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P R O C E E D I N G S

MR. EBINGER: Good afternoon, ladies and gentlemen. I'm Charlie Ebinger, a Senior Fellow in the Energy Security and Climate Initiative. And on behalf of Brookings, we welcome you here today for what I think will be a very exciting dialogue and, most importantly, questions from the floor.

On the stage with me today, on the far left are; my colleague John Banks who is a non-resident Senior Fellow with our program, and John and I, a couple years ago, did a major first link examination of how the Energiewende was going in Germany, and also what was happening in post-Fukushima in Japan, after the tragedy at the nuclear power facility.

Then joining us to kind of give us an update on where both countries are moving towards your energy transition, we have Patrick Graichen, who is Agora Energiewende, as a Director. I'm not going to do lengthy bios because they are in your program, but Patrick I think one of his great claims to fame is that he was one of the first founders and a leader in the formation of the Energiewende.

Then to my immediate left is Mr. Yu Nagatomi, who is a Researcher in the Power Market Study Group at the Institute of Energy Economics, also a Lecturer at the University. And he is going to give us a rundown of the very difficult situation Japan continues to find itself in post-Fukushima.

The way we'll do this, is we'll have Patrick make some opening remarks, and that will be followed by Yu making some. And then John Banks will very briefly get the conversation going with Patrick, and then I will get very briefly conversation going with Mr. Nagatomi, and then we'll open it to the floor. So, without further ado, Patrick, welcome.

MR. GRAICHEN: Yes. Thank you. And welcome to everybody. I'm delighted to be here. Brookings is always one of the key names to put forward when thinking ahead, and thinking basically what needs to be done, and what's going to happen. And therefore I'm delighted to discuss with you maybe, not only the German and the Japanese transformation, but also the power transformation in the U.S. and what one can learn from each other.

Let me maybe briefly say a few words on us. Agora Energiewende is a think tank financed by two foundations, and what they essentially did when setting us up in early 2012 was, so there are now these government goals, of the energy in transition. How do we make it work? How do we make

it happen. Is the power system with 80 percent renewables doable? So, that's our task, to answer that question with yes, we can, and show how. And I've worked for 11 years in the ministry before switched basically to the think tank side.

Where do we stand today? We now have -- I think we'll reach this year, around 30 percent of renewables in the power sector which is up quite considerably, if you compare that to 2000 when the first Renewable Energy Act was put in place. In 2000 we had about 6 percent. So, on those past 15 years, it was an increase by some 25 percent. So that is, on average, something like 1.5 percentage increase per year.

Now, at the same time Germany decided to phase out nuclear, I think you are aware that we decided that twice. First in the year 2000, we had A Nuclear Phase out Act, which was then overthrown in 2010, and reinstated after Fukushima. So, in a way we are now back to square one with a difference that now the nuclear phase out decision is a bipartisan decision, so it was jointly Conservatives and Social Democrats, and Greens and Liberals had decided that after Fukushima, whereas beforehand it was a partisan thing, with the Social Democrats and the Greens on the one side, Conservatives on the other side.

So, now that debate is over. Germany is definitely going to phase out nuclear by 2022. And effective June, we shut down another nuclear power plant, and no one even noticed. So there are eight remaining, and the remaining eight there's a clear plan to phase them out within the next six years. So that's that.

And then the second thing is, we do firmly believe that we need to combat climate change and have our remission reductions go down by 80 to 95 percent by 2050, and if you do the math, it means the decarbonized power sector. I mean, you can't have that without having the power sector being virtually zero CO2 emissions. And for that there are three options, right? Nuclear, which we've taken off the table, CCS and renewables. And with CCS nowhere near, essentially it means renewable-based electricity system.

It's that straightforward, it has nothing to do with ideology in that sense, it's just, what are the technical options. Okay, it's going to be a renewable-based system. Now, if you look a bit closer into

that, and that's what we've been doing, and if you want to know more, these are our two recently publications, our 12 insights on the German agreement, and the second called Understanding the Energiewende.

It essentially means building a power system built on wind and solar. It's not just only renewables, it is wind and solar. Because they are the cheapest renewables, because that's what we have available in terms of resources, and therefore that's the way to go, and the good news is the innovation has driven down the cost for wind and solar, such that we are now at parity with new fossil power plants.

So a new windmill in Germany gets -- it gets $0.09 per kilowatt hours it would probably only need $0.08 per kilowatt hours if we are, we'll see that with first auctioning schemes I guess. The last PV option cleared at $0.85 per kilowatt hours, so that driving down, reaching some $0.06 to $0.07 per kilowatt hours, which is what you need for a new gas, coal-fired power plant as well. New nuclear, I mean we've just seen what the U.K. is willing to pay for the new nuclear power plant, that is way more than those numbers.

So, the good news is, wind and solar are cheap, so the cost that we bear are basically the cost of the past. The additional cost from now on, will probably not be really additional, but you have two in technologies that are completely different to what we had before. Wind and solar are not being switched on and off by some operator, but it's the weather. Wind and solar have 80 to 90 percent investment cost, and then only 10 to 20 percent operating cost; compare that to gas or coal where it's about 50/50.

So run into a system that has fluctuations and high capital cost, and that is what makes this energy transformation really a challenge, because it's not just shifting from one fuel to another, it's about shifting from a fuel-dependent technology to a weather and capital-based technology and that's what really, the whole challenge is about.

Out of those 30 percent renewables that we have so far, roughly 20 percent are wind and solar, the rest is what -- hydro and biomass. And with those 20 percent you already see how the future is going to look like, and maybe I'll use the next -- a few minutes to come on, on that issue of lessons learnt.

The first lesson to be learnt, the new power system is all about flexibility, so with wind and solar coming in, and being driven by the weather. We are going to enter into a system which will have to be very flexible on each side. So flexibility from the fossil power plants to be ramping up and down, and in a way being the negative image of the wind and solar power production. Flexibility from the demand side, so as to move into those hours when there is lots of wind and sun, and out of those hours when there's shortage.

Flexibility from the storage side, so as to basically get the electricity when it's vastly available and put into those hours when there is need. But also flexibility on the grid, the smart grid in order to have all those distributed generators in your system, and you profit the more regional your grid is, because there is not sun and wind, everywhere at the same time, so you get smoothing effects the larger your grid is.

And last but not least flexibility is also about linking the sectors. If you have electric vehicles, if you have power to heat, then those are options to, basically, put back and forth, use the variability and have your heat -- the heat pumps move into those hours when there is vastly renewables available. And what you don't need is a base load power plant that runs 24/7, because then you get excess electricity in those hours when there's a lot of wind and solar. So, you want flexible power plants that run near zero when there is lots of wind and sun, and go up when there is little wind and sun.

So, flexibility is the key paradigm of the future, and we see that already now. If you look at Christmas last year, we had strong wind, 60 percent of our demand was by renewables, and then on December 26th, suddenly the wind was gone. So it went down to some 10 percent of renewables, and interestingly enough, no problem for the system. The coal and gas fire power plant just ramped it up, up and down.

Why did they do it? Because our energy market is now so highly integrated, that they are all bidding into day ahead and the intraday market. And we had prices near zero even for some hours negative prices on the house of power market, and as the coal and gas fire power plant, then you think, well, negative prices, I'm losing money if I produce in those hours because I still have to pay for the fuel, so I'd rather go out. So, basically having a very volatile, very flexible quarterly-hour market and that

should be evolving into a five-minutes market is essential to deliver that flexibility.

The second lesson learned. Investment signals are something to come to grab in such a capital-based world, because while the energy-only market is crucial to get that flexibility done, I'm not so sure whether the energy-only market is really going to deliver all the investments we need. Especially with high capital cost technologies, you'd want long-term contracts for them, otherwise they will be high-risk premiums associated with those investments, and that makes it more expensive than needed.

So, we need to somehow find the market design that on the one hand is very flexible, very short-term when it comes to energy and balancing system. But on the other hand, it's giving some certainty to the market when it comes to investment, because otherwise both your wind and solar power plants, and your backup -- needed backup, fossil power plants are going to be more expensive than needed. So that's the key issue to basically come about.

The third lesson learned, with lots of solar on the rooftop, and now all those Tesla's batteries coming in as well, you are going to have lots and lots of distributed generated electricity, which means the old world with, you know, basically a handful of actors dominating the power market is over. We now have more than 1 million power producers because all those people that have a PV on their rooftop. And therefore, you need some sort of a regulation that embraces that distributed pattern of lots of actors and self-consumption, self-production, integrating that into the grid, which is a challenge. I mean, none of the utilities nor the regulators were used to that.

The fourth lesson learned, I would say is essentially you need to have a look at all your grid fees and tariffs. So far we put them on kilowatt hours, taking from the grid. The more you move into a self-production, self-consumption world, with solar PV on the rooftop and a battery in your cellar, maybe even combined with an electric vehicle, the less you can refinance your grids, the less you can refinance your renewable portfolio, standards, surcharges, whatever, through the old mechanism, and that is kilowatt hours taken from your utility.

So, you have to engage in that discussion, are we going to have a bit more based on capacity? Are we going to have dynamic pricing of all those charges? And I know that a lot of utilities come forward with that issue, having a mind that's a way to block new solar, and I'd say there is one valid

point to that, and that is, the grids still need to be financed, and even those that have loads of shares of solar and battery want to have grid for the moments when there is neither sun, or the battery. So, you need to find a fair financing mechanism there, that's one of the challenges one needs to come to grip about, something we are also still working on.

And maybe the last challenge, the fifth challenge, your utilities needs a new business model. And I think all utilities only realize that a bit late, which is why RWE is struggling so much, and Aon has now come forward to split up their -- basically, operations.

But in a way, I mean, it's inevitable that they need to come into that new world and restructure their whole operation. And what is the function of a utility in that new world? One, of course, if you are on 80 percent renewables, well, you'd better be building renewables. The second, there will still always be the need for backup and some of it will be fossil backup, so the flexible resource adequacy delivery is also something which, probably, only utilities will be able to deliver.

Third, grids, grids will become even more important I would say, even the smart grids, and we have made the experience, I mean we have a very reliability of our grid. We are very proud to be basically, together with the Netherlands, the best-performing in Europe, and way below all those other trades here in the U.S. And I think -- and it has become better even over the past six years. So we had more renewables and the better resilience of the grid which is, I think, because with the more renewables they all had to think about how do we make our grid stable and the side effects to that was, that the overall performance got better.

So managing a grid with high shares of renewables, it's of course a bit more complicated than the old world, but I mean, of course, innovation is taking place in any industry, why should the energy industry be not having those innovations.

And the fourth element is being close to the customer. So, if you have a PV battery on your rooftop, and a battery in your cellar, you'll still want someone to deliver you with the electricity in those hours where you don't produce it yourself. You want to take the electricity from you when you produce more than you need. And you will want someone who manages it optimally for you to have the power, consumption and storage and electricity vehicle all be optimized by some smart algorithm.

And the key question really is, that job, will that be done by utilities or will it be done by IT companies? Is that Google Nest, or is it AT&T, or is it the incumbent utility? I'm not sure about that, but there is a huge market out there to be won.

So, I'll leave it at that, I think. I'm noting that of course, that is a totally new world that's opening up, but if you look across, for example, the states, you also have several states that have high increase in share of renewables. I've just been to California, where they had the 50 percent target by 2030, and they are moving directly in the same direction, and if you look at other states, they also have high and increasing shares of renewables. I'd say it's not really just the German case we are talking about, but it's rather, with wind and solar having become cheap, something that will happen at different speeds but in a general pattern all over the world. Thank you.

MR. EBINGER: Thank you, Patrick. Mr. Nagatomi?

MR. NAGATOMI: Oh. Thank you, Charlie. So, it's my honor to be here and make some remarks on the stage, and I'm aware, we are to talk something on the stage without mic. I'd like to show briefly what happened in the energy policy in Japan, after the Fukushima accident. As you might know, so I think that the greatest Japan earthquake and the Fukushima accident changed our energy policy in Japan, a dramatic threat, and drastically.

For example, just after the Fukushima accident, total active power company areas faces micro power supply. So, unfortunately we had long blackout. This is the first times since the oil crisis. I live in the Tokyo area, but on my friend and my colleagues were very shocked to have the long blackout, because Japan has a very stable power supply, we have a bit high quality over electricity, and there's the regulating structures.

But the reality is the long blackout. So that is one of the key driver to think about, what should our energy structure be in the future? And I think that is one of the key drivers to promote it, an energy system reform in Japan. That is one issue to talk about, might, or not. And another two issues; one is the (inaudible) for promotion of their renewable energies after Fukushima accident, Japan introduces a (inaudible) to promote the renewable energy, very, very strongly, like in Germany or Spanish, in European countries.

And, yes, the results. I think it's the result of the promotion of renewable energy, is a success, but we face this something like a program to promote the farther introduction of the renewable energies. That is a second issue, the third issue is nuclear, I'd like to touch upon the nuclear issues in Japan. So, as you know, that we have the tragedy in the Fukushima accident that even now, the public call on the nuclear restart; almost half of the people say no, on the restart of the nuclear.

I think the public people, even now, so are concerned about the security or safety of the nuclear energy in Japan. So, the first issue is the Energy System Reform in Japan. So, after the Fukushima accident, the government, under the GPJ (inaudible), launches a Special Expat Committee to make a roadmap of the Energy System Reform. The main content is full liberalization of retail market in Japan, and too, launches a neutral system operation, and a (inaudible) of the regulated active fuel duties in 2020.

That is three main contents of the Japanese Electricity System Reform. And in part of the Electricity System Reform in Japan, the government also promoted the Gas System Reform. I think this is the whole of the change of the energy system in Japan. This is a big -- this will have the big impact on the energy market in Japan, energy market -- overseas markets.

That is a very short story about the Energy System Reform in Japan, so I'm surprised to see that, yes, there's such concept of the Electricity System Reform was made by the DPJ (inaudible), but the LDP country we had the LDP Group. LDP also take (inaudible) as a concept of their Energy System Reform. That is the kind of the part of the economic growth, so-called Abenomics. So I think the LDP promoted this Energy System Reform as their economic strategies.

The second issue is the renewable energies. Yes, so in 2012, a Japanese (inaudible) schemes, was long sheets, and at that time many discussion about how much is appropriate level of the tariff for the renewable energy in Japan. At that time, so I think that Germany has success with introducing more and more renewable energy, under the freedom -- German (inaudible), and the cost of the PV is getting lower and lower in Germany.

On the other hand, at that time Japanese politician thinks about to promote the renewable energy, we need kind of rocket start, so the tariff for the PV or tariff for the renewable energy is

extremely higher than any other countries. I think the tariff, for the PV was twice, was twice much as in Germany at that time. So I think many countries were surprised to see that such high prices of the Feed-In Tariff, they were done for such high prices of the Feed-In Tariff, the renewable energy was strongly promoted.

I think the promotion -- In terms of the promotion of the renewable energy, Japanese Feed-In Tariff maybe successful, but the reality is not so easy. I mean, we now have more than 80 gigawatts to satisfy -- search-wise under the Feed-In Tariff, 80 gigawatt, 80 gigawatt is I think as almost same as a minimum power demand in Japan. So it is enormous amount of the satisfied renewable energy on that the entire scheme.

And another issue is 90 percent, or more than 90 percent of the satisfied to renewable capacity is accounted as PV. Only PV has the large share of the satisfied PV, it is not diversified in the renewable energy, such are the challenges. Now, otherwise, the price of the feed-in type surcharge, means in this year, the physical year of 2015, we have around USD1.2 per kilowatt hour to pay the additional cost on the on the electricity payment.

And from the lesson from Germany, the Feed-In Tariff surcharge, will be getting higher and higher. It may be a big economic burden for the personal consumer, or as industrial sectors. So, the Japanese Government started the device of the current scheme, to be more diversified, renewable energy, and to suppress the cost of the promotion of renewable. That is the kind of status of the division of the Feed-in Tariff Scheme in Japan.

The last issue, the nuclear. Following the Fukushima accident there were discussions about neutrality of the inspection, the nuclear industry. So the politician decided to launch his completely neutral authority, so called and nuclear regulatory authority, to check the safety of the nuclear power plant in Japan. The launch of the new NRA was in 2012, and three have passed, so how many plants will be restart in Japan? Do you know?

So, currently only two nuclear power plants will come back on line, and as a sweet, new safety standard made by the NRA. So everyone thinks about, why it's so time-consuming? It is not effective procedure to check safety standards or to judge the start of the nuclear power plants. So NRA is

completely neutral, but some expert say, it's neutral, and NRA may be lonely from any policy or any actions.

So, I say the NRA's promote -- procedure to check the restart of the nuclear power plants, one by one, and as the speed of procedures will be improved, but I think we still have very few amount of the operating nuclear power plant in Japan. And face the next challenges to think about extension of the right time of the nuclear power plants. Some of the utilities tell me it's two extensions of the lifetime of the nuclear power plants, for all the power plants, but the discussion or procedure, and as the NRA is very, very slow.

So, I don't know, so when will the NRA say okay do the extension of all the power plants, and a subtle issue for the NRA is a new one. So, I don't know, with the NRA permits, or -- permits or approved the new nuclear power plants in Japan, but the process is almost no, currently. So, I think these three issues for the main periods to be discussed in the future energy mix in Japan, so we have -- the first Strategic Energy Plan was decided by Cabinet (inaudible).

It consists of the diversified country nation (phonetic) mix, the Strategic Energy Plan, said we need nuclear -- at a certain amount and then we need to have the renewables, and the we need also -- we need also -- I'll find one of the power plants. But the problem is, how. I think we faced the tragedy, the nuclear Fukushima accident. And at that time, so the three or four, important energy policies were implemented just after Fukushima accident, in kind of emergency situation. And in Japanese, the Secretary of the -- the Natural Resources Agency, mentions the future steps of the energy policy, in the interview of the newspaper.

He said, "We, launched a Seminal Energy Policy in the emergency situation after the Fukushima accident, but in the future, we must modify or revise the current emergency energy policy to be a sustainable one." I agree. So I think we, Japan, faced with such kind of device that modifies the stage to consider the energy policy, than the debut of the new Strategic Energy Plan. The Strategic Energy Plan will be revised every three years, so we must have the many discussions about what is sustainable energy policy of Japan, to overcome the strategy just after Fukushima accident. Thank you very much.

MR. EBINGER: Thank you. John?

MR. BANKS: Thank you, Charles. Thank you to Patrick and to Yu for joining us today. I just wanted to throw out one question to get started, actually, kind of a two-part question. One of the similarities that both Patrick and you talked about was the use of a Feed-in Tariff by both countries to drive deployment of renewables. Germany has had a Feed-In Tariff Policy since 2000 and revised a number of times. They are actually starting to move away from that for larger installations; maybe you can comment on that as well.

But the question is, Patrick, maybe you can talk a little bit about some of the lessons specific to the implantation of a Feed-In Tariff, and then a little bit on it, how Germany is moving away from that mechanism, and what those new mechanisms look like. And then second, one of the major differences, as Yu just pointed out, Japan is undergoing a pretty major sector restructuring and unbundling program at the same time that they are promoting renewables.

Germany has obviously had an unbundled and liberalized market for a number of years now. The question I would pose is; how important is it to have a sort of liberalized electricity market with competition and organized markets to accommodate large penetrations of renewable energy? And what sort of lessons are there in that part of the question?

MR. GRAICHEN: Yes. Maybe on the Feed-In Tariff; I would say the Feed-In Tariff is good for the first 20 percent of variable renewables, and afterwards you need, at least for medium and large-sized renewables, something else.

MR. BANKS: And medium and large-sized being?

MR. GRAICHEN: Meaning anything above 500 kilowatts or 1 megawatt, or something like that. And that's essentially, we have evolved from the Feed-In Tariff the current system is a market premium system, kind of like contracts for difference thing, so that, you know, you have to sell as a renewable power plant electricity into the market, and then you get rewarded, basically, the difference between what you earned on the market and a certain premium.

So, that has already led to all renewables being part of the power market, so they are sold into the power market, they are there on all the dispatch, they are there on the quality of the hourly

dispatch, and that was essential in the sense that everyone else at the -- also as part of their optimization calculation. So everyone in Germany was active in the field, in the power market is now watching the weather forecast very closely.

And there is a whole new area of energy whether -- how do you call them -- energy meteorologists; and I visited the trading floor of RWE, and the key -- and they put them right into the center of the trading floor, they are meteorologists. Because, you know, the day ahead, at 12:00 o'clock all the auction is done for electricity the next day, and of course you want to have the most accurate prediction of what's solar is going to be the next day, in order to then make your bids for your fossil power plants.

So, the next step will be auctions, auctioning of those Feed-In Tariffs -- of those market premiums, will happen with the next legislation taking place next year, and it would probably then start as of 2017, 2018.

MR. BANKS: So essentially you've been moving from Feed-In Tariff to a Market Premium Model, and this is for certain size installations?

MR. GRAICHEN: And then auctioning the market premium, and I'd say the next step afterwards, three to four years from now, we'll switching from that market premium, into some capacity premium. So you have basically, wind and solar being paid X-euros per kilowatt, and then they sell the electricity to the market, or to their neighbor, or to whoever, and that's their combination. They get a long-term contract for the kilowatts, and then short term, whatever, on the kilowatt hours.

So you will move, I think, into a system where the government is backing some long-term contracts, but the full flexibility of the market is then playing out for the hourly dispatch and the current. And that maybe goes to your second question, with high shares of renewables, I guess you have two options, one is a really thoroughly monopoly, where it is regulated from the very up to the very down. And where it's within that monopoly that you do all that dispatch, and efficiently do it, or you have a liberalized market where everyone is meeting on the spot market.

Those things in between are going to create lots of regulatory challenges, and since we in Europe went -- already went to that liberalized market thing, that's where we are.

MR. BANKS: Thanks.

MR. EBINGER: Nagatomi, I'd be interested in your views. It seems to me listening to the German and Japanese experiences, that you really are both outliers. Germany is an outlier because for historic reasons, going back to the Anti-Nuclear Weapons Movement in the '60s, and then the events, Patrick; and of course the legacy of Chernobyl, and then Fukushima, one might say there's a nuclear phobia in Germany and perhaps understandable.

And in the case of Japan, clearly you have an unprecedented tragedy, and clearly that is deeply affecting public opinion which, from my understanding, is still very anti-nuclear to a considerable extent. You can correct me if that's not true. But nonetheless it is an aberration. Now if we look at projections for the future of global energy use, it's of course in everyone's interest to have as much of this come from carbon neutral electricity as possible.

But nuclear is carbon neutral, and in my own country I find it just unbelievable, that when 67 percent of our carbon-free electricity currently comes from nuclear power plants, 104, depending on what's up and what's down, a few being built, a few closing down. Let's call it an even 100. To leave those as stranded assets, because of some misguided ideological fervor towards renewable energy strikes me as the height of folly.

And I really query, as we come out of the COP, if someone from some nation is going to have the wisdom and the statesmanship to stand up and say, we cannot meet the global carbon challenge without at least keeping our existing. We can argue about new plants, but at least keeping our existing nuclear plants operating. I don't know, a smaller statement perhaps, but I'd be interested in any of your view.

MR. BANKS: Let's try to grab the pitchforks and head for the street.

MR. EBINGER: I mean, do you believe that the bulk of Japanese can be convinced to restart a third of your reactors?

MR. NAGATOMI: Well, so the impact of the nuclear for the global capital society, I totally agree. I think that when I -- at the Fukushima accident, everyone say no about a nuclear, I understand at that time, and everyone thinks about the times, for such issues -- I mean, the 4 or 5 or 10 years have

passed, everyone forgot the scarcity of the or nuclear power plants. But I'm surprised to see there's a kind -- national poll on the nuclear restart, even now, so public, people say no about nuclear.

So, I change my mind. It may be -- it may not be the problem or the time. It maybe something, the continuous will of the Japanese people to think about nuclear issues, or concerned about nuclear issue, but it's time to change this a little bit gradually, because refineries, we have already started the nuclear power plants this summer. The start of nuclear power plants will be increasing one by one. I hope the start of a nuclear power plants, the (inaudible) are actually tariff, or actually cost, and nuclear power plants, the start of a nuclear power plants will support our economic recovery.

At that time what will happen in the people's mind in Japan? I don't know, but I hope people think about even nuclear is one of the technology to the -- well, for the future of the low-carbon society in Japan. And we can contribute to such low-carbon society, using the Japanese technologies of the nuclear industry in Japan. I hope so.

MR. EBINGER: Why don't we go to the floor? What we would ask, please, as you identify yourself, and if the question is for one particular speaker, please designate, otherwise we'll see if both them wish to comment on whatever questions come. Here on the aisle? We'll go, one, two. Can you identify yourself, please? Sure, go ahead.

SPEAKER: I'm (inaudible), I'm a Retired Economist. Just one question to any of them; when you think of the reliability --

MR. BANKS: Shall we collect the questions, or we can (crosstalk).

MR. EBINGER: Why don't we take another one and we'll -- Why don't we take two and then --

MR. BANKS: Or two or three and then we'll come back.

MR. EBINGER: Two or three, and then we'll go back.

MR. WACKMAN: If I may, I have two, but one may be -- Is this working now?

MR. EBINGER: Yes. It's good.

MR. WACKMAN: My name is Hal Wackman, I'm retired from The World Bank. One question on the German scene, and my second question is for any of you. It's not quite clear to me, if you

are going to maximum renewables, wind and solar, and you are trying to eliminate fossil, it wasn't clear to me, what the supply is when the sun doesn't shine and the wind doesn't blow. You mentioned something about fossil plants still being there, but I don't see how you eliminate them, eliminate nuclear and go to the whole wind and solar, and keep the lights on. So if you could just clarify that, please?

MR. GRAICHEN: Yes.

MR. WACKMAN: The second question is for, well, I guess particularly Germany and Japan. What's the state of discussion, if any, about the carbon tax?

MR. EBINGER: Do you want to take some of that?

MR. GRAICHEN: On the first question. I mean, there is this system outage index called SAIDI, and there, Germany is writing its 12 minutes per customer per year, and the U.S., I think, has an average of 120 minutes per customer per year. So that kind of shows the difference and the large difference is the distribution grid. So, it is on the transmission grid it's very similar, German and the U.S., and then the transmission grid, ours is a lot stronger than yours -- the distribution grid, sorry, distribution grid. Which comes at a cost, I mean, we have higher grid cost than you guys have.

So, in a way, I mean, we have a very strong distribution grid, that's why we have very low outage rates, you guys don't have it that much, and that's why you have higher outage rates, and overall lower grid cost. I guess that's the usual tradeoff, and that's for all those grid regulators to decide, basically, what is your level of security of supply that you want to give to your customers and therefore it has something to do with building more of the grid.

Actually what is needed in terms of high renewables is to make the grid go bi-directional, so what we have, several distribution grids, at times they have more 100 percent renewables in that distribution grid, so it needs to be transported up to the transportation grid. Now if you ask our grid operators 10 years ago, is that possible, they would all say, no, no, no, we can't manage such a system with such high volatile stuff, and now they are doing it. So there is learning process, and they have gone through that, and there are lots of techniques now available to really incorporate.

MR. BANKS: Just two additional comments, in that there certainly is a difference in the SAIDI Index, System Average Interruption Duration Index. It may be a little bit apples and oranges. Lots

of the grid in Germany is underground, and the United States obviously has a lot above ground. There is -- areas in the United States, as you all know, they are very susceptible to severe weather and severe storms that has a big impact on those kinds of figures.

But I would also -- I would echo Patrick's comment about the TSOs, the transmission system operators we spoke with in Germany said the same thing. They said, yes, we are intervening more, we are re-dispatching and there are certain periods where we had to curtail renewables a bit. So there are more interventions, but that we can handle it. It's not an issue. What's an issue is, making sure we build out the transmission grid, but that they were confident that they could hire this higher penetration renewables.

MR. WACKMAN: The fossil fuel?

MR. GRAICHEN: Just a second. What do we do? How do we keep, basically, the lights on, with high shares of wind and solar? First of all, up to 50, 60 percent renewables, I mean, essentially, of course there is still quite some fossil capacity, right? So, no doubt about that, and all I'm saying is, the cheapest option is to keep the fossil capacity there. Of course they have lower operating hours than before, and therefore the question really is, what is the refinancing mechanism for a gas-fired power plant that's only operating 200 hours a year?

So that's the whole discussion on the capacity mechanism, but in terms of security supply, no problem. So what really then, the last stage, 70, 80 percent plus, that's when you really need storage, and long-term storage as well, in order to have renewable electricity in times when there is no wind and sun. And that's probably also going to be the more expensive part.

So I'm saying, you know, let's just move ahead into that 50, 60 percent world there's no problem with that, we have all the techniques available, and at the same time, throw money at research and development in terms of storage and then within the next 15, 20 years, I'm certain we are going to solve that as well.

And a third question was on carbon tax -- Oh, yes. That's a difficult one. I mean, we have our emissions trading system, that's what all the politicians say whenever you come around with carbon tax. And the problem is that it's down and out. So it's not working. It's not delivering. There are

several attempts to reform the emissions trading system. First, we had the introduction of the Market Stability Reserve this year. Second, there is going to be a tougher reduction factor as of 2021, that's the current negotiations; but we did a study saying that's not going to deliver.

The ETS is not going to give us a meaningful CO2 price, not before 2030, which means either we really grips with the ETS, or that's what we are saying we need minimum CO2 price in the ETS, which is a way of the carbon text, right. But unfortunately, the European politicians aren't there yet.

MR. NAGATOMI: In Japan, so we call it Countermeasure Climate Change Tax, but I think though that after Fukushima accident we have agreed to such kind of tax is slightly higher, but after that I don't think about -- there's any discussion about increasing the carbon tax, because I think just now, it was during the (inaudible) in Japan discussed about tax division, in the context of the including the consumption tax, coming in 2017, I think the tax issue in Japan is very sensitive now. So it may be one of the reasons to -- not to promote -- discuss about the carbon tax issue in Japan.

MR. EBINGER: In the back?

SPEAKER: Thank you. Yes. Patricia Schouker, for Pipeline Online Gas in Dubai. I'd like to ask you about Germany's commitment to clean energy and I'd like to push you a little bit more, by asking: At what cost is this strategy of clean energy being purchased? And aren't you pushing European for sensitive -- I mean, sensible, but understandable political reason, into more and more difficult situation where European competitiveness begins to be at risk? Thank you.

MR. BANKS: You have the one before this one?

MR. EBINGER: There is one. The gentleman right ahead, in front of here, we'll take him too.

MR. REGINBOGIN: Thank you. Herbert Reginbogin, Professor of International Law, International Relations, Touro Law School. Efficiency, if you compare the three cultures of Germany and Japan and the United States, how would you rank the efficiency of civil society in terms of consciousness of ecological energy saving? And my second question is directed towards the recent publication in Foreign Affairs about fuel cells, hydrogen fuel cells. And how the automobile which is completely different from the industrial output, will have an impact on the conference that is to be held end of this year about

the emissions problems?

MR. GRAICHEN: Yes. I'd like to combine those two questions actually. First, Germany has one of the highest retail prices of electricity in Europe; so, second after Denmark, and we are about double of U.S. But here is the trick, our household electricity bills are lower than the average U.S. household electricity bill, because we consume about only half of what the U.S. average household is consuming.

So, in terms of what is the percentage that an average German household pays for electricity out of his consumption income? It has been quite stable at 2 percent and goes up to 2.3 percent now. It's probably going to be going down again, because average incomes are going up, and from now our electricity bill is going to be quite stable. So, in terms of household expenditures, it's actually not that much of an issue as it has usually been told.

Now, in terms of industry, what we did, and that's contributing to the high household electricity price, we exempted our energy-intensive industry from all those taxes and levies, which is why our chemical industry is having the lowest electricity prices all over Europe.

There are complaints from the French and the Dutch that we are having lower prices than they have. So, there was a very conscious awareness of that issue in German economic policy, which is basically why we exempted our energy intensive industry from almost everything. We have quite a backpack of costs on our households, that's true, and we are carrying around that for probably quite some while, because we took on those costly early years of solar PV, 2009, 2010, 2011.

But it's going to -- it's not going to rise that much anymore, because now it's only the cheap renewables we are getting in. So, yes, that's kind of the legacy we are carrying around. The good news for everyone else is, you don't have to buy down the PV cost curve anymore, it's already now down. And that's how, basically, the German economy is managing quite well with that situation.

On the issue -- So that's about energy savings and energy conservation, I'd say there is a high awareness, it could be higher as well, because we are struggling about getting more energy efficiency in to the system, and there are lots of different programs now directed to that. But overall there is quite a good ratio on that.

MR. BANKS: Just to add a couple of comments on that, on the issue of the cost of the Energiewende, so when we spoke with our counterparts in Germany, in the government there is recognition that this was an expensive experiment, and that's how often it would be phrased to us. We recognize that this is expensive. We recognize that this is an experiment but it's one worth taking and we think we can show that this is possible to have this large amount of renewables in the system.

The results are -- an addendum to that which is we don't expect everybody to follow this blueprint exactly, but rather that it can be done, and that civil society written large across the political spectrum has brought into it. What we found, and obviously please correct me, because you know this better than I do, certainly, but when there are challenges to the Energiewende, it's more about tinkering with the policy rather than completely doing away with the policy. It's changing how you implement the policy and how you reach your renewable goals, rather than is this whole transition worth it, because there is such a broad buy-in across civil society for going in this direction, generally.

MR. GRAICHEN: Yeah. That's great. I mean, our Energy Association, which was very skeptical, I mean to be clear about it, our utilities didn't like that, the post-Fukushima decisions, but they are having a regular poll now, every year. Do you think the move towards renewables is correct -- is right or wrong? And it's always, since 2010, it's 90 percent agreement. So that's the basis.

MR. EBINGER: Mr. Nagatomi, picking up on Patrick's point there, last point. Do you believe that most people in Japan would support much more attention to renewables? And also when we were working in Japan on our project, we kept hearing about the tremendous particularly wind resources in the north. But of course the lack of an energy tie to Honshu, what is the real orders to go about building that inner tie? Is it technical? Is it cost? Or, what else?

MR. NAGATOMI: In terms of the -- intervene the enforcement of the transmission grid in Japan, to incorporate it as far as -- or more and more wind energy in Japan. I think it -- there's some reason. The cost and the technological issues is also to be discussed, but I think the main issues, or the main hurdle or challenge is to be enforced on transmission is a cost; because there are -- So someone wants to construct a new wind power, but it needs a transmission grid to make such wind power energy there.

Who paid, and how much -- how do we determine the cost of burden such transmission grid? How much? Do the utilities pay the money to construct such a transmission grid? Or how much general people to pay such money to reinforce a transmission grid? It's one of the discussion points, the cost and the cost allocation. And another issue is our transmission grid is already kind of a straight line. It's not mesh grid like European countries, and United States countries, and the potential, the renewable, like wind energy, or offshore wind or something like that, is at each point of the Japanese main islands, so no spot and then it's hot spot (phonetic).

It is very far from the demanding areas. So if someone wants to construct a new wind power in the North area, like Akado (phonetic), but it is far from the demanding area. So two, to deliver power from the wind energy, there is a long way to teach the Tokyo area, and there's long, long transmission line. I think that must be pushing out the cost to transmission line compared to the United States, or Germany, or the European countries.

MR. EBINGER: Yes, sir. Here in the middle?

MR. HALPERN: Josh Halpern, Howard University. I'd like to hear some comments on the fact that baseline power from the French nuclear fleet is available as a last resort backstop, or actually a constant backstop to the renewal of those. And also on this issue of transmission lines, some very long underwater transmission lines are now available in Europe to do such strange things as push energy up to Norway to start hydro. Thank you.

MR. BANKS: Do you want to take another question here?

MR. EBINGER: Matt, you had a -- The young lady behind, ladies first.

MS DAVIS: Hi. Mary Davis, I'm a Master's student at Johns Hopkins SAIS. I wanted to ask about the lessons that we've learned from Germany can Japan can apply to the U.S. market. There was talk about, in order for renewables to play a really large role in the energy portfolio that there would need to be either really strict monopoly as you had spoken about, or a very liberalized market of which the U.S. has neither; we are in a bit of a transition phase. So I'm wondering what would be your recommendation from a policy standpoint as to how the U.S. can bolster its renewables? And also your personal opinions on what nuclear looks like in the future for the U.S.?

MR. BANKS: Do you want to take one more or what?

MR. EBINGER: Matt, do you want to go ahead and then we'll answer those? If we can remember all the questions --

MR. WALD: Matt Wald, Nuclear Energy Institute. How is working? What is your carbon output now in Germany and Japan without the reactors?

MR. GRAICHEN: So, first, are we relying on French nuclear capacity? Well, you know, we have 80 gigawatts of power demand in winter. France has actually, in peak, it's more 100, and we have interconnectors of 3 gigawatts. Just by sheer numbers France couldn't supply Germany. It is a lot of trading back and forth, in the critical hours that we had in the past years it was Germany helping France, because in February 2012 when they nearly a blackout in France, the situation is, when it's very cold France gets these problems because they have very shares of electric heating.

And then that nuclear power plant is operating fulltime, and they need everything else they can get. So, it was Germany helping France at that moment. And in all other moments, there is very active trading across Europe, and if you look at net balance Germany is an exporter, we export more electricity than we import. So far, a clear no, it's not the French that are making that. We have enough of spinning reserves in Germany as well.

What about the whole nuclear thing? I mean, I sense that it's a very touchy thing here in the room. We are special in the way that we are shutting down those nuclear power plants way ahead of their lifetime, of the end of their technical lifetime. I guess everyone else is going to keep them until they -- the regulatory authority steps and says, wait a minute this is now becoming a bit unsafe, and you'd rather reinvest something into your security.

I believe that's the moment when at least 50 percent if not more of the fleet is going to be shut down all over the world. I don't expect that the U.S. is going to keep this 100 nuclear power plants. Whenever it comes to that age of 45 years, or 50, whenever the nuclear authority says, now, a big reinvestment is needed in order to maintain security, the cost for that is just too high. So, I expect a gradual basically decline in nuclear over the next 34 years of the world.

MR. BANKS: Including in non OECD markets?

MR. GRAICHEN: Well, I mean look at -- The only one who is really building are the Chinese. And compared to what they are building and everything else, it's just, you know, 5 percent or something. So, I don't expect that nuclear is going to contribute electricity production ever at the share that we have it today.

What did it make in terms of our greenhouse gas emissions? Actually we had quite constant greenhouse gas emissions over the past years, with the power sector having increased 2011 to 2013, and then decreased again to 2014, and I think it's rather the other way around, if we had all those nuclear power plants still in place we would have probably 50 million tons less of CO2 right now. Yes. So, there would have been a huge, of course decrease in emission which didn't take place so far.

On the other hand, there is a limit to how much base load nuclear, and how much variable renewables you can have. Interestingly in the U.K. when they were thinking about building those new nuclear power plants, the nuclear -- the guys said, you shouldn't have more than 33 percent renewables, because otherwise it's going to have us not be a (inaudible) anymore, and that's going to drive -- increase our cost every further because we have less operating hours.

So, in a way our phasing out of nuclear and the ramping of renewables do match each other. Unfortunately it does have the effect that we are going to ramp down RSU2 a bit later than we should.

MR. EBINGER: If I could just add, picking up on John's point about emerging markets, I think one -- and I don't disagree that the nuclear industry isn't in a lot of trouble in a lot of places. But there are some countries at least moving forward a little bit, but the trend is certainly not good in you are in the nuclear industry. But the other issue I think that is a very critical issue, is that is, what are the implications? If the Japanese don't have a strong domestic market, what are the implications to risk major nuclear vendors selling overseas (phonetic)?

And the United States has trouble selling overseas, and the French, now Siemens has withdrawn from the nuclear market. These were countries that were coming -- companies that were at the forefront from a commercial standpoint of the non-proliferation regime. We all agree on the rules of the game in the Nuclear Suppliers Club. The vendors that are emerging are going to be Russia, China,

perhaps India, as the major vendors. Will they share, swill the share concerns about non-proliferation, and particularly if it's a sluggish global market, and people are really straining to compete with each other.

Who is to say that one or the other won't kind of look the other way on some critical issue that may have negative implications for the non-proliferation regime? This is an issue, I think, anyone interested in nuclear energy cannot ignore. We are setting ourselves up for a complete -- I believe for a very serious deterioration in the MPT.

MR. BANKS: Well, I have a slightly different take on that, which is that all those countries you mentioned are signatories to the MPT, so why would you expect them to behave any differently? I take it that they may have --

MR. EBINGER: Because they cheat.

MR. BANKS: And the AQ Connect work operated through Switzerland, so.

MR. EBINGER: Well, the Swiss don't have a great non-proliferation --

MR. BANKS: Okay. Right, right. I want you to comment on the issue of the carbon emissions, to jump in, because I think the question was actually directed you.

MR. NAGATOMI: Yeah. So, regarding the nuclear and the carbon dioxide, I can't imagine that the Japanese Government makes any target of the carbon dioxide emissions without nuclear. That's a game with the changes -- the game has changed since the Fukushima accident. Before the Fukushima accident we can construct more and more nuclear power plants, to cut carbon dioxide. So at that point we must suppress the growing the nuclear mine, but after Fukushima accident how do -- how can we secure the operations, the existing nuclear power plants to cut carbon dioxide, without brand new one?

But back with my comment, so that it is -- the current is the discussion of the new nuclear power plants is very, very difficult. And as an NRA procedure, so the country's -- so regarding the nuclear issues, how much plants will be -- survive under the very strict, and very, very high safety standard made by the NRA.

MR. GRAICHEN: Would it be safe to -- Just to follow up. Would it be safe to assume, in your thinking about this, that you are not going to see all of the reactors come back online?

MR. NAGATOMI: After, there are some nuclear power plants -- is getting very older, and it's not efficient. So that it depends on the decision, the reactor utilities, that I think all of nuclear power plants will come back under the new safety standards, get out of the market from Japan.

MR. EBINGER: Yes. The lady here, and take those two.

SPEAKER: I'm also a SAIS student, I'm (inaudible). I have a question about the relationship between LNG prices and the Japanese nuclear industry, how it's affecting sort what the NRA is doing moving forward, and at price do you think, LNGs would have to reach before they are consider switching? Thank you.

MR. BOERSMA: I'm Tim Boersma, with Brookings. I wonder if you go -- as you are going into the second stage, if you will, of building out renewables whether your expectation is that existing technologies are going to be sufficient to make that second phase, maybe into third? Or whether you will foresee any new technologies, where also, the focus in R&D investments are at this point in time? The same question could apply to Japan? Thank you.

MR. EBINGER: Do you want to take this?

MR. NAGATOMI: Yes. Regarding LNG, so yes just after the Fukushima accident the LNGs are one of the biggest issues for the Japanese economy. So at that we strongly hope to have LNG from the United States, shall we ask? But you know countries are fortunately the oil price is going to go down, some utilities think about energy from the United States maybe is slightly expensive more than currently market (inaudible), so the economy, it is slightly difficult to think about important energy from the United States, but on the other hand, we need diversification in terms of the energy imported.

So I think that that energy from the United States, Shell Gas is one of the good candidates and other sources like so near (inaudible) areas and other; Africa, Mozambique is a conduit to -- We must think about various sources of the LNG. And yes, some nuclear power plants will come back, will come back online, but energy is the still -- imports -- load of the Japanese energy power market. So, that's why the many utilities and many gas companies to think about how to get energy at the very low prices; and how to promote it, promotion to the diversification for energy sources.

MR. GRAICHEN: On the innovation, we are not wrong; 30 percent renewables and I

think the next step is then moving up to 60 percent renewables. Actually for that step I don't think we need new technologies. We have everything in place. It will be a mixture of more wind, more solar, more grids, smart grids. Smart grids in the sense that, transfer meters, being able to put it up to the transmission grid, that have voltage control by some storage that's already available.

I would say already out there. I expect a lot more storage to come than all those models would optimally put out, because it will just come with Electra vehicles. And there I do expect that basically the U.S. Tesla threat to the German car manufacturers, and Dieselgate, the U.S. regulatory threat to (inaudible) will actually really push electric vehicles within the next two, three years, we are going to see rise there.

And then there's suddenly all these vehicles with storage capacity out there, and you want to have them smart into acting, and not charging all at the same time, to put another stress in the system. So, you'll need IT there, but then there are also a huge opportunity because they could charge always at noon, and then take the solar electricity. So, I think the real technological challenge is for that step beyond 60 percent, that's where we need power to gas, power to X, whatever.

MR. NAGATOMI: I think that, I agree with him, it may be technological issues, but on the other hand, we in Japan have an island country, so it is quite different between Japan and Germany. So we must consume all of the electricity from the renewable energy in -- domestically. So, perhaps German can expose into such suppressed renewables, easily to around the countries but Japan must -- how do you call do you deal with such as suppressing, and especially from the renewable energy, to think about further high, ambitious target to the renewable energy, it is quite very difficult challenges for our island country.

MR. GRAICHEN: Yes. Probably that means they need (inaudible) a bit earlier than we do.

MR. EBINGER: We have a gentleman over here on the side.

MR. LYNN: Hi. My name is Leo Lynn, and from George Washington University. I have a question for Japan. In terms of energy security, Japan, as you have just noted, it's an island country. So, do you think that Japan is facing any security challenges right now, world of perspectives of financial

security challenges that Japan will face most likely in the near future? Thank you.

MR. NAGATOMI: Yes. Thank you very much. All this, the energy security, so first priority to the energy issues in Japan, but unfortunately with the Fukushima accident is a fear of the nuclear is coming first. Energy security discussion has gone against such fear of the nuclear. But remember that our -- you mentioned our -- we are island country, and all of us know domestic we started to have resources in Japan.

So I think the energy security is the first priority. In that context we must define as the nuclear, as a contributor or the new energy security issues, but unfortunately the kinds of public opinion, public people don't think about the impact of the energy security result in nuclear. Why? So, because we have lots of very old solar power plants, after the Fukushima accident, so everyone says, yes, we can survive without nuclear, even after the Fukushima accident. So we don't need nuclear, so nuclear is okay.

But the reality is how to survive such tough situation after Fukushima accident is very old some power plants can help our power supply. So the old such -- some of our power plants is getting retired in the future, so they contribute over the nuclear power plants to the energy security must be defined in the whole energy strategy in Japan.

MR. EBINGER: I think we have two questions along that wall, one in the back, and then this gentleman about half way.

SPEAKER: Hi. Jennifer Sklery with George Mason University, Center for Energy Science and Policy. And this is a question for both of you, because one of you mentioned the challenges of regulating over 1 million power producers, and the challenges associated with distributed generation. And I know that Japan, I saw a lot of solar panels on roofs when I was there, and I know that over 700 applicants, or something like that, have now applied for licenses to be power producers under the deregulated system in the future.

So I'm wondering if you can both talk a little bit about the details of -- I think you phrased it as a regulatory system that embraces this pattern of distributed generation and a lot of power producers. So I'm wondering if both of you can address the challenges that Germany and Japan can

face, and maybe some suggestions of how you would address those challenges.

MR. EBINGER: Why don't we take this question up here, this gentleman, and then we'll answer. Yes. Right there.

SPEAKER: My name is Noshaup Silver, I'm from gas consumption industry. My question on the efficiency of thermal power plant globally. Where it is very good in Japan, like 57 percent, and also Scandinavian countries, but there much less efficiency in other countries, and since you CO2 doesn't have any border, and the thermal power plant policies are related to the border of the respective governments. So it is very essential for the ejection of carbon emission, that if the thermal efficiency of the power plant which is sometimes 37 percent in certain countries. It should be addressed globally so that this global issue could be taken care of.

MR. EBINGER: Anybody want to take either of those?

MR. GRAICHEN: Yes. Maybe a bit on the regulation issue; and I noted I forgot that for your question. I'd say two things. One, we have lots of actors, and that means you need to create a level playing field for all those actors at the House of Power Market. I know that in the U.S. there are lots of different areas. I mean there's Texas very highly liberalized, there is PJM with its capacity markets. There is KISO which is highly complicated, and there is ISO in New York.

But, I mean, I think what's common and what's needed is to have some sort of short-term power market where all those actors interact. And that means that above a certain threshold, and I would say that's above a normal house, rooftop panel, you will required them to participants on that market. Because otherwise, you know, then here is electricity production that totally separated from the overall optimizing of the mix, that if you move into higher shares you get problems.

The second thing is then, what do you do for that homeowner thing; the guys with -- in all those suburbs that live there with a little home and the car, and the rooftop? I mean, it is all about the aggregator and the partner, the energy service provider, be that the utility or be it Google Nest, I don't know. Collecting that and being basically the hub for it, and then, because it's large numbers, also participating in the power market. And I think that's divide -- is something to struggle about, where does large begin, where is small?

And then the question of, what is your regulation for those above and what is the one for below in terms of tariffs, in terms of grids, fees, in terms of who has what kind of rights to connect to the grids and what kind of obligations? But that would be my key take forward. Have some sort of short-term energy in balancing market, shih doesn't mean that there is no regulation. It just means you'll have to design those markets, and you will have to design those markets, and you will have to have the regulatory oversight on that; and the regulatory oversight will also involve some sort of investment backing. Be it through portfolio standards, or some sort of market premium mechanism or something because --

MR. BANKS: This is exactly what's going on in the U.S. in two jurisdictions at least. In New York with reforming the energy vision, they've put forward a concept called the Distribution System Platform where they are asking the utilities to think about how they can play that distribution platform, they are great resources.

California, they are thinking of doing it a little bit differently, they are actually asking the utilities how they could integrate distributed resources into their planning process, and then allowing them to be the owners of the distributed resources; whereas, in New York they are moving on the utilities to think about how to be the platform and not the owner of the resources.

MR. EBINGER: Did he get his question answered about the efficiency of distribution?

MR. NAGATOMI: Well, he knows that we, Japan, we are proud of the high efficiency of the solar plants, like the coal power plants, (inaudible) Shishi also, demonstrate the standards of national economy, so but unfortunately we are a Japanese domestic power market will be shrinking day-by-day or year-by-year. So, that's why the Japanese power -- manufacturer like Mitsubishi or heavy industry or the other heavy industry.

Once you promote this, that they are our own high efficient technology, and in (inaudible) technology in the developing countries, I think the Japanese Government strongly supported such strategies to promote these high efficiencies in developing countries, but on the other hand, you know, there are some United States or European countries, say, concerned about the proliferation of the coal power plant in (inaudible).

It is slightly, I think Japanese Government is struggling with this, and they want to promote the -- sorry -- high efficient coal power plan, but as an OECD countries doubt such an action to expand in the project, expand the coal power plant. But I think before the Japanese economy that four all other words, the high technology -- high-efficient technology should be -- makes the best use of other countries to have the big potential of the -- to cut the carbon dioxide.

MR. GRAICHEN: Yes. But he's right; it should be higher efficiency gas power plant, and not high-efficiency coal power plant.

MR. EBINGER: On that note we are unfortunately out of time. I want to thank both our speakers, and particularly they both came very long distances to participate in. (Applause)

SPEAKER: Thank you that was great.

MR. EBINGER: Very good, very good.

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