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CARBON, COMPETITION, AND KILOWATTS

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P R O C E E D I N G S

MR. SANDALOW: Good morning, everyone. My name is David Sandalow, I am part of a large and growing group of people here at the Brookings Institution working on energy and environment issues. Our work spans quite a gamut. We have experts in geopolitics who are working on Russian oil and Chinese coal, among other topics. We have experts in climate change, looking at issues for the international regime, how it will be safe, as well as how the domestic legislation will proceed.

We have experts on fiscal matters, looking at carbon taxes and other related issues. We have a wonderful paper just written by one of our scholars on energy and dependence and what it means, and working our metropolitan program also on green buildings and smart growth, and it's a very dynamic area.

In all of these areas we try to bring rigorous, fact based, and objective analysis to the table. We are the opposite of the game show, Jeopardy, we start with the questions and we go to the answers. And our work includes, by the way, a wonderful book by our -- a new book by our President, Strobe Talbot, who looks a global governance. It's a modest book that goes from the Garden of Eden to the present day, looking at global governance, and it ends with a discussion of global warming and nuclear non-proliferation. As part of our work, we are thrilled to bring to Brookings

some of the leaders, both in thought and other ways, of the energy industry. And so it's our particular pleasure to bring to you today John Rowe, who is a giant in the energy industry.

John Rowe is the Chairman and Chief Executive Officer of Exelon, the electric utility with the largest market cap in the United States, I'm told. They serve 5.4 million customers in Illinois and Pennsylvania. And John, who's led Exelon since its formation from merger in the year 2000. But beyond that, John Rowe is widely respected as one of the most thoughtful leaders in this industry.

He is co-Chairman of the National Commission on Energy Policy and Industry, an environmental organization that addresses climate change and other issues. And his experience in this issue is long. I'm told he first testified before Congress on carbon taxes back in 1992.

He serves as Chairman of the Nuclear Energy Institute, past Chairman of the Edison Electric Institute, and is, in fact, the Senior Chief Executive in the utility industry, having served in such positions since 1984. Last month *Institutional Investor* magazine named John Rowe the best electric utility CEO in the United States. He's committed to a wide variety of civic and charitable activities. He is going to give a talk, and then he will take questions from the audience.

John Rowe holds undergraduate law degrees from the University of Wisconsin, honorary doctorates from half a dozen colleges.

Ladies and gentlemen, I am delighted to present to you John Rowe.

MR. ROWE: First I need to find out, Ralph, are you advancing the slides or am I? Someone is. I'm not technically confident. Thank you, David. It's a pleasure to be here. It's a fortuitous pleasure to be here on Lincoln's birthday.

I was mulling an introduction for this, and it occurred to me that Lincoln built the Republican party in the 1850's and '60's out of an uneasy combination of the old Whig American system of government intervention in the economy and the Free Soil party, which had formerly been Democrats, and I think it's actually a bit of a lesson for what we're going to have to do if we're going to deal with carbon, which is put together some very significant forms of intervention in the market place and still rely intensely on the market place to produce economically efficient responses to a challenge. David called this in our little briefing session one of the two great challenges facing the world order. I suspect there are more than two, but it's certainly on a short list.

Mark Twain observed over a century ago that everybody talks about the weather and nobody ever does anything about it. Well, I think it's time we all accepted responsibility for doing something about the weather, because we're doing something about it whether we like it or not.

Climate change is a tough issue in this town, where instead of the long range business forecast, which is a quarter, the political forecast is

generally the next poll. But we know certain things today. We know that the three leading candidates for president, Clinton, Obama, and McCain, I changed the order from the written text, I mean no prediction by the order, are all committed to decisive action on climate.

Climate legislation should be an imperative in the first hundred days of any new administration. We at Exelon think we need not and should not wait for a new president. Senators Lieberman and Warner have put together a bill that is at least a framework for constructive legislation; so previously had Senators Bingham and Specter. We think bipartisan legislation is possible and could be done soon. On the Democratic side, Speaker Pelosi, Chairman Dingle, Chairman Markey, and sub Committee Chair Bowcher have all committed themselves to action. On the Republican side, a growing number of senators have committed themselves to action. I think the Democrats can proceed confident that they have the support of, of course, the environmental community, but also, for prudent legislation, much of organized labor. And if President Bush were even now to seize the opportunity to act, he would have the support of a large part of industry and, indeed, a large part of the Evangelical community.

They should move because time is not our friend. It is going to take a very long journey to deal with carbon. As an old Star Trek movie suggests, we are carbon-based organisms, and we live in a carbon-based economy, and there is no quick way to change the second, and we're

unlikely to find a way to change the first.

So the usual Washington approach, doing too much too late, simply won't work. We have to start soon and decisively. It also won't work to adopt extravagant 30 year goals and then do nothing in the early years to achieve them. We must actually do something. I'm not going to belabor this group with a discussion of the science of climate change. People far more competent than I have done that at virtually infinite length.

The Intergovernmental Panel on Climate Change and the National Academy of Sciences have each issued reports which persuade all but the most skeptical, and indeed, at this point, one has to be almost obstinately skeptical to resist the weight of analysis.

These reports conclude that global average temperatures are rising and that human activity, especially the burning of fossil fuels, is a major contributor to that activity. The reports are less sure about the long term effects, they range from predictions of the inconvenient to predictions of the catastrophic.

Since I can't predict the price of natural gas six months from now, it hardly surprises me that the weather is a bit unpredictable. But it's very clear that the science leaves us no excuse for inaction. Just as businesses like mine must invest billions of dollars in some uncertainty, so we as a society must deal with this challenge, and we must deal with it in a way that is both decisive and prudent. We simply don't have the option of

failing either of those goals. I call that a wig free soil view in honor of Lincoln's birthday. You can call it almost anything you want.

But in my view, dealing with this challenge has three fundamental components. The first and inescapably essential is a comprehensive government policy. We simply cannot deal with this challenge without incorporating the cost of greenhouse gas emissions into the market.

Over the past five years I had the honor of serving with John Holdren and Bill Reilly as the co-Chair of the National Commission on Energy Policy. It was designed to be an independent and bipartisan group of people like Sue Tierney, who's here, who really knew something about energy policy and knew something about the environment and would try to cope beyond their immediate interest.

As long ago as 2004, the Commission called for a mandatory economy-wide tradable permit system, a so called cap and trade system with a safety valve as a cost constraint mechanism for greenhouse gas emission. Most of us would have preferred a carbon tax, one that started and ratcheted up at a predictable rate because it's simpler and easier to work. We scraped it as unlikely to be unaccepted politically, but it still has a great many virtues. A cap and trade system will work equally well, as long as it has some cost constraint mechanism, and that is the first area about which there is great debate.

The Bingham and Specter bill had an explicit one, ala the National Commission recommendations. The Liebermann/Warner bill has a sort of carbon bank akin to the fed, but without well designed working principals as yet. The reason we need a cost constraint is simple. It took us several hundred years to get into this problem and it's going to take us a long time to get out of it. No one really knows the cost of dealing with the problem. And all of the estimates turn on assumptions as to technology.

There is no escaping the need to start soon in dealing with this challenge. Neither is there any escaping the need to protect the economy from near term erratic carbon prices as we do so. Consumers simply must know that we're not throwing all of their resources in one vat.

We also should have an allowance system that protects the public against economic windfalls. In the electricity sector, the one that I know best, that means that allowances should be auctioned or they should go to local distribution companies based on what we call load, the actual customers that are served. Substantial allocations of free allowances to generators would result in uneconomic windfalls, a point that Congressional Budget Office has made on several occasions.

The National Commission, however, recognized that solving climate change cannot simply be done with new regulations. We need them, but we also need new machines. The scissors has to have two blades to work. And the government not only has an essential role in adopting the

pricing regime, it also has an essential role in fostering the kinds of machines that can deal with climate; an essential role, but I think a limited one.

First and perhaps most importantly, the government simply must adopt more stringent energy efficiency standards for buildings, for equipment, for appliances, for new buildings, and for rehabs for buildings everywhere it can. We simply shouldn't go out and buy what people ought to be doing for themselves in the first place.

Second, the government must invest in research and development with respect to renewables and carbon sequestration. Third, we need tax incentives for limited quantities of renewables, and we need the government to fund the loan guarantee program for the first nuclear plants. And finally, the federal government must make good on its 30 year commitment, I think it's more like a 70 year commitment, to find a repository for used nuclear fuel. These actions by government, this version of Clay's American system is essential if we're going to deal with carbon.

Now, the second essential is that the market must follow up on these new structures. And I'm confident that it will if the structures are proper. Climate change is as much about economic transformation as it is about regulation. Tom Friedman pointed out in a recent *New York Times* piece, "we simply must enlist the dynamism and creativity of the free market system."

That is because there is no silver bullet, there is no quick or easy technological solution to climate change, not my favorite nuclear plant, not energy efficiency, not wind or renewables, there simply isn't one easy solution.

For the electricity sector, natural gas remains the principal bridge to a lower carbon future. But the domestic supplies have plateaued, prices are volatile, keeping prices within a realm of reason requires more liquid natural gas, that needs new facilities and means that the U.S. gas market will ever more be dependent on world prices. Energy efficiency offers huge opportunities. Most people agree that that is where the low hanging fruit is to be found. I'm going to give you such an example in a minute.

But there is no one who can draw a real supply curve for energy efficiency. Both the customer behavior and the technology is far too complicated to make it possible to draw a real supply curve. We simply don't know how much is out there and at what price it can be obtained.

I submit to you that anybody who's ever taken their new compact florescent home and found that it didn't really go with the decor in the living room might have had a short lesson in the complexity of customer behavior.

But Exelon has a great example of where it works, too. We recently redid ten floors in a 1970 Chicago office building to lead platinum standards. We reduced our electricity consumption by about 50 percent

through state of the art efficiency in lighting, advanced controls on HVAC, and energy star rated equipment and appliances. This one really worked, but we had the great advantage of being able to free ride on some work already being done by the building. We intend to try to achieve about 25 percent reductions in our other buildings, but the numbers aren't so simple. Exelon works in states, largely Pennsylvania and Illinois, which have renewable portfolio standards. We already are the largest or one of the largest purchasers of wind power east of the Mississippi, and we will continue to meet those requirements.

But renewables are a very expensive way to deal with carbon constraints. According to a study released last week by Cambridge Energy Research Associates, the cost of abating carbon dioxide with wind power is approximately $67 per ton, and that is net of or after the effect of federal subsidies.

New coal technologies must be developed. Given the growth in east and south Asia, there is literally no way to deal with this challenge without having a way to use coal. And there's no way to greatly reduce existing emissions, much of which comes from coal, without being able to sequester C02. That technology is both elusive and very expensive. Witness DOE's recent cancellation of its energy future project in Illinois. And MIT has recently released a report that poses serious questions about geological sequestration. And then we, of course, must come to terms with

nuclear energy. Now, as was hinted at in the introduction and is clear in the resume, Exelon is the nation's largest operator of nuclear power plants. It will come, therefore, as no surprise to you what we like the machines.

But as somebody who's 63 years old and knows that a new nuclear plant takes a decade to build, I can assure you that I'm not planning on the prophets from new nuclear plants to pad my retirement. It's actually quite an asymmetric risk. If we build one and it works, it will be named for my successor; if we build on and it fails, it will be named for me. Nonetheless, they must be built. Nuclear power today provides the vast majority of low carbon energy in the U.S. The new plants -- the existing plants are running safely and efficiently, and the new, more passive plants will be both more safe and more efficient.

The federal government must keep its commitment with respect to use nuclear fuel. But I am convinced that we need at least 25 to 30 new reactors if we are going to meet the kinds of carbon challenges in the Lieberman/Warner bill by 2030. And that's not suggesting that nuclear will do it alone. You need the natural gas, you need the efficiency, you can keep experimenting with the renewables, but you also need the nuclear plants. Because the real inconvenient truth about climate change or perhaps what Senator Gore meant when he called it an inconvenient truth is that dealing with climate change is going to be very expensive.

The Energy Information Administration has estimated that the

utility industry will have to spend $400 billion in dealing with carbon over the next 20 or 30 years. I think that number is much on the low side, and that number comes on top of all the other capital needs of the industry. But 400 billion in itself is nearly as large as the entire market capitalization of the U.S. utility industry. This is a lot of money and it translates to many cents kilowatt hour.

I think the EIA estimate of cost is conservative. A recent city group, Cost Analysis, found significant costs over the past three years for all kinds of generation. Coal and gas combined cycle have increased by as much as 60 percent, wind has increased, nuclear cost estimates, and there hasn't been a new plant built in the period, have increased by 45 percent, and they're still just estimates. The question is, will we have a system in place that allows the utility industry to make these kinds of investments? I have served as a utility CEO now for 24 years. I started guiding companies that were rate based regulated as the rate base system died under the -- of a nuclear plant called Seabrook. It's running very well today, but you can still see a picture of it on Congressman Markey's wall.

After rate base, New England, California, Texas moved to systems usually called integrated resource management, systems in which regulators decided how much power should be built and who it should be purchased from. Almost infallibly, those systems drove up the cost of power even more, though now we switched to competition.

But in each case the reality has been that when costs go up substantially, state policy-makers try to change the rules. If we do that yet again, we will not only undermine utility balance sheets, we will totally undermine effective greenhouse gas regulation. Utilities simply cannot make these investments on unstable regulatory surfaces.

One of the ironies of the current debate is that even as federal policy-makers are trying to harness the market place through a cap and trade system, the dealing with carbon emissions, thumb state policy-makers, and more than a few rather short sided industry groups are trying to undermine competition in electricity itself. And this is happening despite the successes of competition in bringing about new environmentally preferred resources, in drastically improving the performance of power plants, especially nuclear plants, and indeed, in containing wholesale prices increases.

The electricity industry must invest not just billions, but hundreds of billions of dollars to deal with carbon. It cannot do this unless it has stable systems of regulation in which to operate. And I think the American economy as a whole cannot bring the creativity that will be needed unless we have the broadest possible markets, not only for kilowatt hours, but for new kinds of energy saving, and indeed, for carbon itself.

And that brings us to my third essential for a successful climate change action, the first two being government framing of a market, and effective and highly competitive market places. The third essential is that

industries must actually step out and do something.

Our company has tried to do a number of things. Five years ago, we first endorsed a mandatory cap and trade system. Over four years ago, we endorsed the report of -- or three years ago, the National Commission. About seven years ago, we sold the large part of our fossil fired power plant fleet. We did that for a number of reasons, but one of them was the climate issue. We have adopted aggressive internal goals being part of the U.S. Climate Leaders Program, and I think we will exceed those goals. And we have also committed $100 million to pursuing a construction permit and operating license for a new nuclear station to be located in Victoria County, Texas.

But none of that adds up to enough. Though we have been pursuing a way to put everything we are doing in our Exelon companies together into a real plan on how we can deal with carbon. Our low carbon energy strategy is, simply put, a set of measures which, taken together, would reduce, displace, or offset the equivalent of our entire carbon footprint by 2030.

Now, let me say, this is something that we can only do because we are already a nuclear utility. We're not pointing fingers at anyone else, we can't, we're simply proposing how we could have the largest effect at the lowest cost. First, we will continue to reduce our own emissions. We will look at ways to improve our fleet, which is already largely hybrid or

partially biofuel. We'll keep looking at ways to improve our transmission and delivery operations. We'll try to follow Wal-Mart's example in what we can do with our supply chain. And down the road, we may even shut down one of our few remaining coal fired plants. Second, we're going to help our customers reduce their greenhouse gas emissions.

ConEd, the retail utility that serves Northern Illinois, has already begun to implement what will be one of the nation's largest energy efficiency programs in two years. ConEd will be spending about $175 million a year. Dennis O'Brien and his colleagues at PECO, excuse me for the cough but it doesn't go away, Dennis O'Brien and his colleagues at Peco will be negotiating a similar system with Pennsylvania policy-makers.

Exelon Generation and Exelon Energy, our wholesale and retail marketing agencies, are looking for more low carbon green and demand management products that they can sell in the market place. Third, and here is where the plan starts to get a bit more controversial, we can reduce the greenhouse gas emissions others by building new and economic low carbon generation.

Slide five is our very best effort at an Exelon supply curve for carbon reduction. The costs are shown as costs to society before federal subsidies or loan guarantees. The slide is the result of the best evaluation that we can do of the various costs of different technologies and different amounts of energy. You'll note that not all of them can be done at one cost

in unlimited amount. Thus, we have energy efficiency in the east and west, the two yellow blocks, defined as certain amounts that are better than free. We think the first steps will really pay for our customers.

You can see a pale blue block of nuclear up rates. Well, we're going to do that anyway, it's clearly a good thing to do economically, but we can't do an infinite amount of those anymore than we can do an infinite amount of energy efficiency for free.

Then you'll notice we move into things like new gas combined cycle plants, which are very close to economic in today's market conditions. And then, of course, the more controversial things come out on the right. Those great big blue blocks are what new nuclear power plants could do in the way of carbon abatement. The solid blue is the cost to society pre-government intervention. The white dotted lines show how much the cost to Exelon is reduced if the loan guarantee program is fulfilled. It's, in fact, a very big deal. But now go out and look at the green lines which are wind. Pre-subsidy, we think wind is somewhere around $80 a ton of carbon. After subsidies, it's still somewhere between $20 and $40 a ton of carbon, and so it goes. People are free to argue about anything that's on this slide. I submit it, however, as the result of a great deal of work and as an honest description of how we see these costs.

The really important thing to note here is that if we can do things which are economic, if we can get a real market in greenhouse gases,

we can deal with carbon much more cheaply than if we try to do it through some magic on our own system.

Now, in order to do all of these things, there are prerequisites. Obviously, one isn't going to buy the wind without the subsidies. We're not going to build the new nuclear plant without the federal loan guarantees.

And, indeed, this is one of the ways in which this chart becomes typical of other utilities, you find yourself heading to gas whether you want to or not if we don't have a policy framework that both puts a price on carbon and helps with the first generation of new machines. But we believe that what this chart says is that if certain policies are continued, Exelon can reduce its effective carbon footprint by 12 to 15 million tons of greenhouse gas emissions and do so at an incremental cost which is a little over two cents a kilowatt hour. We have those nuclear plant loan guarantees, we can reduce the footprint much more. If, however, competitive markets are abandoned, or if we are not broad in our definition of the ways in which we can reduce carbon emissions, we think the costs will look much more like those under renewable portfolio standards, going from 2.2 cents a kilowatt hour to something like 6.7 cents a kilowatt hour, and there will still be difficulty placing all of those tons.

And remember, what is hard for us is virtually impossible for a large coal burning utility. We're dealing with 12 to 15 million tons; the utility industry has to deal with more than two billion tons of reductions if it is to

meet the Lieberman/Warner targets.

Now we go back to the Wayne quotation. I hope that much of what I've said today is simply reasonable and pragmatic. I know that some of what I've said today is either vexing or provoking. Claiming credit for reducing the emissions of others is a very complicated thing to account for. But inasmuch as we don't have the technology today that effectively remediates carbon emissions from existing coal plants, almost everything that we can, in fact, do will involve reducing the operation of those coal plants in creating energy in new ways. It's really -- the whole purpose of a cap and trade system is to find the economical way to deal with this problem. If only those who emit carbon can clean it up, we ought to skip the cap and trade system all together and simply do it by command and control, and yet we know that won't work without a replacement for coal.

The fact is, our Exelon companies are very good at low carbon electric generation. We think we can become good at demand side programs on energy efficiency. If we can invest in cost effective efficiency, we can reduce our own costs, and for a while, those of our customers. If we are encouraged to invest in low carbon generation, we can replace significantly more carbon and also promote innovation. That's how we think we can work on a low carbon future.

Ladies and gentlemen, the stakes in climate change are really huge. You all know what are the stakes of inaction, but this is very costly.

We think programs like those we've outlined here can for Exelon deal with its footprint at something like two to three cents a kilowatt hour, perhaps for the larger industry can deal with carbon at three to five cents a kilowatt hour. If you try to do all the things like renewable portfolio standards, and whatever is the darling technology of the moment, without using the market place, we're quite sure you're talking about something like ten cents a kilowatt hour. And in truth, you're very likely to spend all that money and still find you haven't done anything out the weather.

We think the stakes of how you deal with carbon are every bit as big as the stakes of whether you deal with carbon. Thank you very much for your kind attention. We have worked very hard on this. We think we know where it is sure. We know we know places where it is vexing. And I'll be delighted to answer questions about it.

MR. SANDALOW: Well, thank you, John, for that very thoughtful and provocative talk. A couple of questions I will start with and then throw it open to the crowd. I wanted to start with technological innovation. A number of commentators have noted that innovation has proceeded more quickly in the information technology realm and in the communications realm than in the electric sector, and have pointed to opportunities with a smart grid and other types of innovations in the next decade or two to both improve customer service and to reduce emissions, and I wondered, do you agree with that observation, and to what extent does

your supply curve in your slide number five reflect technological innovation that hasn't yet happened?

MR. ROWE: Well, we're not very good at mapping the unknown. Like medieval cartographers, we tend to put here be monsters in the stock when we don't know. But let me pick up on your point.

Technological change occurs much faster in bits and bites than it does in microwatts and milliwatts. And technological change occurs very much faster in microwats and milliwatts than it does in kilowatts and megawatts. I think there's a physical law there somewhere, as we discussed before, but I can't name it.

We have no doubt that there will be all sorts of changes that we can't foresee. Some of them will be bad, some of them will be good. Some technologies have almost exhausted their cost improvement curve, other technologies have only begun their cost improvement curve.

My own perspective on that is that there are some areas largely on the demand side, for example, the new digital light bulbs, or the new light emitted diode light bulbs, excuse me, where we're seeing really quite rapid technological change and it's only begun. There are other areas like fuel cells where we've been looking for technological change for my entire working life, and it comes very slow. The same might be said of solar. Speaking from myself about the unknowable, I think the improvements in the demand side will be huge. I do not think they will come very quickly

through smart grids. I think smart grids are important for the long term for a whole lot of reasons, including demand management, but the pay off will be very slow.

I think the very definition is, we simply don't know where there will come, and that's the magic of both technology in the market place. What we're trying to do with our supply curve is to put up something that isn't faith based. I mean the president has been roundly chastised for a faith based approach to climate change. Well, I respectfully submit that the people who think that technology will just do it magically and for free are no less faith based.

We think it's going to be expensive to deal with climate. We think you have to do it, and we would respectfully urge that, to the extent you make early bets on technologies, you make more of them on things like nuclear plants that you at least know something about than on carbon sequestration that we don't yet know much about.

MR. SANDALOW: I've got two more questions for you before opening it up. First is on the politics of nuclear power and climate change. I went recently to the website of the Nuclear Energy Institute and looked at the priorities for Congress for the next year, and cap and trade legislation was not mentioned on that. And I wonder in light of your very powerful speech here today, is that something you see changing, and if not, why not?

MR. ROWE: Well, let's put it this way, I hope so, and I'm

reasonably confident that Admiral Bowman, who's in the front row, hopes so, too. Do bear in mind two things, that some of the most important members of the Nuclear Energy Institute also operate a lot of coal plants, and historically, the senators most prone to support nuclear also support coal. These are areas of relatively uneasy bed fellows, if you will.

I think you will see NEI consistently taking a stronger and stronger position on the relationship between the cap and trade system and nuclear. I doubt you will see it taking cheap shots at coal any time soon.

MR. SANDALOW: You were quite bearish on renewables and quite bullish on nuclear in your talk, and my own view is we're probably going to need both in order to fight global warming over the course of the next several decades. But since you were bullish in one and bearish on the other, let me just take the other side and get your thoughts.

For renewables, one of the advantages is that you don't have the long lead times. If the wind turban that you build doesn't take the ten years and you can put your name on it while you're still on this job, and the same with the PV, and indeed, the solar thermal unit.

And you mentioned expensive cost for wind turbans or for -- but those are today's costs, and any new technology has a predictable supply curve, and there's certainly a view out there that we are at a different point in the supply curve for renewable power than we are nuclear power, and we can expect to see much more dramatic cost reductions in renewable

power over the course of the next decade or two. Any thoughts on those comments?

MR. ROWE: I've been hearing that for two decades and it usually hasn't come true. I mean we all think the room for improvement in solar is huge, but most of the numbers I see are still 30 to 50 cents a kilowatt hour. I had someone ask me not long ago if four cents a kilowatt hour solar would make a difference to my business, the answer is, it would revolutionize it, but it's not something that I -- expecting to find in the morning. Wind has shown first a generation of significant improvement. Now, in the last three years, a time of significant price raises, and I think what's happening is, it's becoming more and more important where you put the wind. The best sites, particularly east to the Mississippi are often taken. And what drives the cost of wind so high is the percentage capacity factors. There's a limit to the ability of new technology to improve upon that.

I stated my remarks the way I did, not because I think you can do it all with nuclear or relying on nuclear is easy. I doubt if there's anybody more familiar with the financial risks of nuclear than I am, or anyone more concerned about it.

I'm reminded of the head of Public Service to New Hampshire who was Seabrook's largest owner when all the New England utilities were suffering under the cost of Seabrook. He and I were having a drink one night, and he looked at me over a very large glass of bourbon and said,

those bastards say they hate Seabrook, I'm the only one who really knows how to hate Seabrook. So I think I have been cautioned on the risks, but, you know, the easiest thing in the world for a utility CEO is to put his or her name on something uneconomic. And I think it is very important that people know what the cost of the commitments we're making right now. If you extrapolate to a large portion of the electricity market, every $10 of carbon extrapolates to something like a penny a kilowatt hour for electricity.

And if the real cost of wind is something like $85 a ton, and that's what it is today, then simply the hope that it will get better tomorrow should be opening the door to an unlimited commitment. I mean let's keep doing some, we'll comply with the law in Illinois.

But you know, I'm reminded, three years ago I was at a meeting of a bunch of utility CEO's from Japan and Europe, almost uniformly they said at that time the climate issue was real when many U.S. executives wouldn't have. Almost uniformly they chastised the U.S. for not going along with Kyoto. But then they smiled and said, but our governments aren't going to keep their commitments either, and oh, by the way, 50 years from now, coal and nuclear and hydro are still going to be where power comes from.

And it's, of course, possible that everyone in our industry is wrong, but you know, my father used to say that even a blind pig will find an acorn once in a while, it's possible that even a utility executive might be right on occasion.

MR. SANDALOW: Well, with that, please state your name and affiliation. Far back of the room.

MR. BLOCK: My name is Jonathan Block and I work at the Union of Concerned Scientists. I had two questions. Without putting words in your mouth, Mr. Rowe, I recall a statement appearing in the media attributing to you the notion that Exelon would not be building more nuclear plants until there was a solution to the waste problem. So I was wondering about a comment on that.

Second, last week I attended the Platts Energy Conference, and there was a very interesting ending symposium on wires issues, and it seemed to me that there was an incredible concern that the current wires infrastructure, the transmission infrastructure, cannot handle these large, new 1600 megawatt reactors, and this seemed to be a real concern by people who actually work in that particular area. So I was wondering if you could comment on both of those problems.

MR. ROWE: Sure; first, I think I have been consistent ad nauseam in saying we simply must have a solution to the spent fuel problem. Several members of my board who suggested in saying we would never build without that solution might have been a tad beyond my authority. But I still believe we ought to have one. And in our Texas project, we're working very diligently on whether we can find a state sponsored solution. Because, you know, deep down, we all know that Yucca Mountain isn't going to

happen in any near term time frame. And while I think the federal government should adopt some sort of surface storage solution, I don't have a time table to predict that that will occur either.

So let me state it in a way that I'm absolutely sure of. Exelon will keep doing everything it can to help get a solution. And while you may see a very small number of nuclear plants built as sort of a first generation to keep technology going, without that solution, I don't think you can have the 25 or 30 that I think we need without -- solution. I still think it's a very high level importance. I was -- for a long time.

On your second point, the state of the transmission system is a concern for any kind of technology. You add 3,000 megawatts at one site, you have to do some transmission reinforcing, that's just clear. You add distributed resources in a high number of rural sites, you also have to add some. And I think the need to keep reinforcing the transmission and distribution system is very large. As a utility CEO, I'm as concerned that the U.S. continue to invest in that infrastructure as I am about the climate issue. And it must be done, it must be done for windmills, it must be done for nuclear, it must be done for security, and it must be done for the level of reliability that customers in an information driven age want.

MR. SANDALOW: Way in the back.

MR. TALLY: Thank you. Ian Tally, Dow Jones. First a political question that you already somewhat touched on, but I do want to

pressure you a little bit more on. What is your perspective in this new Democrat controlled Congress, on the respectability to encouraging nuclear? We know that there are some components in the Democrat ranks and the Senate side, you are losing (inaudible). Can you talk about some of the leadership roles there?

And secondly, on a more market philosophical question, you mentioned a report, mentioning the life cycle of renewables in carbon footprint, but I wonder if your assessment of market generation, of nuclear, included the liability of storage costs. And you also mentioned loan guarantees, there's a question about how much of that is representative of a true market, if you are being subsidized, if you call if that.

MR. ROWE: Well, let me start with the simplest one. If you look at the -- get a card copy of the chart I put up, you'll find that we explicitly demarcate the cost of new nuclear in terms of dollars per ton of carbon, pre-loan guarantee and post loan guarantee, and the cost difference is huge because in today's markets, to do a merchant nuclear plant without the loan guarantees, you'd have to have a very high equity percentage.

So that cost is calculable and it's very large, and indeed, it's prohibited. So we tried to address that squarely and honestly on the chart, and you can get a copy and take a look at it.

Now, going back to the political composition of the Congress, Betsy Moler, our Government Affairs EBP, and a convinced Democrat, is

smiling at me in hope that I won't put my foot in her mouth, and I'll try not to.

Let me state it very simply; a new generation of nuclear plants cannot occur unless it is solidly bipartisan. Nuclear has been a partisan technology for much of the past 20 years. And while that has sufficed to keep the existing plant running, you haven't noticed any new ones being built. A nuclear plant is something that takes eight to ten years to build. It has an operating life of perhaps 60 years. You don't have any chance of getting your money back in less than 20. Anybody who thinks you can have a nuclear based electricity system without bipartisan support is simply smoking.

So the issue is very simple; if I am right, and that nuclear really is essential to a carbon constrained economy, and is really essential to dealing with carbon in an economic way, I'm reasonably convinced that the Democratic majority will come to reflect that, and my real task is less to persuade them than it is to wait until they get there of their own thinking.

Now, both candidate Clinton and candidate Obama have expressed some open mindedness. I can't say that either of them have expressed the level of conviction that I'd like to see, but such is life.

My own guess is, we wait and see. And I don't know if it will be in the first session of the next Congress, but in my opinion, if we start dealing with carbon, you go three sessions and nuclear will again have a bipartisan

base, because I don't think it can be done without it. And then you asked about the cost of spent fuel; well, until somebody tells us how the government is going to deal with it, there are limits on what we can know about that. But the nuclear industry has for the past 20 years been paying the government real money to put toward this problem, and as you know, the government takes money really well, but spends it poorly. I mean I might have betrayed a little bit of political conviction in that, and we have yet to see a solution. So I think we have incorporated that cost as fairly as we can in our modeling.

MR. SANDALOW: Frank.

MR. LLOYD: Frank Lloyd; my question is this, and it comes on top of the last question. Assume that you would be asked this big assumption to write a couple of paragraphs for the Democratic candidates for president on nuclear; what would you like them to say that is within the realm of political sensibleness that would unlock your willingness to invest and point the government in the appropriate direction so that you can invest, in addition to the loan guarantee program that you've covered and which we understand?

MR. ROWE: Well, that's not a very likely premise to the question, but Betsy might be asked, so there's hope. I would like them to say that the climate issue must be dealt with, that efficiency must be one of the first pillars of dealing with it, that the other pillars likely will have to include

nuclear, that we will fund the loan guarantee program for some limited number of plants, and we will get on with finding a federally sponsored place to put the spent fuel, that's as much as I would ask.

If they deal with the climate issue through a cap and trade system, over time, I'm quite confident that the carbon prices will support a new generation of nuclear. The question is, will we have done the homework on the first plants to put us in a place where we know how to build them.

MR. SANDALOW: Go.

MR. ECKO: Bill Ecko with Carlton Capital. I've heard the argument raised that part of the issue with dealing with the nuclear waste is not necessarily the storage issue, but to create less of it by further processing it, as they do in other parts of the world, which apparently is not allowed by our regulations; is that part of the answer, and how much of the waste could be using the most advanced technology available in the world today further processed, recycled, et cetera?

MR. ROWE: I think the answer is something like 80 percent reductions. The real expert on that is Admiral Bowman, who is four chairs ahead of you, and you can grab him afterwards. The issue, of course, as I asked David before the meeting when he said that climate was one of his two greater global concerns, I asked him what the other one was, and he said nuclear weapon proliferation.

And the reason President Carter stopped reprocessing in this

country in '77 or whichever year it was was that the existing reprocessing technologies, including, to the best of my understanding, those used in other parts of the world, create weapons grade plutonium. And when you do that, you create at least the potential for diversion.

Now, there are on the drawing boards reprocessing systems that leave the plutonium hot, and thus, make it very difficult to handle and very difficult even for the passionate to divert.

And this is what President Bush was after and what he called GNAP. I've talked to John Holdren, who suspects that Democratic leaders will have a new name and a slightly different variation. But I think the thought of a more efficient reprocessing cycle, you know, will continue to be on the table, and there are designs that do largely avoid the weapons diversion problem. They haven't been done to date because the price of uranium hasn't been high enough to justify it. But I think as everybody realizes how hard Yucca Mountain has been, if it's this hard to build one permanent disposal facility, and I mean politically hard, then you obviously don't want to have a cycle that's dependent on building five or six. And I think that will compel over the next several decades us to look very seriously at an advanced reprocessing cycle. I think the magic words are Urex and Purex, but I can't -- I suppose the P stands for plutonium, I don't really know, though.

MR. SANDALOW: Do you have views on international facilities either for enrichment or storage?

MR. ROWE: I trust international governments less than I trust our own. Nonetheless, you know, you're now in an area where you know something and I know very little, and so I will defer that one to you.

MR. SANDALOW: Well, the first -- I know little, and I'm not fully prepared to believe that you know little either. Sir, right next --

MR. POVLOSKY: Nick Povlosky from Georgetown University. I'm from the Energy Club there. Well, Mr. Rowe, thank you for inviting us. I got an email from your secretary. And my question is, how is Exelon establishing a relationship with the Chicago Climate Exchange and helping it to develop further? And on the second part, is Exelon looking into promoting the development of fusion?

MR. ROWE: Into fusion?

MR. POVLOSKY: Yes.

MR. ROWE: Well, the second one is easy, the answer is no. We simply don't have that level of research capability. We like to watch the national labs do it, but we think that's a level of research that somebody else has to do.

On the first one, we are not a member of Chicago Climate Exchange. That is not because we don't respect what they do, we respect what they do a great deal. But their initial marketing framework was more advantageous to members who were already very large coal burners, and we didn't fit, and second, we think our power team in Philadelphia has the

ability to trade this kind of thing independently in fairly creative ways.

But Chicago Climate Exchange is a very constructive effort to build this sort of market. And if we do get cap and trade legislation, you'll see that sort of thing expand.

MR. HOLLY: Chris Holly with the Energy Daily. Mr. Rowe, I have two questions, the first, political, the second, more philosophical in nature. The political question, I wonder if you could give us an assessment of how you are doing in your argument with law makers on the allocation issue. You have some fairly wavy colleagues, notably Michael Morris on the other side of that issue, and I'm wondering, are you getting any -- is your message falling on receptive ears in Congress?

MR. ROWE: Well, you ought to catch Betsy afterwards to get a play by play. But Leiberman/Warner's allocation principals are much more like those we would suggest than were the original Bingham and Specter. Senator Bingham got six of us together one day, as did Chairman Dingle, and they both told us to go work out the allocation issue amongst themselves.

Well, if they tell us which one of us they're going to beat up more, we probably can, but short of their pounding on our heads, you know, a coal burner and a nuclear company are not likely to find the answer in sweet reason.

I think the need of the federal government for money, the need

of governments at both federal and state levels to have some way of ameliorating the cost of carbon legislation for low income people, the never ending desire of politics for more money for more things will cause people as they get to the hair splitting to be increasingly skeptical about giving large portions of the allowances away forever. But needless to say, I'm on one edge of my industry on that. There are people, however, to my left on that one in the industry.

MR. HOLLY: The other question is, it seems no matter what technology or what sector of the power generation industry one discusses, you see fairly massive public opposition in any construction. You can take windmills in West Virginia or the mountains of Maryland, you can take transmission lines crossing Civil War battle sites. The FERC chairman last week or the week before told us that FERC won't need eminent domain authority to site new C02 pipelines, which the pipelines will be crucial if we're going to build the kind of coal generation you and others are talking about.

L&G terminals remain an exciting adventure. How does one swear the seemingly overwhelming public opposition to any big things that go in their property lines or lines of site with the obvious need to reduce emissions while providing the energy to power our economy?

MR. ROWE: I'm reminded of somebody who looked at me one day and said, you know, John, life's a bitch and then you die. The great

blessing of my business is, everybody wants our product. The great curse of our business is that nobody wants the things that make or deliver it. And I see no likelihood of that conundrum being squared in my remaining working lifetime.

But let me push the conundrum because I can't answer it. It's very clear that as long as the U.S. perceives itself to be comfortable and wealthy, what we call in my business the NIMBY problem, or somebody else came up with one called the nana, which says don't build anything anywhere at all, will continue to haunt the business.

It's in the nature of being what people like to think is a post industrial society. But, you know, the risk we're really running is to be a nation that has California's electric rates without California's coast and climate.

There may be ways to deal with energy demands, I personally doubt it, but there may be ways to meet them without facilities that people find aggravating or offensive, but if there are such, the costs will be awesomely high. You know, right now rates in Philadelphia for electricity are about 15 cents, 16, New York, they're 18, all of California is 19, with pale blocks running as high as 40 cents a kilowatt hour. Rates in places like Lima, Ohio are still only five or six. You know, the real issue is, you know, how much cost increase are people prepared to tolerate before they decide that a big plant somewhere wasn't so bad after all?

We find that most of the people who would be near the proposed site for our nuclear plant in Texas would like to see us come. Give us a year of recession and we'll be even more popular. But that's kind of why we picked Texas. We weren't thinking of Waneka.

And, you know, you're right about the full scope of the problem, that's what's really hard. If you could say it was just nuclear plants, you'd say, well, maybe the right technology, but people don't want it, so we'll do something else. But, as you said, they don't like L&G terminals either.

And it turns out that the more wind farms you build, the more opposition you find, which is why I don't think wind is on the kind of lower cost technology per -- that David asked about earlier. I mean I think this becomes one of those sort of profound questions of, when can Democratic society permit economic outcomes that are in the interest of the larger body. And just like the costs of carbons is a cost of the commons that has to be introduced into the market place that I respectfully submit that the need for some kinds of new generating facilities is going to have to be put there, too.

I was with John Bryson of Edison International discussing this one day with a group not so different than this, and the problem is, we both agree that if the policy cannot make a decision on something else, the fall back solution will be gas, gas, and more gas, and that both is only a limited solution on climate, it also will cause much more wild fluctuations in natural gas prices.

I mean if anyone can stop a project, we're simply going to have very expensive electricity, and that's very damaging to poor people.

MR. SANDALOW: We have time for one quick question; sir.

MR. DOLLY: Steven Dolly with Plats. I was hoping you might be able to tell us a little bit more about, in Texas, some of the possible state sponsored solutions that are being looked at for the waste problem, and then just quickly, we've talked about loan guarantees and the need for a solution to the spent fuel problem, but there's a lot of discussion also about potential regulatory delays either at the Nuclear Regulatory Commission or at other levels and possible litigation. Do you feel the risk insurance that's currently been laid out in the Energy Policy Act would be sufficient to address that?

MR. ROWE: If it's funded, I do, or put slightly differently, we're not going to get more than that, so time to stop oinking and get on with our work. I believe -- I mean this was not written to be largely a nuclear speech, although I deeply believe nuclear has to be part of the puzzle. I don't see how we deal with climate without a big nuclear component.

I think if we have a cap and trade system, carbon prices will rise high enough to make nuclear investment much more comfortable than it has been in my working lifetime. I think we just need some plans to get there first. But you're going at another side of the question the previous gentleman asked. You know, it remains to be seen whether nuclear power can command a broad enough political consensus so that it can be built

economically.

We all know the business failings of the last generation of nuclear. We didn't run them well enough, we didn't build them well enough, as an industry, we took on too much with not enough professionalism. I think we can fix many of those problems in this generation. But those weren't the whole story. A big part of the story is, we lost the political consensus to the technology like this needs. And it has to come into existence again or we will deal with solutions that are both much more piece meal and much more expensive.

I mean I have great confidence in the market's ability to find things that we don't know about today, but I don't have so much confidence that I would like to ignore what we do know today.

And, you know, we spend a lot of time in our shop looking at nuclear versus carbon sequestration, and we decided we knew a lot more about nuclear and thought that could be a better bet. We think the political consensus questions around miles of -- hundreds and thousands of miles of carbon dioxide pipe and C02 wells forever are going to be very demanding.

And while we do think innovation will be huge on the efficiency side, it will never be enough, and we think it's a fair while before you're going to see a big economic role for renewables.

MR. SANDALOW: Well, happy Lincoln's birthday. We're thrilled to have another resident of Illinois here to share your thoughts and

wisdom and more than living up to your reputation for thoughtfulness in today's talk. So thank you for being with us. A big hand, please, for John Rowe.

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