

EIA Energy Conference, April 6, 2010

Opening Plenary Session

Introduction of GE Power & Water President & CEO Steve Bolze

by EIA Administrator Richard Newell

Richard: Thank...am I on? Thanks very much, Phil. That was excellent. To round up the opening plenary, I'm very pleased to introduce Steve Bolze, President and CEO of GE Power & Water. Mr. Bolze has extensive experience in the power sector and in business development and management. GE Power & Water is a world-leading provider of traditional and renewable power generation technology, as well as water and process technologies, which is an issue we'll also take up in one of the break-out sessions.

Their products and services cover gas, steam, water, wind, nuclear, aeroderivative turbines, solar electric products, power plant services, gasification technology, Integrated Gasification Combined Cycle or IGCC systems, desalinization, water purification, and industrial water applications. So, you can see why it's relevant that we'll be hearing from Mr. Bolze today.

Prior to his current position, Mr. Bolze had a distinguished career at GE, and I'm also sure he's in a good mood this morning given his degree from Duke. So without further delay, let me please introduce Mr. Bolze.

Steve: Congratulations. So, no, that was a good game last night. So, it's a privilege and an honor to be here this morning. And in addition to being in front of this distinguished group, it's also great to be back in my hometown; this is where I grew up. So, a couple of key points I want to go through today, which I'll get into in just a minute, but we have an exciting challenge in front of us addressing what's listed here as the

theme of the conference, short-term stresses, which everybody feels around the world but also working through those impacting long-term change.

We are witnessing a rapid shift around the world to a global, clean energy economy. And the US must act to drive its leadership, which is the same point the Secretary had this morning. What I'd like to do is share our perspectives at GE on the challenges facing the energy industry around the world over the next decade. Now, my perspectives come from our GE energy businesses, which span a team of 82,000 employees, which does business in 140 countries around the world. Just give you a sense; last week, I was with our teams in Germany, Austria, Russia, and next week I'll spend the entire week in China. So, our perspectives come to you global. And as you can see from our breath of offerings around the business, we are fuel agnostic. We cover all technologies. And just to give you a little sense, is Thomas Edison would be proud, 25% of the world power today is coming from GE technology.

By the way, I sit in the building that Thomas Edison's started the company in, and it's connected in New York. We ship a wind turbine every three hours. More than 50% of the US wind turbines in the US are GE's. We have three major assembly facilities in the US. And through the efforts of this organization in the room, supporting the policies like the production tax credits, we've been able to invest a billion US dollars in the technology enhancement of wind over the last seven years alone. Last of which is our water technology. Our technology supplies two billion gallons of clean water everyday to the world enough for 200 million people. So, we understand our responsibility to the industry.

So let me just share our perspectives. And I have three key points for you today. The first of which is, there are a unique set of new challenges, some of which you've heard about this morning that need to be addressed. Number two, there are diverse technology solutions. There's no silver bullet, one, answer and many of those in the good side is just today [sp?]. And number three, pragmatic policies are required. You

heard this from Secretary Chu this morning. Those pragmatic and long-term policies are needed; that's what our customers need, for those long-term signals to drive investments.

You heard about a potential \$8 billion nuclear power plant. The customers need those sort of long-term signals to move forward with investments like that. These three key points will define who's going to be the leader in the clean energy economy. And as the Secretary said, the train's moving. And we'll talk about what some of the other countries in the world are doing. First let's shift over to five challenges, some of which you've heard about this morning. The growth centers in the world are shifting. Last year was the first time since World War II, the electricity consumption in the world dropped. However, there were places in the world that's still in up last year. China was up, India was up, Saudi Arabia was up.

We now ship the majority, over 50%, of our new gas turbines to the Middle East. Our still-largest installed base in the world and customers we serve are in the US, but bending on the growth of the markets, it's shifting to the developing countries. Their advocacy, responding and recovering quicker from the economic crisis, places like China, India, and others. What you're seeing now is 2X electricity growth in those developing countries. And in those developing countries, they're using higher carbon fuels and also energy...more energy intensive. Just one statistic. Also, when I say energy intensive, emerging markets require 3X oil equivalent barrels to produce the same GDP growth of the advanced industrial countries. So, it has a big impact.

Now, this growth in developing economies drives the second key challenge, which has to do with the diverse power generation mix. This chart lays out our view of the next 10 years worth of power generation equipment investment in the world. One of the things that you can see is key on this chart is no one single technology is the answer. Wind, solar gas, and oil are all upward trends. But coal is still going to be

predominant in the world. And while I didn't put it on this chart; over 60% to 70% of the world's new generation is going to go in China and India.

Clean energy, green energy is growing but still a third is going in for new coal, going forward in the world. Now, which brings us to a third challenge; it was talked about this morning...with the shale gas discoveries. Clearly over the last three or five years, it's one of the major new trends to hit the entire energy industry, but it has a major opportunity to cause a revolution in the US natural gas markets. We're excited about this opportunity. It still has a number of questions to work through, still uncertain a bit on what the price is going to be for some of these supplies. Our view though that this will have a significant long-term impact on North America and natural gas in the...for an energy source.

Fourth major challenge, we're facing an integration of two infrastructures. We've talked a bit about the electrical infrastructure. What's also going on is a revolution and a modernization of the information infrastructure, smart grid, other technologies. But what's also important here is their stress on the system from intermittent loading, as renewables are not a base load source in many cases. And also as you go to developing countries, they don't have the transmission distribution network in the place that the US does, and it's driving the needs for distributed generation.

Therefore, smarter grids, energy efficiency is major trends that we have to work through in the US. The last challenge I want to touch on, something we call the power and water nexus. Water issues are coming more to the forefront. I know there are worked on now at the Congress. EIA is working through it. But in the US, about 50% of the water withdrawals go to producing power. Now, the majority of that is for once-through cooling. But still, it's a major item as we go forward. Now, in the world context, 30% of the world's population is water constrained today. And estimates have it by 2020, that number will jump to 60%.

Now, power is the most heavily user of water. So, in an environment where water becomes scarce, power is going to be one of the first to be curtailed. So, this is something that's going to become a major issue going forward. It is a major issue in some countries today. And by the way, as we utilize the gas from the shale gas recoveries, it's going to become more pressure on this item.

So, in addition to carbon emissions, we need to deal with the water scarcity issues at the same time. Now, let me shift gears to a second topic, which is diverse technology solutions are required. And as I'll touch on, many of the technologies exist today. And I'm just going to touch on a few of them here on this chart. Some of the solutions have nearer term implications for creating power as the Secretary mentioned. Some of them take longer to put in the place and start generating power.

I'm going to talk about just a couple of these, first of which being wind, wind power. When people think about renewables, wind is really the most well-established and the most scalable right now in the world. You heard it from the Secretary about some of the policies in place that have been there — Spain, Germany, Denmark. Many of these countries have more than 20% of their power from renewables and wind; US, 3%. Now by the way based on favorable policies in the US, production tax credits, the US in 2008 was the number one installer of new wind turbines in the world. But in 2009, it's China. In 2010, it will be China, so the stable long-term policy, which we'll come back and talk about, is critical to continuing to rollout of wind.

Now, the other thing I had mentioned, and it was in the couple of papers two weeks ago, GE just announced a \$450 million investment in offshore wind. That's still only about 2% of the wind market in the world. But from a business perspective, it's \$100 billion investment over the next 10 years, where are for our customers. And there are many long-term favorable policies that are in place in Europe right now to support offshore wind. Policy remains key to the rollout of ongoing wind.

Second one, combined cycle. This is clearly one of the major choices for our customers. Just, people, think about options here. As you see, relatively low capital expenditure gives you high efficiency and a short project development cycle from when you start construction to start generating power. We're building today two of the biggest power plants in the world. One of which is in Saudi Arabia, the other which is in Kuwait. But these power plants have a tremendous opportunity for now improving operating flexibility. They don't run. They slow. When you have renewable sources that are running part of at a time, you need grid stabilization, and gas turbines play that role, and fuel flexibility as key, one of which is shale gas, burning gas turbines. So, this is a major effort for technology investments going forward.

The third is gas engines. Gas engines, these are smaller. We *[inaudible]* at the color green on this. But these are anywhere between a half megawatt and ten megawatts. By the way, we have about 8000 of them in the world, and when you look at them now, our second biggest market in the world is in the Netherlands. And what do you think they do with the carbon exhaust? They put it in the greenhouses. By the way, we have 1400 engines today that burn biomass. You can burn alternative gases, biomasses, landfill gas in these kinds of engines today. It does require a long-term incentive, which is why our largest market in the world is Germany.

By the way, some countries in the world are dealing with the issues of flare gas. Just a bit of statistics here, 150 billion cubic meters of flare gas is flared every year. This is the equivalent of 5% of the global gas production or the annual gas demand in France and Germany combined. You can burn flare gas in these engines. That's a policy issue for certain parts of the world.

The next one, integrated gasification combined cycle, use of coal, and that with carbon sequestration. Our view is that coal continues to be part of the energy mix. By the way, we're working in conjunction with Duke Power and Bechtel to build the only, right now, 630-megawatt integrated gasification combined cycle plant in the world. The

world's watching the construction of this plant. It happens to be in Edwardsport Station, Indiana. But by the way, the Chinese are watching it, the Australians, everybody's watching what's going on in the US for IGCC. But going forward, the view is that there are technologies which it can get you up to about 90% carbon capture capable. It's a cost issue, and there's some ongoing policy around addressing this sequestration liability.

Nuclear, very good option as we talked about earlier for base load power, proven installed base, *[inaudible]* 72 gigawatts in the world. Obviously, a very high percentage in places like France, Japan, and others. Currently, there are 39 gigawatts of new nuclear under construction in the world. None of which is in the US. We with our partners and others have been building, for example, power plants in Japan consistently. And by the way in Japan, they can build a power plant, a nuclear power plant, in less than five years. So, it can be done, supportive policy is required. The kind of efforts for loan guarantees that was discussed by the Secretary, as well as other are critical to the long-term build out of nuclear, as well as some new technologies around what to do with the nuclear spent fuel rods.

Last of which you want to touch about is water technologies. This issue again is coming up more in power. There's advanced membranes, technology use for treatment as well as what I call liquid discharge technologies. This area is going to be very critical in the policy implications. Water reuse must be a part of the answer to address the power and the water issues going forward.

So my last point I want to touch on was similar to the Secretary's pragmatic policies, long-term stable policy is required to build out leadership in the clean energy economy.

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...And the people that laid this out right are going to be the countries that lead in the world.

Now on this next page, policies must be addressed at the national level. That's the experience that we've seen so far. This chart lays out some examples, as you could see on the water slide here. Saudi Arabia, 11% water reuse today have targets for 65% by 2016 is real 85% Spain. By the way, the US is at 6% water reuse today and there's policies being discussed to increase that.

On the renewable side, I think you're fairly familiar with some of the targets for the EU, China, and India. And we have policies in place for the US, but a lot of those policies tail out in 2011. US has a tremendous opportunity to lead here. We've had good experience in the past. I mentioned the production tax credit. We need to do that again. And what's being discussed? One of the areas that GE does support is a US clean energy standard.

As an example, this is a summary of a draft bill by Senator Graham in South Carolina being discussed with administration in Congress today. What would this do, a clean energy standard here would do? One, it widens the technology tent. It's not just renewables. It encompasses new nuclear megawatts, it encompasses carbon capture for coal, and it also encompasses energy efficiency where you can get about a quarter of the new megawatts screen from energy efficiency efforts.

Number two, meaningful goals both short and long term. For example, 13% by 2012, rising to 20% by 2020, 50% by 2050. Upgrading the system. There are incentives in there the retire old coal and currently estimated between 20 and 40 gigawatts in the US. And lastly, help build out this US clean energy future that the secretary in the previous energy speaker talked about. Our estimates of that are approximately at additional 100,000 jobs will be created by 2012. Think about this clean energy standard as a down payment on climate change for the near term. But our view is long term. A price on carbon is still essential.

Now, just we've run some numbers, the impact of a clean energy standard hire deployments on renewables. In the case, the numbers we've seen is we could see over

a 120 gigawatts of clean energy added between 2010 and 2020. In the short term or renewables but over the 2020 and beyond, this would help supporting new nuclear in coal with carbon sequestration.

And then the other side of this is run some numbers with the teams as far as a clean energy standard could also have a sizable potential impact on the reduction in CO2 emissions. And in this case, we estimate that a clean energy standard will produce carbon dioxide emissions from the power sector by 400 million tons cumulative to 2030, which would stabilize CO2 emissions from the US power generation at their current levels. As you can see it's the same effect of basically pulling 75 million cars off the road in one year.

So these policies, there's others being discussed in different draft forms. Our view is that a predictable long-term policy, as the Secretary mentioned also, is critical in the US and it's what other countries are doing in the world.

So, just last chart to summarize. Succeeding in the next decade of this clean energy economy requires addressing those new challenges we talked about as well as oil in a couple of this that we addressed earlier, diverse technology solutions, good thing is which a large exist today. But the third and most important is pragmatic long-term policy.

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We all have to do this together. We understand our role. We all have to play our role. But in the end, it's about the leadership in the clean energy economy and in the future of the planning. So, thanks for listening. I appreciate the opportunity.

Richard: Thank you very much, Steve, and Phil Sharp's going to rejoin us on the stage. We'll do some question and answers. Let's start off with the question for Phil since you've had a bit of a break. How do you see the politics of gas shaping out in the Congress? There's been a formation of a natural gas caucus. There's...I've heard some

impressions that, you know, gas wasn't fully reflected in certain bills and there's been movement. How do you see this shaping out?

Phil: Well, it's clearly reshaping people's thinking and probably the coalition politics as well. And I can't really speak for the industry. I know many are looking for new outlets for what they view as big new supplies. And in the fight over the distribution of credits in the carbon...the cap and trade system that was one of the places that gas thought it was short change. The surprising thing to me is I don't see how gas does not have a potent in a powerful position. It's a question of how much.

And very frankly gas like coal, like everybody else in my view, grossly over states what they have to have in order to survive in this future. All are going to be a part of our energy future and have a thing. So, I find that...that the risk by...for gas and for others is if they make such high demands in this process, if they don't get a policy in place, and then they've got to figure out what this world is going to look like. So, I'm not as, say, going about the need for gas to be so highly organized in order to fight for a better share. It's going to have a major share. It should have a major share. It will win it under any set of policies. They do make a difference, I grant you, but my goodness if you're in the gas business you can't make money. There's something wrong with you.

Richard: Steve, you had commented a bit on the...the shale gas and could you say a bit more about specifically how you see it affecting GE technologies and mainly, you know, potential increased demand for gas turbines or is there other aspects that are ...?

Steve: I think over the long term it clearly opens up more gas supply. There are some issues that I mentioned that need to be worked to as far as the economics of that. But as far as technology, you know, their implications for gas turbine development, more of a shift as we talked about. If a clean energy standard gets put through there's 20 to 40 gigawatts of coal that's going to get replaced. And that could be gas. And the

shale gas, there is water that needs to be dealt with as part of that process that drives a lot of new investment in GE right now.

We're actually, over the last two years, we've been on a path to double investment in our water technologies business. Part of the support of that is in shale gas discovery process work. But once you extracted the gas, the technology can be burned in the gas turbines today. So that's not the technology hurdle.

Richard: Phil, you started getting into the...I think the prospects for energy and climate legislation, could you say more about your view on that over the course of this year or in the future?

Phil: Well obviously, things are moving at the snail's pace in the Senate. It's very hard to know whether those negotiations that are underway are going to be able to pay off. So the current speculation is time's running out. The politics are too hard and we won't get that kind of proposition. I still hold out the prospect that there are lots of political reasons and economic reasons to try to get the answers accomplished yet in this Congress.

And by the way, the election year is not the problem. All major energy legislation and all major environmental legislation are passed at the end of election years, right before elections not in the first year round.

So, I think it's a very difficult one. I do have to back up a little bit on my gas statement. Obviously, people who invested in high-cost gas when the prices didn't fail, they've got a problem. And I admit life is not easy that way. But it's the thing that we politically need now in the Congress, we're going to need it if the EPA does this. Whoever does this is a recognition in all of these energy sectors that they have a stake in findings some persistent policy, and while they naturally are going to lobby for something that is more favorable to them, usually it's rare that groups don't.

If they take this point of view, they must...there's only one thing and that is they've got to have it. They are going to complicate horrendously the capacity for us to

get rules in place that mattered to the country and matter, frankly, I think to people in energy business all across the sector.

Richard: Steve, the Secretary alluded to it he also...I think brought up in your comments potential electrification and transportation system. So, could you say more about your *[inaudible]* or your current thinking on the prospects for electrification of transportation and what the time frame is?

Steve: Yes, and again, what I was talking through is that the whole transmission...and I think about it as a T&D infrastructure, it needs to be modernized. It's a cost issue. But it's not only for moving new power. It's the power in the US grid is becoming more renewables, which means it is and it's more peaking during the day and therefore is you got more fluctuations going through the grade. So, you need more intelligence in the grid. Energy efficiency efforts is going to be important for that. GE is investing obviously in smart grid technologies. We have some cities that were in the process, Florida being one that we are going through the process of deployment of advance metering. But we work on those efforts with the customer base. So our view is it's a trend. How quickly it deploys is, you know, is I think up for questioning but for us, it's one of our fastest business growth areas as far as how we continue to invest in our business and deploy new technology.

Richard: Phil, have you...do you have any thoughts in electrification or transportation? Is that something that ...?

Phil: Well, obviously it's moving forward. The *[inaudible]* the auto companies, the several utilities are deeply engaged in trying to accelerate this. And I think that that private sector effort is absolutely essential. Public policy is designed to help support it with the, the subsidies of electrification cars and various other things in the stimulus package on the...the grid, although the grid issues are for the future, not for anything nearby.

I think the thing about this is like all of these technological things, I think they are hugely important to us in the future and possibilities. But nobody should get the mindset that we know this is all going to happen because what we have discovered over and over, over the last 30 or 40 years that we tried to allude to is let oil prices go way down, that will change this.

If oil prices go way up, I can assure you that will accelerate this. But we have not only technological questions but consumer acceptance. We have to find out whether people really will tolerate a higher cost vehicle and a higher cost...well, it depends on the fuel and what the price of gasoline is to the fuel. And those are not things we actually know. And so we...it's one of the reasons in my view to get the carbon pricing thing and that doesn't solve all problems. It won't solve at me or anything else, but it will give guidance to help keep this technological and the green tech revolution going. We have started on this revolution several times, folks. We are enormously...important point where it just seems to be taking hold here and around the world. But that doesn't mean it has to continue.

Richard: Here's a related question which is, does greenhouse gas regulation, under the Clean Air Act, provide enough regulatory certainty for long-term clean energy investment? I guess I'm assuming as opposed to a carbon price, perhaps.

Phil Sharp: Well, there are different paths they can take and their heart has to get in place with the regulation and litigation and what not. It seems to me what they do, do is send a signal that if you can do things more efficiently, whether it's in the production or in the use of energy, you're going to be better off and that's a valuable signal that it will send. But I think that the catch in the Clean Air Act Approach as opposed to a continuous rise in the price of carbon is what it does to innovation. I don't think there's any doubt that regulatory systems can help push innovation as people struggle to meet the next standard, and to be more efficient with it.

But then to get the next step, you almost always have to ratchet up to standards in order to push the envelope farther, which is a complex, legal, time-consuming process. And I think you're going...it is going to get more continuous innovation and change and greater incentive across the board in this country if we can get any price on carbon because we don't know who wins and who loses, they'll find out and they'll go at it. And I think that is a slower pace under a regulatory regime but this can be argued. We don't have a good grasp, *[inaudible]* on what really triggers innovation, which we need in technology.

Steve: Here's just thought on that one is, and I think the Secretary had in his presentation too which is, what are customer's need who are making the investments, be it in the US or are other areas is long-term stable policy, which that in the end, the Secretary had it in there, drives investment in the clean energy economy. Price of carbon. And our view is important. The question is this, when you get that, right? It's important long term. A clean energy standard is it would be very impactful to continue the momentum that was built up. If we take the example of the wind industry, you know, it built up dramatically over the last five or six years. But it's dropped off now significantly. And a clean energy standard could be a bridge between that and the eventual price on carbon long term.

Phil: Well, if you can keep these policies sustainable, and the fact is our experience is not very solid on that front at the federal or even at the state level, even now in some states with RPS' and AB32 and whatnot, those are under political challenge. We don't know if the political challenges will undermine them. But one has to recognize that these are difficult certainties to get in place. And it's one of the reasons why in the process of picking policy options, we generally should be governed by trying to find what's cost effective in getting our goal as best we can because people do not tolerate cost well. And they have a way in their representative system of government of letting their representatives and their regulators know that fact.

And so need...we have a reason for the efficiency of our economy to focus on this cost effectiveness, but we have even a great political reason for sustaining policy and make no mistake about it. We are not going to be able to subsidize our way out of the federal treasury to a low-carbon future. Anybody who thinks that we don't have serious fiscal problems now is crazy, whether we can sustain the kind of investments and tax credits that we've already committed to is problematic kind of proposition because other things are going to come crashing down on the system.

Richard: We have time for a couple of our questions. Steve, you mentioned that you had recently been in China. And, you know, China itself is also growing its own, clean energy industry. So, I'm wondering your view on the relative competitiveness of the US companies in China and how you see that looking forward.

Steve: You know, one of the big long-term, I would say, advantage of China in scale, and as they scaled up, they put out more new coal plants than anybody in the world and they can do them on a standard schedule. They are building up now in wind. And as I mentioned, the largest wind market in the world, I think they'll put in 13 gigawatts, which will be bigger than the US this year.

Their technology is evolving. I would say as if you look at a customer's perspective on that, let's say the reliability isn't quite there, the efficiency isn't quite there, but the scale is tremendous long-term potential. And when they move, you know, if you look at the US power grid, it is a thousand gigawatts. It will add probably 20 gigawatts a single year. They added 80 gigawatts last year. And a chunk of that is wind. So as they say, *[inaudible]* percent more is going to be wind, that's a lot of power.

So, they will be scaling up. They have good technology. I would say, it's not at industry leadership but they're pretty solid. We have a facility in China that we build manufacture wind turbines for China. And we have a fairly large research and involvement center in Shanghai. So, you have to be local and you have to scale up. But they have long-term policies for the build out of renewables. It's not just wind. It's...there

has been some sizable projects that have been discussed in the paper over the last couple of years on solar. So, it's a long term trend but *[inaudible]* a big part of their ongoing power supply is going to be coal.

Phil: You know, the Chinese represent a competitive threat that the secretary alluded to, you've alluded to that we really are to take very seriously in terms of our industrial base and competition. But they also represent an enormous contribution to our future well-being because if these markets scale up, as you say they clearly are, they can drive down on the cost of some of these efficiency technologies, fuels, and things at a much more rapid pace, certainly more rapidly than we can subsidize them in our country to bring down those cost at those developments. So, there is an enormous pluses for us and around the world in part of what is happening in China, not necessarily all the coal plants but ...

Richard: I've got time for one last question here. If we turn back the clock to 1980 and imagine the similar 1980, what would be the most important differences and maybe even similarities?

Phil: Well, the first big difference would be we would have been talking about price controls. And if we've learned anything it is, don't install price controls on oil and natural gas. We had 30-year religious war over natural gas and about a decade of religious war over price controls. And they are not a smart way to go.

We still have them in the electric sector because we haven't quite been able to figure out how to undo them there, although we've got major ways we've undone them. That would have been front and center, the issue of government policy at that time.

The other is, of course, was whether you needed to have any regulation at all with the dispute over CAFÉ was in place, the fuel economy standards, one faction wanted to totally repeal it. The other factor, wanted to keep it kind of thing but it was an argument over that.

I think the great advance is that I think we all recognize now that it's not a fight between supply and efficiency or conservation. We need both of the...I think there's a broader recognition of these kind of concerns and we're out of the price control argument. So, we've actually advance in some significant ways. But we were about to enter into 1986, which comes with a huge drop in oil prices, totally unanticipated, while some people probably predicted it in those people probably wrote books and got rich. But they weren't on the front lines and they weren't in the companies and they weren't in the government kind of proposition, which then just pulled the wind out of the sails of all the investments and that have been made in clean energy.

Richard: We're going to have to leave it at that. Before...we're going to take a short break now. The first pair of break-out sessions will begin at 11:00. And the Climate Change Policy Breakout will be in the Amphitheater, Biofuels in Ballroom B. And if you look at your agenda, all of the odd numbered sessions, which are down the left hand side, I think, are in the Amphitheater and all the even ones are going to be in Ballroom B, which people will be staying outside, direct you to those.

I will meet back here for lunch at 12:30 and again here for the reception. With that, I want to thank our plenary speakers. Great conversation and I hope you enjoyed the rest of the conference. Thank you.

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