CHAPTER 6

MR. BECK: Chapter 6 is way beyond my intelligence level, since I flunked out of law school after a year and a half.

MR. PALMER: It reads fine. It's understandable.

MR. BECK: And I don't know what else we could add to it. These guys are truly on top of this thing. We may need to work with them directly to get some really specific, refined recommendations, I think. But obviously, in the legal aspect there are a lot of things that come into play; there's



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a lot of other environmental laws that are going to be a part of this if the Congress does not move legislation. If they do, we will have to see how they treat all these other, if you will, competing environmental statutes.

There are obviously, liability issues and I think that this particular chapter begins that debate rather thoroughly and probably raises more questions than it is going to answer. But clearly I think it is a critical part of the whole carbon management.

MR. PALMER: Would you ask them to revisit this and take the economics out. We've got that in other parts. They are just giving you a regurgitation of what's in the literature.

MR. BECK: Are you on a page?

MR. PALMER: Yeah, (176). Wherever they are giving lawyerly like opinions on the economics, I don't think that is appropriate. Now, the geologic criteria as



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to when you can do it and when you cannot, that's fine. I think that probably would be my major, -- my only one, really. I do think it's a good job.

And ask them to be more specific when they talk about liability risks. What risks are people worried about? That is the loosest discussion in this whole field is the fear of liability risks associated with CO2. What does that mean, specifically? What? Why? How? When and where? As the reporters say. But, tell them thank you and it is a great job.

MR. BECK: Will do. Considering what they normally charge and we got it for free, I think that's a pretty good job.

MR. PALMER: Well they have a lot of clients that have a big interest in this, so I am not sure they weren't paid for it.

MR. BECK: They are getting paid for it. There's no question about it, they are getting paid for it.



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DR. BURKE: That's why we got no lunch.

MR. BECK: That's right. Blame it on Huntley Williams (phonetic), it wasn't the National Coal Council.

VIII. CHAPTER 7

MR. BECK: Chapter 7 is another section of the report that was done by Ray Field.

MR. PALMER: That's the Eastman (phonetic)?

MR. BECK: That's correct. And frankly, I just got this a couple of days ago, so I have not even had a chance to really go through it in any detail. Ray has indicated to me that he has already reworked this, so we should be able to get a second version of this very quickly, again, Monday or Tuesday of next week.

MR. PALMER: What do you think about, -- where would you put this? Would you just have it sitting at Chapter 7? I mean



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what is this, -- if we style this, -- if the name of this thing is something like "The Urgency of Sustainable Coal," then that kind of, -- this kind of discussion really ought to go in the Executive Summary; up front.

MR. BECK: There is nothing magical to the numbering system for chapters. We have not done it on a priority basis. I think we did think through where we had Chapter 1 for example, because that's kind of where traditionally you have got to get all that stuff up front. After that, I think we can order or number the chapters, working with Frank, through the editorial process. I don't know that we have a strong feeling on what ought to go where. But, I do agree with you that the guts of this particular chapter need to be prominently displayed and discussed in the Executive Summary. Because as I recall, this is one of the main, --

MR. PALMER: I guess what I am not saying, I am not sure I would have a separate



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chapter.

MR. BECK: Oh, I see. Okay, I see what you're saying.

MR. PALMER: Because it is back to the comment that was made earlier; I cannot remember who made it, but it is a context.

MR. BECK: I see what you're saying.

MR. PALMER: And then what flows from the context is okay, here's how you do sustainable coal. It's what internally we call why coal/how coal. So the why coal ought to be in one place and the economics is part of why coal. Now Frank can take this and use it so that this work is not loss, but to have it as a separate stand-alone chapter, I guess that would probably cause ideas, --

MR. BECK: Well, I don't know whose, -- I mean in talking about it, it was discussed in a number of different meetings and phone calls. Let me ask a question Fred. Generally everything we have in the Executive

Summary; and I think this is why we have the stand-alone chapter, everything we have in the Executive Summary has a more detailed discussion of it in the body of the report to which we can refer back.

MR. PALMER: But, let me interrupt. Because the context is not in the report itself. The context is the framework for why do we feel the urgency of sustainable coal? That's the Executive Summary. Do you see what I'm saying? As opposed to a separate chapter study.

MR. BECK: Okay.

MR. PALMER: It's to say here's where we were in 2006 when we did the other study, -- when we did the America's Future Study. Here's what has happened in between. Here is where we are and it could go higher, and you lose this, this and this. It's clear beyond doubt that we need to do, -- that we need to use more coal in a broader context with carbon capture and sequestration. Here's



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how we will do it.

So, this Chapter 7 is like an addendum almost.

DR. BURKE: Can you take Chapter 7 and make it, -- I don't know what you want to call it in the context of an overview or something like that, make it, -- after the Findings and Recommendations, make it the first chapter. And then have the Executive Summary Findings go off from this, some findings and recommendations to make that the first entry in the Findings and Recommendations Section.

DR. BEZDEK: I think that's a good suggestion.

MR. BECK: Sure.

DR. BURKE: I think what Fred said is right. You know this does not even belong at the last, -- it belongs at the beginning. It explains what electricity from coal is all about and what coal is all about. But if you make this the Executive Summary then it takes



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you forever to get into the Findings and Recommendations. So I think reordering and putting this as the first chapter, calling it overview and context or something and then draw some findings from this and make those the first of the sets of chapter findings and findings and recommendations.

MR. BECK: That is simple to do. That is very easy to do. The reason that the chapters are put in the order that they are put in, really is no substantive basis. It is just in looking at the letter that was sent to the Secretary back in August of last year when we proposed doing the study, we had a list of things that the study would cover and they were listed in no specific order. We just then took that list and said well, number one is Chapter 1; number two is Chapter 2. And that is really how we did it. So, there is no real rhyme or reason for the actual numbering of the chapters based on priority or based on assuage or any of that kind of thing. So, to



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take this and move it to the front of the body to make it Chapter 1 is, --

MR. PALMER: But, I am challenging the notion that this should be in there at all in the context that it is in. Because this is more of an academic; here is what coal has done; here is what it can do, as opposed to we have a train wreck, you need to pay attention. Here is why and here is how you can do it. And so that, as opposed to this economic argument; which has gone nowhere.

I mean we have made these kinds of arguments in every study that we have done from the beginning of time. And you know we are way beyond that. We are way beyond this kind of advocacy or advice, I guess I could say, in the context of where we are from an energy standpoint. When George W. Bush became President of the United States oil was $20.00 a barrel and natural gas was two and a half dollars an MCF. So, we've got a five times out of the one and five times on the other,



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and if anything, we are moving away from the paths that we thought we were on three or four years ago. And these prices are just ramping. This is an opportunity to just say to people pay attention. And I don't think this kind of academic economic discussion does that.

Now, having said that, I will defer to you and Frank, when you sit down and try to, --

MR. BECK: Well I will see what we get from Ray first.

MR. PALMER: -- scramble the egg and then put this back. And see what you get from Ray, -- and it is good work. I am not denying that, but I do not think it has the urgency, --

MR. BECK: You're just saying that it is behind the curb a little bit?

MR. PALMER: Yeah, it's too vanilla.

MR. BECK: Plain vanilla. Okay, let me see what I get from Ray. I will call



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him tomorrow when I get back and see exactly where he is at; what he has got going on and obviously talk with Frank as well and we can see what we can do in terms of making this more hard hitting, more specific and then moving it to the front part of the report, in some way, shape or form. We will see how we can do that.

MR. GRIMES: Hey Bob, it seems to me that there is one way to make it a little more hard hitting is just to parch out from it the various good arguments. If I understood Fred, what Fred was really getting at I thought was that this is the kind of thing that is an argument as opposed to the other sort of analysis going on. And I think what Fred is calling for is to come in with a strong argument to back up his urgency suggestion. And you need to take a few points and bang them in there real hard. So maybe they need to be more specific, but a little less lengthy, near the front of that document



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somewhere as the opening argument.

DR. BEZDEK: Focusing on the economic consequences, rather than the academic discourse.

MR. GRIMES: Yeah, everything that comes behind it will back it up. But you know if you are writing a brief you want to get your best shot up in the first two paragraphs.

MR. PALMER: It must have been the lawyer in me.

MR. GRIMES: Am I understanding you right Fred? Is that what your point is?

MR. PALMER: Yes.

MR. GRIMES: Kindred souls.

MR. PALMER: There you go. Okay, that takes us through the document in its entirety and let's go to the recommendations.

IX. RECOMMENDATIONS

MR. PALMER: Where are those?

DR. BURKE: We have kind of gone through them already.

MR. BECK: Yeah. Actually we, --



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MR. PALMER: Let me ask it this way; does anybody have anything further with respect to the recommendations? Obviously, the recommendations are going to get reworked, because the whole thing is being reworked, but does anybody have any additional comments on it.

MR. BECK: Yeah, I think that is a better way to put it, Fred. We did, in fact, walk through almost all the recommendations on a chapter by chapter basis. Now would be a good generic time to talk generally about what are the things you might want to see added or put stronger or whatever. And I know a couple of folks have been kind of waiting to make their statements.

MS. MIGDEN-OSTRANDER: I had one thought, which was that on page 9, it states,

> "The National Coal Council makes the following recommendations".

And then after that we start specific recommendations. And I was wondering whether



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it made sense to say on page 9 that,

"The National Coal Council makes the following general recommendations".

And then when you start with Chapter 2 say, "specific recommendations include". And then to capture the specific recommendations from each chapter.

DR. KRUTKA: The recommendations on Chapter 9, -- or on page 9, are from Chapter 1, so that they are specific to that chapter.

MS. MIGDEN-OSTRANDER: Oh, okay.

MR. BECK: Yeah. I understand what you are saying Janine, but they are, --

MS. MIGDEN-OSTRANDER: Yeah. I guess because it does not state that this is Chapter 1.

MR. BECK: It does, way back on page 2. The summary for Chapter 1 is rather lengthy, because the chapter is rather lengthy.

DR. BURKE: The findings and recommendations I assume, are going to be pulled out and put into a separate section on findings and recommendations by chapter?

MR. BECK: Right.

MS. MIGDEN-OSTRANDER: Yeah. I guess that is where I got confused here. Because you have a whole summary of Chapter 1 and then you have Findings and Recommendations. And then you move on to Chapter 2, Findings and Recommendations without necessarily a summary.

DR. KRUTKA: We can just write Chapter 1 Findings and Recommendations.

MS. MIGDEN-OSTRANDER: Yeah, I would just put Chapter 1 right above it.

MR. BECK: But, what we have done; if you go back to the 2006 Report as the format, we go chapter by chapter with findings, and then we go to recommendations that are not attributed to any chapter, they are just recommendations. That is the format



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we used in '06, we used a similar format in the study from June of 2007. It is not necessary to link each recommendation with the chapter that it came from, I guess is what we are saying. And because we do not prioritize recommendations; or we never have in the past, we have always tried to make them more broad in terms of being study-wide, rather than from a specific chapter.

MS. MIGDEN-OSTRANDER: I don't know, for me and the way I, -- just the way I think and work things through, it helps for me to see that it is tied to a chapter so if I want more detail I can go back and no where to find more detail and where all of that is coming from. So I kind of like that, --

DR. BURKE: In this case, it might be better to link, -- the reason being that if you look at it the chapters are really quite a bit different. I mean this is a collection of several different stories, as opposed to different parts of the same story. So the



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recommendations are all fairly specific to the findings for that chapter.

MS. GELLICI: And I would agree with that, except that I think to get back to Fred's suggested title, "The Urgency of Sustainable Coal," I know it is maybe a departure from what we have done in the past, but there is a lot of recommendations in here and the way things get done you know Bob, they read the first five pages, three pages, two pages.

MR. BECK: Right.

MS. GELLICI: And if we really want to make some points I think we are going to have to do some prioritization of some of these recommendations and pull some out that we think are most urgent.

MR. PALMER: Let's get this thing reorganized and get them in one place, I agree with that and then call them.

MS. GELLICI: Because I think they are going to get lost.



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MR. PALMER: And just get nuts and bolts recommendations, you know use the wrench this way and put the wheel on that way, as opposed to the higher level recommendations in terms of federal incentives and driving the bus on carbon capture and sequestration and research and development and a regulatory regime. Those are really the high level kind of things that I think we should focus on.

Because I agree with Janet's observation that you've got four or five pages of detailed recommendations that nobody will read anyway.

MS. GELLICI: And I know working in Chapter 3 we've gone through even the CTL stuff that are very, very extensive and a great list of recommendations and the Roger's gone back through and actually prioritized some of those. And you know I still get to that section and I go; is this really a priority? Is this something that we really need to include in this section? And you know

we can walk through some of my thoughts on those. But, I am starting to really get lost in just the volume of recommendations and stuff here, so. Have we run into this before, Bob?

MR. BECK: We actually have not run into it. Well, let me rephrase that. In my ten years we have never run into it. In previous studies before that; the thirteen years before that, you know I cannot speak to that.

But this study is a little bit different in that I think Frank's point is well taken, each chapter is kind of almost its own study sort of in and of itself, because it deals with, -- it all deals with coal, but it deals with it in kind of a different way. But I still think if we stay with the template of the last two studies and we force ourselves to really just put the findings from the chapters in there and then we can put the recommendations on a chapter by chapter basis

too. I think you are right Fred, we are going to have to pick the silver bullets that we want to put up front, because otherwise even though it is an Executive Summary you are not going to get people past the second or third or fourth page. And if it is twenty pages, which is about what it is, nobody is going to get back to ten, eleven, twelve, thirteen. And if that is where your recommendations are you have sort of lost your opportunity to really say what you want to say.

So, I think we can take all of this stuff and try to rework it. Since Frank was involved in this specifically as well, I think we can take another crack at it and let you guys see what comes back.

MR. PALMER: Okay.

MR. BECK: We have the time to do it. I know time is short, but we do have the time to do it.

MR. PALMER: Okay. The process from where will be Bob and Frank, and of



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course, Paul and Eastman too, -- so the comments, -- you will set up a working group and Frank will have the working document and make the changes and then as these changes are made they will be circulated.

MR. BECK: Yes.

MS. MIGDEN-OSTRANDER: May I make a suggestion? What might be helpful is for the folks working on each chapter to sort of highlight what they think are the most important recommendations in their chapter to help cull it down even further.

MR. PALMER: Good suggestion.

MR. BECK: I agree 100 percent folks. I mean they are the people that have been doing it. So, we will make that request I guess. Now, let me just kind of ask around the table, because we have got some of the leaders; Holly, you got a whole bunch of suggestions and whatnot given to you, you are going to go back with Mike and maybe reconvene the Chapter 1 people or whatever and you are



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going to basically redo Chapter 1 based on today.

DR. KRUTKA: Yes.

MR. BECK: I am going to call Ray and Paul on Chapters 2 and 7, and also on Chapter 7 obviously, work with Frank and see if we need it or where we put it.

Roger is going to do pretty much the same thing on three, right? You are going to take the changes and get some language from Roland and get that taken care of.

Frank, I don't know that we did much damage to Chapter 4, but, --

DR. BURKE: I am going to make my recommendations look more macho.

MS. GELLICI: And I do want to ask, I mean do we want to be stronger than where we currently are with that? So, I am happy to, --

MR. BECK: Well, I think we want to be as strong as we possibly can be. There is no sense in saying well gee Mr. Secretary,



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we sort of, kind of, --

MR. PALMER: Well I think the biggest thing on plug-in hybrid is tax credits.

DR. BURKE: Yeah, I think incentives, -- like I said a combination of the vehicles and the generating technology go hand in hand. You know logically, trying to move those along simultaneously.

MR. PALMER: I mean we will have all the incentives for carbon capture and sequestration in other parts, so.

DR. BURKE: We hope.

MR. PALMER: Sure. But plug-in hybrids I think by itself it needs to be curved on all levels.

DR. BURKE: Okay. I will go back and look at that.

MR. BECK: And Chapter 4, Janine and myself are already working with Julio Friedmann and we are going to get that revamped rather quickly as well.

I think six we are pretty comfortable with. There are a couple of questions; I will go back to Fred Ames (phonetic), and David Van Houck Stratten (phonetic), and ask them to clear up your question on economics and those at risk, something or other, -- liability risks.

MR. PALMER: It is not clear up, it's be specific. What are you talking about? What risks are we afraid of?

DR. BURKE: Are they going to actually have some recommendations? Right now they don't.

MR. BECK: They do have recommendations. Frankly, they are not in there by design. They are getting paid by other people and they have some attorney/client privilege that they have to be careful of. They know we need recommendations; they want to give us them, because if it does in fact help them and in the long-term probably their clients, to see



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those offered to the Secretary. And we will go back and ask them okay guys, now is the time to provide that.

And we will shoot for a week to ten days to having that revised draft and get that out to everybody and continue the process.

MS. MIGDEN-OSTRANDER: The question was asked way back if we had any comments on any of the recommendations. I did want to, -- before everybody winds up; on page 16 with regard to personnel; and this going coal to liquids, I think part of the issues, -- and I am finding that in the regulatory world too, is that maybe one of the things we ought to recommend is that we somehow advertise to young people in high schools and to their parents, that this may be a good career path for you; getting involved with engineering and science with respect to energy issues; coal to liquids or any other aspect. Because I keep hearing over and over in

conference after conference, about how as the baby-boomers retire then there is not enough other people coming up that understand this and can step into these fields and do this work. And I think that in addition to trying to put together programs in schools, we have got to let people start thinking about it and knowing about it.

MR. PALMER: Bob, I would put it in terms of enhance academic program support in chemistry and advance public awareness of the need to rebuild the workforce for coal technology. Something like that.

DR. BEZDEK: And it is a recommendation that is not specific to CTL.

MR. BECK: It is truly across the board. Dick Masurey (phonetic), has been singing this song for a long time. He sees West Virginia University engineering students and whatnot, just falling off, you know down to almost nothing. So, it is a very good point. And you are right, it probably should



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be a generic recommendation, not just a CTL, but across the board.

MS. MIGDEN-OSTRANDER: And I am even thinking something as you know like you see the Army advertising on TV about join the Army, here are the career opportunities, from time to time, doing some TV ads on the shows that teenage kids watch. That say have you ever considered, -- you know energy is our future; have you ever considered a career in this area? Contact such and such and maybe there is a web site they can contact for more information.

MS. GELLICI: On page 12, on the research and development recommendation, I think I have addressed this before, but I am not quite sure I am making my point well enough. When we are asking for more, -- should increase and expand focused fundamental R&D programs for CTL, one of the arguments that we make as an industry is that this is a proven, mature technology. And I get



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concerned when I see that we want more research. And I think there are some specific recommendations in terms of advanced R&D, but I get a little nervous when I see more generic statements that the recommendation there, --

MR. PALMER: I think that is a valid point.

MS. GELLICI: -- should increase and expand focused fundamental R&D. So, I am just wondering, --

MR. PALMER: Roger, how do you respond to that? How do you think that is valid? What do we need on CTL R&D?

DR. BEZDEK: Well, it is a delicate point. I think there is a general agreement that we want to recommend additional R&D in certain areas of CTL, but we do not want to go over board and make it look like, --

MR. PALMER: Well, what is the need? What specific R&D is needed for CTL?

DR. BEZDEK: Well, there is a

whole list of them here. The question is should we take out this generic recommendation or tone it down, --

MR. PALMER: Yeah, I think the point was there is not a list of them; that it is generic.

MS. GELLICI: There is some that once we get into the chapter Fred, that it goes into. And there are some great points about some of the advanced R&D that is needed on this. But again, I get a little, -- I think we need, --

DR. BEZDEK: Well, there are specific R&D recommendations at the bottom of page 12 and 13 and at the bottom of 14, plus more in the chapter. But again, the question, -- and Janet and I have discussed this before, maybe we should delete or reword this, this first recommendation.

MR. PALMER: Okay, I gotcha.

MS. GELLICI: And then my final point, --



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MR. PALMER: You should just restrict it to biomass coal-fired.

MS. GELLICI: Which I think is the most important in the scheme of things.

MR. PALMER: I do too.

MS. GELLICI: You know if we have to prioritize, just because that is such a popular word.

MR. PALMER: You got that? So I guess what she is saying is the generic should just get hooked.

MS. GELLICI: I just do not what to leave the impression that we still need to do more work on the basic technology on the CTL, because we just need to build them.

MR. PALMER: And if there is something specific that is not covered, then it should be added in.

MS. GELLICI: And the specifics are really for some of the advanced things that it would be great to have, but you know we can start building some of these things.

DR. BEZDEK: Instead of focused fundamental; advanced R&D programs? Would that solve the problem?

MS. GELLICI: Yeah. And I think we can go back and, --

MR. PALMER: Why do you need a generic program? There is no context for a generic recommendation. People won't read that stuff.

MS. GELLICI: Why don't we go back Roger, and look at the, --

MR. PALMER: If you do have something specific you want done, then we will say it. But, in terms of just saying gee, we want money, --

DR. BEZDEK: All right, we will just delete this recommendation. We have got plenty of it and that's fine.

MS. GELLICI: I am concerned about going to the well too many times, because that comes through on this report as well. We need this. We need this.



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DR. BEZDEK: Well, that is something that concerned me. It seems all the recommendations, we need more, more, more. More R&D, more tax credits, more of this and more of that.

MR. PALMER: Well, it's true.

DR. BEZDEK: Well, there a hand and it's out.

MR. PALMER: No, it's not that, the spirit is a partnership with the Federal Government and industry working together to create an energy manufacturing industry to meet our energy needs. It is not a handout.

MS. GELLICI: And I think that is one of those urgent recommendations that pulls in from all of the chapters.

DR. BEZDEK: And if in indeed, if the focus here or the theme is urgency, then urgency means that the Government has to do a lot of things, -- a lot of generous things real quickly.

MR. PALMER: Yes.



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MS. GELLICI: And then a final point Roger, on page, -- it looks like 11. On the first, -- under the financial bullet; "CTL capital costs are high and are escalating". Again, my concern there is that costs are escalating for all infrastructure development projects and this makes it seem as if the costs are only escalating for CTL. My recommended change there would be CTL capital costs are high and consistent with other energy project developments worldwide, --

DR. BEZDEK: You are on page 11? Where, --

MR. PALMER: Ten actually.

MS. GELLICI: Ten. I'm sorry.

MR. PALMER: Right under the bold.

MS. GELLICI: CTL capital costs are high and consistent with other energy project developments worldwide that are escalating.

DR. BEZDEK: That point is made in the chapter, but it does not come out in the



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recommendation.

MS. GELLICI: Right. Thank you.

MR. PALMER: Thank you. Anything additional from anyone else?

[No Verbal Response]

MR. PALMER: The meeting has been duly authorized and publicized and is open to the public. The public can submit comments to the Department of Energy or if any individual wishes to speak they may do so at this meeting. Those of the public who wish to speak may do so for a maximum of ten minutes. Does any member of the public wish to speak?

[No Verbal Response]

MR. PALMER: Hearing none, we have no further business before the Committee and we stand adjourned.

MR. BECK: Thank you, Mister Chairman.

MR. PALMER: Thank you all.

[Wherein at 1:40 p.m. the meeting was adjourned.]

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