Department of Energy
Washington, DC 20585

May 14, 2014

The Honorable Tim Murphy
Chairman
Subcommittee on Oversight and Investigations
Committee on Energy and Commerce
U. S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

On February 11, 2014, Dr. S. Julio Friedmann, Deputy Assistant Secretary for Clean Coal, Office of Fossil Energy, testified regarding "Department of Energy Oversight: Status of Clean Coal Programs."

Enclosed are the answers to seven questions submitted by you for the hearing record.

Also enclosed are six Inserts that were requested by Representatives Cory Gardner, Bill Johnson, Billy Long, and you to complete the hearing record.

If we can be of further assistance, please have your staff contact our Congressional Hearing Coordinator, Lillian Owen, at (202) 586-2031.

Sincerely,

Christopher E. Davis
Principal Deputy Assistant Secretary
for Congressional Affairs
Congressional and Intergovernmental Affairs

Enclosures

cc: The Honorable Diana DeGette, Ranking Member

QUESTIONS FROM REPRESENTATIVE TIM MURPHY

Q1. At a September 20, 2012 hearing before the Energy and Commerce Committee's Energy and Power Subcommittee, a representative for Alstom, a maker of Carbon Capture and Storage (CCS) related technology, testified that "it is unaware that any supplier of [CCS technology] is ready or able to offer commercial guarantees for…full scale systems of carbon capture." The representative testified that "the final stage to reach commercial status is to perform a demonstration at full commercial scale…It is critical to be at commercial scale to define the risk of offering the technology. This cannot be defined until the technology can be shown to work at full scale. This is the first opportunity that we have to work with the exact equipment in the exact operating conditions that will become the subject of contractual conditions when the technology is declared commercial and is offered under standard commercial terms including performance and other contractual guarantees," In your response on February 11, 2014 to a question by Rep. Griffith about those commercial guarantees, you stated that, since the Alstom testimony, "a number of those companies have actually, do now offer performance guarantees." Are the performance guarantees you reference in your testimony the same as the manufacturer's commercial guarantees described in the September 2012 testimony?

a. If so, have these guaranteed technologies been demonstrated in CCS systems in operating electric generating units at full commercial scale, sufficient to define the risks in the exact operating conditions that will become the subject of contractual conditions when the equipment is offered under standard commercial terms?

A1a. Although some CCS suppliers have stated their willingness to provide performance guarantees, the extent of the terms, conditions of those guarantees and the enforceability are not known at this time. The guarantees typically cover such things as the amount of CO_2 captured per day, the purity of the product, and the energy consumption required by the process. If one of the guaranteed performance specifications is not met, the supplier typically has to rectify the problem and/or pay liquidated damages. For guarantees provided to current CCS demonstration projects, it is likely the extent of the damage payments is significantly less than what would be expected for a more widely deployed technology. DOE has successfully demonstrated for the past year, a CCS project on a commercial scale. For example, the Air Products CCS demonstration project – funded in

part by the Department – has been capturing CO2 since May 10, 2013. DOE also has other projects that are near completion and will become operational soon thereafter.

b. Identify the specific technologies and specific companies offering performance guarantees that support your testimony, and whether the manufacturers will warrant these technologies for use in utility-scale commercial service on coal-based electric power plants.

A1b. There are three companies that have provided performance guarantees for utility-scale CCS projects. More detail can be provided in a manner that allows for the safeguarding of confidential business information. However, we can state that we have successfully demonstrated for the past year, a CCS project on a commercial scale utilizing CO_2 Capture from Steam Methane Reformers.

Q2. In response to a question to confirm that CCS has not being implemented commercially at full scale on a functioning electric power plant, you disagreed and provided the example of the Beulah, North Dakota Gasification Facility, claiming this industrial facility was a power plant because it supplied natural gas that may be used in power plants.

a. Does the Beulah facility represent successful demonstration of CCS systems on a commercial, coal-based electric generating unit that is supplying electric power to the electric grid?

A2a. The Great Plains Synfuels Plant is a commercial-scale coal gasification plant that manufactures natural gas. Synthetic natural gas (SNG) is a gaseous fuel manufactured from coal using the coal gasification process. SNG produced at the Great Plains Synfuels Plant leaves the plant through a two-foot in diameter pipeline that transports the gas 34 miles to a gas portal on the Northern Border Pipeline.

The Great Plains Synfuels Plant also produces a variety of coproducts including about 50 billion standard cubic feet of carbon dioxide annually. Since 2000, more than 25 million

tons of CO2 has been captured, compressed and transported through a 205 mile pipeline to oil fields near Weyburn, Saskatchewan, Canada for use in enhanced oil recovery.

b. What is the history of DOE's loan guarantee in support of the plant? What was the taxpayer liability, in 2014 dollars, after the partners defaulted on the DOE loan?

A2b. In the early 1980's, the Department of Energy (Department) guaranteed a $1.5 billion loan for the construction of a facility for converting coal into synthetic natural gas near Beulah, North Dakota. In 1985 the partnership which developed the Great Plains Coal Gasification Plant (Plant) experienced financial difficulties and defaulted on their $1.5 billion loan. The amount of $1.55 billion dollars of loan guarantee default in 1985 would convert to $3.37 billion in 2014 dollars (Calculated using the Bureau of Labor Statistics CPI data.) The Department repaid the lender and operated the facility from 1985 through 1988.

In October 1988, the Department sold the Plant to the Dakota Gasification Company (a subsidiary of Basin Electric Power Cooperative) for 1) $85 million, 2) a share of future revenues which ultimately totaled more than $390 million, and 3) secured a waiver of tax credits valued at about $750 million.

Q3. In your testimony, you mentioned an $8 billion loan guarantee solicitation, which was released on December 13, 2013 and covers a broad range of advanced fossil energy projects.

a. The loan guarantees under this new solicitation are authorized by Title XVII of the Energy Policy Act of 2005 and will be administered by DOE's Loan Programs Office, correct?
b. Advanced fossil energy projects include technologies such as carbon capture, correct? What kinds of projects do you plan to support under this program?
c. How will they be similar to and/or differ from the existing major demonstration projects in CCS.

A3a,b,&c. The Advanced Fossil Energy Projects solicitation is authorized by Title XVII of the Energy

Policy Act of 2005 through Section 1703 of the Loan Guarantee Program and is administered by the Department's Loan Programs Office (LPO).

Under the Title XVII program, these loan guarantees are made available to support projects that employ new or significantly improved technology, are located in the United States, reduce, avoid, or sequester greenhouse gases, and have a reasonable prospect of repayment of both principal and interest. For more information, please reference the solicitation materials on the Loan Programs Office website: http://lpo.energy.gov/resource-library/solicitations/advanced-fossil-energy-projects-solicitation/

Q4. DOE indicated that it expected the initial applications under this new loan guarantee program by the end of February 2014. Did Doe receive any applications by February 28, 2014 that relate to CCS technologies for coal-based power plants?

a. If so, describe how many and the types of projects.
b. What timeframe do you anticipate for awarding these loan guarantees and for the full implementation of the underlying advanced fossil energy projects?

A4. DOE has received applications under the initial February 28, 2014 Part I application deadline.

DOE anticipates additional applications in response to the future deadlines given the time required to develop projects and complete applications.

Under this solicitation, applications will undergo a two-part review: Part I will determine the initial eligibility of a project and whether it is ready to proceed. Applications that clear Part I then proceed to Part II, which includes the full application process and continued due

diligence. Viable projects that are granted a conditional commitment from DOE then undergo the complete underwriting process and negotiation of terms for the loan guarantee.

Q5. You suggested that the Environmental Protection Agency's requirement of CCS use by the power sector would facilitate state utility commission authorization of cost recovery for CCS through consumer rates.

a. When do you expect state utility commissions to authorize consumer rate-based cost recovery for non-government-subsidized CCS meeting EPA standards?

A5a. Please note that DOE has no jurisdiction over state utility commission decision-making processes and each state utility commission is unique. We offer the following perspective in response: Many factors are considered when a state utility commission authorizes consumer rate-based cost recovery for any new power project. The cost of the technology is certainly one constraint, but other factors may be in play in specific scenarios which would encourage the use of more expensive technologies such as CCS. For instance, coal based systems provide ancillary services and reliability, and diversify the fuel mix, which may be necessary in some situations.

The timeframe for acceptance and deployment of any individual technology will depend on a number of factors in addition to cost, including but not limited to external system constraints that may provide the right market conditions earlier than expected. In addition, highly constrained areas that require base load power in the absence of strong natural gas infrastructure, the proximity to economic enhanced oil recovery opportunities and expectations about future carbon policy may make first generation technologies attractive in some early cases, without government subsidies.

b. Explain how state utility commission could authorize such consumer rate-based cost recovery for non-subsidized-CCS, given the prevalence of cheaper generation source alternatives. Upon what rationale would a state utility commission make such an authorization given competing availability of natural gas and nuclear fueled power generation?

A5b. Please note that DOE has no jurisdiction over state utility commission decision-making processes and each state utility commission is unique. We offer the following perspective in response: When a power system is chosen, its goal is to meet specific site and system requirements using a mix of available information including forecasts of future situations. Factors such as fuel diversity, system reliability, and other benefits a technology can provide are part of the consideration. The positives and negatives are weighed, with cost being only one of those factors.

State utility commissions could authorize rate recovery based on those considerations. In some instances, the electricity system has a requirement for a specific type of technology. Coal plants with CCS may diversify the fuel mix and reduce a region's dependence on a single fuel type. A plant may also provide baseload power with high capacity factors, stable, consistent fuel prices, and provide stronger reactive power and voltage control. These ancillary services may be necessary for the system, and coal with CCS could be uniquely positioned to do so. If the right mix of requirements, including future anticipated needs, can be met at an acceptable cost to the state utility commission, they may allow a non-subsidized-CCS plant.

Q6. DOE's Energy Information Administration (EIA) recently reported in its 2014 Annual Energy Outlook that, after the addition of current demonstration projects, there will be no increase in coal-based electricity generation in the United States for up to 30 years.

a. If market and regulatory factors indicate no new coal power capacity, please explain where DOE will find the facilities to demonstrate its CCS technologies for coal-based power at utility scale.

A6a. DOE typically pursues technology demonstrations utilizing a mix of projects that include the entire plant and smaller projects to integrate and demonstrate specific new technology components, also keeping in mind what is most likely to be successfully replicated on a commercial scale. Our current focus is the construction and operation of the existing portfolio of demonstration projects.

b. What are you doing, if anything, to adjust your program goal and development and demonstration plans to reflect these EIA projections?

A6b. DOE's Clean Coal Research Program will continue to focus on providing advanced technology options that produce affordable, efficient, low-carbon electricity from coal.

Q7. You stated that you hoped to see an increase in large scale deployment of CCS so it would manage 12-20% of U.S. emissions by 2050.

a. To attain such widespread deployment, how many power plants does DOE assume would implement CCS in the ensuing time period; how many over the next five years and in each five year period between now and 2050?

A7a. Through the CCPI, we are currently demonstrating the first generation set of technologies for application in new plants and retrofit to existing plants. The Office of Fossil Energy will continue to explore transformational technologies for future power systems. In the post-2020 timeframe, we may see the retirement of many base load units, which could result in the need for additional base load power plants.

The latest outlook from Annual Energy Outlook projects energy sector CO_2 emissions to be about 5,700 million metric tons in 2040. The reduction of CO_2 will come from a

variety of sources which are difficult to predict and model this early. A portion will likely come from the expansion of renewable technologies and fuel switching. We believe that industrial CCS projects can provide some of the early experience in CCS, and also encompass a large number of point sources.

Mr. {Klara.} Yeah.

Mr. {Johnson.} Same thing? Over the past several years, the president's budget request for coal R&D funding has steadily declined from a request in fiscal year 2010 for $404 million to most recent request in fiscal year 2014 for $277 million. Congress did not agree with these levels of funding and recently passed an omnibus appropriations bill increasing the funding by more than $100 million. So what does this say about your department's aggressive planning and the administration's priorities to advance coal technology if you are cutting funding for this work?

Mr. {Friedmann.} Thank you again for that question. We recognize that the budget process is complicated, that there are many, many competing interests, and so we make our requests. And we make our recommendations to the secretary, and the secretary brings those to OMB and to the White House. And together they figure out what is in fact what they want to put into an omnibus budget.

I would say that in general I think about these kinds of questions as a tradeoff with urgency. The more urgency one has, the more one is willing to spend on any particular

issue.

Mr. {Johnson.} I understand the budget process, and I realize there are conflicting priorities. But do you agree with the additional funding levels that Congress has appropriated?

Mr. {Friedmann.} What I would say is that we have very clear ideas about how we would use that well.

Mr. {Johnson.} Good, because that was my last question. And I am sorry. I got 15 seconds so let me get that one in. Would you please submit to this subcommittee how you plan to spend this additional funding?

Mr. {Friedmann.} Yeah, we will be happy to take that question for the record--

Mr. {Johnson.} Okay.

Mr. {Friedmann.} --and to have follow up with additional meetings.

Mr. {Johnson.} All right, thank you. Mr. Chairman, I yield back.

Mr. {Murphy.} The gentleman yields back. And now recognize the gentlelady from North Carolina, Ms. Ellmers, for 5 minutes.

COMMITTEE:	HOUSE ENERGY AND COMMERCE, SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS
HEARING DATE:	FEBRUARY 11, 2014
WITNESS:	JULIO FRIEDMANN PAGE: 95, LINE: 1888-1895

INSERT FOR THE RECORD

The Department plans to spend the additional funding for the Coal Research Program by continuing to support research and development of second generation and transformational technologies that reduce the cost of carbon capture, improve efficiency of power plant operations, and ensure safe permanent storage of carbon dioxide. Funding plans include the following:

- Carbon Capture will continue laboratory, bench, and small pilot scale tests for second generation and transformational technologies. This includes continued support for the National Carbon Capture Center, recently competed.
- Carbon Storage:
    - Will implement activities in the appropriations language for enhanced oil recovery technologies and continue the support for the large-scale injection tests of the Regional Carbon Sequestration Partnerships.
    - Has released a funding opportunity announcement for Geologic Storage Technologies to address key questions associated with CO_2 injection such as geomechanical effects and reservoir and seal behavior.
- Advanced Energy Systems:

- The Fuel Cells activity is addressing the technical challenges to commercialization, specifically cell performance, reliability and durability, and will advance and test progressively larger solid oxide fuel cell systems (~ 60 kWe) that will be the building block for commercial solid oxide fuel cell systems.
- Efforts are also being expanded in Gasification on novel polygeneration concepts that will build upon prior scoping studies.

- Crosscutting Research:
  - Will support efforts on water management by identifying key opportunities to reduce water consumption and to add new water supplies (e.g., derive revenue for waste-water treatment products and to further improve the use of alternative water streams currently being wasted).
  - Computational tools such as those being developed by the National Risk Assessment Partnership (NRAP) and the Carbon Capture and Simulation Initiative (CCSI) will also be continued. NRAP will develop Integrated Assessment Model Development with Monitoring and Mitigation for Risk-based Monitoring and Mitigation Protocols for Long-Term Carbon Storage and CCSI will support the initial deployment of the CCSI Toolset to industry users.

confluence of opportunity, resource, and revenue.

Mrs. {Ellmers.} Just and there again, and I am probably just asking you to speculate on this. But how many would you say that would be? When you say niche, are we talking about a small--like one to five?

Mr. {Friedmann.} Maybe a few dozen.

Mrs. {Ellmers.} A few--okay, so 24--

Mr. {Friedmann.} But I would not consider that widespread.

Mrs. {Ellmers.} --across the country about.

Mr. {Friedmann.} Just kicking around numbers, sure.

Mrs. {Ellmers.} Okay, that is good, and I appreciate that. Thank you very much. Mr. Chairman, I yield back the remainder of my time.

Mr. {Murphy.} Thank you. Now recognize Mr. Long for 5 minutes.

Mr. {Long.} Thank you, Mr. Chairman, and thank you all for being here today and your patience so far. Mr. Klara, has the Department of Energy estimated how many billions of tons per year will need to be stored if the United States is to sequester a substantial portion of coal-based carbon

dioxide?

Mr. {Klara.} There are many estimates that are out there relative to what the future could be for CO2 production.

Mr. {Long.} Many estimates from the Department of Energy?

Mr. {Klara.} We rely mainly on estimates from others. So for example the Intergovernmental Panel on Climate Change, the Electric Power Research Institute has looked at these.

Mr. {Long.} Do you know a ballpark range on how many billions of tons they are talking about? Have you looked at any of that or not?

Mr. {Klara.} Well, some of the estimates, and we could give you specifics for a record, question for the record. But some of the specifics would be looking at CCS having to handle potentially 20 percent or more of the reduction needed to get the CO2 stabilization. And yes, that could be in the range of, you know, a billion tons or more.

Mr. {Long.} Billion or multiple billions?

Mr. {Klara.} I would have to go back and look.

Mr. {Long.} Okay, if you wouldn't mind if you could get

COMMITTEE: HOUSE ENERGY AND COMMERCE, SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS

HEARING DATE: FEBRUARY 11, 2014

WITNESS: JULIO FRIEDMANN
PAGE: 100-101, LINE: 1984-2009

INSERT FOR THE RECORD

According to the U.S. Energy Information Administration's (EIA) 2014 Annual Energy Outlook, the 307-gigawatt (GW) fleet of existing U.S. coal-fueled power plants emitted 1,514 million metric tons (MT) of carbon dioxide (CO_2) while generating 1,499 billion kilowatt-hours of electricity in 2012. This corresponds to an average coal fleet CO_2 emission rate of 2,222 lbs/MWh. If CO_2 were captured from the existing fleet of coal-fueled power plants, the total CO_2 storage requirements would depend on how much of the fleet was controlled for CO_2, the capacity factor for each plant, and the percentage of CO_2 captured from each plant. A CO_2 capture rate of approximately 40% would be required to achieve a CO_2 emissions rate of 1,100 pounds per gross megawatt-hour. A 90% CO_2 capture rate is the nominal goal of the U.S. Department of Energy's Clean Coal Research Program.

Mr. {Friedmann.} One of the reasons why we do everything we do is that the future is opaque, and it is important to prepare as many options for the market as possible.

Mr. {Long.} That is why I think that the private sector should be involved in more of this than the government, but I will stick with you, Dr. Friedmann. Does the Department of Energy intend to intervene to make sitting pipelines for distant carbon injection a more realistic option? I understand this has been a barrier to some utilities who want to pursue CCS projects.

Mr. {Friedmann.} What I can say is that we have--so for any project that we have been involved in, we have supported the development and deployment of those pipelines. Where we see opportunities for regional networks to emerge that would help anchor CCS industries and large coal projects, we are keenly committed to seeing those pipelines come forward. One example of this is actually the support we have given to the FutureGen project in the FutureGen Alliance and their efforts to build a pipeline within Illinois.

Mr. {Long.} Okay, and, Mr. Chairman, I yield back and

thank you all again for my time.

Mr. {Friedmann.} Mr. Chairman, if I can clarify something for the record.

Mr. {Murphy.} Yes.

Mr. {Friedmann.} Thank you. This actually had to do with respect to Representative Ellmers' questions. She was asking about the price of capture. The answers which I gave were for a high fraction of capture, basically 90 or 95 percent capture. At small fractions of capture, say 50 percent capture, the actual integrated cost is much less. And that is relevant with respect to how you can deploy either modular units or smaller fractions of capture on the new or existing fleets.

Mr. {Murphy.} Is that a reference to a question about the 40 percent increase in costs?

Mr. {Friedmann.} Yes, exactly.

Mr. {Murphy.} Do you have the information, or can you provide it for this committee in addition to her question about what this breaks down to in a cost-per-megawatt generation and what this would then cost the average family? Do you have that information now, or is that something you

can get to us?

Mr. {Friedmann.} We prefer to bring that to you as a question for the record and give it back to the committee later. We have many of those kinds of calculations. Again it is the excellent work of National Energy Technology and their assessment team have done that for a wide range of power plants, a wide range of technologies, and a wide range of fuel prices. We are--be happy to provide that to the committee.

Mr. {Murphy.} That would help the committee and the families who are trying to pay attention to this and see what this means.

Mr. {Friedmann.} Of course.

Mr. {Murphy.} I now recognize Mr. Gardner for 5 minutes.

Mr. {Gardner.} Thank you, Mr. Chairman, and I thank the witnesses for joining us today. Mr. Klara, is it correct that successful development and deployment of second generation technologies are aware the Department of Energy expects the cost savings that may help make CCS for coal power competitive in the marketplace?

COMMITTEE:	HOUSE ENERGY AND COMMERCE, SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS
HEARING DATE:	FEBRUARY 11, 2014
WITNESS:	JULIO FRIEDMANN PAGE: 104-105, LINE: 2073-2101

INSERT FOR THE RECORD

The cost to the average family varies greatly due to regional variations in electric generation and market structure. Additionally, the type of generation technology and future status will also influence the cost. As such, it is not really possible to undertake this analysis well. DOE has not determined nor is it aware of an assessment which determines the cost for the average family of deploying carbon capture technologies under a specific greenhouse stabilization scenario.

Mr. {Klara.} I mentioned earlier, but we have three buckets of technologies that we are going after. First generation, which is the technologies deployed now. Second generation is what you are referencing, and then we have transformational technologies. And with second generation technologies, we are headed toward a reduction in cost as indicated by your remark.

Mr. {Gardner.} And what is NETL's assessment of the readiness of the technologies most critical to driving down costs?

Mr. {Klara.} Certainly when it comes to carbon capture and storage, capture is by far the key element to drive the cost down, and that is the majority of the focus of our research program.

Mr. {Gardner.} Have any of these second generation technologies have been taken to the demonstration phase to validate they work at commercial scale in a coal-fired power plant?

Mr. {Klara.} Not at this time, second--

Mr. {Gardner.} Not at this time?

Mr. {Klara.} Yeah, so demonstration of those would be

part of your planning.

Mr. {Gardner.} Dr. Friedmann, about how much of DOE's $7.6 billion over the past decade has been dedicated towards the second generation technologies?

Mr. {Friedmann.} The overwhelming majority of the $7.6 billion that we have dedicated so far is actually to the large-scale commercial demonstrations. So but in that context, to generate and develop the second demonstration technologies, as you said, we have put already several hundred millions of dollars into that research effort.

Mr. {Gardner.} Okay, and the information that I have says that we spent around $3 billion towards the second generation technologies. Would that be correct, of the $7.6 billion?

Mr. {Friedmann.} No, I don't think that is correct actually.

Mr. {Gardner.} Okay, maybe we can get--

Mr. {Friedmann.} We would be happy to clarify that. Yes, sir.

Mr. {Gardner.} When do you expect demonstrations of these second generation technologies will be completed?

COMMITTEE:	HOUSE ENERGY AND COMMERCE, SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS
HEARING DATE:	FEBRUARY 11, 2014
WITNESS:	JULIO FRIEDMANN PAGE: 107, LINE: 2136-2152

INSERT FOR THE RECORD

Over the past decade, the total investment in first generation CCS technologies has been $4.45 billion in first generation technologies and $3.15 billion for second generation and transformational technologies.

cut in half. We expect them to come in at something like $40 to $60 a ton for an integrated system.

Mr. {Gardner.} And you are also working what you call transformational technologies. What would be the cost savings of these expected transformational technologies?

Mr. {Friedmann.} Again on a thermodynamic and an engineering basis, they can get maybe another $10, another $15 a ton cheaper. So something on the order of $30 a ton is probably about the limit of what you can reasonably expect.

Mr. {Gardner.} And so when do you expect the demonstrations of those transformation technologies to be completed?

Mr. {Friedmann.} Again we have laid out our road map, and we are hoping to see those deployed in the field by 2025.

Mr. {Gardner.} Okay, deployed in the field commercially?

Mr. {Friedmann.} Yeah.

Mr. {Gardner.} Okay, at what price of CO2 capture per ton or percentage of capture will the cost be low enough to put a system on a level playing field economically with traditional coal-fueled electrical power production?

Mr. {Friedmann.} I honestly don't understand your question.

Mr. {Gardner.} So basically at what, the price point, the break point of CO2 capture per ton or percentage of capture will the cost be low enough? Basically when will this be economic, low enough to put a system on a level playing field economically with traditional coal-fueled electrical power production?

Mr. {Friedmann.} It is my contention that the second generation technologies are going to be the clean energy choice in terms of a competitive market in a variety of markets. In some markets, they won't be. In some markets, they will be. And the transformational technology would just increase the market share at that time.

Mr. {Gardner.} But in terms of the cost, you know, putting it on a level playing field from where we are today with costs from where you want to be with these new technologies cost. Do you have estimates? Have you produced estimates and that will produce estimates of when this break point will be?

Mr. {Friedmann.} Again all environmental technologies

add cost. So it is not appropriate nor do we for the purpose of policy decision compare the cost of carbon capture and storage with an unretrofitted plant or with a new build plant without it. We do that to demonstrate the delta, but a clean plant is not comparable to a Dickensian plant. They are different things.

Mr. {Gardner.} Okay, if you could supply any cost estimates that you have made, comparisons to the committee, that would be fantastic. And have any of your estimates changed in light of current market conditions?

Mr. {Friedmann.} First of all, we are happy to provide those numbers. The market conditions are constantly changing. We actually try to bring that uncertainty into the way that we make our price calculations in terms of availability for labor, availability for materials, global markets for things, and so forth. In that context, as the market has changed, our estimates don't change as much as you might guess. Some of that information is baked into the way we do the calculations.

Mr. {Gardner.} Thank you. And thank you, Mr. Chairman, for being generous of time.

COMMITTEE:	HOUSE ENERGY AND COMMERCE, SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS
HEARING DATE:	FEBRUARY 11, 2014
WITNESS:	JULIO FRIEDMANN PAGE: 111-112, LINE: 2221-2251

INSERT FOR THE RECORD

In the current market, capturing CO_2 from an existing coal-fueled power plant will increase its cost of generating electricity relative to a traditional coal-fueled power plant, but offsetting revenues can be obtained by selling the captured CO_2 for a beneficial use such as enhanced oil recovery. If the Clean Coal Research Program R&D goals are achieved, coal-fueled power plants which utilize second generation CO_2 capture technology are projected to be competitive with other electricity generating sources, but will be dependent upon future market conditions and status of technology development of these other fuel sources and generating technologies.

that if I may.

Ms. {Schakowsky.} Okay.

Mr. {Friedmann.} Again thank you for the question and for your compliment. It was very nice of you to say so. Shell Oil Company has announced that they use a $50-a-ton estimate for carbon dioxide for any project that they put together. Other companies, most Fortune 500 companies have a similar kind of number which they keep in terms of how they assist risk in a carbon-constrained future.

We do not actually use those numbers to estimate cost of capture. Those are straight-up technical calculations based on the facility, the technology, the rank of coal, et cetera. What we do is we think about deployment in the context of those costs. Cost of carbon is something which is actually outside of what the Department of Energy does, but we do believe that we are in a carbon-constrained world and that increasingly the cost of carbon dioxide emissions will be internalized into the cost of doing business.

As that happens, it is our privilege and our pleasure and my passion to find ways to drop the cost so that that deployment of clean energy technology can be as widely

successful as possible to create the brightest possible clean energy future for the United States.

Ms. {Schakowsky.} Perfect ending as far as I am concerned. Thank you.

Mr. {Murphy.} Thank you, and I have a clarifying question here too with it. So you mentioned about Kemper. They have that advantage of being able to use enhanced oil recovery from their plant. Different coal plants around the nation may not have that same advantage. And as you were preparing information for us, would you let us know what you believe the costs are for new plants or retrofitting old plants?

Mr. {Friedmann.} Um-hum.

Mr. {Murphy.} Give us some comparisons and having that public because we would like the companies themselves to be able to respond to those estimates if you would be able to get that for us.

Mr. {Friedmann.} Yeah, we would be happy to.

Mr. {Murphy.} Thank you.

Mr. {Friedmann.} Let me add that the availability of EOR doesn't affect the cost of the project. It affects the

COMMITTEE: HOUSE ENERGY AND COMMERCE, SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS

HEARING DATE: FEBRUARY 11, 2014

WITNESS: JULIO FRIEDMANN
PAGE: 115, LINE: 2307-2320

INSERT FOR THE RECORD

In the current market, capturing CO_2 from an existing coal-fueled power plant will increase its cost of generating electricity relative to a traditional coal-fueled power plant, but offsetting revenues can be obtained by selling the captured CO_2 for a beneficial use such as enhanced oil recovery. If the Clean Coal Research Program R&D goals are achieved, coal-fueled power plants which utilize second generation CO_2 capture technology are projected to be competitive with other electricity generating sources, but will be dependent upon future market conditions and status of technology development of these other fuel sources and generating technologies.