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3 HEARING ON THE FUTURE OF COAL UNDER CLIMATE LEGISLATION

4 TUESDAY, MARCH 10, 2009

5 House of Representatives,

6 Subcommittee on Energy and Environment

7 Committee on Energy and Commerce

8 Washington, D.C.

9 The subcommittee met, pursuant to call, at 9:35 a.m., in

10 Room 2123 of the Rayburn House Office Building, Hon. Edward

11 J. Markey (chairman) presiding.

12 Members present: Representatives Markey, Doyle, Inslee,

13 McNerney, Dingell, Boucher, Green, Gonzalez, Matheson,

14 Barrow, Waxman (ex officio), Upton, Hall, Stearns, Whitfield,

15 Shimkus, Pitts, Sullivan, Scalise, Barton (ex officio), and

16 Terry.

17 Staff present: Matt Weiner, Clerk; Alexandra Teitz,

18 Senior Counsel; Joe Beauvais, Counsel; Melissa Bez,

Professional Staff; Ben Hergst, Senior Policy Analyst; Lindsay Vidal, Press Assistant; and Michael Goo, Counsel.

Mr. {Markey.} Welcome to the Subcommittee on Energy and Environment, and our very important hearing on the Future of Coal Under Climate Legislation. For the information of the members, this hearing is being televised, recorded by C-Span, and we thank Mr. Shimkus for his help in making sure that we have the cameras working. We have portable cameras in here today showing the ingenuity of technological innovation when necessity requires, and that breakthrough is the same kind of breakthrough that I think we are going to hear in coal and its sequestration and other potential processes.

Before we get started this morning, I want to inform the members and their staff that tomorrow from noon to 1:00 p.m., the Secretary General of the United Nations, Mr. Ban Ki-moon, will brief our members and their staffs. The subject of the briefing will be global climate change and the international negotiations leading to the U.N. climate conference this December in Copenhagen. This briefing is for subcommittee members and their staffs only and will not be open to the public or the media. Secretary General Ban will address the subcommittee after which members will have an opportunity to direct questions to him. This is a great chance for us to have an open exchange with the Secretary General on this critical issue, and I strongly urge the members to attend so

they can do so.

There is a growing consensus that to avoid catastrophic climate change, we must cut global greenhouse gas emissions by at least 50 percent by 2050. U.S. emissions must be cut by at least 80 percent in the same period. Those objectives, quite simply, cannot be achieved unless we act quickly to control coal-fired powered plants. Coal supplies half of all electricity in the United States, and we have the largest coal reserves in the world. China and India also have abundant reserves and are even more coal dependent. But while coal is plentiful, it is also the leading source of global warming pollution. Coal-fired power plants are responsible for over a quarter of all U.S. and global greenhouse gas emissions. We are at a watershed moment.

By 2030 U.S. electricity demand is expected to increase by 30 percent and global demand will double. Coal’s role in meeting that demand will play a huge role in determining the fate of our planet. Globally as many as 3,000 coal-fired power plants are projected to be built by 2030. These new plants alone would increase global emissions by 30 percent. At the same time, coal’s future here in the United States is deeply uncertain. In the face of escalating public opposition and regulatory risk dozens of planned coal-fired plants have been cancelled in the last 2 years.

The Department of Energy's Energy Information Administration is now predicting a flat line in construction of new coal plants over the next 20 years. Meanwhile, the Environmental Protection Agency is expected to move forward with regulation of carbon dioxide emissions from power plants and other sources under the Clean Air Act. Carbon capture and storage or CCS offers a path forward for coal and opportunity for the U.S. economy and a bridge to a low carbon future. CCS generally involves capturing CO_2 emissions at the source and disposing of the CO_2 in deep geological formations. All indications are that CCS is a viable interim solution to the coal problem.

CCS could also dramatically increase domestic oil production by providing abundant CO_2 for enhanced oil recovery. Ultimately, CCS can go beyond geological disposal. For example, Silicon Valley based Calera Corporation is proposing to convert captured CO_2 into cement. That technology could be a game changer, a win-win solution that would dramatically reduce cement's carbon footprint while sequestering billions of tons of CO_2 from power plants. All these advances are possible but only if we enact the right policies to drive innovation. The economic recovery package passed last month includes 3.4 billion in advanced coal technology funding much of which will be used for CCS

demonstration projects. But ultimately only climate legislation can provide CCS the boost it needs to create jobs and unleash the private sector's vast resources and ingenuity. We need regulatory drivers and strong incentives.

An economy wide cap on global warming pollution will provide the long-term investment incentive, but the cap alone will not insure rapid deployment of CCS. To drive innovation, we must require new coal plants to use CCS by a certain date. At the same time, we must provide robust financial incentives for early development of this technology. This carrot and stick approach was included both in my ICAP legislation and in the discussion draft put forward by Mr. Dingell and Mr. Boucher last year. If we fail to bring CCS online quickly, we will have the worst of all worlds. Coal's future here in the United States will remain dim and the fleet of coal-fired plants being built in China and India will swamp whatever emissions reductions we achieve at home.

But if we blaze this trail, the world will follow, and we will reap the environmental and economic rewards of leadership. I trust that this morning's hearing will help guide us in that endeavor.

[The prepared statement of Mr. Markey follows:]

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Mr. {Markey.} Let me turn now and recognize the ranking member, the gentleman from Michigan, Mr. Upton, for his opening statement.

Mr. {Upton.} Thank you, Mr. Chairman. The future of coal mirrors the future of our economy. Coal provides inexpensive American made energy to power our manufacturing sector and keep electricity affordable for millions of Americans, and, like it or not, without coal the U.S. would hemorrhage millions of jobs. Electricity rates would skyrocket and we would become dependent on imported natural gas to meet electricity demand. In a recent hearing, Treasury Secretary Geithner said cap and trade will increase the cost of energy on those fuels that are high in carbon. For people whose behavior is energy, and energy use doesn’t change, the cost will go up. Translation, coal has a big target on its back and America’s working families already struggling will get stuck with the bill. Now is not the time to send those costs higher. Now is not the time to turn our back on coal.

It is imperative that we continue to take advantage of our Nation’s vast coal resources, which have the promise to produce clean and affordable power for generations, and in our quest to reduce greenhouse gas emissions and protect the

environment, we must promote clean coal technologies that will not only keep costs down from consumers but also foster new jobs and a strong economy. These technologies exhibit great promise and encouraging advancements in carbon capture. We will be able to responsibly fortify our Nation's energy supply with American made energy and protect the pocketbooks of our Nation's consumers as well. Last year, members of this committee introduced legislation that would block any new coal-fired power plant without carbon capture and sequestration.

At the same time, I introduced bipartisan legislation with Representatives Boucher, Barton, and Shimkus that would spur investment in CCS technologies, and surprisingly none of the co-sponsors of the anti-coal bill co-sponsored our bill that would insure CCS actually would become available. We plan on reintroducing our CCS deployment bill in the next few days, and I would hope members of this committee would join us in co-sponsoring that important legislation. In '08, the IEA noted CCS offers a viable and competitive route to mitigate CO_2 emissions. Current spending and activity levels are nowhere near enough. Investment in CCS will only occur if there are suitable financial incentives. The next 10 years will be critical.

To put our existing policies in perspective, wind

currently enjoys a subsidy of $24.35 per megawatt hour versus 44 cents for coal, 24.35 versus 44 cents. Wind must be an important part of the overall equation, but it will never compare to the base load generation that we need for coal. To replace the 3,300 megawatt coal-fired plant in Monroe, Michigan that sits on 200 acres and runs at greater than 90 percent capacity would require 6,000 wind turbines covering some 300,000 acres generating a 30 percent capacity and over 2,300 megawatts of natural gas generation to act as a backup at nearly double the cost. By insuring that CCS becomes available, we won’t need to set arbitrary mandates that will send electricity rates through the roof and American jobs overseas.

We have a choice, pursue irrational policies that will bankrupt America’s working families and eviscerate our economy or pursue sound policies that in fact will improve our environment, preserve the intensity of our economy, and keep costs down for consumers. We are clearly at a crossroads. Whatever course of action we pursue, we do so with the economy in a precarious position. By using a common sense, no regrets legislative approach that focuses on deployment of all clean energy, we can avoid a costly cap and trade scheme that will have no impact on emissions from the developing world. Instead, we will advance technology that

creates U.S. jobs and provides the opportunity to export. Working Americans will be better off. I yield back.

[The prepared statement of Mr. Upton follows:]

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Mr. {Markey.} The gentleman's time has expired. The Chair recognizes the chairman of the full committee, the gentleman from California, Mr. Waxman.

The {Chairman.} Thank you very much, Mr. Chairman. Today's hearing is about the future of coal, and as we seek to reduce both domestic and global greenhouse gases addressing the use of coal will be at the center of our efforts in the years to come. The U.S. has abundant reserves of coal, and generating electricity from coal is inexpensive relative to other fuel types. Currently roughly half of our Nation's power is supplied by coal. Although coal is abundant the emissions resulting from its use are massive. Burning coal results in roughly twice as much carbon dioxide being emitted as compared to using natural gas.

Coal-fired plants, which are large and typically have life spans measured in decades, can emit millions of tons of carbon dioxide per year. Today about 80 percent of the CO_2 emissions from domestic electricity generation come from coal. The U.S. and other countries are recognizing there is simply no way we can continue to use coal the way we do today if we intend to tackle climate change in a meaningful way. State energy companies and particularly the investment community have all begun to understand this new reality.

With EPA regulation of carbon pollution imminent, new coal facilities are facing longer details and more cancellations. Climate change legislation that provides a framework for the substantial reduction of greenhouse gas emissions and that lays down clear rules going forward will provide a certainty to the marketplace. This is necessary to protect our planet, necessary to insure the long-term viability of coal, both domestically and globally.

Today’s hearing will examine the technologies that could allow for the continued use of coal while substantially reducing carbon dioxide emissions. In particular, we will hear about the technologies that will enable us to capture carbon and store it in geologic formations and underground. I believe these technologies hold great promise. The individual components of carbon capture and storage or CCS technologies are well understood and in many cases have been used in industrial settings for years. The challenge ahead of us is putting all the pieces together in a way to enable the cost effective production of low carbon electricity from coal.

I hope this hearing will explore the ways in which federal climate legislation can help industry deploy CCS to realize its full economic and technical potential. Accomplishing that objective is essential if coal use is to

be part of our Nation’s low carbon energy future. I look forward to hearing the input of our witnesses on what role coal can play as we seek to address the threat of global climate change, and as we transform our Nation’s economy to low carbon sources of power. Thank you, Mr. Chairman.

[The prepared statement of Mr. Waxman follows:]

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Mr. {Markey.} Thank the gentleman. The Chair recognizes the gentleman from Texas, Mr. Barton.

Mr. {Barton.} Thank you, Mr. Chairman. I appreciate you starting this hearing at 9:30. You saved me from having to go a political meeting at the NRCC, so there is one good thing about this. It is good to have the hearing record being established on climate change and potential legislation. I am seriously supportive of establishing a true and fair record. And I think today's hearing is probably the--I am not sure how many others you are going to have, but I believe this is one of the most important ones, if not the most important, because as the chairman just pointed out, and other members of the panel, we are generating half of our base power load of electricity with coal, and it is an abundant domestic resource.

We have somewhere between 250 and 500 years of supply of coal depending on the technologies that we choose to employ, and something that is not often said but I think needs to be said it is our cheapest base load fuel source. I know the advocates of climate change legislation aren't too concerned about the cost but if you look at the map of states, states like Kentucky and West Virginia and Ohio, their average retail price for electricity is somewhere between 5 and 6-1/2

cents a kilowatt hour. They get over 90 percent of their electricity from coal, generated by coal power. On the other hand, if you look at your state, Mr. Markey, it gets only 2 percent of its electricity from coal generation and its base load cost, retail cost, is 15.4 cents kilowatt hour.

The full committee chairman's State of California's electricity cost at retail is almost 15 cents. Well, you know, you compare 5 cents to 15 cents, that is 300 percent cost differential. Now if you are a Hollywood producer, it probably doesn't matter much, but if you are a manufacturer that is operating on a 2 percent margin, and you have to decide whether to keep your plant open in Ohio or move it to Mexico or China, it matters a lot. So coal matters. Our economy matters. We are in a very serious economic situation, and if we start shutting down coal-fired power plants, we just make our economic problems worse, not better.

The issue at hand is the capture of CO_2. Now CO_2 is not a criteria pollutant under the Clean Air Act. It is not like lead. It is not like sulfur dioxide. It is not ozone. It is not like any of those things. CO_2 is a naturally occurring compound. It is a greenhouse gas. That is a true statement. It is not a pollutant in the sense of the word that it is harmful to public health. I am producing CO_2 as I speak. I drink 3 or 4 Diet Dr. Peppers a day. They have CO_2 in them.

That is what makes it a carbonated beverage. So it is a little bit different breed of cat.

And we can be on both sides of the issue. Somebody like me who is a climate change skeptic, and somebody like Mr. Markey or Mr. Waxman, who is a true believer, and still think that we need to do something to capture or convert CO_2 if we can do it economically, if we can do it economically. We don't want to raise the price of coal to 15 cents a kilowatt hour at retail. We don't want to destroy the industrial base of America. So if we get this right, and Mr. Boucher has got a bill to do the research to see if there is a technology that works. I am a co-sponsor. I am going to be a co-sponsor when he reintroduces it some time in the near future. If we can get coal right in America, Mr. Markey can be happy, and I can be happy, and everybody can be happy, and all God's children can be happy, but we got to get it right. We can't kill coal.

And so I am glad to see David Crane here. His company is a big industrial producer of electricity in Texas, and we are proud that he is although I wish he wasn't headquartered in New Jersey. It kind of galls me but that is the way it is. I am glad to see Mr. Hawkins here because he is the one of the international experts, and I am glad to see somebody from the Mining Association in Ms. Patton, who is going to

talk about some of the liability issues. This is a good panel, Mr. Chairman. And, as I said earlier, this is I think the most important hearing and if we get this hearing right and the policy coming out of it right our country has a chance to stay economically competitive. So with that, I yield back.

[The prepared statement of Mr. Barton follows:]

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Mr. {Markey.} We thank the gentleman. The chair recognizes the gentleman from Michigan, Chairman Emeritus Dingell.

Mr. {Dingell.} Thank you, Mr. Chairman, and thank you for holding this hearing. It is an important one. The future of coal is an issue that must be addressed if we are to succeed in passing meaningful climate change legislation. As we all know, currently coal generates more than 50 percent of the United States electricity supply. We have hundreds of years of coal reserves. Realistically, coal must and will play a significant part in our energy future. The challenge, however, is to balance the need for dramatically reducing their greenhouse gas emissions with the continuing need for coal to power this Nation. To meet this challenge legislation must spur development and deployment of carbon capture and sequestration, CCS technology.

China and India’s reliance on coal makes the need for this technology that much greater. And when I hear my friends amongst the environmentalists tell us how we should develop technology, I agree, but this is some of the technology that should be developed here. One approach this committee considered at a hearing last year is Mr. Boucher’s Carbon Capture and Storage Early Deployment Act. I was very

sympathetic and remain so to that excellent piece of legislation. This bill is based on recommendations put forward last year by the advanced coal technology work group, an advisory panel to the EPA. I urge this committee to look at this draft legislation when considering broader climate change legislation although some changes may be appropriate given CCS provisions in the stimulus bill incorporating large scale grant programs to accelerate the commercial demonstration of CCS and for testing carbon dioxide storage sites is essential to the success of CCS and therefore essential to the success of comprehensive climate change legislation.

We are also becoming aware of the fact that there are now technologies which can be used by this country to convert CO_2 emissions from power plants into a useful raw material for other industrial processes. This also must be pushed forward. The committee should also consider the CCS deployment program that Representative Boucher and I and other members of this committee released last year. We proposed an incentive system for carbon capture and sequestration technology. Power plants or large emitters that that adopt CCS technology early would receive bonus allowances. A similar incentive system was included in the Blueprint for Action put forward by USCAP, an alliance of

industry and environmental groups. Both the Boucher-Dingell draft and the Blueprint for Action coupled with the incentive program with requirements that insure that newly permitted coal-fired facilities will employ technology to capture and store carbon emissions.

The date for compliance, however, merits further discussion in my view as we yet do not know when CCS technology can be ready. Therefore, in this hearing I look forward to hearing more about progress being made on CCS technology and prospects for wide scale commercial use. Many questions still need to be answered including can we achieve significant reductions in greenhouse gas emissions before CCS technologies are ready. Are we doing enough to insure that these technologies are on track? How will carbon stored underground impact water resources and the environment generally? What happens to CO_2 after it is captured? Who owns it? Who is responsible for keeping it safe? These are just a few of the important questions that need to be answered about carbon capture and sequestration technology.

I look forward to hearing from our witnesses and learning more about the future of coal and climate legislation, and I warn that this country must proceed carefully, wisely and well lest we create greater home than benefit. I thank you, Mr. Chairman.

[The prepared statement of Mr. Dingell follows:]

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Mr. {Markey.} We thank the gentleman. The chair recognizes the gentleman from Kentucky, Mr. Whitfield.

Mr. {Whitfield.} Chairman Markey, thank you very much, and we certainly appreciate this important hearing on coal and the impact that environmental legislation and climate change legislation can have on this industry. I noticed that over the last couple of days the 2009 International Conference on Climate Change has been meeting in New York City, and basically that is a group of skeptics of global climate change. Primarily, I noticed in reading some of the speeches yesterday they were talking about the atmosphere of people creating an alarmist state on this whole issue, and that is one of the reasons why this hearing is particularly important because when you have one entity, the coal industry, providing 50 percent of the electricity in our country and then recently we met with a group of Chinese who came over, energy experts, and they quoted--they set out the fact that in China they are bringing on one new coal-powered plant into operation about every 2 weeks.

And that is why it is so vitally important that as we look at climate change legislation, we look at cap and trade legislation. We look at renewable mandates and the impact that that can have on the economy in the U.S., particularly

at this time when our economy is weakening, unemployment is going up, if we do not move very carefully then I believe that we can put the United States at an economic disadvantage to other countries particularly like China and India who are relying more and more on the fuel that produces electricity at the most economical cost.

And the thing that is really frustrating about all this is that as we look at the models projecting the future of global warming it is really almost impossible to detect the total cost of what the impact of that might be, and yet we can very clearly demonstrate the cost of renewable mandates and how much they will increase electricity, how that will make us less competitive in the global marketplace and will go a long way, I believe, in harming our economy as we try to come out of this economic decline. So I look forward to this hearing. I think it is vitally important and I yield back. I see I have no time to yield back.

[The prepared statement of Mr. Whitfield follows:]

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Mr. {Markey.} The gentleman's time has expired. The chair recognizes the gentleman from Pennsylvania, Mr. Doyle.

Mr. {Doyle.} Mr. Chairman, I would like to start by thanking you for having this important hearing today. Mr. Chairman, it is clear that coal remain the fuel that powers the world for years to come even as we work dramatically to expand our own Nation's renewable energy technologies. Your recognition of this fact is much appreciated, and I want to offer you my continued support as we put together policies and incentives to encourage the rapid and immediate deployment of widespread carbon capture and storage technologies. In a hearing last week, British Secretary of State for Energy and Climate Change, Ed Miliband, warned our committee about the massive expansion of the Chinese economy expected over the next decade. This is an economy that is 78 percent powered by coal and has projected increases in emissions that are many times the current emissions of the entire European Union.

Without widespread development and deployment of CCS technologies here in the United States, and the selling of these technologies to nations such as China, we will never be able to achieve the worldwide reductions we need to combat climate change. It is not a question of if we can do this,

it is a question of how fast can we get it done. The building and export of clean technology such as CCS will revitalize our Nation's manufacturing base as America will become a world leader in the production of clean and cheap energy. Investments in CCS technology as well as those in wind and solar power will help lead this energy revolution here at home while the technologies we export will generate tremendous carbon reductions abroad.

I look forward to continuing to work closely with you, Mr. Chairman, so that we can make the widespread deployment of CCS a reality here at home as well as abroad. And I yield back.

[The prepared statement of Mr. Doyle follows:]

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Mr. {Markey.} We thank the gentleman. The chair recognizes the gentleman from Illinois, Mr. Shimkus.

Mr. {Shimkus.} Thank you, Mr. Chairman. I will try to respect your comments from last week and start in third gear, not overdrive, as I did last time. To my colleague from Pennsylvania, I think that was the same guy who said he is not going to permit a single new coal-fired power plant in his country in that discussion, and I think that is what this is all about. I also want to appreciate the C-Span coverage, Mr. Chairman. This is really important for the public to understand and if this is our only shot then we need to take advantage of it. And it is a very good panel. I want to agree with Congressman Barton.

Here is an article from the Alton Telegraph, 3,000 workers needed for refinery construction. There is an expansion going on. 100 full-time jobs will be added. This is what I want to see in the coal industry, but what I seen especially--and we talked about this too last week, Mr. Chairman, is Peabody, you are going to get tired of seeing this, Peabody 10, 1,000 mine workers closed because of the Clean Air Act amendment, actually 1,200. These are the individuals who lost their jobs. That is my passion and that is my focus. I actually found out more stats. This is

another request I have for you, Mr. Chairman, to invite the United Mine Workers here to talk about the impact of job loss because I am throwing out what happened in the Midwest. Hopefully, they can give me the reasons why they are strangely silent on this bill, but after the ’90 amendment in Southern Illinois alone 18,200 mine workers were working the mines in southern Illinois.

That United Mine Worker region was reorganized into a 3-state region that represented only 4,000 United Mine Workers. There is a devastating effect on this to jobs, rural America, and coal areas of this country. We better, in the words of John Dingell, tread very carefully. And I yield back.

[The prepared statement of Mr. Shimkus follows:]

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Mr. {Markey.} The gentleman's time has expired. The chair recognizes the gentleman from Texas, Mr. Green.

Mr. {Green.} Thank you, Mr. Chairman. And seeing my colleague from Illinois hold up that sign about 1,000 workers needed to expand that refinery, we do expand refineries in my part of the country. And it is interesting following the merger, you say the United Mine Workers, I have the same thing in my area, the United Steel Workers. We don't have any steel plants, so to speak, in my area, but now they represent all my refineries so it is interesting what the market and the economy has done. Today's hearing reflects on the critical need to address coal's future, both under climate legislation and within our broader national energy security strategy.

While coal emits high levels of carbon dioxide, it is also one of our Nation's most abundant energy resources. Long-term strategies must be in place to reduce coal's carbon footprint and incentivize new technology development for carbon capture and sequestration, CCS, in order to utilize our vast coal reserves. CCS is one of the most important possible solutions for climate change unlike capture carbon injection technology is well-established and has been used for enhanced oil recovery for over 30 years. The Permian

Basin in west Texas is home to the majority of carbon dioxide injection in the entire world. This is good news for addressing climate change and producing more domestic energy.

Federal policies to encourage the development of CCS related technologies are key to avoiding severe cost disruptions in our economy. Several cost models for climate change tell us that one of the largest variable for the impact of energy costs under the climate change program is the availability of CCS. EPA's analysis last year of the Leiberman-Warner bill indicated that CCS could account for 30 percent of CO_2 reductions by 2050 which would involve injecting several gigatons of CO_2 underground. If CCS technologies were unavailable or not commercially viable these reductions would have to come from elsewhere and likely at a higher cost.

I hope today's hearing and testimony will shed some light on the most appropriate policies and approaches to develop CCS technologies when allowance prices may not be sufficiently high to encourage rapid development of CCS. And, Mr. Chairman, like my colleague from Texas, I want to welcome Mr. Crane. NRG has a great office in Houston and does a lot of different things. Although we will try to do NRG just like we did Calpine. Calpine actually expanded more alternatives and natural gas facilities in my district than

they did in California so they opened up an office in Houston and California Energy is now Calpine in Texas, so we don’t mind you expanding your office in Houston. I yield back my time.

[The prepared statement of Mr. Green follows:]

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Mr. {Markey.} The gentleman’s time has expired. The chair recognizes the gentleman from Florida, Mr. Stearns.

Mr. {Stearns.} Good morning, and thank you, Mr. Chairman. As pointed out by other speakers, the United States is the Saudi Arabia of coal, and we talked about the huge reserves that we have in this country. Recently, some of this research was put together in a paper that was published in the Stanford Law Review, December addition, so that I am a strong advocate of coal, and I was happy to see that President Clinton recently said--excuse me, President Obama recently said, ``This is America. We figured out how to put a man on the moon in 10 years. You can’t tell me we can’t figure out how to burn coal that we mine right here in the United States of America and make it work.'' So I think his statement, Mr. Chairman, shows that he recognizes with the huge reserves we have it is a national security to use that and learn to mine it right and to figure out to burn coal that does not affect our environment.

It is so abundant in this Nation. In fact, on the average coal costs $1 to $2 per million BTU compared with $6 to $12 per BTU for oil or natural gas and because of this plentiful and cost-effective coal reserves power plants fueled by coal account for more than half of this Nation’s

electricity production but because of the recent regulatory uncertainty surrounding climate change legislation only 12 new coal-fired power plants have been built in the United States since 1990.

Coal is a prime source of energy throughout the world as pointed out, particularly their moving ahead in China and will inevitably remain so as world wide energy demand continues to rise. So, Mr. Chairman, any meaningful effort to achieve long-term, sustainable reduction in global greenhouse gas emissions will depend on the development and deployment of new energy technology including advanced clean coal technology and carbon capture and sequestration. The rapid development demonstration of widespread deployment of such technologies are of paramount importance in any reasoned and effective effort to address climate change concerns. Thank you, Mr. Chairman.

[The prepared statement of Mr. Stearns follows:]

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Mr. {Markey.} We thank the gentleman. The chair recognizes the gentleman from Washington State, Mr. Inslee.

Mr. {Inslee.} There is widespread agreement that the future of the country's economy, the future of the planet, my grandkids' future depend upon the ability to find a technology to use coal cleanly. But I want to make two points that have not been made here yet. Point number one, this requires a major, technological transformation. It requires us to really look at the horizons and know the companies that are challenging those horizons right now. I want to list three of them. The Ramgen Power Systems Company in Bellview that has a compression technology that might reduce the cost of compression of CO_2, which is necessary for geological sequestration by 30 percent.

The Calera Cement Company that has found a technology where you can sequester CO_2 from coal-fired plants in building materials so that we can make CO_2 part of our buildings rather than wasting it and putting it below ground. The Sapphire Energy Company in San Diego that has a way to take algae that can eat the CO_2 from the smoke stacks and produce a gasoline product chemically undistinguishable from gasoline. We need these technologies to advance, and that leads to point two. We have to have a fund by which to fund this research and

development. And here is the point I want to make to my friends who want to advance coal. To have that fund, we have to have an auction of the permits under the cap and trade system.

If, and only if, we have an auction that will generate revenues that can be used to help the coal industry develop these technologies does coal have a future in this country or anywhere on the planet. If we are going to sell these technologies to China, which we have to do so that China will not destroy the planet Earth, we are going to have to have a fund to invest in these technologies. The biggest debate in Congress this year on energy will be about this issue of whether we are going to have an auction or whether we are going to give these permits away, and what we are going to use the money for, and I hope my friends who advocate for coal recognize the existence of this industry depends on actually having auctions and having the revenues that can save this industry for a future for the United States.

So I know that seems counter-intuitive to some of my friends of coal but until we realize the necessity of those revenues, we are not going to get this job done. Thank you.

[The prepared statement of Mr. Inslee follows:]

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Mr. {Markey.} The gentleman's time has expired. The chair recognizes the gentleman from Louisiana, Mr. Scalise.

Mr. {Scalise.} Thank you, Mr. Chairman. I look forward to hearing the testimony from the panel as we continue the process of exploring all of the various pieces that are involved in coming up with a comprehensive national energy policy. I think as many of these issues are discussed it shows the problems that are created by the fact that our country doesn't have a comprehensive strategy. But we have got to also recognize that coal is still a very viable and inexpensive source of energy and in fact is a backup source of energy for many of these renewable sources as we advance more wind and solar technologies, and I encourage us to do that. We all know that the wind doesn't blow all the time. We all know that the sun isn't shining all the time and that coal is a backup source for many of those renewable sources of energy, and some people do have a desire to bankrupt the coal industry. We have heard those comments.

I think we need to be much more pragmatic about encouraging clean coal technologies to advance as opposed to literally bankrupting an industry that provides so much of our power in an inexpensive way and in a way that can be captured in a much more clean and economic process. And so I

think as we look at some of these proposals and especially the cap and trade proposals that are before us which in essence is an energy tax, a tax on energy, that by some estimates would cost American families up to $1,300 a year more in increased energy costs. I think that is a very dangerous road to go down as we are talking about economic shortfall where we are trying to get our economy back on track. Let us make sure that we don’t create policies that cost our economy thousands more jobs and cost American consumers up to $1,300 a year more in energy taxes.

There is a better way to do it. There is a cleaner way to do it, and let us pursue those technologies instead of trying to bankrupt some at the benefit of others, so look forward to hearing the panel. Yield back the balance of my time.

[The prepared statement of Mr. Scalise follows:]

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Mr. {Markey.} The gentleman's time has expired. The chair recognizes the gentleman from California, Mr. McNerney.

Mr. {McNerney.} Thank you, Mr. Chairman. Well, we clearly need to include coal in our national energy mix, but I am not really sold on carbon sequestration technology. We have the geologic formations. We probably have the technology, but are we going to be able to do this cost effectively. That is what I am hoping you all can sell me on. I am open-minded about it. I want to see what we can do here but I am a person that is going to have the same sort of skepticism that my friend from Washington State has, so I look forward to your testimony. I yield the balance of my time.

[The prepared statement of Mr. McNerney follows:]

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Mr. {Markey.} The gentleman's time has expired. The chair recognizes the gentleman from Pennsylvania, Mr. Pitts.

Mr. {Pitts.} Thank you, Mr. Chairman. I would like to thank you for convening this hearing today. The role of coal in climate change discussions is an important one. As most people know, coal is the most abundant energy resource in the United States and is particularly plentiful in my home state of Pennsylvania. It plays a crucial role in Pennsylvania's economy and will continue to do so as long as economically stifling climate change legislation does not force many coal-fired electricity plants out of business. While I believe it is essential to protect our environment and atmosphere, I do not believe it is prudent to bankrupt an industry that not only produces nearly 50 percent of our electricity today but also provides jobs to countless Pennsylvanians and Americans throughout the country.

Passing cap and trade legislation right now would certainly have a negative effect on the coal industry and on consumers who pay low prices for coal-generated electricity. It is essential that we work towards utilizing clean coal technology. We must take decisive action to insure that coal generation can continue while taking steps to improve the process of carbon capture and sequestration. We must ensure

that liability issues are resolved so that carbon capture and sequestration projects can forge ahead. Investors, owners, and operators need to have confidence that litigation will not squander their investments. We also need to continue to work towards reducing the cost of carbon capture and sequestration projects so that it becomes a practical and economically sensible process. If people truly believe we need to mitigate the effects of carbon in the atmosphere.

It is every bit as important to pursue ways to use coal in a clean manner. I look forward to hearing the testimony today and I yield back.

[The prepared statement of Mr. Pitts follows:]

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Mr. {Markey.} The gentleman’s time has expired. The chair recognizes the gentleman from Virginia, Mr. Boucher.

Mr. {Boucher.} Thank you, Mr. Chairman. I am going to waive opening statement and reserve time for questions.

[The prepared statement of Mr. Boucher follows:]

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Mr. {Markey.} The gentleman reserves time. The chair recognizes the gentleman from Nebraska, Mr. Terry.

Mr. {Terry.} Thank you, Mr. Chairman. I am an interloper on this subcommittee today. Obviously, Nebraska is about 70 percent dependent on coal so I want to hear what the industry has to say, and I will yield back.

[The prepared statement of Mr. Terry follows:]

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Mr. {Markey.} We thank the gentleman, and now we will turn to our witnesses, and we begin by welcoming Mr. David Hawkins who is the director of the Natural Resources Defense Council's Climate Center. He is also a former assistant administrator of the EPA and has more than 30 years of experience on air quality, climate change, and energy policy issues. We welcome you, sir. Whenever you are ready, please begin.

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^STATEMENTS OF DAVID HAWKINS, DIRECTOR, CLIMATE CENTER, NATURAL RESOURCES DEFENSE COUNCIL; DAVID CRANE, PRESIDENT AND CHIEF EXECUTIVE OFFICER, NRG ENERGY, INC.; IAN DUNCAN, ASSOCIATE DIRECTOR FOR EARTH AND ENVIRONMENT SYSTEMS, BUREAU OF ECONOMIC GEOLOGY, UNIVERSITY OF TEXAS AT AUSTIN; FRANK ALIX, CHIEF EXECUTIVE OFFICER, POWERSPAN CORP.; HAROLD P. QUINN, JR., PRESIDENT AND CEO, NATIONAL MINING ASSOCIATION; AND LINDENE PATTON, CHIEF CLIMATE PRODUCT OFFICER, ZURICH FINANCIAL SERVICES

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^STATEMENT OF DAVID HAWKINS

} Mr. {Hawkins.} Thank you, Mr. Chairman. Thank you for inviting me back to the committee. I would like to highlight six points in my prepared testimony. The first is that to prevent a climate catastrophe, we simply cannot keep using coal the way we use it today. Coal is so abundant that even if we put a small fraction of the carbon that it contains into the air global temperatures would rise to dangerous levels. New coal plants now on the drawing board around the world would put more carbon dioxide into the air over their operating lives than all the CO_2 emitted from previous use of coal in human history.

The second point is that carbon capture and disposal is ready for commercial deployment today but without a strong climate protection law this deployment simply will not happen. Third, the failure to enact climate protection legislation would be disastrous for the climate but ironically it would not assure a sustainable role for coal in the United States. Today regulators and investors are saying, wait a minute, when it comes to new coal. The most recent Energy Information Administration forecast flashes projected coal builds for new coal builds in the United States by 60 percent from the forecast that it issued just a year ago. Other than plants already under construction, the EIA projects that essentially now new coal plants would be built for over a decade if climate policy remains unresolved.

The fourth point is that coal needs more than carbon capture and disposal for it to serve as the 21st century fuel. Shameful practices like mountaintop mining removal, conventional air pollution, coal ash management, these things have to be fixed as well, but carbon capture and disposal could make coal and climate protection compatible. The fifth point is that carbon capture and disposal could help reduce our dependence on imported oil as well. NRDC estimates that the CO_2 captured in a robust carbon capture and disposal program could support an expanded, enhanced oil recovery

industry large enough to back out about 2 million barrels of imported oil every day by 2020 and about 5 million barrels per day by 2025. In addition, electricity made from coal plants with carbon capture and disposal could back out more oil by powering plug-in hybrids.

The sixth point I will make is that business leaders and environmental groups are coming together and have proposed a policy package that would both help protect the climate and speed deployment of carbon capture and disposal in the United States. In January of this year the U.S. Climate Action Partnership, USCAP, issued its Blueprint for Legislative Action. In addition to an economy wide cap on global warming pollution, the Blueprint recommends a four-part package for using carbon capture and disposal to cut coal plant emissions. The first recommendation is to direct EPA and other agencies to adopt rules required for CO_2 transport and disposal, second, to fund 5 gigawatts of coal plants with carbon capture and disposal by 2015, third, to enact CO_2 emission standards for new coal plants now, and, fourth, to provide direct payments to create incentives for carbon capture and disposal in the early period of the cap program.

Enactment of this package, Mr. Chairman, and members of the subcommittee, would make carbon capture and disposal a reality in the United States in the next few years and would

show leadership to the world. Thank you.

[The prepared statement of Mr. Hawkins follows:]

********** INSERT 1 **********

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Mr. {Markey.} Thank you, Mr. Hawkins. Our next witness is David Crane. Mr. Crane is President and CEO of NRG Energy, a leading wholesale power generation company. He has many years of experience and was previously the CEO of International Power. We welcome you, sir. Whenever you are ready, please begin.

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^STATEMENT OF DAVID CRANE

} Mr. {Crane.} Thank you, Mr. Chairman. Thanks to members of the committee and particularly Congressmen Barton and Green for their kind words to me. And I want to start by thanking you for addressing climate change and combating climate change which we believe is the critical task before us. We think clean coal is the key to successful combating of climate change and carbon capture and sequestration is the key to clean coal, so again we applaud you shining a spotlight on this technology, this issue which unfortunately remains obscure to the American public.

NRG is a company that owns power plants. We own 24,000 megawatts of power plants across the country. That is enough to power 20 million American homes. About 1/3 of our generation is coal. I think we are the fifth largest consumer of Powder River Basin coal, and we span the great expanse of red states to blue states in that we have coal-fired power plants in Texas, Delaware, New York State, and, Chairman Markey, in your home state of Massachusetts.

We are not a rate-based utilized. We are not able to socialize the cost that we bear to the public but they are borne by our shareholders, and since 2006 we have been

investing our shareholders' money in decarbonizing generation. We built 270 megawatts of wind in Texas. We announced last week an intent to build 500 megawatts of solar thermal plants in California and New Mexico, and we believe we will be the first company to build a new nuclear plant in the United States having filed with the NRC a year and a half ago to build a 2,700 megawatt nuclear plant in Texas, which our company has already spent close to $200 million on just to file the permit.

All told, what we have going so far would be about a $10 billion investment and create about 9,000 high paying jobs. If we succeed in all we do, we would achieve a significant reduction in our carbon intensity. As a company currently we produce about 64 million tons of carbon emissions in the United States in order to make about 70 to 80 million megawatt hours of production. But when you hear the list of things we are doing, noticeably absent from that list is clean coal, and if I say one thing that this committee remembers one of the things I have been saying to our investors when they say, David, are you really able to develop nuclear power plants, I say developing nuclear power plants in this environment is easier than doing clean coal. That is the part that is really a challenge.

But this is not for want of trying on our behalf. In

2006 we won an award from the State of New York to build an integrated gasification combined cycle plant. Two years later after spending over $10 million of our shareholders' money, that project which was started by the Pataki Administration was cancelled by the Patterson Administration and in fairness to the Patterson Administration it just proved that doing a full-blown IGCC project with CCS was just beyond the reach of any private company working with any state at this point in time so again we heartily support the federal government's effort to support this. I would just like to quickly list what we see as the five main obstacles to going forward with commercial scale CCS. Obviously, the first one is there is no price on carbon in the United States right now. The second would be even if there was a price it would be unlikely be set at a level that would incent carbon capture and sequestration.

The lack of a proper legal and regulatory scheme proved to be an enormous impediment to us with our New York project. The fourth point would be that the normal government incentives, production tax credits, loan guarantees are not particularly useful in the course of CCS, particularly when you are talking about post-combustion carbon capture, which of all forms of carbon capture is by far the most important because of its ability to be retrofitted on existing plants.

My colleague, Mr. Alix, will, I am sure, talk about that more. And the fifth point, which in this day and environment there is actually no money available from our normal sources for anything much less new technologies.

So I would like to just a few thoughts for the committee to consider. One is I think that the big bang approach to going with CCS as maybe reflected by FutureGen is not going to be the quickest or the most cost-effective way to go forward. I have nothing against FutureGen, but I think there are other things that the committee can incent. I think that when looking at brown field coal plants, I think one thing the committee should recognize is that our analysis indicates that the best use for those plants is not to be retrofitted for post-combustion carbon capture but probably to be converted to gas so that they confirm renewables on a basis. And the last point I would make, and I respectfully would disagree with Congressman Inslee, whose book I have read and who I respect in his opinions but we don’t support 100 percent auction because we think that the best people to get the carbon out of coal are coal companies and coal-using power general companies, so we support the USCAP Blueprint which calls for transitional and partial allocations plus auction for early funding. So thank you, Mr. Chairman.

[The prepared statement of Mr. Crane follows:]

********** INSERT 2 **********

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Mr. {Markey.} Thank you, Mr. Crane, and thank you for the shout out for Mr. Inslee’s book as well. We appreciate that, and that is why we have these cameras working again. Our next witness is Mr. Ian Duncan, who is the Associate Director for Earth and Environmental Systems for the Bureau of Economic Geology at the University of Texas at Austin. Dr. Duncan was the geologic sequestration lead for the Texas FutureGen team and focuses on the technical and legal aspects of long-term carbon storage. We welcome you, sir. Whenever you are ready, please begin.

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^STATEMENT OF IAN DUNCAN

} Mr. {Duncan.} Thank you, Mr. Chairman. I am part of the Gulf Coast Carbon Center at the University of Texas which is dedicated to doing the science, engineering, and policy research necessary to establish a successful sequestration industry in the Gulf Coast. My personal research is in the business operational and long-term risks associated with CO_2 sequestration. I am going to organize my remarks around the four questions that you asked, Mr. Chairman, in your invitation. The first question was what experience do we have from CO_2 enhanced recovery and other experience to help determine the feasibility of large scale CO_2 sequestration. The CO_2 EOR industry in the U.S., over 80 percent of it in Texas, has transported 600 million tons of CO_2 over the last 37 years. It has injected 1,200 million tons into oil reservoirs in west Texas.

Just to give you an example, the sack rock field currently injects about 30 million tons of CO_2 and each year 6 to 7 million tons of that is retained in the reservoir, and by that mark this is the largest sequestration project in the world if it was using anthropogenic CO_2. Only part of it is. The safety record of the industry is stellar. There are no

deaths, no serious injuries related to the injection of this CO_2 or the transportation. As a scientist, that is somewhat problematical to me in that it is very difficult to calculate statistics from the set so I got some challenges as to how to do this. The second question, what degree of confidence can we have in the feasibility and safety of CO_2 sequestration? Let me first define risk. Risk is likelihood or probability times consequence.

Risky things typically have a probability of about 10 to minus 3. Things that we perceive as being not risky such as driving on the road and air travel have risks of about 10 to minus 4 or 10 to the minus 5. Most of the risks that I have evaluated and associated with CO_2 sequestration so far have risks in the order of 10 to the minus 5 to 10 to the minus 7, so there are several orders of magnitude, less risky than flying in a plane. Now that is not to say that CCS and carbon sequestration is going to be risk free. However, if it is done in a proper way if it is regulated well, I think the risk is comparable to other industrial operations. The one that we know least about is the long-term risk to contamination of water, and this risk is clearly site dependent. In other words, there are some sites where one could infer that the probability would be higher.

There are other sites where the consequences, the water

resources are more valuable. This leads to the third question what are the principal regulatory obstacles. I would assess that the EPA has done a commendable job in its draft rules for class six wells, however, there is no mechanism in the EPA rules to identify the best sites for sequestration. The regulations are purely binary, sort of like a pass-fail exam. The EPA does not in my opinion have the authority to drive a mechanism to select best sites.

Final question, what role can CCS play in expanding enhanced oil recovery and impact of U.S. oil supply. In Texas if we were capturing CO_2, we could gather an extra 3.8 billion barrels of oil. This is equivalent to discovering a giant field in Texas. However, there is an issue. There is no currently considered regulation of CO_2 EOR in terms of sequestration. I would think that a class 2A regulation, A being anthropogenic, would help to introduce sequestration as part of enhanced oil recovery, and this would help develop CCS in conjunction with enhanced oil recovery. Thank you.

[The prepared statement of Mr. Duncan follows:]

********** INSERT 3 **********

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Mr. {Markey.} Thank you, Dr. Duncan, very much. Our next witness is Mr. Frank Alix, CEO, and co-founder of Powerspan, a New Hampshire-based company, currently working on carbon dioxide capture technology for electric power companies. We welcome you, sir.

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^STATEMENT OF FRANK ALIX

} Mr. {Alix.} Thank you, Mr. Chairman, for the opportunity to share my perspective on the future of coal under climate legislation. My testimony today will focus on the prospects for commercial deployment of carbon capture technologies on coal-fired power plants. Powerspan has been developing and commercializing advanced clean coal technology since 1994. Our approach to CO_2 capture, called ECO_2, is a post-combustion process designed to capture 90 percent of CO_2 emissions. The technology is suitable for retrofit to the existing coal-fired generating fleet for new coal-fired plants. Pilot scale testing of our ECO_2 technology began in December of 2008 at FirstEnergy's Burger Plant in Southeastern Ohio. The ECO_2 pilot was designed to treat a 1 megawatt flue gas stream and capture 20 tons of CO_2 per day.

Initial testing has demonstrated 80 percent CO_2 capture efficiency which is a promising start. We recently completed two minor design modifications that we expect will increase the CO_2 capture rate to 90 percent. The pilot plant was built using the same type of equipment that we plan to use in commercial systems. Therefore, successful operation of the pilot unit will confirm our design assumptions and cost

estimates for large-scale CCS projects. Although commercial scale CCS projects still have some risk, that risk is manageable because the major equipment used in the ECO_2 process has been used in other commercial applications at the scale required for CCS. Our experience in the emerging market for commercial scale CCS projects supports our optimism. In 2007, Basin Electric Power Cooperative conducted a competitive solicitation for a post-combustion C)s capture technology to retrofit their Antelope Valley Station, which is a coal-fired power plant located in Beulah, North Dakota. The Antelope Valley project will install CO_2 capture equipment on a 120 megawatt flue gas slipstream taken from a 450 megawatt unit. Basin Electric has targeted 90 percent CO_2 capture efficiency to provide 1 million tons of CO_2 annually for enhanced oil recovery.

Six of the leading CO_2 vendors for post-combustion capture technology responded to the Antelope Valley solicitation and after a detailed evaluation, Basin Electric selected Powerspan. This commercial CCS project is scheduled to start up in 2012. Since being selected for the Antelope Valley project, a feasibility study has confirmed that there are no technical limitations to deploying ECO_2 at the plant. The study estimated cost of less than $40 per ton for 90 percent CO_2 capture and compression. A similar study of ECO_2

recently conducted for a new 760 megawatt super critical coal plant estimates CO_2 capture costs of under $30 per ton. A third engineering study focused on ECO_2 scaling risks determined that our pilot plant will provide sufficient design information to confidentially build commercial scale systems up to 760 megawatts.

Independent engineering firms led the feasibility, cost, and scaling studies for our prospective customers. As a sign of our confidence, we will back our commercial ECO_2 installations with industry standard performance guarantees. Despite the promise indicated by the Basin Electric project, strong government action is needed to ensure timely deployment of CCS technology to support climate change mitigation goals. Government actions should focus on three areas: 1, a strong, market-based cap on greenhouse gas emissions; 2, a CO_2 emission performance standard for new coal-based power plants; 3, early deployment incentives for commercial scale CCS systems.

Incentives are needed to ensure early deployment of CCS because CO_2 capture technology is not yet commercially proven on large coal plants and early CO_2 prices will not be sufficient to offset CCS costs. To be most effective, CCS incentives must provide long-term CO_2 price certainty to facilitate project financing and must be awarded

competitively, preferably by reverse auction in order to minimize cost while also providing a market signal on the real cost for early CCS installations. Early deployment of CCS technology will also create jobs and promote economic growth.

CCS projects require 3 to 4 years to implement and create significant economic activity over their duration. In addition, by incentivizing early deployment of CCS, the U.S. can assume a leading position in this critical sector and create a thriving, high-tech export business, and the quality jobs that come with it. In summary, CO_2 capture technology is commercially available from several qualified vendors with standard commercial guarantees. Independent studies show that early commercial installations of CO_2 capture technology are likely to be successful. The cost of widespread deployment of these technologies appear manageable, particularly when compared to the cost of other low-carbon electricity solutions.

The most important reason to promote early deployment of CCS is that post-combustion CO_2 capture technologies will preserve the huge investment in existing coal-fired power plants and allow us to effectively use abundant, low cost, coal reserves in the U.S. and developing nations, even in a climate constrained world. Thank you, Mr. Chairman.

[The prepared statement of Mr. Alix follows:]

********** INSERT 4 **********

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Mr. {Markey.} Thank you, Mr. Alix, very much. Our next witness is Mr. Hal Quinn, who is the President and CEO of the National Mining Association. The National Mining Association represents coal, metal, and industrial mineral producers, as well as equipment, manufacturers, and suppliers. We welcome you, sir.

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^STATEMENT OF HAROLD P. QUINN, JR.

} Mr. {Quinn.} Thank you, Mr. Chairman, good morning, and good morning to the members of the subcommittee. I would just like to make several points this morning. Several of them have been well documented in your opening statements. The first point is coal is indispensable for meeting our energy needs here and worldwide for the foreseeable future. It is precisely because of the virtues of coal that were stated this morning in many of the opening statements, its abundance and affordability and it supplies over half the electricity in this country, and because of those virtues it also provides 125,000 high paying jobs for U.S. coal miners, as well as thousands of other jobs for many of the businesses and industries that depend on affordable and reliable electricity to remain competitive worldwide.

Globally coal has been the most rapidly growing fuel in the world. Countries such as China and India already rely upon coal to meet over 70 percent of their electricity needs. They, like us, depend on coal to sustain their economies and to raise their standard of living. The second point is as follows. Neither this Nation nor the global community can address climate effectively without advance clean coal

technologies including, and most importantly, carbon capture and storage. Between 2007 and 2030 global energy demand is projected to increase by 50 percent. CO_2 emissions are projected to increase by 57 percent according to the International Energy Agency. Virtually all of this emissions growth will come from non-OECD nations, and the point being is if the United States and every OECD nation completely stopped using coal 75 percent of all CO_2 emissions would remain untouched and unaddressed.

In other words, without CCS, we deprive ourselves of the most effective tool for addressing climate change, particularly in the developing world. In other words, no climate policy will be successful without coal and CCS. This leads me to my third point. The United States must do much more to support accelerated development and deployment of CCS technologies. $3.4 billion including coal technologies including CCS provided for American Recover and Reinvestment Act is a good first step, but we need to push the technology as hard and fast as we can as noted by many members of the subcommittee this morning, and this will require further investment by the government and the industry.

As the World Resources Institute has pointed out, CCS technologies not only have to be tested and brought up to scale, but also have to be integrated on a series of

electricity generation platforms. That is a challenge beyond the sole scope of first-adopters in the coal-based generation community. Similarly, as others have pointed out, a carbon price signal alone is insufficient. There has to be a push as well as a pull to get the job done. The Carbon Capture and Storage Early Deployment Act sponsored by Representatives Boucher, Barton, Upton, Whitfield, and Shimkus provide such a push through mechanism for sustained funding to support development and deployment of the enabling CCS technology.

This brings me to my fourth point for your consideration. The solution we all seek requires that we harmonize the timing when controls are placed on emissions with the commercial availability of the critical CCS technologies needed to reduce them. The consequences of getting this policy wrong could be dire. The period of time between when promising technologies are developed and successful commercialization is often referred to as potential valley of death. By extension industries may confront a valley of death but they are trapped in the period between the mandate requiring a certain level of performance and availability of the technology enabling them to meet the requirement. The same fate could befall our economy if we impose harsh restrictions that jeopardize our ability to meet electricity demand before we have the necessary tools to meet

future emissions requirements.

Our current economic crisis reminds us all the more the importance of structuring any actions responsibly so we can meet both our environmental and economic goals. In short, the solution must be sustainable in every respect, environmentally, economically, and politically. To sum up, Mr. Chairman, let me just make the following--sum up my points. First, coal is indispensable for meeting our energy needs domestically and globally. No climate policy will be successful without coal with CCS. We must accelerate the development and deployment of CCS, and the policy solutions must harmonize the expectations of commercial availability of enabling technology. Thank you very much for the invitation.

[The prepared statement of Mr. Quinn follows:]

********** INSERT 5 **********

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Mr. {Markey.} Thank you, sir. And our final witness is Lindene Patton. She is the Chief Climate Product Officer with the Zurich Financial Services. Ms. Patton works on developing insurance products that address the risk associated with climate change. We welcome you.

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^STATEMENT OF LINDENE PATTON

} Ms. {Patton.} Thank you. Chairman Markey, distinguished members of the Energy and Environment Subcommittee, my name is Lindene Patton and I serve as the Chief Climate Product Officer for Zurich Financial Services. Zurich is a global insurance company providing insurance and risk management solutions to customers in 170 countries. We have been serving customers in the United States since 1912. We are the third largest commercial property-casualty insurer in this country with over 20,000 employees in the U.S. I would like to begin my testimony by thanking you for holding this critical and timely hearing because immediate, concrete and responsible actions including the commercial-scale deployment of carbon capture and sequestration should be taken to reduce the risks associated with climate change.

Zurich is in the business of risk management. In 2008, Zurich announced as part of its climate initiative, that it would dedicate significant resources and apply its skills in the area of risk management to assist stakeholders in adapting to and mitigating the risks of climate change. Zurich has applied these skills specifically to commercial deployment of CCS. The focus of my testimony today will be

identification of the essential risk management components of a legislative framework necessary to ensure the commercial deployment of CCS in an environmentally and economically sustainable manner. The role of an insurer in a CCS context is to assess risk, price risk, and create risk management best practices. Insurance imposes quality underwriting restrictions which are not only in the interest of the insurer but are in the interest of public good reducing risk to property damage, bodily injury, environmental damage, and other economic loss.

Insurance performs a role like no other in society, sending price signals to incentivize risk-reducing behavior. To ensure that commercial deployment of CCS occurs in a sustainable manner with respect to natural resources, the environment, and public safety, the following four elements of a risk management framework are critical. First, estimating the expected. Appropriate analysis is needed to estimate the expected value of financial consequences that may arise from each individual CCS site. Specialty insurers are expert at estimating these low frequency, potentially catastrophic risks.

Second, proper identification and quantification must inform permitting, operation and maintenance requirements. No amount of insurance, trust fund, or other financial risk

management system can overcome poor siting or inappropriate operating techniques. Third, establishment of a CCS safety board. With respect to siting, operational oversight and long-term stewardship of CCS facilities, a private/public government corporation should be chartered and vested with the authority to oversee the siting and design of CCS facilities and the management of CCS facilities in the event of conflict of law or resources.

Fourth, establishment of a CCS National Trust. A trust managed by the CCS safety board should be established to pay long-term stewardship costs only after the CCS facility is released from post-closure. Finally, it is critical that policymakers avoid the establishment of any liability scheme that would provide first dollar indemnity for liability during operational, closure or post-closure periods. No first dollar indemnity should be provided for sovereigns for risks manifesting from CCS activities during operational closure or post-closure periods because indemnity separates actions from consequences and masks risk price signals. Simply put, first dollar indemnity removes one of the greatest incentives to deploy CCS in an environmentally and economically sustainable manner.

With respect to international action and implication of commercial scale deployment of CCS in the U.S., I have a few

observations. If we as a global community are to meet 2050 emissions reductions recommended by the IPCC scientists, the U.S., Europe, Australia, China and India must reduce emissions from coal-fired power plants. Ultimately, it may be necessary not only to export U.S. CCS technologies to China and India, but also our risk management frameworks and policies. Countries in the EU and Australia are moving forward with CCS deployment now.

In closing, Mr. Chairman, Zurich strongly believes private insurance has a critical role to play in the deployment of CCS, and we look forward to working with you, members of the committee, and your staffs to make this happen.

[The prepared statement of Ms. Patton follows:]

********** INSERTS 6, 7 **********

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Mr. {Markey.} Thank you, Ms. Patton. The chair will now recognize himself for a round of questions. Mr. Crane, Mr. Hawkins outlined the USCAP proposal for a package of incentives and regulations to drive deployment of CCS. Do you believe that that package can work?

Mr. {Crane.} Yes, Mr. Chairman. I do believe it works. I think the real--would work. I mean I think the real focus is how you get the 5 gigawatts, in particular what we call the rapid demonstration projects how to get them up and running. Certainly the idea is to get up enough scale so that some of the costs of these projects come down because I think everyone on the panel probably has their view on how much carbon capture and sequestration is going to cost, but until we do a few of these projects it is all guesswork.

Mr. {Markey.} Thank you, Mr. Crane. Under the Obama Administration, there is an expectation that the EPA finally will follow the law and move forward with regulating CO_2 emissions from coal-fired power plants under the Clean Air Act. Given those facts, it seems to me that coal is only going to have a future in the United States if we enact comprehensive climate legislation that provides the financial incentives and regulatory drivers to make CCS technology a reality. Would each of you respond to whether you agree with

that assessment? Mr. Hawkins.

Mr. {Hawkins.} Yes.

Mr. {Markey.} Mr. Crane.

Mr. {Crane.} Yes.

Mr. {Markey.} Mr. Duncan.

Mr. {Duncan.} Not really my field, I am afraid.

Mr. {Markey.} Okay, fine. Mr. Alix.

Mr. {Alix.} Yes.

Mr. {Markey.} Mr. Quinn.

Mr. {Quinn.} Yes. It is in our interest to get this issue resolved.

Mr. {Markey.} Okay. Thank you. Ms. Patton.

Ms. {Patton.} From an insurer’s perspective insurance can accommodate the legal scheme of choice that is supplied.

Mr. {Markey.} Mr. Alix, how significant is the potential of CCS technology to create jobs here in the United States? Are we at risk of losing this market to Europeans and others if we fail to follow it aggressively?

Mr. {Alix.} I think that technology is being developed in many nations. When we competed in Canada, we competed against Japanese companies, French companies, Canadian companies, and certainly an individual project probably creates 500 jobs at its peak in construction and another 100 to operate the system so certainly a danger that if others

moved before us that they will develop technology that will create jobs abroad instead of in the U.S.

Mr. {Markey.} Now I heard you describe your technology, Mr. Alix. I met recently with Brent Constantz, who is a Stanford scientist who is the founder of Calera Corporation. Calera proposes to use CO_2 capture from power plants and other sources to make cement simultaneously sequestering the CO_2 and reducing cement's carbon footprint. I was very impressed with that technology's potential. Are you familiar with that technology, Mr. Crane?

Mr. {Crane.} Yes, Mr. Chairman. In fact, the application that Calera has in front of the DOE for a loan guarantee is actually with our company at one of our coal plants. And, you know, we wouldn't be doing that if we weren't impressed with the technology but I just want to caution the chairman that Mr. Alix's technology needs to be scaled up from 1 megawatt to probably 100 megawatts. I will let him speak for himself but the Calera technology is almost at the test tube stage. They don't even have a continuous process going. They are mixing it in batches right now. So when you think of the millions of tons of carbon that come out of a 500 megawatt power plant, it is a great promising technology that the government should support, but scaling up to utility size power plants is not around the corner when it

comes to the Calera technology.

Mr. {Markey.} But if we had a cap placed upon carbon, would that not create a lot of market incentives for the development of technologies like that that might completely surpass anything that we are now contemplating?

Mr. {Crane.} I agree with you completely, Mr. Chairman, that putting a cap on a cap and trade system, I mean, yeah, to stimulate all sorts of innovation and disruptive technologies, you are exactly right.

Mr. {Markey.} What do you think the likelihood of that happening, Mr. Crane, that a disruptive technology would in fact emerge as it did--You Tube and Google only have emerged because we changed from a narrow band to a broad band policy. If we move to a cap and trade system, do you think that that would encourage the private sector--

Mr. {Crane.} Mr. Chairman, I am not a probability analysis guy. I am just a poor businessman, but Dr. Duncan may have a better view on that, but I would say that over 20, 30 years, I would be pretty confident that there would be disruptive technologies. I would not be confident over the next 5 to 10 years. I think the next 5 to 10 years we are going to be slogging forward with what we have and demonstrating at scale.

Mr. {Markey.} Mr. Hawkins, would you like to comment on

that briefly?

Mr. {Hawkins.} I would agree completely with Mr. Crane that adoption of the economic signal from a cap and trade program will unleash all sorts of interest in exploring technologies and systems that will keep greenhouse gases out of the atmosphere, and in the next 5 or 10 years we have lots of tools we can work with. The challenge is to get them deployed and create the market conditions. After that, we are going to see ideas coming out of the woodwork, and the regime for controlling global warming pollution 25 years from now is probably going to look very different than any analysis today would suggest.

Mr. {Markey.} Thank you, Mr. Hawkins. My time has expired. The chair recognizes the gentleman from Michigan, Mr. Upton.

Mr. {Upton.} Thank you, Mr. Chairman. It has been noted that I think since 1990 we have built about or we have put on line about 12 plants, 12 coal plants, which is slightly more than one per year. At the same time, China is bringing on a new coal plant virtually every single week. Wall Street is not financing any of the projects unless they have carbon capture as part of the long-term goal. And I would just like to comment on the last question that the chairman asked, and that is as I look at cap and trade, I am

a very strong supporter of CCS. We need legislation to do that. But the last thing that we want to do is embark on cap and trade without knowing whether in fact it is going to work for sure and it is in place or not as those years commence.

Mr. Crane, you made the comment that nuclear would be a lot easier than clean coal from your experience in New York, and I know that as you were embarking on a project in New York State your CCS project virtually collapsed. The question that I have is you said that this technology is promising carbon capture but it is not around the corner. How long do you think it is until it can be in place whether it is using Mr. Alix's technology, when is the date that we can look at it--

Mr. {Crane.} Well, I am actually not a technology--I think we are ready to go forward with scale demonstration projects right now. I think every element of the CCS chain is ready to go at scale whether it is with Frank's technology, and we have carbon pipelines down on the Gulf Coast in Mississippi and up in the Big Sky country. So, no, I am a big believer that it is ready to go, but in New York State it wasn't that we didn't think that we knew how to do it. It was just too expensive. And, you know, keep in mind that the greatest stimulant in the electric industry to doing other things apart from having money available from Wall

Street, which there is none for anything, is high natural gas prices.

So in a low natural gas price environment the trouble that you see with clean coal, solar, wind, everything, is that the price of natural gas is now so low that that is by far the cheapest way of producing electricity.

Mr. {Upton.} Were there liability concerns in New York as well?

Mr. {Crane.} Yes. Yes. Liability with the carbon migrate underground, and we had the geological studies to show that it would stay very contained and it did not propose a threat, but there is a big difference between having that in a study and making people comfortable. And we didn’t even get out into the public with that. That is just making the public policymakers comfortable.

Mr. {Upton.} Dr. Duncan, I know that Texas is not a Great Lake state. How do you get away with or how do you proceed with liability issues in Texas as it relates to ground water and the whole NMBE factor? Is there a special law that Texas has that other states or Oklahoma may have that we don’t have in places like New York and Michigan?

Mr. {Duncan.} Well, there are some differences in the common law tradition in Texas that are different than other states. I think that the attitude in Texas was portrayed

when the Texas legislature voted unanimously to take on the liability related to FutureGen CO_2. So I think there is a high degree of comfort in Texas both amongst the general public and legislators as to the safety and efficacy of CO_2 injections, which comes from the long record that we have there. During the FutureGen project, I was out in the communities where we were considering FutureGen sites, and I think that there was a large degree of public acceptance. We found that there was a negative reaction towards new coal power plants that didn't have CCS, but there was a high degree of acceptance of carbon capture and storage.

Mr. {Upton.} Last year there were certainly a lot of us that were encouraged that we would actually move the CCS legislation that Mr. Boucher and many of us were co-sponsors of. Have each of you had a chance to look at that legislation and what comments would you have as we look to have it moved this year in terms of changes that we might want to make to that legislation. Does anybody have a suggestion? Mr. Hawkins?

Mr. {Hawkins.} We did review Mr. Boucher's legislation and commented favorably on it last year. This year we think it would be a good contributor to what we would call a two track proposal on CCS. Deployment is the top priority. Some of the concepts that are in the Boucher legislation would

provide additional resources for research that could be done along with that deployment to advance some of the technologies that are further behind.

Mr. {Upton.} I know my time has expired so I will ask my last question which may not require an affirmative answer. Is anyone on the panel against our legislation? That is a good answer. I yield back.

Mr. {Markey.} The gentleman’s time has expired. The chair recognizes the gentleman from Pennsylvania Mr. Doyle.

Mr. {Doyle.} Thank you, Mr. Chairman. I want to for all the panelists just first given the power makeup of the United States today and for the near future and given the prior makeup for developing countries like China and India, is there anybody here on the panel that thinks we can meet our greenhouse gas reduction goals without widespread development of CCS technology? Is there a way to do this without CCS? Does anybody think that? So it is critical that this technology be developed and deployed if we are going to have any chance of meeting these targets.

Now here is my question for all of you. I heard Mr. Hawkins said that this technology is ready to go today. I have seen television commercials that says it is a complete myth and doesn’t exist and won’t be ready for 50 years, and I heard all of you talk a little bit about it, but I still

don’t have a clear--could each of you tell me in your opinions how long you think, how many years are we talking about until we have widespread deployment where we can go to our coal-fired utility plants here in this country and start to export this technology to countries like China and that. Are we 10 years away from that? Are we 20 years away from that? Is it ready today or is it a myth? Could each of you just tell me what your opinion of that is? Yes, go ahead.

Mr. {Hawkins.} Yes. Mr. Doyle, I think what I would say is that with respect to the question of readiness it is ready today. My view is that if the comprehensive climate legislation were enacted, we would see contracts of the first commercial scale projects being firmed up within months, less than a year from enactment. That is my view. In terms of widespread deployment, that is more difficult to predict, but in terms of--you know, we build power plants one at a time, and the first ones could be on line within the normal construction time path of a power plant without carbon capture and disposal if you get the legislation and the economic conditions to support it.

Mr. {Doyle.} Mr. Crane.

Mr. {Crane.} My view is that the quickest way to go forward, and I agree with David’s time table, is to split the carbon capture and the sequestration, prove carbon capture

and combine it with enhanced oil recovery. You can do that now. Frank's technology is one of the leaders scaled up to the 100 megawatt size. Prove up sequestration sides by just putting off the shelf gasifiers from the chemical industry on top of the geological formations that you want to prove it in. And if you do that, you can be going within a year and you prove it up over the next 5 years, and you can be exporting at scale within a decade.

Mr. {Doyle.} In a decade you think we can be to scale and deploy these things?

Mr. {Crane.} Yeah. And the huge market here obviously is all the newer coal plants, not the 50-year-old coal plants in the United States, which are reaching the end of their useful life anyway.

Mr. {Doyle.} Mr. Duncan.

Mr. {Duncan.} I believe from a technical viewpoint and a technological viewpoint we are ready to start now. I think there are some policy issues and regulatory issues that need to be worked out.

Mr. {Alix.} Assuming the policy and regulatory issues are worked out, I think 3 to 4 years in a build cycle is about right, and as both Mr. Hawkins and Mr. Crane said, we are ready to go, so really the financial incentives have to be in place and we can see commercial units come on line

2012, 2013, then I would think a year or two on line is sufficient to demonstrate that it is commercially ready at any scale so I am a little bit more optimistic. I would say by 2015 we should be ready to do this everywhere at whatever scale is needed if we get going in the next year with the incentives needed to get commercial scale units deployed.

Mr. {Doyle.} Very good.

Mr. {Quinn.} My understanding of the consensus would be that a widespread deployment, commercial deployment, is 2020, 2025 for CCS. That is not to say there can't be breakthroughs that some of the panel just mentioned that can accelerate that even--

Mr. {Doyle.} You are saying the year 2020. You are not saying 20 to 25 years.

Mr. {Quinn.} No, the year 2020, between the year 2020 and 2025 with widespread commercial deployment.

Ms. {Patton.} I think the time frames which have been outlined are consistent with our understanding from the insurance industry perspective. At Zurich in January of this year we announced the availability of insurance capital that is immediately deployable in this context. And, in fact, we have been asked to and have provided an indication for coverage already so from my perspective not only is this technology technically ready to go but there are indications

in the marketplace that the business is ready to go.

Mr. {Doyle.} Very good. So basically the consensus is certainly within the decade or shortly thereafter we would be ready for widespread deployment of this technology. Is that what I am hearing? Okay. Thank you very much. I think that is important to have on the record. Thank you.

Mr. {Markey.} We thank the gentleman. The chair recognizes the gentleman from Texas, Mr. Barton.

Mr. {Barton.} Thank you, Mr. Chairman. I would ask unanimous consent to put two documents in the record for this hearing. Both are from the Energy Information Administration. One is the last updated price of coal per short ton in the United States. It is February of 2009. The other is a chart of coal prices per kilowatt hour by state that is from the EIA, and it is January of 2007.

Mr. {Markey.} Without objection, it will be included.

[The information follows:]

********** COMMITTEE INSERT **********

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Mr. {Barton.} Thank you, Mr. Chairman. The reason I put those two documents in the record is because we are having a nice warm touchy feely discussion about CCS and all that, and I am on the Boucher bill. I am supportive of it. But consumers make decisions based on price and utilities make decisions on what kind of plants to build based on the price of the fuel. If I heard Mr. Alix correctly, he said that his technology is going to cost $40 a ton of CO_2, which is the equivalent of $120 a ton of coal, so he is going to-- the base load price of coal in the United States according to the EIA is around between $26 and $30 a ton. So he has just added 400 percent to the cost of coal if I understand him correctly. Now Mr. Doyle asked the question, and it is a good question, does anybody think that we can meet all of our environmental challenges without using CCS technology for coal, and you all answered no.

But the real answer is yes. You don’t use coal. You use natural gas or you use nuclear or you use some other alternative. Natural gas prices are falling like a rock. Last month in Texas in the Barnett Shale, which is partially in my district, you could buy all the natural gas you wanted at about between $4 and $5 a thousand cubic feet. Now there is a formation up through Pennsylvania and New York called

the Marcellus Shale. It is estimated that it has so much natural--it could have 500 trillion cubic feet of natural gas. Now to put that in perspective, we use about 22 trillion cubic feet of natural gas a year. The Barnett Shale, which is the largest new producing formation of natural gas in the world last year produced about a trillion cubic feet.

So we have this formation up in Pennsylvania and New York that has so much natural gas potentially that we can't even estimate how much we have, so there is a way to do this without using coal, but having said that I think we need to use coal. Now my question to Mr. Crane and to Mr. Alix if we really, really, really study this CCS under Mr. Boucher's bill, what is a reasonable expectation of how much lower you can get the cost of this technology so that it really is cost competitive with natural gas and nuclear? Mr. Crane.

Mr. {Crane.} Congressman, it is not clear to us that the house load of post-combustion carbon capture, it is difficult to see from an engineering perspective how it ever gets below sort of taking up 20 percent of the production of the power plant itself, so while we expect--

Mr. {Barton.} It takes that much electricity just to run the technology?

Mr. {Crane.} Yes.

Mr. {Barton.} Twenty percent of the output?

Mr. {Crane.} Yes.

Mr. {Barton.} Okay.

Mr. {Crane.} So our view is that Mr. Alix's $40 a ton, I mean can it get down to $30 a ton? Maybe it can. We don't believe it will ever go--

Mr. {Barton.} That is per ton of CO_2?

Mr. {Crane.} Yeah, per ton of CO_2. We don't believe it will ever get to--the economy is such that we don't believe it ever gets to $5 a ton or $10 a ton, so it becomes an inconsequential portion of the whole. When you talk about the cost of carbon for a coal-fired power plant on a deliberate basis $40 a ton is a little bit more than doubling the cost of coal because the $8 a ton of coal that you are talking about of course is up in Wyoming. You still have to get it to where you are using it. So it is a big adder but maybe not quite as large as you said.

But the issue with gas is that if it turns out that the country has an infinite amount of gas in these shell formations then probably the future for coal isn't that great anyway. I think all of us in the power generation industry remember what happened the last time the power industry plunged wholesale at the gas which was that the price of gas went from $3 per million BTU to 15 last June, so I think we

really think there needs to be a balance. I know that you agree with that.

Mr. {Barton.} I agree with it. My time has--could I let Mr. Alix answer?

Mr. {Markey.} Yes.

Mr. {Barton.} How low can you bring the cost of your technology if you really refine it and expand it?

Mr. {Alix.} I think we are looking at between $20 and $30 a ton as a reasonable goal based on what we know today for an advanced coal plant. I think that adds about 2 to 3 cents per kilowatt hour if you look at advanced coal plants. I think it is important to note that natural gas plants have about half CO_2 of a coal plant, so CO_2 emissions from natural gas plants would not be free under a cap and trade bill and they would increase as well, so under many scenarios we have seen even adding that 2 to 3 cents per kilowatt hour to coal, if you look at gas historically more in the 8 to 10 per million BTU and the CO_2 emissions of gas coal still remains quite competitive.

Mr. {Barton.} Thank you, Mr. Chairman.

Mr. {Markey.} The gentleman’s time has expired. The Chair recognizes the gentleman from Utah, Mr. Matheson.

Mr. {Matheson.} Thank you, Mr. Chairman. I thank the panel as well. We may have covered this a little bit in Mr.

Barton’s questioning. I just want to say one of my concerns about moving too quickly on climate change in terms of whether the key technologies are really developed or not, you have heard in fact a lot of the members on the panel ask you questions about when is this going to be ready, when are we going to be viable. But beyond being viable, I guess the question is how much is it really going to cost? You know, 2 years ago a witness before this subcommittee noted the new technologies at that point predicted the total cost of a new coal-fired plant would increase by 60 to 70 percent.

Do these new costs--what level of concern do you have about the potential cost impacts if we are going to employ carbon capture and sequestration? I just ask that to the panel in general. How much do these new costs concern you?

Mr. {Hawkins.} Well, I pay electricity bills and so I can certainly relate to the concerns about cost. What I would say is that the first generation of these plants is likely to cost more and the percentage increase that you are describing is what is called the production cost of electricity. That is not going to translate into that kind of a price rise in retail electricity prices for several reasons. First, coal is half of the power production in the U.S. Second, production cost is about 60 percent of the electricity bill you pay, but most importantly we are not

going to deploy this technology on all 330 gigawatts of coal-fired power plants overnight. It is going to happen gradually. The first ones are going to be somewhat clunky. I remember the first portable computer that I had. It was about the size of a carry on bag on an airline, and it had a lot less computing power than this cell phone. So we are going to get better at this, and we are going to get better faster if we start right away.

Mr. {Matheson.} Do people think cap and trade legislation, that there is going to be a way to provide cost mitigation to consumers that feel this? Is that a piece of this equation as well?

Mr. {Crane.} Well, yes, at least that is part of the USCAP Blueprint is to provide cost mitigation through some of the proceeds from the auction to the hard-pressed consumers.

Mr. {Matheson.} I would suggest that doing so is more complicated than it sounds. About half the states in this country have primary reliance on coal as their electric and fuel source, about half the states don’t, and one of the concerns I have coming from one of those states that about 90 percent of its electricity comes from coal is we are going to have a regional wealth transfer, if you will, in this country based on who pays more on the utility bills and how the cost mitigation funds are directed to consumers who are affected

by it. So I don’t know if anyone on the panel has expertise on that issue but I would just suggest to you that this is a lot more complicated than people are making it out to be I think in terms of how you do cost mitigation in a fair and equitable way.

Let me move to--I mentioned that mid-term action--I mentioned that quote earlier. The witness in the 2007 hearing was Jeff Sterba, who is the CEO of PNM Resources. I know he can’t be here today but at that same hearing in 2007 he said that it is only through the steady and judicious advancement of these applications during the course of the next decade we can start to bring the costs down. It seems to me we have a long way to go in terms of making the advances we need to make between 2007 and 2017. We thought we made some progress in the bill, the legislation that passed Congress in 2007, the Energy Independence and Security Act, but from the policymaker’s side of the equation what more do we need to be doing?

I am a co-sponsor of last Congress--the Boucher bill, as you heard before. Is that the approach we need to take? What are your suggestions policy wise for how we can move this technology along?

Mr. {Crane.} Well, just even on your regional wealth transfer point, I agree with you that there is the potential

for that, and right now absent support for clean coal in particular, but also for nuclear there will be a wealth transfer to the parts of the country that have more solar, wind resources or more gas-fired generation than ones that depend on coal and nuclear, and we think all of those technologies, solar, wind, gas, nuclear, and clean coal need to be supported, so I would say to answer your last question what you can be doing is exactly what you are talking about which is early funding to get clean coal going because that is definitely the laggard of all those technologies right now in terms of, you know, ready for commercial deployment. So to prevent that regional wealth transfer, I think pushing forward the way you are is the way to go.

Mr. {Hawkins.} And I would add we would recommend this USCP Blueprint, which has a series of proposals to address all the concerns that you mentioned, both in terms of regional impacts and in terms of the serious program to deploy carbon capture and disposal.

Mr. {Matheson.} Thank you, Mr. Chairman.

Mr. {Markey.} The gentleman’s time has expired. The chair recognizes the gentleman from Kentucky, Mr. Whitfield.

Mr. {Whitfield.} Thank you, Mr. Chairman. I guess after hearing all this testimony and reading it, I am not particularly optimistic about carbon capture and

sequestration myself, but I noticed recently, Mr. Hawkins, that the NRDC in partnership with Alliance for Climate Protection produced some TV ads, and they focused on an employee of a plant using coal, and basically the commercial ends with a caption stating in reality there is no such thing as clean coat. Now does that ad, does that apply to a plant using CCS or not?

Mr. {Hawkins.} Unfortunately, it does today, and that is the reason that we co-sponsored these ads. Today we don’t have a commercial scale electric power plant in the United States that is using carbon capture and disposal.

Mr. {Whitfield.} But you would be supportive of the coal industry if it did have CCS in a commercial--

Mr. {Hawkins.} As I have testified, NRDC is a strong supporter of CCS deployment and we have supported it for a number of years now and continue to support it. We would like to be able to run an ad very soon saying in reality there is such a thing as coal with carbon capture.

Mr. {Whitfield.} Now say by the year 2030 just from the NRDC’s perspective, what would you like to see the fuel mix used worldwide to produce electricity, say about 2030?

Mr. {Hawkins.} We don’t think that it is appropriate for Congress or for an organization like ours to dictate the fuel mix. We think it is important for the Congress to set

criteria for environmental performance, and we think the environmental performance of the global power sector has to be a lot better in terms of carbon dioxide pollution than it is today. You say by 2030? Globally, we should be trying to reduce emissions on the order of 30 percent or more. In the United States, we would like to see reductions on the order of 40 percent or more reflecting our large historic contributions to the CO_2 in the atmosphere.

Mr. {Whitfield.} Ms. Patton, one of the issues relating to commercial use of carbon capture and storage certainly relates to liability issues, and you touched on insurance policies in your testimony, but from the liability side of this companies that are first using commercial grade CCS and storing this the post-injection liability issue, is that something that you all are willing to cover?

Ms. {Patton.} Absolutely. Our customers came to us and asked us for some assistance specifically in managing risk associated with carbon sequestration, especially the post-injection issues. From our perspective, we evaluated the existing suite of technologies in this case, and as I indicated in my written testimony we announced the availability in January of two policies that are designed to provide liability coverage during the operational closure and post-closure periods. The first policy addressed is the core

risks were identified to us as unique for the sequestration activity, so clearly existing in the insurance industry already there was capital available to address construction liability associated with constructing capture ready facilities.

With respect to the injection component our customers identified five areas which we developed a policy around. They were concerned about pollution liability for underground sequestration activities so what would happen, as Dr. Duncan noted, if there was a migration of stored CO_2 into ground water. Our policy does respond to that. They were concerned about liabilities associated with transportation, whether that was a short distance or a long distance. Our policies respond to that. With respect to injection activities itself potentially that a well could go out of control, we were able to respond to that. There was concern about a geo-mechanical event so basically the active putting the gas into the ground causing a geo-mechanical event, a seismic event. We are able to respond and provide coverage for that.

And, finally, there were concerns about business interruption. What would happen if after this project was constructed there were circumstances where the plant had to-- had a business interruption and they might have to buy carbon credits or some other equivalent in that process. We are

prepared to extend coverage to address that during that period. The second area of policy looks at the specified activities that may be imposed by a permitting system if one is implemented, which will dictate the terms under which those facilities will be closed and released in a post-closure context. So what must an operator do to prove that that site is stable enough for a long-term stewardship, and we have a second policy which addresses those issues. So, yes, we stand ready today to commit capital now for those applications.

Mr. {Markey.} The gentleman’s time has expired. The chair recognizes the gentleman from Washington State, Mr. Inslee.

Mr. {Inslee.} Thank you. My compliments to the panel too. This has been one of the best panels. We have had about two dozen hearings and this has just been a great panel. I have 1,000 questions. I will start with one to the whole panel. Does anyone believe that the coal industry has an ownership right in the atmosphere that gives it right to use the atmosphere? Does anybody believe that? No one said yes so far. Okay. Does anybody believe that the coal industry should have the right to put unlimited amounts of carbon dioxide at zero cost into the atmosphere? Does anybody believe that?

Mr. {Quinn.} Congressman, I am not sure of the point of your questions whether the coal industry has that right. Aren't we just talking about whether society in terms of how--

Mr. {Inslee.} Yeah, that is a good point. Let me rephrase the question. Does anybody at the table believe that anyone, any industrial group, utility or coal-based using industry have the right to put unlimited amounts of carbon dioxide which is causing global warming into the atmosphere at zero cost? Does anybody believe that? So far nobody--

Mr. {Quinn.} Well, again I just think the question is a little narrow. It keeps invoking the coal industry, and we are talking about society and economic activity, and there is a lot of different activity that has carbon contribution.

Mr. {Inslee.} Do you think a utility that has a coal plant that is spewing tons of CO_2 into the atmosphere that is causing global warming, do you think that utility has a property right to put that CO_2 into the atmosphere in unlimited amounts at zero cost? Does anybody believe that? Okay. Nobody believes that, so there is a consensus that we should have a legal framework that does not allow that to happen so now here is my next question on how to form that consensus. Does anybody believe that the cost of developing

this technology that I think there is broad consensus in this room needs to be developed to figure out a way to sequester carbon dioxide, does anybody believe that the cost of developing that technology should fall exclusively on the public as opposed to those industrial entities that are using the coal that are putting the CO_2 into the atmosphere? In other words, does anybody believe that cost should be exclusively on the taxpayers who would have to fund that research?

Okay. Now one has said yes to that question, so that means there is someone else going to have to fund this research, so now I want to ask for your opinions about that. I have suggested, others on this committee have suggested, that we have a cap and trade system that auctions off the right to put carbon dioxide in the atmosphere and uses at least a substantial portion of the auction revenues to go to research and development activities, some of which would be through the utilities of actually doing this work. Some of this would be through the companies developing this coal-generating technology. Some would be from academic institutions but basically this fund would help fund this new technology.

How many people think that at least in part is a good idea that we fund this new technological development at least

in part to the auction revenues of a cap and trade system? I see a bunch of heads nodding. Why don't we just go down the table? How many people think that is a good idea in general?

Ms. {Patton.} I think there are multiple methods for doing funding. I think the critical issue is that there needs to be funding.

Mr. {Quinn.} I think in part an auction would assist in providing the push to funding, but I think it is also important that we allocate any allowances properly to protect any economic dislocation because after all we are talking about businesses that are going to have to adjust their cost structures to increase energy supplies, and if you are going to make them pay more some of their factories in your districts could be their last in the United States.

Mr. {Alix.} I would support in part funding CCS technology with auction revenue.

Mr. {Duncan.} This issue is outside my field of expertise, but I am in favor of funding.

Mr. {Crane.} Yeah, we agree in part auction but we know the government has many different uses for funds and that often they don't end up in the place where we would agree with you.

Mr. {Hawkins.} We support funding for deployment of this technology. It could be done either through an auction

or it could be done through direct allocation of allowances, which would then be turned into money, so you can turn the allowances into money at the start of the process or one step down the chain but it is important to get the funds there.

Mr. {Inslee.} Thank you. And I just note Mr. Doyle and I are working on a provision that would allow a partial distribution of permits to energy intensive industries that compete in international commodities that would otherwise might have a difficulty of competing so at least I am proposing the bulk of these auction revenues to go to develop this new technology but that there be some assistance, if you will, to these energy intensive industries. Thank you very much to all the panelists.

Mr. {Markey.} The gentleman’s time has expired. The chair recognizes the gentleman from Louisiana, Mr. Scalise.

Mr. {Scalise.} Thank you, Mr. Chairman. Mr. Crane, I think you had said your company, NRG, is the only company that is actually seeking a permit right now for nuclear plants?

Mr. {Crane.} Well, no, I was just expressing a high level of confidence that we would be the first to build, but I think there are something like 24 companies that have filed permits. There are 14 that asked for the Department of Energy loan guarantees, and I think the Department of Energy

is down to considering five and they will pick two to three.

Mr. {Scalise.} So you are close enough to where you think you--do you have any time table when you think you would--

Mr. {Crane.} Well, close enough in the nuclear world.

Mr. {Scalise.} When do you think you would get that--

Mr. {Crane.} Well, the Nuclear Regulatory Commission has published a schedule for our permit which would qualify for us getting the permit in 2011, and then if we proceed to build immediately we first would be on line in 2016.

Mr. {Scalise.} Now how long has this process been going on for your company to try to get--and how much does it cost?

Mr. {Crane.} We were a late start and we moved fast so it has been only 3 years for us so far but keep in mind we are permitting a nuclear design that has been previously designed certified by the NRC at a site that has been previously approved for four units and has two there now so--

Mr. {Scalise.} It is not a new plant. It is not a new site or it is not a new model that you are using.

Mr. {Crane.} Well, it is advanced. It is far newer than any other nuclear plant currently existing in the United States thanks to the 30-year lag, but it is not new by international standards.

Mr. {Scalise.} And how much have you spent so far?

Mr. {Crane.} The application process has cost us close to $200 million.

Mr. {Scalise.} What do you think the reasons are for that high cost? There are a lot of barriers to entry--

Mr. {Crane.} Nuclear plants are complicated, and the NRC takes their safety mission exceedingly seriously as they should. We have no criticism of the NRC in the way that they have been dealing with our application.

Mr. {Scalise.} I don’t want to put you on the spot because you are waiting for them to approve this but you have seen this across--

Mr. {Crane.} Good point.

Mr. {Scalise.} There are many people, not mentioning you, but there are many companies that want to pursue nuclear but consider barriers to entry, not just cost but regulatory burdens in a proven technology. This is not something new. This is something that has been perfected. It is very widely used in Europe. They sure don’t put those same types of barrier to entry and have been able to get a carbon free energy product much more readily. It is much more widely used in other parts of the world.

Mr. {Crane.} I think the biggest barrier to entry to nuclear as a macro-economic or solution in the U.S. is that I don’t think in my life time there will be a nuclear plant

developed in the United States that is not at an existing site, and since there are roughly 60 some existing sites and probably half of them they can’t have expansion for various reasons, it limits--the limiting factor for nuclear as a solution is siting long term.

Mr. {Scalise.} Mr. Hawkins, I think you have talked about, and I will let you explain your real feelings on it, but in terms of coal, I think you have called for a moratorium on coal facilities, if you could expand on that.

Mr. {Hawkins.} Nuclear plants should be built with carbon capture and disposal.

Mr. {Scalise.} And so you are saying that that technology is not available today though, right?

Mr. {Hawkins.} No, we are saying the technology is available but the policies are not there to require it or to create an economic incentive for it.

Mr. {Scalise.} When would you foresee being in place where a facility could be built that would have that technology?

Mr. {Hawkins.} Well, Chairman Waxman has said he wants to get a bill out of his committee by Memorial Day. If that happens and if the Senate moves it could be before the end of this year.

Mr. {Scalise.} And how long would it take then to get

those facilities built if, and assuming a lot of things, but--

Mr. {Hawkins.} Well, the coal-fired power plant takes 3, 4, and 5 years to build and as soon as the policy signals are straight, I think, as I said before, you would see contracts written, and 3, 4, 5 years after that you would see projects that could come on line with this technology.

Mr. {Scalise.} We have had hearings on a number of renewables. I think we all support the continued development of those renewables to get them at a place where they could be even more reliable. I think the estimates I have seen on wind and solar is you could maybe get 20 on the high end, 30 percent of your grid in electricity generated through those methods, and everybody acknowledges that even then it is not a continuous source and so you would need backup power supplies and another method of providing continuous power because when we turn on our lights of course we are not going to just have the lights be on when the wind is blowing, and so you have to have that backup. Even if under those scenarios you laid out, how would you suggest solving that problem of the fact that you don’t have a continuous source just by using renewables?

Mr. {Hawkins.} As I said, we don’t propose a system that is 100 percent renewables. We think that the most

likely electricity system in the U.S. in the next several decades is going to be a mix of renewables.

Mr. {Scalise.} Nuclear, gas?

Mr. {Hawkins.} A mix of the technologies that we have today. With respect to renewables, I think we will see the development of storage technologies which will make renewables and the intermittent nature of renewables much less of an issue than it is today.

Mr. {Markey.} The gentleman’s time has expired. The chair recognizes the gentleman from Virginia, Mr. Boucher.

Mr. {Boucher.} Thank you very much, Mr. Chairman, and I want to commend you on organizing our discussion this morning on the future of coal. It is a critically important conversation for us to have as we consider cap and trade legislation direct funding legislation for carbon capture and sequestration and other measures that are related to climate change. And I agree with Mr. Inslee. This has been one of the more productive conversations we have had in this subcommittee very recently. The Electric Power Research Institute widely regarded for its expertise in energy technology tell us that if we had a dedicated funding stream of approximately $1 billion per year for a 10-year period that at the end of that 10-year period by approximately 2020 we would have available, reliable, and affordable carbon

capture and sequestration technology available. And very shortly within a matter now of just a couple of days, as has been mentioned in the course of our discussion today, bipartisan legislation that would achieve that funding schedule and put those dollars in place for research development and demonstration for carbon capture and sequestration will be introduced.

I have heard some interesting testimony today from a number of the members about perhaps there being carbon capture and sequestration technologies available in the nearer term, and I would like to explore that for just a moment, and I would ask for relatively brief answers to these questions because I have another train of questions I would also like to ask. My sense, and I would like your reaction to this, is that it is possible certainly today for a CO_2 emitting facility to install carbon capture and sequestration technology. That would be possible, for example, if you were sitting on top of an oil field and you are using a gasification technology which is well understood, and as Mr. Crane indicated has been a commercial application in the chemical industry now for a number of years, and you are simply injecting that carbon dioxide directly into the gas or oil field. In fact, that is happening today in Canada at Wayburn with natural gas that is--with CO_2 that is being

generated from a coal-fired power plant, I think it is in one of our Great Plains northern states.

But there are some challenges, and that is what the funding is designed to address. First of all, we really don't have storage caverns other than oil and gas fields, well characterized for CO_2 sequestration. Secondly, we don't have post-combustion technologies that are at hand for CO_2 separation. There is an older technology but improvements are on the way that will yield a larger suite of technologies including chilled ammonia, including oxygen firing, and other processes that will make far more reliable, available, and affordable that full suite of CCS technologies, and it is the need for that, the characterization of fields other than oil and gas, that being, saw caverns or perhaps unmountable coal seams. It is the need for these next generation technologies for CO_2 capture that it is essential we provide this funding for.

So let me just ask if there is general agreement with the statement I have just made about the need for this legislation directed towards those objectives. Mr. Crane.

Mr. {Crane.} Well, Congressman, I agree with you completely. I would just be careful if you get the money, who is dispensing it because you are going to need someone with a bit of an entrepreneurial event, and the DOE has

traditionally been exceedingly conservative in the way that they have--

Mr. {Boucher.} Thank you. I appreciate the answer that we need to do it. We do have in our legislation a comprehensive mechanism involving broad participation in the policy making about how it would be distributed. Mr. Hawkins, would you care to comment?

Mr. {Hawkins.} My view, Mr. Boucher, is that you would get a lot more bang for your buck if your legislation were incorporated into climate legislation that will make sure that the private sector is motivated to spend this money as effectively as possible to deliver results as quickly as possible.

Mr. {Boucher.} Thank you very much, Mr. Hawkins. Mr. Quinn, would you care to comment?

Mr. {Quinn.} Congressman, I agree totally with your statement, and we are supportive of your legislation.

Mr. {Boucher.} All right. Does anyone have a different view? Okay. I will take that as essentially unanimous agreement from the group. Mr. Hawkins, I would welcome your advice on the fundamental difference between research development and demonstration on the one hand which government typically funds because these are large scale projects often times beyond the scope of private industry in

order to finance and the deployment of that technology once it is developed on the other hand. And my sense about how that division should be drawn is that a larger scale, longer term projects are deserving of government funding perhaps through a mechanism such as the legislation we are about to introduce that would speed those dollars to it. And then when it comes to deployment that should be a shared responsibility between the polluting--well, I don’t want to use that word, between the emitting sector, the industry that is emitting, and the government perhaps through a mechanism in our cap and trade legislation that would devote revenues from whatever share of the allowances we decide to auction toward that purpose. Would that be essentially the right division?

Mr. {Hawkins.} Yes, sir. The U.S. has supported deployment of critical technologies in the past. The interstate highway system is one such example, and I think that one can say that with respect to the electricity sector support for deployment is a reasonable thing to do for energy security reasons and to attack this critical problem of climate change.

Mr. {Boucher.} Thank you very much, Mr. Hawkins. Ms. Patton, one question for you as my time expires. I am very encouraged to see that the insurance industry is now offering

products to insure against liabilities, short term, long term, operation closure, post-closure, for those who inject carbon dioxide for sequestration purposes. And that tends to resolve some of the issues that we have discussed over the last several years about that liability and who is going to bear it. Now the industry potentially can bear it because they will have insurance against it.

What I think is absent from this conversation is the cost of that insurance, and can you give us a sense of what the premium is on the policy that you are now offering perhaps in terms of the unit of dollars or sense, I suppose, per ton of carbon dioxide that is stored?

Ms. {Patton.} In short, the answer is in the absence of a specific submission unfortunately, no, not in the amount of time that I have available.

Mr. {Boucher.} So, in other words, you have a product available, price to be determined?

Ms. {Patton.} It is price based on the geologic conditions that are present and to the extent that we provided indications to customers, they have indicated that they can absorb that within their business model.

Mr. {Boucher.} All right. So they have found it to be affordable?

Ms. {Patton.} Affirmative.

Mr. {Boucher.} All right. Thank you very much. Thank you, Mr. Chairman.

Mr. {Markey.} The gentleman’s time has expired. The chair recognizes the gentleman from Illinois, Mr. Shimkus.

Mr. {Shimkus.} Thank you, Mr. Chairman. I apologize. We have a health subcommittee meeting going on. We met with local county officials, so you know I would rather be here 100 percent of the time, so I apologize for not being here.

A couple of things. One is part of the memo from committee staff talks about, and I think, Mr. Hawkins, you referenced the fact that there is no really movement on fossil fuel in the capital market section. I would submit that it is more a fear of politics than the fear of--that fear is putting a high risk on raising capital for this because we are uncertain and we are not moving in the direction. In fact, I would talk about the new appointee to the Secretary of Health and Human Services, Governor Sebelius, who 3 times vetoed legislation for a coal-fired power plant in the State of Kansas.

That is the signals that are going out there in the community that--and added by, I know Mr. Whitfield talked about your ads that there is no clean coal, and I would add based upon your web site you say there is no such thing as clean coal even with carbon capture and sequestration. That

uncertainty provides exactly what you all want is fear in the markets to move products. Now, fortunately, in Illinois we haven't fallen to those fears.

I just talked about the mechanical refinery expansion. I got the Prairie State campus that is employing thousands of workers. In fact, it is taking the jobs of laid off steelworkers because of this economy and putting the work in the power plant now in my district. We have Taylorville, Illinois. We have Decatur, Illinois. So I would say that we need to get this right and we need to bring certainty, and it is the politicians who are doing this. Mr. Chairman, I would like to for the record also submit the Wall Street Journal editorial from yesterday which raises the issue of who pays for cap and trade. And you know who pays? The Midwest. Mr. Doyle, it is going to be Pennsylvania. It is going to be Virginia. It is going to be Louisiana. It is going to be Illinois. It is going to be those fossil fuel states who are going to be paying to really transfer wealth from the Midwest to the coastal states.

And if you allow it to be submitted, Mr. Chairman, I would appreciate it. I think it adds to this debate on the whole cap and trade regime.

Mr. {Markey.} Without objection, the Wall Street editorial mentioning my name will be included in the record.

[The information follows:]

********** COMMITTEE INSERT **********

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Mr. {Shimkus.} You are on here. I didn't know that. I didn't read that far down, Mr. Chairman. You are always one step ahead of me. I want to go--Mr. Crane, I think you made a critical point on the nuclear power and expansion, so I agree with you 100 percent that site selection is a limiting factor. I wish the environmental community would get on board with helping us expand nuclear power. Let me address this current question as far as Yucca Mountain and the high level nuclear storage. If we don't address the nuclear storage issue, does that inhibit the ability of expansion on site for nuclear power?

Mr. {Crane.} I don't think so. I mean whether Yucca Mountain goes forward or not is a decision you all make. That is above my pay scale. We proceeded with nuclear development on the view that dry cast storage--

Mr. {Shimkus.} On site.

Mr. {Crane.} On site would be good for one or two centuries.

Mr. {Shimkus.} But you would have to get permission to expand. There are nuclear power plants right now that in the current siting they are almost at capacity.

Mr. {Crane.} And I hate to be colloquial but that is someone's else problem. Our nuclear power plant is on 15,000

acres.

Mr. {Shimkus.} Okay, but if you are talking about the expansion of nuclear power so what is not good for your competitors but nuclear power, which is important for the country to meet these caps, I hope that in this you would think better of the country than just your shareholders.

Mr. {Crane.} Well, no, certainly as an American I am a huge proponent of nuclear power and I think it ties directly with the electric car which is I think a service that nuclear power is tied to. The siting question though and the nuclear storage question, again that is more of a political public policy issue.

Mr. {Shimkus.} And, guess what, you are in front of politicians and the debate on public policy, and the Yucca Mountain debate is a current debate on how we deal with this, and there are nuclear power plants that are at capacity that will either have to expand their on site storage, and of course the State of Illinois is a big nuclear power state with 11 reactors in suburbia. My colleague who chairs this talks about the threat and the risk. However, we never seem to address a threat and risk of major metropolitan areas that have nuclear power facilities while we keep high level nuclear waste right in the backyards of suburbia. Mr. Chairman, I could go on for more but my time is up and I

don’t want to push the limits. I yield back.

Mr. {Markey.} Thank you. I thank the gentleman very much, and just a brief correction here that unless something has gone terribly, terribly wrong in the private sector, Mr. Crane, that decision on nuclear waste storage is actually way below your pay grade. We will make that note for the record. Let me turn now and recognize the gentleman from Florida, Mr. Stearns.

Mr. {Stearns.} Thank you, Mr. Chairman. Well, let me see if I can get through this and perhaps speak a little louder. I had the opportunity to have dialogue with the European Union and I get a lot of information from those meetings over in Europe and then they come over here to the United States. And recently I read that the European commissioners for energy last November said that coal with CCS, carbon capture sequestration, is the low cost, low carbon alternative. Reports published by the European Commission and the IEA, which is the International Energy Agency, last year made the direct statements that, A, the cost of achieving European climate goals could be 40 percent higher without CCS, the European EC, and, B, the cost of mitigation without CCS is 71 percent greater than coal with CCS. Given that position, is there an opportunity for large scale cooperation with the EU on large public-private CCS

partnerships? Mr. Quinn and Mr. Hawkins.

Mr. {Quinn.} Congressman, I think so, and I think it was the IEA that actually made the statement that in the long term that coal with CCS will be the most affordable, low carbon energy source for the world. Perhaps some of the panelists have better information than I do but there are sequestration demonstration projects currently proceeding in Europe. There are some American companies participating in Asia with carbon capture and storage projects in China, so there are opportunities on those I think that are underway in terms of those types of partnerships.

Mr. {Stearns.} Mr. Hawkins.

Mr. {Hawkins.} I would agree that there is great potential in these partnerships. Actually I am going to Europe on Saturday to have conversations in Brussels with European legislators about this very thing in addition to Europe, China, Australia or other places where this kind of work could pay off big benefits.

Mr. {Stearns.} Anyone else like to comment on it? Yes.

Mr. {Alix.} We have also been to Europe and asked to compete for projects in Europe and Australia, so I think the initiatives are in the national scope in terms of trying to bring the best technology to bear on the problem.

Mr. {Stearns.} A study by a collaboration of both

unions and industry leaders published last month estimate that 5 to 7 million jobs would be created during the construction process of CCS facilities, and that a quarter of a million permanent jobs would be needed in order to operate these facilities. With that said, in your opinion what is needed to jump start the CCS technology industry to ensure widespread commercial deployment of the technology and what can Congress do to make these jobs a reality? The same two individuals perhaps. Mr. Quinn.

Mr. {Quinn.} Well, Congressman, I think what we have heard today is two things. We need a push. Congressman Boucher’s legislation provides part of that push in terms of sustained funding source for this technology. Probably also what we have heard today is that there needs to be a framework that establishes some certainty, a balanced framework in terms of carbon management. It provides a certainty we need to build out our existing coal-based generation source. Part of the discussion today has been about some of that uncertainty. Mr. Shimkus raised it. Uncertainty in terms of technology, operational uncertainty and policy uncertainty are all the enemy of investment and capital investment.

Mr. {Stearns.} What do you think are the biggest hurdles to reaching CCS commercialization?

Mr. {Quinn.} We have three pieces there. We have the technology in terms of capture and use, and from what I have heard today it sounds like we have very promising demo projects and pilot projects underway or close on their way. Scaling those up and to be applied and integrated into commercially available electricity generation platforms, still there is a way to go on that particularly in terms of the economics. The transportation segment, transporting that to a storage facility and then the siting for storage and what is suitable for siting, and I think on the last part there is quite a bit of studying underway that sounds very promising, but I am not--I will defer to Dr. Duncan in terms of the status of that.

And there is probably the issue that Ms. Patton talked about in terms of how we underwrite the risk for long term for that type of storage. So there are a number of different hurdles there we have to get through but I am very confident that in the time horizons we talked about today that we will overcome those.

Mr. {Stearns.} Mr. Hawkins.

Mr. {Hawkins.} In terms of what Congress can do again I would hold up for the cameras the USCAP Blueprint. It provides a cap on emissions and it provides a very structured program to get carbon capture and disposal systems into the

market, emission standards and financial incentives to make sure that these first projects are economically affordable to build and fold into our power system.

Mr. {Stearns.} Mr. Duncan, is there anything you would like to add to this before I close?

Mr. {Duncan.} Yes, thanks. I think that a number of the statements being made about cost of CCS and gas prices are a little misleading. First, all of the prices with regard to carbon capture are referred to retrofits of post-combustion capture. Capture can be much cheaper if you do it through an IGC plant or through oxy firing through new builds rather than just retrofitting. Another thing, if I might add just quickly, is the comments on natural gas prices and the Barnett Shale and so on were very misleading because those gas productions will not continue under gas prices, and the average life time of the Barnett on the shale well is about 9 months in terms of its productivity so gas prices are going to go higher.

Mr. {Stearns.} Good point. Thank you.

Mr. {Markey.} The gentleman’s time has expired. The chair recognizes the gentleman from Texas, Mr. Hall.

Mr. {Hall.} Mr. Chairman, can you hear me?

Mr. {Markey.} Unfortunately, yes, very clearly.

Mr. {Hall.} I just didn’t want you to cut me off like

you did my friend from Florida. I am from a fossil fuel state, and I realize the importance of technology to address CCS, and I support nuclear power totally and completely, clean coal, of course. But I also recognize the presence of a thing that some of you seem to forget, and that is the presence of a cash register. You know, China doesn't really want to go by the cash register.

And you can, Mr. Hawkins, hold up all the periodicals that you have there in your whole briefcase and you can't force China to change their mind. They are not only refusing to participate financially in the clean up but they are deteriorating daily and weekly as has been testified to here and none of you objected to that or disagreed with it. And about the same thing can be said for Russia, Mexico, India, and go right on down the line. They just don't want to talk about the cash register. That is too plain. That is something that the American people can understand.

I am a little bit sick of all the self-serving, worn out determination to push and rush to judgment when, you know, you don't even say global warming anymore. You are saying global change. And of course we have to have global change, and we ought to have technology. We ought to be addressing it. And this young lady over here can give you a quick policy of insurance, the whole line, legal reserve, non-

cancellable on global change. Now I wonder if that would also include global freezing. Sometimes up here I am about as afraid of global freezing as I am global warming, but you all don't seem to notice that.

I guess in the question by Mr. Inslee from Washington about unlimited amount of carbon dioxide, who has the right to do all that into the atmosphere and whether or not--I would really like to ask Ms. Patton a question but I think it would take too long to answer about your policy and how you arrive at a policy to insure against and what do you insure against on global warming, an occasion? Just yes or no. You insure the happening or the non-happening of an occasion, right?

Ms. {Patton.} We insure the happening of the triggering event.

Mr. {Hall.} Okay. I think you might have meant mechanical event, and would that to get to be more plain that something an American, that I could understand, does that mean devastating--is there something in the small print that describes what your mechanical might be?

Ms. {Patton.} A geo-mechanical--

Mr. {Hall.} Let me ask you, would that be when the Statue of Liberty is under water or the Sahara Desert becomes Sahara Ocean or what mechanical event has to happen before it

triggers your pay off?

Ms. {Patton.} Mr. Hall, in response to what coverage we are providing for the geo-mechanical issues, the covered event would be a resultant earthquake from the injection of gas.

Mr. {Hall.} You have a board that can insure against earthquakes?

Ms. {Patton.} If, in fact, the CCS injection, the injection of the carbon dioxide, does cause that event, we are prepared to pay in response for any consequential--

Mr. {Hall.} I am pleased to know that it does exist, and do you sell many policies in China?

Ms. {Patton.} We do offer coverage in China. However, this particular coverage is--

Mr. {Hall.} I will get to my question before Mr. Markey turns me off like he did the guy from Florida here. I like Mr. Markey. Don’t misunderstand me. I just don’t like the way he votes. He has killed my vote for 28 years up here. Mr. Quinn, in your testimony you state that coal is not merely important to the United States and the world, it is indispensable for meeting our energy needs for the foreseeable future, and I sure agree with you to that effect. I am big on coal. Now only that, but coal could provide 125,000 direct high-paying jobs to the U.S. coal miners and

support hundreds of thousands of additional jobs throughout the value chain and then companies and manufacturing operations that depend on reliable coal-based electricity to keep their energy costs down, and Mr. Barton alluded to that.

What will happen to these jobs if we stop using coal-fired generation or we arbitrarily raise the price of coal-fired generation through cap and trade?

Mr. {Quinn.} Well, if the wrong policy is chosen and coal is adversely impacted then those jobs would be gone. Those jobs happen to be the highest paying jobs in many of those regions including in your State of Texas as well.

Mr. {Hall.} Do any of the other of you four who said yes, yes, yes, yes, have a different answer to that? I presume that you don't. I yield back my time, Mr. Chairman.

Mr. {Markey.} The gentleman's time has expired. By unanimous consent, Mr. Terry, who is not a member of this subcommittee, will be recognized to ask questions.

Mr. {Terry.} I appreciate it. Mr. Hawkins, in your booklet, the plan, does it state where the cap should be placed on CO_2 emissions, at what level?

Mr. {Hawkins.} It does.

Mr. {Terry.} And what is that?

Mr. {Hawkins.} There are targets for 2012, for 2020, for 2030, and for 2050.

Mr. {Terry.} Just for 2012, what would that be?

Mr. {Hawkins.} It is a range of between 97 percent of 20205 levels to 102 percent of 2005 levels, so basically bracketing 2005 levels.

Mr. {Terry.} Very good. Then the follow-up question would be to Mr. Crane and Mr. Alix, for a coal-fired plant in Omaha, Nebraska sitting on the Missouri River, 500 megawatts, does technology exist that allows them to comply to the cap by 2012?

Mr. {Crane.} To take the carbon--to comply by not emitting the carbon as opposed to--

Mr. {Terry.} Right, that plant, starting up a new one and shutting down the current one.

Mr. {Crane.} My opinion is that the technology will not be ready so that by 2012 a 500 megawatt flue gas stream could all be 90 percent carbon captured but Mr. Alix may have a different point.

Mr. {Alix.} I would agree with that. I would say it is available to confidently predict you can deploy it by that time frame. I would say it is not ready yet. It is available to demonstrate. It is not commercially proven.

Mr. {Terry.} And by 2012, will it be commercially proven in your opinion?

Mr. {Alix.} The current commercial demonstration

project we have on track should be running in 2012. Generally, people want a year of operation to say it is commercially proven so I would say on that track by 2013 you might suggest it is commercially proven at that point.

Mr. {Terry.} So perhaps maybe part of our discussion is not only what the level of the cap should be in a cap and trade, but also what year it should take effect. Would any of you support or feel that a trigger that the technology exists before the cap would be enforced is a reasonable position? Any of you have an opinion on that?

Mr. {Crane.} Well, I have an opinion. I think it is a classic chicken and egg situation that you cannot wait for the technology to be proven or to put the cap and trade system in place or else it will never happen. Certainly that has been our history of progress over the last 10 years is there has been actually very little progress made in that regard, so I think you have to set the target out there and then set the private sector working with the government out there to get after it.

Mr. {Terry.} I am curious--I am sorry. You wanted to say something?

Mr. {Quinn.} I just would add that I think Mr. Crane makes some good points. I think it is important to know you shouldn’t be picking a time frame that is arbitrary and then

saying hopefully the technology catches up so somehow there has got to be integration in terms of figuring out what the time frame is based on what we know right now or in the near future about when that will be commercially available, and that is different than commercially--it has been commercially tested. I mean why leave available commercially is a whole different animal.

Mr. {Terry.} I think that is an excellent point. Do any of you, again probably Mr. Crane or Mr. Alix, have any idea or opinion about what the cost to the utility would be around 2012 to retrofit their coal-fired plant to be able to meet the requirements of the cap, what those costs would be, ballpark? We are guessing here but give me an educated ballpark.

Mr. {Alix.} We have done a number of studies both for retrofitting new at commercial scale 500 to 760 megawatts and they indicate capture costs in the vicinity at large scale plants of $30 a ton. When you add in sequestration if it is enhanced oil recovery you may recoup some of those costs. If you pay to inject it in general people--

Mr. {Terry.} Now is that the operating cost to do that or the upfront cost of the technology?

Mr. {Alix.} That includes capital and operating with some assumption of financing costs which today is a big

assumption because current markets are not widely open as Mr. Crane pointed out.

Mr. {Crane.} I would agree with Frank. Normally you would express in our industry in dollars per megawatt, but in this market where you can’t get the money to fund a 500 megawatt power plant would be looking at $500 million or more in upfront cost.

Mr. {Markey.} The gentleman’s time has expired. All time for questions has expired. What I am going to do now is ask each one of you to give us your 1-minute summation of what you want us to remember about your testimony as we move forward in drafting climate change legislation. We will begin with you, Ms. Patton.

Ms. {Patton.} Thank you very much. In closing, Zurich believes that commercial scale deployment of CCS must be achieved soon to meet the 2050 emission reduction goals. Zurich encourages this committee to proceed with legislation of whatever form you see fit that would provide the necessary funding and support to study and generate data that is necessary for us as an industry to properly underwrite risk and send price signals in the form of insurance premiums and otherwise support risk mitigating technologies. The more data that we have available, the better sites we can select and the lower fees that we can charge in terms of deploying

our capital.

Mr. {Markey.} Thank you, Ms. Patton. Mr. Quinn.

Mr. {Quinn.} Thank you, Mr. Chairman. I say again several points I would like to leave you with are that coal is indispensable for meeting our energy needs here in the United States, as well as globally. No climate policy will be successful without coal with CCS. We must accelerate the development and deployment, widespread deployment, of carbon capture and storage. And, finally, the policy solutions to meet those needs must be harmonized so that expectations are harmonized with commercial availability of the enabling technology.

Mr. {Markey.} Thank you, Mr. Quinn. Mr. Alix.

Mr. {Alix.} Thank you, Mr. Chairman. My point is that CO_2 capture technology is commercially available today from several vendors with commercial guarantees. Studies suggest that they have a high likelihood of success upon deployment. To get those projects deployed, we need some type of financial incentive offered from the government either as part of a comprehensive climate bill or separately, and we suggest that those incentives be competitively awarded so we get the lowest cost solutions moving first at the best sites. Thank you.

Mr. {Markey.} Thank you. Dr. Duncan.

Mr. {Duncan.} I believe that CO_2 sequestration and deep brine reservoirs and oil reservoirs can be done safely and effectively. I think that in order to do this, I think that Congress should develop some sort of regulatory mechanism that encourages the best sites to be selected, just not okay sites. I also think that they should encourage the development of regulations for CO_2 sequestration in association with enhanced oil recovery.

Mr. {Markey.} Thank you, Dr. Duncan. Mr. Crane.

Mr. {Crane.} Thank you, Chairman Markey. What I would try and focus the committee on is as we go forward with looking at energy policy to not get distracted by wind, solar, smart grids, conservation efficiency. All those things are great, but what your focus on today, this is central, coal is central, carbon capture and sequestration is central, and as you turn to how to incent that focus on what we can do now. We need to get dirt turned. We have been studying this for so long. We need to get some metal in the ground to see what works and what is the cost of these various technological options.

Mr. {Markey.} Thank you, Mr. Crane. Mr. Hawkins.

Mr. {Hawkins.} Yes, Mr. Chairman. Carbon capture and dispose technology is ready for commercial use today. The industry is waiting for a signal, and that signal has to come

starting with this subcommittee. If you consider and adopt legislation that applies a cap to global warming emissions that applies, emission standards for new coal power investments, and that couples that with a financial incentive program to promote the early use of carbon capture and storage, you will make that happen. Thank you.

Mr. {Markey.} Thank you, Mr. Hawkins. We thank each of you, and I couldn’t agree with all of your testimony more. This is--

Mr. {Hall.} Mr. Chairman.

Mr. {Markey.} The gentleman from Texas.

Mr. {Hall.} Since you are telling them that you agree with them, do I have the right to tell them that I am disappointed that none of them mentioned the taxpayers and how much it would cost and how soon we would know that it would help, whether it be 10 years or 50 years, whether we would know that we had had any--and why they didn’t mention China’s inability or unwillingness to come forward and participate, Mexico, India, and the others. I think they ought to take those into consideration when they go to recommend what the taxpayers of this country have to pay for something they will never receive.

Mr. {Markey.} I think they assume that one of the members would mention all those facts and that they could

keep their testimony on the subject that was at hand which is that we have to find a solution to the burning of coal not only here but around the world and only if we find the solution here can we export that solution to China and India and other countries, and so the burden is on our shoulders. We are the technological giants on the planet. The world is looking to us. We have to put in place the incentives to find the solution to these problems. Thank you. We thank each of the witnesses for being here today.

[Whereupon, at 12:15 p.m., the subcommittee was adjourned.]