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MR. DADI: (Inaudible) -- have your earphone because we will have both speakers in Chinese and English. Allow me to speak in Chinese.

Dear Mr. Zheng and dear Mr. Thornton and all our guests, ladies and gentlemen, good morning. I am very honored

today. My name is Zhou Dadi. I am the Vice Chairman of the China Institute for Innovation and Development Strategy, and also the Executive Vice Council Chairman for the China Energy Research Society. Today I feel very honored to facilitate this session at this forum. We have six distinguished leaders and experts who are present here today to deliver their speech, so as a moderator -- and I feel this is an easy job for me, so I will just introduce them, and I will just watch time for them, and 15 minutes for each person.

And after the speeches we hope we will have some time for Q&A for the audience, because we have to finish this session in an hour and a half. That's why we have to be on schedule. We will try to give more time to our speakers, so our first speaker will be Mr. John Holdren. He is the Assistant to the President for Science and Technology and Director of the White House Office of Science and Technology Policy.

Mr. John Holdren has been for awhile been a very well known and an outstanding scientist and educationalist, and so he has a long experience behind him. And so now we would like to

invite Mr. Holdren to come and give his speech to us. Thank you.

MR. HOLDREN: Chairman Zheng, Minister Wan, excellencies, colleagues, it's a great privilege and an honor to be here to address this very important meeting on clean energy cooperation between China and the United States.

I want to start with what I see as the essence of the challenge at the intersection of energy, technology, and climate change. And the essence is this: Without energy there is no economy. Without climate there is no environment. Without economy and environment there is no material well-being, no civil society, no security for anyone. And the trouble is that the world is getting most of the energy that our economies need in ways that threaten the climate that our environment needs.

We need a rapid transition to clean, meaning particularly no carbon and low-carbon energy sources. Delaying action in this transition is dangerous. Most of the scientists who think about climate change and its impacts have concluded that the most prudent target that is still attainable is to try

to limit the global average surface temperature increase to about two degrees Celcius above the preindustrial level.

The European Union embraced that target in 2002. The G8 and the G20 both embraced it in 2009, but to have just a 50 percent chance of staying below an increase of two degrees Celcius, developed country emissions need to peak no later than 2015 and to decline rapidly thereafter, and developing country emissions need to peak no later than about 2025 and decline rapidly thereafter.

But the world's energy system is like a supertanker: It's immense, it's expensive, and it is difficult to steer. This is a statistical look at the world energy economy, the fossil fueled supertanker in the sense that 82 percent of the world's energy in 2008 was still coming from fossil fuels, and some of the largest users and emitters are listed there, China and the United States both about 85 percent dependent on fossil fuels, Russia over 90 percent, India about two-thirds.

That supertanker is on a dangerous course. Consider projections going forward of coal-fired electric power for the next 20 years. Those projections have coal-fired electricity-

generating capacity nearly doubling from 2005 to 2030, a large part of the increase in China and India. If those are conventional coal-burning power plants not capturing and sequestering their carbon dioxide, the impact on global climate would be immense, perhaps unmanageable.

There is a lot that could be done. This is a picture, a supply curve if you will, showing the cost and the quantities for potential contributions to an emissions trajectory out to 2030 that would put us on track to achieve this result, that would give us a good chance of staying below two degrees Celcius. And what you see is lines below the zero point. Bars below the zero point indicate contributions that would actually pay, they have negative costs under current market conditions. The bars that are above the line have positive costs under current market conditions. One has to pay to avoid those carbon emissions by these means.

You see an immense variety of technologies there. This reminds us that there is no silver bullet. As Jim Rogers, the CEO of Duke Energy who I think is here today likes to say, he calls me "Silver Shotgun Holdren" because I keep saying

there's no silver bullet. We need a great many bullets in order to address this particular problem.

Thinking about this curve tells us something about the kinds of policies we need in order to be on this trajectory. The so-called low-hanging fruit, if we use the metaphor of a fruit tree, the low-hanging fruit is the set of options that would actually pay off economically even under current market conditions, but we're not currently picking very much of that fruit, and we're not because there are barriers in perverse incentives, in lack of financing, and lack of information. In order to get that low-hanging fruit, we need policies to reduce or remove those barriers.

In the middle of the supply curve are options that have a modest positive cost in which we would embrace, the marketplace would embrace if there were a modest price on greenhouse gas emissions, including particularly carbon dioxide emissions. So we need a carbon price in some sense to motivate us to reach higher into the tree.

At the far right are the most expensive options. Those that even with a modest price on carbon would not be within reach,

and this is where we need research development and demonstration in order to lower that highest hanging fruit into reach. And that is mostly what I want to talk about today, of course, given the topic of our meeting.

What do we most need from research development and demonstration in this domain? We need more energy efficient commercial and residential buildings and industrial processes. We need cleaner more efficient motor vehicles, hybrids, electrics, fuel cell powered vehicles. We need biofuels that don't compete with food and forest. We need improved coal technologies to make electricity and hydrogen while capturing the carbon dioxide and storing it away from the atmosphere. We need advanced nuclear reactors with increased safety and proliferation-resistant fuel cycles. We need cheaper photovoltaic cells, and we need smarter electricity grids.

Why should the United States and China cooperate on the needed research, development, and demonstration in clean energy?

Well, first of all, the global climate challenge is global, and the United States and China are the two biggest emitters of the offending gases. That challenge cannot be solved without both of us, and we each have a stake in the pace of progress of the other.

Secondly, cooperating in research, development, and

demonstration shares costs and risks. It provides each side with access to the specialized expertises of the other. It increases the diversity of approaches that can be investigated, and for all of these reasons, it speeds up progress on both sides.

In addition, as the largest developed and developing economies respectively and as economic competitors in some respects, our decision to cooperate in addressing the global clean energy challenge sends a clear message to the rest of the world about the seriousness of the problem and about the strength of our commitment to solving it.

In addition, the rapid expansion of China's energy sector makes it a natural test bed for innovative technologies in which China and her partners share the benefits of advances.

This chart shows the projected investments in clean energy technology from 2009 to 2013 in billions of U.S. dollars, and you see that China is expected to make larger investments in clean energy technology deployment over this period than the United States, South Korea, and Japan all together.

If you look at domestic commitments to expanding nuclear energy, well, the United States still has the largest nuclear energy operation in the world. The amount being added, the amount under construction is far larger in China, again, making China a test bed, if you will, for the deployment of advanced technologies. Only in carbon capture and sequestration does the

United States currently have more planned activity and current activity than China does, but that picture is rapidly changing. And both countries in a sense should be seen as test beds for the other in this immensely important domain of developing and deploying technologies to capture and sequester carbon dioxide.

But there are other factors that favor cooperation. Cooperation and competition are increasingly recognized as not incompatible but rather complementary contributors to innovation, and in a number of respects, innovation has been becoming less national and more multinational and more international for some time. That's been happening through the efforts of multinational and global cooperations, through cross-national cooperative joint ventures, through rapidly proliferating university to university and NGO to NGO cooperative projects in science and technology, and other projects that actually link the public and the private sectors of the two countries.

And the United States and China have a long history of cooperation in science and technology going all the way back to 1979. The first formal agreement between the two countries following the normalization of relations was the agreement on Science and Technology Cooperation signed by President Carter and Premier Deng Xiaoping in 1979. Under it, there have been joint commission meetings on science and technology cooperation co-chaired by the Ministry of Science and Technology on the Chinese

side and the Office of Science and Technology Police in the White House on the U.S. side. All of this time, the participants in those meetings come from departments and ministries of state and foreign affairs, treasury and finance, commerce, energy, in addition to the ministry of science and technology and OSTP, and those meetings take place every two years with meetings at the executive secretary level in between.

There has been, under the auspicious of those joint commission meetings, tremendous progress, tremendous achievements across a wide range of fields: high energy physics, disease control and prevention, environment protection agencies cooperating on air pollution monitoring, modeling, control strategies, and cooperation involving universities, the Ministry of Science and Technology, the U.S. Department of Energy on clean vehicles, clean coal technologies, and energy modeling. That cooperation on clean energy in particular has been expanding rapidly, as it should. That will be discussed here in more detail I know by Assistant Secretary of Energy David Sandalow and by other speakers.

But I just want to say in closing that the Obama Administration very strongly supports the extension and expansion of these important cooperative efforts between the United States and China.

Thank you very much.

Zhou Dadi: We have one minute or two minutes for questions? Anyone? Always we put the questions at the end of all the speakers. Okay.

Zhou Dadi: Next we are very honored to invite the vice chair of the consultative committee, Minister Wan Gang to give a speech. Other than the fact that he is the leader scientific matters in the country, but he personally is also very involved and an expert in terms of the new type of vehicles. So welcome him.

MR. WAN: Thank you, Professor Zhou, Honorable Mr. (inaudible), Honorable Mr. Deutch, Dr. Holdren, Mr. Sandalow, Assistant Secretary of DOE, distinguished guests, ladies and gentleman. Good morning.

I'm very glad to attend the China-U.S. Relations Forum for the 21st century, and the second session of strategic forum on U.S.-China Clean Energy Cooperation. I believe productive cooperation is highly important. This is what we need urgently.

On behalf of the Ministry of Science and Technology of China, I would like to congratulate on the convening of this forum. My thanks go to the Brookings Institutes and China Institutes for innovation and development strategy for your preparation and considerable arrangements. Thank you, Mr. (inaudible).

Ladies and gentleman, with the concerted efforts of the

international community, the world economy is slowly recovering, but this recovery is on an unsteady basis with unbalanced progress and certain uncertainties.

Meanwhile, however, as my old friend Dr. Holdren mentioned, climate change, energy and resource security, food security, major natural disasters, et cetera, as well as other global challenges are getting more prominent. The reliance of traditional fossil energy development for the economy is making the global challenges more severe for us.

Faced with these challenges, no country can tackle them alone. We must rely on science, technology, and innovation. We must join hands to promote energy conservation and emissions reduction. In that way we can promote the human civilization from fossil energy era to clean energy era, from industrial economy development to information economy, from industrial civilization to eco civilization. This has been the common consensus for the whole world.

China is a big developing country with a huge population. We are now in the process of rapid development, but during this process we attach great importance to the efforts to save energy to reduce carbon dioxide emission, to reduce energy consumption per unit of GDP and carbon dioxide emission.

The Chinese government attaches great importance to science, technology, and innovation in energy fields. From 1990

to 2005, China's energy consumption per unit of GDP and carbon dioxide emission intensity was reduced by 46 percent. At present, Chinese government propose that by 2020 carbon dioxide emission per unit of GDP will be reduced by 40 to 45 percent compared with the 2005 level. Non-fossil energy will take up about 15 percent of prime energy consumption.

Perhaps the figures are not so interesting. Let me cite a few examples for you. Just now Professor Zhou mentioned about vehicles. For that goal by 2020, for each car carbon dioxide emission per kilometer will buy 115 to 100 grams, but at that time the European countries reached only 90 grams per kilometer. So that will be a great challenge for China.

In order to achieve that goal, we must accelerate the application of advanced technologies to transform the conventional industries, promote energy conservation and emissions reduction in key areas, and accelerate the development of strategic emerging industries including new energies, create new economic growth points to vigorous develop green economy, low carbon economy, and cycle economy to address climate change. In doing so, we can build our economic development on the solid basis of a friendly environment and energy and resource conservation efforts.

Our work mainly includes the following. First, complete related laws and regulations to create a favorable policy environment for the development of clean energy technologies.

Recently we promulgated renewable energy law. The outlining for national mid and long term S&T development, China's S&T actions to address climate change and renewable energy mid and long-term development plan.

Those have contributed greatly and laid a sound policy environment for China to safe energy to reduce emission and develop new energy technologies. From different walks of life and the energy communities, we have been working together to achieve that goal.

Secondly, we have vigorously promoted key demonstration projects in energy conservation and emission reduction science technology, and we try our efforts to force strategic emerging industries as the new growth points. Energy conservation and new energy vehicle demonstration program has been demonstrated in 25 cities in China. In public transportation area, 7,500 new energy vehicles have been promoted and used.

For the LED lighting application program, in 21 pilot cities in China, we promoted and used over 1.6 million LED lights of various types, saving energy by about 164 million kilowatts per hour every year.

For the smart grid and PV par generation demonstration program, China has given support to more than 100 PV par generation projects, and in the coming two years, grid connected par transmission technology will be supported for 640 megawatts.

For the 2008 Beijing Olympic game and 2010 Shanghai World Expo, we have used and demonstrated new energy vehicles, LED lighting, solar and wind powers.

For the Shanghai World Expo, we have the largest of 1,000-vehicle new energy demonstration in that area, and in the 3.58 square kilometers of the Expo Park, PV roofs have provided about half of the electricity needed by the new energy vehicles. That shows that we can use new and clean energies to promote the socioeconomic development of China.

Third, we should vigorously develop new energy science technology international cooperation and exchange and form a new pattern which is mutually beneficial, reciprocal, and win-win progress. China has signed Science and Technology Cooperation Agreement with 97 countries like the United States. We have participated in ETA as well as other major international S&T cooperation program and science projects.

And let me report to Mr. Wu that we have worked hard towards that goal, and we have full confidence to achieve our goal.

Between China and the United States, clean energy cooperation should take the lead and set a good example for the whole world. As Dr. Holdren mentioned just now, since the signing of the China-U.S. Science and Technology Cooperation Agreement in 1979, we have been conducting clean energy, science, and

technology cooperation. During the past 32 years, we achieved fruitful results under the framework of the agreement and on the platform of JCM we jointly built Beijing Electrum (inaudible) experiment projects, et cetera.

Between most of China and DOE of the United States, we signed and implemented a series of collaborative protocols including China-U.S. nuclear physics and magnetic confined fusion research protocol. China-U.S. fossil energy technology developments and utilization protocol, which we celebrated for the 10th anniversary last year and also China-U.S. energy efficiency and renewable technology development collaborative protocol.

In the coming two years, with the concerted efforts of the two governments and research institutes, universities, and enterprises of our two countries, we have made new breakthroughs in this area.

In November 2009, the two heads of states of our two countries jointly announced the establishments of China-U.S. Clean Energy Research Center, namely CERC. In the coming five years, we will jointly invest 150 million U.S. dollars to support the establishments of consortia in priority areas, namely clean coal and CCS, clean energy vehicles, and building energy efficiency.

The consortia are consisted by universities national laboratories and clean energy enterprises of our two countries. They jointly promulgate work plans and report to the Sterling

Committee meeting for their work progress every year. Later on today, we will witness the unveiling of the plaque for CERC and the signing of the work plans of the consortia.

In last July, at the clean energy ministerial meeting, co-chaired by Dr. Steven Chu of U.S. DOE, China and the United States jointly proposed the electric vehicle initiative, and we got responses from different countries including Germany, France, and the U.K.

According to the EV initiative, we will pick up some demonstration cities for EV projects in public transportation area. Between Shanghai and LA, we will have EV demonstration collaboration for R&D demonstration and commercialization experience sharing. Also, between ENN of China and Duke Energy Company, they will jointly establish a clean energy eco city in the province of China and North Carolina of the U.S. to demonstrate the application of building energy efficiency, new energy vehicles and clean coal technologies in the eco cities.

So I hope that we can promote collaboration in many other areas including basic research environments, health, et cetera.

Ladies and gentleman, let’s work together under the framework of China-U.S. S&T agreement on a series of platforms like CERC. We should continue to facilitate collaboration between our two countries in clean energy areas.

My vision is that through science and technology cooperation, we should promote the collaboration between the industries of our two countries to facilitate the business and trade development of our two countries.

Between enterprises of China and the U.S. there might be competition, but here we see today more cooperation than competition. They have achieved mutual benefits and win-win outcomes, and they have contributed greatly to the benefits of the peoples of China and the U.S. and the whole world.

Thank you.

Zhou Dadi: Thank you very much, Minister Wan for your very warm and inspiring remarks.

Next we would like to have Assistant Secretary of the Department of Energy, Mr. Sandalow to say a few words. And obviously he has a long and rich experience in the field, and he has also published a lot of publications on the issues. So now, Assistant Secretary, please.

MR. SANDALOW: Thank you. Minister Wan, Dr. Holdren, Dr. Deutch, Dr. Zhou, distinguished guests, let me start by congratulating Brookings and the China Institute for Innovation and Development Strategy on this very timely and important conference. At Brookings, special thanks to John Thornton, Strobe Talbott, and to Ken Lieberthal. At the China Institute, special thanks to John Begin, and his entire team. Congratulations on

your vision which brought us all here today.

In my time I'm going to discuss three topics: first, the U.S. and Chinese energy economies; second, the reasons that it makes sense for us to cooperate; and third, some of the programs we have underway to do exactly that.

Let me start with some basic statistics. Together the China and United States consume about 40 percent of the world's energy, a little bit less. This data goes to 2008. It's trending upwards in 2009 and together account for more than 40 percent of global greenhouse gas emissions.

China is currently the largest emitter of greenhouse gases. The U.S. is the largest historical emitter. If you integrate under these curves, you get the stock over the last 20 years of greenhouse gas emissions put in the atmosphere by both of our countries. But there is still a big gap in per capita energy use, as you can see here. This is primary energy consumption and millions of BTU per person. China is much, much lower than the United States.

But China's economy is much more energy intensive than the United States as we can see here. That's the result of a number of factors, heavier industrial sector as compared to the service sector, many more opportunities efficiency in China than the United States, although we both have extraordinary opportunities to benefit by doing exactly that.

Here is some statistics I thought might be interesting just by way of comparing and contrasting. Throughout these we will have China in the red and the United States in the blue. Population 1.3 billion in China, about a little over 300 million in the United States. Coal consumption, China has about 46 percent of the world's coal consumption. We have about 13 percent here in the United States.

Here's an interesting one. I'm going to come back to this, annual motor vehicle production. Today more than twice the number of vehicles made in the United States are being made in China, a dramatic change from only a couple of years ago.

Here is an interesting one that I think may not surprise people in this room, but I think it would surprise a lot of Americans, high tech exports. China and the United States have roughly the same percentage today of high tech exports as a percentage of their overall manufactured exports.

Current greenhouse gas emissions are about equal in the two countries. China is a little bit greater. Cumulative greenhouse gas emissions, another version of the chart I showed, dating back to 1850, much bigger in the United States than China. Greenhouse gas emissions per capita, much bigger in the United States than China. Energy consumption roughly the same.

And here is an interesting one, vehicles per 100 people, about 80 here in the United States and about 6 in China.

I thought it might be useful just to look at a comparison of the ways that we produce electricity. One similarity that stands out here is we both rely heavily on coal. It's about half of our electricity generation here in the United States. It's almost 80 percent in China. The difference there is largely made up by the United States' greater relative use of both nuclear at about 20 percent here and gas at about 21 percent here in the United States. China has a greater use of hydro. I think the projections in both countries, certainly in our country, is for an increasing percentage of natural gas in the years ahead and China is scaling up in nuclear and other areas as well.

In the vehicle sector where oil is mainly used, both countries now import around half of their oil. We became a net oil importer here in the 1940s. China became a net oil importer in the 1990s. We're two of the three largest oil importers in the world, and that, by the way, is a very strong shared interest between our two countries.

Here is what I referred to earlier. I think this is an extremely striking graph. If you look at 2007 and compare Chinese auto production to U.S. auto production, and that year U.S. auto production, which is the blue line, was significantly above China. Look at the trends here with our economic, financial crisis in 2008 and other issues. Our auto production fell very sharply. China has risen very sharply in exactly the same period as anyone

who has spent time in Beijing traffic can tell you. Most Chinese production is sold to its rapidly growing domestic market. Look at this curve. Hard to say when that -- what the slope is going to be in the years ago, but it is rising extremely sharply.

And this for me is especially striking. China is going to add about -- today the United States has about 300 billion square foot of floor space in buildinga. China is projected to add exactly that amount in the next 15 or 20 years. China is going to build another United States, a building stock, according to most projections in the next 15 or 20 years.

So just a word on our complementary differences and why it makes sense to cooperate. I think John Holdren has already spoken extremely articulately on this. I'll just add a few additional thoughts. On innovation, the United States has a mature innovation network with universities and national labs. In China, this is a growing national priority. Just a couple months ago, Minister Wan and Dr. Holden co-chaired extremely productive conversations between our two governments on innovation policy.

We have a lot to learn from each other. Our two governments have not always seen completely eye to eye on innovation policy, but there's a lot we can learn from each other. And we have had a lot of progress in these discussions.

In credit markets, there have certainly been recently challenges in the United States. Credit in China is abundant.

Capital markets are well developed here in the United States with venture capital and private equity. There are significant volumes of low cost capital in China.

On infrastructure, generally slower construction cycles here in the United States, mostly replacing existing stock. In China there are rapid construction cycles with widespread new build, which Dr. Holdren has already referred to as opportunity for test beds in China.

And so I believe by working together we can learn from each other, drive down costs, and accelerate the clean energy revolution.

Science and technology has long been a foundation of U.S.-China cooperation. It was Deng Xiaoping and Jimmy Carter signing the 1979 S&T agreement, and here in November 2009, President Obama and President Hu announced seven new joint U.S.-China clean energy initiatives in the Great Hall of the People. Here they are: the Clean Energy Research Center, which Minister Wan has already spoken about as well as Dr. Holdren, an electric vehicles initiative, an energy efficiency action plan, a renewable energy partnership, a cell gas partnership, a 21st century coal initiative, and a business cooperation program we call the Energy Cooperation Program.

This reflects, I think, the potential for our clean energy cooperation and today the Department of Energy is releasing

a progress report, which is on tables outside and is on our website at www.Energy.gov which provides the details of the substantial work done throughout the last year in these seven U.S.-China initiatives.

Let me just talk about a few of them. A flagship program here is the U.S.-China Clean Energy Research Center. It's the first of its kind, a joint clean energy R&D center. It brings together teams of U.S. and Chinese scientists and engineers, more than 150 of whom have come to Washington, D.C. today and tomorrow and many of whom are here in the room. We thank you for your commitment to this work, hugely important and tremendous opportunities we believe.

It's $150 million in public and private funding over 5 years split evenly between our two countries. In the past couple of weeks, I've had people tell me both that that's too little and too much. So maybe we got it about right. And the initial topic areas are buildings, coal, and vehicles.

Here is my boss, Secretary Chu with Minister Wan at the signing of the Clean Energy Research Center Agreement last year along with U.S. Commerce Secretary Gary Locke and State Councilor Liu Yandong. This was in the Great Hall of the People.

At the Department of Energy in the past year, we released what we call a funding opportunity announcement. It's a good legal American term offering funding for consortia that

wanted to implement the U.S.-China Clean Energy Research Center Program. We received 25 different applications, and through a rigorous process selected West Virginia University to run our coal consortium, the University of Michigan to run the vehicles consortium, and Lawrence Berkeley National Lab to run the buildings consortium. As you can see, these are very much group efforts with U.S. companies, U.S. research institutions, very deeply involved. Over the course of the past several months, these groups have been working with Chinese counterparts to come up with joint work plans, which are going to be signed in just a few moments in this building.

We have also made a lot of progress on our U.S.-China electric vehicles initiative, and that is in no small measure due to the leadership and vision of Minister Wan, who is sitting here, who is such an expert in these topics, along with the vision and leadership of Secretary Chu.

Among the things we've done is hold a workshop at Argonne National Lab last August in which we brought together U.S. and Chinese researchers to learn from each other on battery technology, road mapping, battery testing procedures, and electric vehicle demonstration and infrastructure. This is an area where our two countries have an enormous amount to learn from each other, where we have an enormous joint interest. Both our countries will be much better off if electric vehicles are

deployed quickly in the other.

We have also been working on shale gas, and this is, I think, one of the most exciting areas in energy policy, energy technology today, extraordinary technical advances in shale gas. DOE, the U.S. Trade and Development Agency, and DRC have jointly hosted a shale gas training program in Beijing. The U.S. Geological Service is working to conduct and publish a detailed assessment of China's shale gas resources and DOE hosted a shale gas policy dialogue. So a lot of work underway in this extremely important area.

I thought I would end with first a picture of the Shanghai waterfront in 1983. This is two years after the first time I had a chance to see the Shanghai waterfront. I lived in Shanghai in the summer in 1981, and here it is today, 1983 and today. I just want to offer that for anybody who thinks that some of these problems are too difficult, for anyone who thinks that the two largest countries, largest economies, largest developed country, and the largest developing country in the world can't work together, for anybody who thinks that the climate challenges are too insurmountable, for anybody who thinks that we can't innovate energy technology for the sake of our children and grandchildren, just look at what has happened in this great country over the course of 27 years and think 27 years into the future and imagine what it might be.

Thank you.

ZHOU DADI: Thank you very much, Mr. Sandalow, for your wonderful remarks. And I would also like to add that Mr. Sandalow has played a very important role, has made great contributions to the China-U.S. collaboration on clean energy.

Our next speaker will be Mr. Chai Songyue, who is the president of China Energy Research Society, and he also serves as a China political consultation counselor. And he has been very active in energy and power industry, and he used to be the governor of (inaudible).

MR. SONGYUE: Dear Mr. (inaudible) and dear Mr. Holdren, ladies and gentleman, I'm very pleased to have this opportunity and share with you my scientist views and opinions of energy issues in China. And the purpose is to bring more understanding to our collaboration, and I have three issues to share with you.

First are some basic evaluations of the future energy supply in China with rapid increasing economy in China. The basis for the rapid developing Chinese economy is the Chinese energy industry. Based on our observation of the previous years, observation of the Chinese energy supply and consumption, we made the following several observations and several predictions.

Number one, energy supply and consumption will continue to increase at relatively fast speed. Chinese government has proposed that by 2020 China will double its GDP of 2000. By

the middle of the century, China society will have relatively modernization. The rapid growing economy brings the rapid growth of energy, supply, and consumption. We estimate that if the Chinese energy consumption continues to increase at the average speed of 8.9 percent since the beginning of century and also based on the current energy efficiency, by 2020 China's energy consumption will reach 8 billion TCE, which accounts for half of the total global energy consumption. This is going to impose tremendous pressure on resource and environment.

Second, coal-based energy supply structure will remain pretty much the same in the foreseeable future. In our estimated non-renewable energy reserve, 90 percent of that is coal. Petrol accounts for 6 percent and natural gas less than 1 percent. So based on our natural endowment, which is obviously based on coal, it would be very difficult for us to change the current energy consumption and supply structure. Coal will continue to be the major source of energy. Based on our prediction, by 2020 coal will account for 55 percent of the non-renewable energy consumption with a total of 3.8 billion tons. By 2050, coal consumption will still account for 50 percent of the total energy consumption.

The third assessment, renewable clean energy will make great strides based on our natural resources and the environmental restrictions, and we believe that renewable clean

energy will be a very important source for the future energy supply for China. The Chinese government has promised that by 2020, non fossil energy will account for 15 percent of non-renewable energy consumption and with increasingly restrictive goals, we estimate this percentage will continue to increase after 2020.

We know that we're facing very severe challenges in China in terms of energy supply. We have to make very wise, intelligent judgment evaluation in this area. This will help us find solutions to face these challenges.

The first challenge, the energy consumption intensity is tremendous and the sustainable supply is under great pressure based on the research of my society. If the Chinese economy continues to grow at the current 8.9 percent annually and the Chinese government somehow can manage to reduce per unit GDP by 20 percent every five years, by 2020, China's energy consumption will still account for 30 percent of the world total.

If we look at coal, if we continue to use and consume at the current speed of 3.5 billion tons a year, no matter how much we have, how much coal we have, it's going to be eventually depleted. Therefore, we have to have overall numbers, overall control and a balanced adjustment of the overall energy consumption structure.

The second point, we have very poor energy structure

which exerts great pressure on the environment. In 2010, in nonrenewable energy consumption, coal accounts for 70 percent, which is 40 percent higher than that of the global average. If we look at say electricity consumption in 2010, the total 4.2 million kilowatt electricity consumption, coal-fired power plant accounts for 80 percent of that -- 83 percent of that is from coal-fired power plants.

So the massive use of coal has created a number of serious problems for China. For example, the railway transportation and half of that, half of the rail weight capacity is used to transport coal and a number of environmental problems -- underground water deterioration, air pollution, sinkholes, and of course, the massive use of coal brings tremendous pressure on the control of CO2 emissions.

Next, we have very low energy efficiency which increases energy consumption. Based on statistics, China's GDP accounts for seven percent of the world total. But at the same time, China consumes close to 18 percent of the world energy resources, which is a very low efficiency. The main reason for low energy efficiency is because of the current economic development model in China which is heavily dependent on fixed asset investment and exports. It's too much tilted toward raw material and general manufacturing. At the same time, because of the pool technology, China's equipment compared to many other

countries, especially the developed countries, has very low energy efficiency. And the overuse of coal resources reduces -- further reduces energy efficiency. Low energy efficiency in turn brings more consumption of energy resources. It becomes a vicious cycle.

And the next point, we see a rapid increase of gas consumption that put a lot of pressure on gas supply. In 2010, we have a domestic supply of gas of 200 million tons, but we import around 240 million tons of gas with an increase of 20 percent of imports and 55 percent dependent on imported oil. So with the increasing living standards of the Chinese people, we see that -- we believe that oil consumption will continue to increase rapidly in order to satisfy the domestic need. And how do we look at the overall international environment for oil supply? And how to achieve a balance between the domestic and overseas market? And how to establish a pre-warning mechanism for oil supply? This is a very serious challenge for both industry and Chinese government.

Facing all those challenges, we have to make necessary adjustments. We think we need to approach this from six aspects. First, we have to move to science-based energy production and energy consumption. Second, we have to move from coal-based energy consumption to green diversified and low carbon energy development. Third, we have to move from our

overdependence on domestic energy to a balanced dependency on both domestic and international market. Fourth is we have to protect the environment and we cannot sacrifice the environment for the development of the economy. Fifth, we have to move from energy dependent development model to innovation and science-driven development model. Sixth, we have to develop a diversified portfolio of energy supply.

The third point, and let me share with you some of our visions for China's energy strategy. We can't step on the same paths of the high energy consumption of the developed countries and we have to stay below the average of the developed countries while we are modernizing China. Recently, China's Energy Research Society held a forum discussing energy development for the 12th five-year plan. Experts shared their opinions and their analysis on China's energy strategy. Here I'd like to share their opinions with you.

We believe that there are four characteristics in China's new energy strategy. It should be scientific, high efficiency, green, and low carbon. Scientific is the number one strategic characteristic. We have to base it on science. We have to depend on technology to support our economy. High efficiency puts conservation as a priority. And we have to conserve. We have to preserve in order to achieve a good balance. Green means we have to be environmentally friendly in

our energy development and use. No carbon means we need to reduce emission intensity of greenhouse gas and at the same time we have to effectively control the growth of greenhouse gas emissions.

So there are six aspects in this. First is we need to prioritize conservation, control total consumption. Conservation, efficiency, and total consumption control. These are the three priorities. We hope that through our effort, by 2010 the total energy consumption will be controlled within 45 billion TEC. By 2050, the total energy consumption will be controlled between 5 billion to 5.5 billion TEC. This goal is based on the current Chinese GDP annual gross.

The second aspect, we need to continue the scientific development of coal and the development of clean coal energy and make necessary strategic adjustments. Coal mining must be safe, must be highly efficient, and environmentally friendly. This is a path we have to step on. And the percentage of coal in our total energy consumption will continue -- should continue to decrease. Hopefully by 2050 we'll reduce it to 40 percent or below 35 percent. At the same time, we need to try our best to reduce the speed -- increasing the speed of the coal consumption. We hope eventually it is going to reach a peak and stabilize.

The third aspect is we need to continue to support gas

and oil as strategic resources. And we're going to expand our exploration and actively import gas and oil. Natural gas is very clean energy and it has a very big growth in our energy overall structure. And we'll try our best to increase its percentage in our energy consumption. We hope by 2030 our domestic gas supply will be 10 percent of nonrenewable energy supply.

The fourth aspect, we will continue to develop hydropower and other renewable energy. The hydropower is the first priority for renewable energy development before 2030. We hope by 2020, 2030, 2050 we'll reach capacity of 300 million kilowatt, 400 million kilowatt, and eventually 500 million kilowatt.

And we try to do this to take advantage of solar energy as well as biomass so that they will become the new pillars of our green energy sources and nonwater or hydraulic renewable energy that by the years 2020, 2030, and 2050, that its total contribution will separately, respectively reach 200 million tons of TEC, and four and eight in respective years. Renewable energy, whether it's water or nonwater, we know that the strategic position will continue to be perfected so that it will be upgraded from that of an alternative energy to one of the leading energy sources.

Now, on a fifth point, those second generation energy

technologies that have already matured, especially along the coastal area and the inland area, we should continue to build on them and continue to work on a third generation energy so that we can speed up our development so that by 2020 the nuclear power generation will be able to reach 70 to 80 million kilowatts. By 2020 [sic], 200 million kilowatts, and 2050, over 400 million kilowatts so that we will be able to provide even more energy sources by -- energy by 15 percent.

Number six, I hope that we will continue to develop energy -- all kinds of diversified energy that are highly efficient and safe and intelligent with Chinese characteristics so that we will continue to improve the existing system.

Ladies and gentlemen, the Chinese new energy strategy -- the implement of the strategy -- oops -- is dependable on the mutual cooperation of our two energy powers, China and the United States. And so here I would like to propose that in this particular energy area we'll continue to enforce our coordination and cooperation so that we will be able to tackle all the energy problems that are now happening around the world.

Thank you very much.

(Applause.)

ZHOU DADI: -- for the ceremony of the U.S.-China Clean Energy union. But maybe they are already late.

So next the speaker will be John Deutch. I'm sorry.

I speak in Chinese. Mr. Deutch is kind of a legend because I remember he was teaching at MIT in the 1940s and had written over 140 publications. And also whether as national defense secretary of CIA or the Energy Department, he was the -- all the senior leaders and was the director of the CIA. And so politically and also in terms of energy he's an expert and so now we'd like to give the floor to him. Thank you.

(Applause.)

MR. DEUTCH: Thank you very much, Zhou Dadi. I always enjoy being on a panel with Zhou Dadi. We've been many places in the world but the most exciting time I spent with him was in the Houston Rodeo on Texas. And I'll be selling pictures of Zhou Dadi in a big Texas hat at a Texas rodeo outside after this session.

I was not supposed to speak at this session as subsequently organized, but I will offer a few comments. My first trip to China was in 1977 with Frank Press, who was then the president's science advisor. And the purpose was to negotiate with the Chinese the first student exchange to the United States, which you have heard from Mr. Holdren was confirmed when Deng Xiaoping and President Carter signed in 1979 that agreement which I was present at. I returned to MIT in 1980 and welcomed the first 14 Chinese students to arrive. Who can imagine the extent of interaction that has taken place in

science and technology since that time? I do not know of any technical person in the United States who has not visited China in an effort to understand the activities that are going on, consider cooperative projects, and indeed to look for business opportunities. It is a fantastic and unimaginable change in 30, 40 years.

I do think there are challenges to further progress, and in my brief comments I want to mention three. Three comments about the challenges from a U.S. perspective. The first is since 1977, I returned in ’78 with Secretary James Schlesinger, the first secretary of the Department of Energy and former CIA director as well. And every time a U.S. cabinet officer has gone to China, a cooperative science and technology agreement has been signed. And I urge us to look to the concrete technical activities that are taking place as opposed to the agreements. And here I am most pleased about the signing ceremony which is going on outside, which is a concrete effort to develop a joint research and development program in automobiles, clean coal, and building efficiency. And I know there are many other industrial cooperations which are going forward, joint Chinese-U.S. activities which deserve our attention. And it has been -- this is the area which needs to be accelerated.

The second point I want to make is a challenge, an

anxiousness that I have about U.S. attitudes, especially in green technologies and solar technologies and biomass and batteries and other technologies among young technical people in the United States. They are passionately concerned about the chart that Mr. Sandalow showed of the difference in R&D expenditures and government support for energy technology in China and in the United States. And I must say these young technical people in the United States in the clean energy area are passionate and they are angry about it. Now, they're not clear whether they're angry against the United States government, who should be doing more, or angry against the Chinese government who are doing so much.

But this is a matter which deserves attention, especially in the political world in which we live. The anxiety of a difference in the effort which are being made and energy research development and demonstration in our two countries. It must be addressed and actually a bilateral group such as this one is the kind of community that could address it in a constructive way because the debate goes on without any attention to data. It is based on opinion.

The third is a more distant challenge. Why are we doing this technology cooperation? We are doing this technology cooperation because we believe that it will lead to mutually beneficial economic opportunity for both of our countries, and

therefore for the benefit of our citizens. It is the economic benefit that we can jointly enjoy that is the motivation for the technology investments, and cooperation.

And here there are three items which must simultaneously move forward from the American side and similar movements are required on the Chinese side as well but I don't know it as well as I know the United States. What are those three?

First is a reduction in export controls by the United States. And here I might say President Obama has the beginnings of a very important initiative. The second must be greatly facilitated possibilities for investment by China in the United States. And the third must be the opening in a realistic way of Chinese markets to U.S. industry to invest and to operate in China. So I pose an additional, beyond a clean energy technology cooperation, the challenges that unless we move forward on all those three fronts we will not reach the benefits that both our countries deserve.

Thank you very much.

(Applause.)

ZHOU DADI: Thank you very much, Mr. Deutch.

All the speakers today are all characterized by one thing, that they are all very senior people and yet they're all also scientists. And so the final speaker is Mr. Xie Kechang,

who is the Vice Dean of the Chinese Academy of Engineering.

He is from Shanxi, the biggest coal mining province of China. He was the dean of the university there. Also, the NPC of Shanxi, the second in position. So he's an expert, a technical expert, as well as a highly respected expert. So I would like to give the floor to him.

XIE KECHANG: Thank you. Thank you very much. Distinguished guests, ladies and gentlemen, good morning.

My title today is about promoting substantive cooperative and to promote the development of clean coal. The climate change is a challenge that we both face. It is a global issue. And as we face this issue, normally we know that it has to do with the energy development but it will also affect the development of each individual country because it will have a social economic effect on the country as what the other five speakers have already spoken before me.

Now, this kind of global challenge if not properly handled can bring new conflicts and differences. And if it's well done, then it will produce a lot of opportunities to allow China and the U.S. to enhance our cooperation so that we'll be able to achieve win-win results. Currently, the consumption -- total consumption in China has already exceeded that of the United States and we are expecting to see more in the future. So in the future, how do we balance reduction of contamination

as well as to continue to produce clean energy has become a big strategy in China.

Currently, we depend on our domestic sources. We are using almost 90 percent -- almost 90 percent of our sources come from China. Because we have very limited resources in coal and natural gas, therefore, we still are relying heavily on coal. Currently, it accounts for 70 percent of our total consumption and currently we have not come up big in terms of our industrialization. And so our per capita emission is still lower than a lot of industrial countries. And so the rural countryside needs to have jobs created for them by urbanization and to also raise the living standard. And therefore, you can expect that we are going to have even higher emissions. So how can we urbanize and how can we industrialize as we continue to develop the economy but can also control the emission? This is a very big issue and challenge that is faced by China because currently our industrial structure is really not too balanced.

And so we need to develop an economy. We also are facing the pressure of reducing our emissions. We really need to have other, better options. We need to develop even faster the clean coal energy and also the low emission coal technology so that we -- as we develop this kind of new energy we can make it more diversified so that ultimately we'll be able to develop sustainable development. We need to work -- speed up our pace

on changing our development model.

So this has become the topic of the theme for our next (inaudible). As we face the climate change and as we develop new energy, we must also do so based on science. So the development in China is that we will take clean energy to be our top priority. We have proposed that our per capita or unit GDP emissions will lower by 20 percent by 2020 so that we will have a better system to regulate these energy emissions. And some of these have already been implemented quite effectively. And all kinds of efficiency standards for the products have already been issued and all kinds of standards have also been pushed forward and developed. And through all these measures that have been taken, we hope for the last five years we are able to raise the efficiency of our products by over 40 percent. So we hope that by the (inaudible) we'll be able to reach our goal. And I believe that this goal is still very possible because according to the Chinese Academy of Engineering, in China, 20 to 30 percent -- we still have 20 percent to 30 percent space for us to continue to expand.

In terms of energy supply, it is also China's top priority to develop clean energy. In the next few decades, China will consider natural gas, hydropower, and also nuclear power to be our main items of development. And we will also try to develop policies to create an environment for these energy

sources to be developed. We will go on the low carbon trajectory, but of course in the next few years coal will still be the main energy source so that low carbon use of energy will become our goal. So here I would like to -- as far as the direction that we're going to go forward and as far as our bilateral cooperation is concerned, I would like to let you know how we plan to do this.

First, we would like to develop clean coal energy in nine areas. Highly efficient, green mining, and also try to clean up the burning process and also the generation process, as well as the distribution process, and the transfer process. And also how do we conserve energy in producing clean coal.

Next, on clean coal, which has the biggest potential for U.S.-China cooperation, as far as clean coal is concerned, China has a lot of pollutants that come out as a result of this. So we can learn a lot from the United States. And in terms of the sulfur reprocessing process, we think that we each have our own advantage. And so as far as the oxidizing method that is used by the U.S., we can also learn from that.

In terms of super criticalness, this kind of technology in China is -- can also learn from the advanced technology in the United States.

XIE KECHANG: -- the power distribution technology. And I would say that China enjoys their advantage in the

capacity and also installation. We are actually standing on the forefront of the world. But did you notice these in the joys of Montage? Smart grid. R&D and efficacy. So I'm trying to say energy efficiency. China has extraordinary and developed some advanced technologies and these are already in demonstration. However, the United States again enjoys an advantage of the application of certain technologies. We know that two companies -- one Chinese, one American company in a joint venture -- and we'll put in 115 billion R&D. R&D and application of array of advisor technologies.

In fact, an American expert in an article urged that in order to satisfy energy needs in the world, we need to develop clean coal energy in order to avoid the saturous effects on the emissions so as to reverse the course of climate change. And he also believes that China at the present point is standing on the forefront in clean coal technology R&D. I am an expert in this area. I cannot totally agree with James, but I absolutely agree with his suggestion. That is that the United States, together with this government and the private sector, should strengthen the cooperation with their Chinese counterparts. According to a World Agency survey in 2009, China produced 45.6 percent of the total coal production in the world and the United States is about 21 percent. And we consume about 49 percent; the United States consumes about 15 percent of the

coal production in the world. These are numbers for 2009.

Now, in 2010, 70 percent of China's power actually came from coal. And what is the United States? Forty-six percent coal. So we can see the largest co-producers and consumers can cooperate. There's a huge room for our cooperation because we both possess tremendous capacity in R&D and we have relatively some foundation for further collaboration. And as a matter of fact, other than -- oh, in addition to the substantial cooperative results. In fact, we should further expand in human resources development, R&D, and support from the academia.

So including the Chinese Academy of Engineering should expand our cooperation, my Academy as a matter of fact participated in a strategic consultation project. So I believe if we further our cooperation in a substantive manner, like Mr. Zheng Bijian said just now, that definitely it will contribute yet to another convergence of our interests and it will become a key component to furthering our relationship. This is not only to increase energy efficiency but also to contribute in the leadership to combating climate change. If we can do that, then we can achieve the goals set by President Hu Jintao stated in his remarks to further bilateral relationships.

Thank you very much.

(Applause.)

ZHOU DADI: Thank you, Mr. Xie Kechang. We still have a little bit of time left so you are welcome to raise questions or share your comments with the six panelists.

SPEAKER: The mike is not on.

SPEAKER: The U.S. Is that right? What was your second point? Was your second point that China needs to do more investment in the U.S. of the three points you made at the end of your speech? And if so, what kind of investments?

SPEAKER: No, the second point was that the United States should be more open to Chinese investment here.

SPEAKER: A slightly different tact.

SPEAKER: Sorry?

SPEAKER: Slightly different spin on that then. What kind of investments do you have in your mind?

SPEAKER: I happen to be unusually in my case on the left wing side of this, and I would say anything they want more or less. But certainly CNOOC investment in unit oil would be an example of something which I would have thought would have been quite permissible.

SPEAKER: Any more comments or questions?

SPEAKER: I'd like any of the panelists that would like to address this question -- when we're still talking about large utilization of coal by 2050 I believe some of the panelists were talking about, this seems to fly into the face of what the

intergovernmental panel on climate change is saying, which is by 2050 we have to be on the trajectory downward. And unless I heard you incorrectly, I think I heard that by 2050 China would still be on an upward trajectory even though in percentage terms it might be down in your total primary energy usage, and I wonder how you -- if I heard you correctly, I wonder how you dovetail the trajectory upwards with the conclusions of the IGPCC.

SPEAKER: Let me take at least a shot at that.

First of all, what is going to matter as we move deeper into the 21st century is what technologies we use to burn the coal that we burn. China may well still be burning a great deal of coal in 2050. The question is how much of that coal will be burned in technologies that capture and sequester the carbon dioxide.

I think two things are going to happen going forward to tend to increase the fraction of coal that's used that ends up with the CO_2 captured and sequestered and that tends to increase, as well, the contribution of other clean energy technologies as opposed to uncontrolled burning of fossil fuels, and the first of those factors is that I believe, unfortunately, the symptoms of damage from climate change will continue to escalate, which will motivate countries to move more rapidly in the direction of replacing the high emitting technologies with

low emitting technologies. The second thing I think will happen is that technological advance will make it less expensive to make those transitions than we currently expect.

So, both of those forces will move in the direction of decreasing emissions from the energy sector over time at an even greater rate than we probably currently anticipate.

SPEAKER: Please.

SPEAKER: My question is with regard to this discussion on clean coal utilization, you know, and also falling on the previous exchanges. Coal, no matter how you use it in a clean way, as an energy source it emits CO_2, and if you use CCS, it just increases the energy utilized in the process.

Now, between U.S. and China, not only we are the two largest country of coal use and production; also we are the -- what -- U.S. is the largest country of nuclear fleets, and China is the country with the largest growing nuclear power market. And nuclear is the true no-CO_2 emission power source. So, utilizing coal with reduction in CO_2 would necessarily require some kind of a low-emitting power source, and nuclear would be a great way. And so cooperating between the two countries for nuclear -- technology development and nuclear deployment would be a very important aspect.

Thank you.

SPEAKER: So, what is the question.

SPEAKER: Well, to that I could only say I agree.

ZHOU DADI: Well, so we will have to wrap up by 11:30 for this session, so now it’s exactly 11:30, and so again I would like to thank the six panelists for their outstanding remarks and thank you for your participation. Now we will get right into the networking session. Thank you very much.

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