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P R O C E E D I N G S

MS. SOLIS: My name is Mireya Solis. I'm a Senior Fellow here at Brookings and it will be my pleasure to host our panel discussion.

And let me just start by introducing some of the topics. Why is this so important, such a pressing issue to be talking about this afternoon?

As you all know Japan today faces a fundamental question. What will be its energy future? In the aftermath of the Fukushima nuclear crisis, a lot of Japanese people felt that they could not put their faith that nuclear power could be supplied in a safe manner. And they have gone to the streets to ask for a nuclear phase out.

The Japanese government seemed to lean in that direction when on September 14th the Energy and Environment Council announced a new energy plan that endorsed the idea of a zero nuclear Japan by the year 2040. But just a few days later we learned that the Japanese Cabinet refused from endorsing that goal of zero nuclear for Japan. And we also know that there are a few reactors still under construction. And that therefore, they could still be operational past that 2040 deadline.

There is also a lot of concern as to what would be the future of this spent fuel reprocessing facility in Aomori if Japan were to go completely off nuclear. And the latest back and forth of the past couple of days has been between the newly established nuclear regulation authority and the central government on who actually in Japan will make the decision on when to restart reactors that have met those critical stress tests. Each party says that it's the other's responsibility.

So, to say that we have a very confusing picture in front of us is clearly an understatement. And the fundamental question still remains: what could be the appropriate, the right energy mix that helps Japan reconcile a number of very important priorities, things that we would all like to see accomplished. How could that be done with

one energy mix?

First of all, public acceptance that the safety concerns have been met. Second, a reliable and cost effective supply of energy so that the Japanese economy can maintain its competitiveness. And third, Japan's adherence to its international commitments on climate change goals.

So, because we would like to have some more clarity of where Japan stands today, where Japan is going in terms of its energy future, we have gathered a very distinguished panel of experts today. You have their bios. It has been distributed in a handout so I'm not going to go through very lengthy discussions. Let me just briefly announce who they are.

So, we have Mr. Toshikazu Okuya, who is a special advisor to METI and a Director of the JETO Office in New York. We have Dr. Llewelyn Hughes, Assistant Professor at George Washington University, Mr. Scott Campbell, Director of the Howard Baker Forum and Dr. Charles Ebinger, Director of the Energy Security Initiative here at Brookings.

Now, from the outset I'm going to tell you that I've been very unfair to the panelists because I have asked them to cover very difficult complex issues and I've given them 10 minutes each. But the idea here is that we want to have a lot of discussion. There is a lot of debate going on and we want to capture all of that and therefore leave a lot of time for your opinions, for your questions, for your comments.

So, let me tell my fellow panelists that when you see me raise a white piece of paper that means that you have one minute left. And when I raise it for the second time, it's not a peace offering but actually is that you have to conclude. No, no this is not the (inaudible @ 00:04:15). When I say it's enough, it's enough. You have to stop.

All right, thank you so much. So, Mr. Okuya if you want to go first? And I think that the panelists are going to step down so we are not in the way for the PowerPoint. Thank you.

MR. OKUYA: Thank for giving me the opportunity to make a presentation today and I appreciate Mireya to arrange this, the exciting conference. So, I look forward to have a discussion with my friends, the panelists and the people joining the conference.

And I would like to start my presentation but it doesn't work so. So, excuse me.

MS. SOLIS: We'll get some technical assistance here.

MR. OKUYA: So, before starting the explanation about the Japanese Energy policies, so I would like to share the background condition about the Japanese energy policy. And after that I would like to explain the direction of Japanese energy policy.

The first way, yes thank you very much. So, I would like to share the background condition about Japan. So, this machine cannot read my material so that now, the staff take pictures. So, this right about a global energy service and (inaudible @ 00:06:09) ratio. It's easy to understand how low Japanese energy services (inaudible) ratio is, 90 percent including nuclear energy. So, result of nuclear energy, Japanese energy service (inaudible) ratio is less than five percent. It's easy to understand how serious Japanese energy situation is.

And this is primary energy situation is Japan. The upper chart that precedes the left side chart that's a before Fukushima accident situation. The nuclear energy of total primary is the 90 percent but the after Fukushima, less nuclear portfolio of total primary energy in Japan is around four percent. So, it means gas and oil covered

the reduction of renewable nuclear energy. And it's very clear what happened in Japan in the power generation area. This is the primary energy for generating electricity before Fukushima 2010 our dependency for generating electricity from oil and gas and coal around 60 percent.

But in July 2012 our dependency on the oil and gas to generate electricity is around 90 percent. That's the reality of Japan.

So, I would like to share the macroeconomic of Japan from the energy perspective. In 2011, we had the first annual trade deficit in these three decades because of expansion of oil and gas input like this. This is a very serious problem because this is a structural problem. It's not easy to find a solution quickly.

That's the background about Japanese energy policy. And as you know that on September 14th Japanese Energy and Environmental Council under the Cabinet introduced a new strategy titled "Innovative Strategy for Energy and the Environment." The first three appeals, the main agendas to manage the energy policy in Japan and the first would be the realization of a society dependent on the nuclear power. The second, the realization of green energy (inaudible @ 00:09:20), and the third for ensuring stable supply of energy.

Also, to introduce efficiency on our electricity power supply structure, we will also do the bold implementation of reform of electric power system. And we recognize our obligation to reduce (inaudible @ 00:09:50) carbon emissions, that's a fight. And after the decision of the Energy and the Environmental Council, the Japanese Cabinet, government Cabinet, introduced a Cabinet decision, the future policy for the Energy and the Environment on September 19th.

In the decision, government stated like this: "Government of Japan will implement the future policies on energy and the environment taking into account of the

innovative strategy on energy and the environment." And we constantly review and reexamine our new energy policy direction because we have a very, very vulnerable global energy structure and the Japanese economic situation reflects that. We have to care about that.

And this is the first pure realization of a society not dependent on the nuclear power. Further, I would like to say because of the shortage of electricity power. In the meantime, nuclear power plants whose safety is assured by new nuclear regulatory authority will be utilized as an important power source.

And there are guiding principles. The first stricter by the stipulated rules regarding a 40 year limitation of the operation. Second, the start that the operation of nuclear power plants one, that nuclear regulatory authority gives safety assurance. The third, not to plan the new and additional construction of a nuclear power plant.

There are five processes. First one, nuclear fuel recycle policy, many people have a concern about that maybe. We will continue our present nuclear fuel recycle policy. And we have to keep across the Agency for International Community and the local people to manage this program. And also, we have to maintain and strengthen the human resource, how to manage a nuclear energy policy and the technology to make a contribution in the world to use a nuclear energy and with the cooperation with the International Community and the local people.

And the third, the strategy mentioned, touch up on the review of the past about this strategy because as I mentioned there are a lot of uncertainties in, not only, Japan but also the world how to secure our energy supply in Japan, so we will constantly review and reexamine our energy policy. And regarding green energy revolution there are two agendas. Firstly, energy savings.

From 1973 - 2009 Japanese GDP increase at a two point three times.

And the energy consumption in the consumer sector, individual sector, increased two point four times. On the other hand, the transportation sector's energy consumption increased one point nine times below GDP growth. And the industrial sector, their consumption increased zero point eight five times. It means the industrial sector succeeded in reducing energy consumption from 1973.

So, it means we succeeded in primary energy consumption per GDP improved 33 percent from 1979. We made our best effort to conserve the energy use but on the other hand we have to push our effort more and more. So, that we introduce a very complicated structure to conserve the energy. We introduce an energy conservation law so this gives an obligation to each sector. Also we introduce a tax and (inaudible @ 00:14:00) to push conservation.

This is an image of expansion of energy savings we will try to complete by 2030s to reach 19 percent of energy consumption reduction.

And the second agenda in the green energy revolution is renewable. In 2003 actually the Japanese government and METI introduced the starting of imposing an obligation to utility companies to introduce a certain amount of renewable energy. So, because of that from 2003 to the present amount of renewable in the power sector has doubled but on the hand only one percent of total primary energy for power generation. It's not enough. So because of that we introduced a (inaudible @ 00:15:00) system and that system started from July 1st, 2012.

This is structure of a (inaudible) and actually so we estimate that we will be able to add two point five gigawatt from renewable in 2012 fiscal year. And this is an image of expansion of renewable. We would like to reach out the 300 billion kilowatt power hour by 2030 from renewable from 110 billion and ensuring stable supply of energy.

Yes we have, as I mentioned from the trade deficit situation we have no room to buy expensive gas and oil from the world. On the other hand, we have to push; we have to strengthen the diversity of the resources for Japan. So, it means that we discuss with you the American friends and the Canadian friends, Australian friends, Russian friends like that. And in the (inaudible @ 00:26:11) meeting in last September, Japan and Russia introduced an agreement that Japan will support to introduce a new (inaudible @ 00:26:21) facility in Vladivostok, Russia and also how to use effectively heat is one of the big questions so that we will also push it for generation.

And how to use effectively the electricity is a big question. Japan has a practical (phonetic) electricity supply structure so we have to introduce more emphasis in the structure. We will push and on other hand we have to pay attention to the cost of structure to generate power to manage well the Japanese economic performance. So, that there are a lot of programs and I'm sorry to use a long time. Thank you very much.

MS. SOLIS: All right. Thank you so much, Mr. Okuya, for a very interesting presentation. Now, we're going to move to Dr. Hughes' presentation. He's also going to use a PowerPoint.

DR. HUGHES: Okay. Thanks very much. It's a delight to be here. Thanks, Mireya, for putting today's panel together. Really a very timely topic.

What I wanted to do in the 10 minutes or so I have initially is to make three pretty brief points. Firstly, that for the first time I think for 40 years or actually probably even longer, really everything is on the table in terms of Japan's energy sector reform. That is in previous periods we've seen pieces of what's being proposed here discussed.

In the 1990s and the 2000s Japan carried out limited liberalization of its power sector particularly at the retail level. In the 1980s and the 1990s we saw cost

being a significant, a reduce in costs being a significant driver of oil market liberalization. In the 1970s we saw, obviously, big investments through subsidies and other measures to try and promote the role of nuclear energy. But if you look at what the DPJ has proposed, although this is contested as Mr. Okuya pointed out, all of those things have been put on the table at the same time. So, it's a very ambitious agenda.

The second point I want to make is that it's the process through which the DPJ reached this conclusion looks very, very different to the way that Japan has typically gone about carrying out its internal discussions over the design and implementation of energy policy. It's actually shifted from what I like to call a process of quiet politics to a much noisier model in which there are more voices and it's far less insulated from the types of discussions that have gone on before.

The third point is perhaps the most important. And that is what's going to stick? That is you can see a lot of different proposals being put on the table and there's a question about whether this is really just about electoral politics or whether there is something which is likely to stay from this proposal in the medium to long term.

It's not in our exaggeration, I think, to say that the DPJ's proposal which has come out of their National Policy unit for the energy sector is a pretty radical reimagining of Japan's energy sector. It drew great public interest in the public consultation period of the review which took about a year. They receive 90,000 submissions from organizations and individuals who are interested in giving their thoughts on what to do post March 11, 2011 about Japan's energy mix.

And the main conclusions Mr. Okuya introduced to us broadly are the most important and probably the headline is that the proposal suggests that Japan should vastly reduce the role of nuclear power in its energy mix. Now, nuclear power has been the absolute core of the way that Japan has gone about managing its energy security and

it's environmental and it's kind of competiveness issues which have driven its energy policy in the post war period.

In order to reduce the role of nuclear power, they've suggested introducing a 40 year limit to the operation of units, nuclear units and not extending those, also, not allowing the reconstruction or the expansion of existing units. So, we'll see a gradual reduction in the role of nuclear power over time and replacing that with three measures.

The first of those is to increase the role of the thermal, that is gas and coal as well as renewable energy sources as Mr. Okuya talked about. Secondly, pretty aggressive targets over the next 10-20 years in demand management, particularly in the residential sector. And then lastly, in order to try and promote the uptake of renewables, a comprehensive reform of Japan's electricity sector. Right? That means full retail liberalization and also the potential breakup or the separation of transmission from generation with, you know Japan currently has regional monopolies. Pretty radical.

How did it come about? So, the process through which the DPJ reached this conclusion plays, although you know it can look messy, I think that if you were to summarize it, then it plays off, it uses the same playbook that Prime Minister Koizumi used. That indeed Prime Minister Hashimoto used, that is that previous activist Prime Ministers have tried to use when they've tried to implement significant microeconomic reform into Japan's economy, okay? That means that they have avoided the kind of bottom up decision-making structure that's been -- and I'll give you an example of this in a moment, that's been dominated by people who a stake in the existing system. And they've tried to shift outside that by actively introducing new voices and by shifting the location of decision-making, okay?

We can see this going on in Washington with Congress with the deficit

discussion, for example. Where you choose to make the decision produces a very different kind of outcome in terms of policy and that's exactly the strategy that the current government has tried to use. Let me give you an example of what I mean by this. It's probably long enough ago now that I can say this without all of you throwing rotten fruit at me. But 10 or 12 years ago I guess now, I was based in Japan working for a firm that was pushing electricity liberalization in Japan. And most members of that firm who turned out not quite to be the smartest guys in the room after all.

And the reason that we lost that debate was because of the California mess, and probably our own incompetence to some degree as well. But it was also because it was very difficult to get a voice in the system, okay? Why was that the case? Because you had a very bottom up decision-making structure which was handled in a technocratic manner and which moved forward in an incremental way over a fairly long period of time.

And that's been the basic decision-making structure for microeconomic reform, for structural reform for Japan for a long time now. What it tends to produce is incrementalism. If you shift forward, if we characterize that as quiet politics and we shift forward to the way that the DPJ went about trying to put this proposal together, it's a much more akin to a noisy political process. As I said, borrowing from the kind of strategies which the previous LDP administrations have actually used, that is expanding the role of the Cabinet. Giving a special minister within Cabinet the key role in driving reform from the top down and explicitly choosing to insert new voices into the kind of design, market design issues.

So, for example, I'll give you a couple of examples. If you look, for example, at the expert committee which did the initial proposal on power sector reform, it looks very different to the committee which drove it 10 years ago. 10 years ago there

was a single new market entrant who sat on the committee but most of the other members were from either the existing utilities or from people who had a stake in the debate. What you saw in the proposal generation process for the DPJ was the inclusion of economists, the inclusion of legal scholars who have done a lot of work on anti-trust, investment analysts and so on and so forth.

So, it's a very different make up of, in terms of committee membership and it's not surprising given that that they reached fairly radical proposals relative to what has been put in place before. The other way in which new voices have been inserted or indeed have inserted themselves into the energy debate is through public opinion. It's no surprise that the Japanese public have been concerned about the role of nuclear power and this nuclear village that you keep reading about in the press. So, the DPJ carried out a fairly comprehensive survey of public opinion and you can see that a majority -- this is the data from a newspaper polling six months after the disaster.

You can see a large number of people wanted to reduce or remove the role of nuclear energy. In the survey data from July of this year, that number had reduced somewhat but there is still a majority of the public who want to significantly reduce let's say the role of nuclear energy. And this was used in a way of justifying the types of conclusions that the government reached over this proposal.

So, my third point is trying to answer the question of what's likely to stick here. That is, we've seen a very radical proposal for reducing the role of nuclear power and replacing it with thermal renewables and whole raft of demand management measurements. We've already seen contentiousness. The Cabinet on September the 19th refused to openly rubber stamp or put their hand call (phonetic @ 00:28:20) on the agreement which was reached in September the 14th.

We've seen Mr. Fujikawa who was one of the strong proponents and

drove this process forward not included in the new Cabinet which is being put together by the Prime Minister. And we have an election coming up. And if you look at the LDP and the people who are supporting Mr. Abe, there are strong supporters of the utilities and the existing energy structure within the kind of core LDP leadership now.

Having said that, it's my opinion that we're not going to return to the status quo ex ante and the reason for that is because I think that a lot of what has been included, if you remove the headline figures, a lot of what has been included in this proposal has actually already been implemented or it represents some kind of consensus between the political parties. That is, regardless of who in government wins government, we're going to see a similar set of measures and produced -- I've been given my second flag wave of death. So, let me be quick here.

If we're looking at the reduction in the role of nuclear power on the supply side, for example, the law establishing the nuclear safety commission, the article 43331 states that unit operations should be limited to 40 years. But during negotiations with the LDP over passing the law through the upper house, a clause was inserted which allows the extension of those units for 20 years if safety procedures are met.

So, in a way we have a law. Laws are harder to pass in Japan than the United States at the moment. So, this is established in law and it represents some kind of consensus between the parties which doesn't say 40 years. It actually says 40-60 years per unit. And that moves us well past the 2030 date.

Now when the rubber is going to hit the road with this is going to be when Kansai Electric, a large number of their units are going to come up in 40 years in this decade, so how that is negotiated and whether the nuclear safety commission extends the life of those reactors, there's going to be one signal we need to look for. This is my last, last slide. And the second area I think where there's general consensus is

over the broad implementation of phenontyre system in order to promote the development of renewables.

Solar or a phenontyres were implemented by the LDP administration, expanded by the DPJ. And there's reasonably strong support amongst the solar industry and increasingly amongst Japanese producers of wind turbines for these very, very attractive rates. In fact, I had provided some advice to a firm called GR Japan who do public affairs in Japan and they've received a lot of calls of interest about this particular scheme and how people can make some money on it.

So, to conclude there are big areas of dispute. There are big areas of agreement and perhaps we can talk more about the areas of dispute during Q and A. Thanks very much.

MS. SOLIS: Thank you very much, Dr. Hughes.

So, now we move on and, Mr. Campbell, if you could go next, please?

MR. CAMPBELL: Well, thank you very much Dr. Solis and thank you to Brookings for having us here today. This is a very, very timely panel discussion as our large group demonstrates. And I think Brookings has to be congratulated. They've proved to be extremely agile in staying on top of breaking developments in energy largely thanks to Charlie Ebinger here. This session is a very good example of that.

You know in the world of energy it's always something, right? It's one disruptive event, technology or policy after another. It's a war in Iraq. It's the Iranian nuclear bomb threat. The shale energy revolution and now we have the Japan zero nuclear option. And these developments are always global in their repercussions.

If Japan were to quit nuclear power, it will be hugely disruptive and we shouldn't kid ourselves about it. It's the zero option as Mr. Okuya and Llewelyn pointed it is not official but it has the potential to do two things, to handicap the world's largest

economy and undermine 50 years plus of US-Japan partnership in nuclear energy with consequences for Japanese and Americans. We have to remember that Japan is the single most important partner to the United States in nuclear energy. It's a nuclear diplomacy in maintaining the NPR, I don't mean Big Bird and General Air, I'm talking about the compilation (inaudible @ 00:32:50) of course. And in nuclear commerce, extremely important, international power markets, the US companies, the Japanese companies consistently and very often partner to meet the global demand for nuclear power plants around the world.

We may not have a nuclear renaissance in the United States but there is one going on around the world and many new power plants will be built over the years. American companies and Japanese companies want to be there but it could be quite difficult if Japan zeros out nuclear power.

Now for about five years now I've served as a Director of the US-Japan round table on nuclear energy. It's a public policy platform for US and Japanese who do business in the nuclear space. Members include companies from all sides in all phases of the nuclear power industry from the very beginning to the end. The round table gives me a window, if you will, on the experiences and the views and the concerns of both US and Japanese companies. And I think they're interesting in this case. And it's the view of many round table members that the zero nuclear option threatens the very underpinning of the US-Japan partnership to assure a safe and secure nuclear expansion in the world which is coming.

Many observers, including our members and some of our experts, fear that the world will become a very dangerous place with the US and Japan barely able to compete. Not real players in the nuclear game, something that's likely to happen if we really -- if Japan zeros out nuclear power.

But of course the zero option is not a done deal. And as you heard from Okuya-san and Llewelyn, much is in turmoil and flux. But I would argue and I think our members, many of them, believe that in fact zero option is not even achievable given the practical realities for Japan, a major economic power, an export economy without indigenous resources in a competitive global market where energy costs are an important component of the cost to manufacture.

Zero option may seem like good politics to the DPJ but I doubt that it's good policy. And if you ask our members, they'll tell you that, they'll give you about six reasons why it's not. And they are, number one, it's too costly. Importing LNG and relying on renewables is too costly for an export economy. You know the trade deficit as we saw a moment ago in Okuya-san's slides soared the first half of 2012. They have a record trade deficit now approaching $32.1 billion. Five times greater than the deficit a year earlier.

The energy cost of manufacturing will push up export prices, prices of export items at a time in which Japan's automobile industry is being challenged by the Koreans. Eight point four percent in Hyundai sales, I think he bought one and Toyota down one point three one percent in sales. There are a lot of reasons for that obviously but it certainly doesn't help to make the cost of production more expensive because of rapidly increasing energy prices.

Number two, zero option doesn't work because renewables are inadequate. This will be an unpopular thought but when solar and biofuels are too expensive and lack the energy density to adequately supply the power needed. And we may find that they make an important contribution over time. They can make a contribution but in the near time hardly.

I know Chris Slavin was from the World Watch, he would say that the

Germans are nuclear free and they get it done but they can rely on Russian gas, their pipeline and the French nuclear powered electricity. We definitely do not have ready access to Russian gas via pipelines or French next door.

And number three, the zero option doesn't work for Japan because it undercuts Japan's progress in combating global warming. I think Okuya-san pointed that out. Japan can't meet its Kyoto targets with greater dependence on LNG, which I think will be necessary. The Kyoto protocols call for 25 percent reduction by 2020 and with an average of six percent a year I think they're seeing a 17 percent increase was in March 2011-March 2012 they saw a jump. Obviously, they emitted 439 million tons of CO2, a big increase over the previous year.

And I think there's been one government study so far by the Japanese government that says that the best they can do is maybe 16 percent reduction instead of 25. So, it inhibits and hurts their attempt to deal with climate change.

Number four, the zero option reduces Japan's standing, its geopolitical influence in the world, I think important for a nation of its size and important for our world economy. It weakens Japan's leadership role in the global nuclear renaissance and related non-proliferation efforts. Therefore, it weakens an important ally of the United States in those regards. The basic bottom line, I think, is in both the United States and Japan, if you're not an industry leader, you're not going to be at the table in the future proliferation regime, the rules of the game, the nuclear game in a period of rapid expansion, developing countries around the world. Many without a safety culture, and this becomes very reckless and a risky proposition at least from some perspectives.

Number five, zero option hurts the American nuclear enterprise, energy that's from American companies. US nuclear are owned or they are in partnership with or suppliers to Japan's nuclear industry. It used to be the other way around. But we now

lean heavily on the Japanese industry to which the zero option is a crippling blow. How do you sell reactors abroad if you can't place them in your own country? The US brand is largely carried to the world by Japan, Toshiba owned (inaudible @ 00:38:54) partners with Hitachi. So we see, or at least (inaudible @ 00:39:00) US competitiveness. Loss of sales here as well as in Japan, and eventually loss of jobs at a time when we're very sensitive to that.

And finally, number six, zero option doesn't make a lot of sense, at least to our members, both countries lose the next generation of human capital when it comes to nuclear expertise in both countries. Very, very important at a time of nuclear expansion worldwide and then we already have an aging nuclear skilled workforce. It disappears. The younger men and women go to China, Korea and Russia.

We're already reading in the Japanese press about a brain drain. Apparently the Koreans and the Chinese are offering between 50 million and 60 million yen per year to nuclear engineers in Japan. There's real concern over the loss of human capital. China and India alone plan to build 80 and 70 new nuclear power plants respectively by 2020, that's a $1.9 trillion market by some estimates. Something that Japan would miss out on an enormous economic opportunity for Japan and concurrently for the United States.

So, at the end of the day the zero option probably won't take effect would be my argument because it doesn't make sense for Japan. And in closing, I would commit to Japanese government and all those policy makers who have to make this decision as they go through this long process, the advice of Governor Bobby Jindal, the governor of Louisiana during the BP deep water oil crisis you'll recall. He warned as the President had begun a six month moratorium on offshore drilling which is now lapsed and is no longer called for, but he warned us don't turn environmental disaster into an

economic catastrophe. Good advice for Japan as well. Thank you.

MS. SOLIS: Thank you so much, Mr. Campbell. And now we move to Charlie Ebinger, please.

DR. EBINGER: Good afternoon, ladies and gentlemen. I'm going to keep my presentation short because Mr. Campbell covered a lot of the points I would agree with. But before beginning I want to congratulate Dr. Solis. For those of you who don't know, she's our newly installed Head of our Japan Chair and this is really her first formal event and I think she's done a marvelous job getting both other good speakers and such a distinguished audience. So congratulations.

I'm going to pick up on the point of what happens if Japan goes to zero option in terms of the global regime for both commercial nuclear power and nonproliferation. Because I am deeply concerned that Japan has not addressed the question or rectified the stark differences that obviously occur the new policy if it is implemented on how on the one hand they move to back off of commercial nuclear power. And yet, on the other hand having been in the forefront of research for commercial nuclear reprocessing and plutonium recycle what happens to that. They have been, you know, albeit with problems. Albeit at a very high cost to Japanese society but they have been along with the French in the forefront of trying to prove that the nuclear waste from the conventional fuel cycle can be recycled with the depleted uranium and the plutonium created in the once through cycle, recycled for productive use in a world economy of the future.

And I would worry that, if along with the zero option that ultimately reprocessing gets knocked out as well, we will lose a tremendous opportunity for the future, albeit perhaps the very long future of the next generation of nuclear fuels. And I know that's a very controversial statement, that many would disagree with it, but I think

it's something to think about.

And the point Mr. Campbell made about Japan's leading role along with the United States in the global nonproliferation regime, I think we have to seriously think about if Japan backs out of the nuclear market, and I think they have to. Because I don't think if they don't have the maintenance market for the existing reactors or that slowly erodes and no new reactors coming in, they aren't going to keep up the technological lead that they have historically helped the world to do with generation III, generation III plus and generation IV reactors on the horizon.

And I think as Mr. Campbell said, it's very likely that this will not be good news for GE and Westinghouse and other smaller nuclear vendors in the United States given the lengths they have with Japan's nuclear industry in terms of remaining competitive in the international nuclear marketplace. So, I can envisage if the zero option went into effect that we effectively have a world of nuclear commerce in the future because a lot of countries as was alluded to are embarking on nuclear power plants whether we like it or not. Led by such countries as South Korea, China, Russia, perhaps India and a handful of others all predominantly state owned entities which in the scramble for international nuclear commerce, I think, is at least legitimate to ask will these countries have the same commitment to nonproliferation objectives that Japan and the United States have had over the last 40 or 50 years.

We hear in the Japan model about they'll buy more LNG, that the United States is going to become a big LNB exporter as is Australia and a handful of other countries. It's clearly the case that the United States is going to become, I hope, an LNG exporter but if you really look at the numbers involved, it's far more sobering than some of the glossy forecasts that have come out of certain analyses.

We completed a study back in May suggesting that we think it's very

unlikely that there will be more than four BCF a day by 2020 coming out of the United States, growing to some six BCF by 2025. And we also show that by 2020 we'll be a very difficult market. There will be great competition from Australia, from new gas supplies coming out of Mozambique, Indonesia, Malaysia, Papua New Guinea. There's going to continue to be tough competition with coal. So, I think for Japan to think that coal and natural gas is going to be an easy fill the gap for nuclear power should at least be looked at much more soberly than it has to date.

The one great potential, I think, looking longer term but probably not till the 2025 period that represents a tremendous opportunity for cooperation between our two countries would be a very substantial LNG project out of the state of Alaska. But you know this has also been talked about for nearly 40 years. There is movement in that direction now, but one shouldn't be too sanguine that that is going to occur.

Back in 1990 Professor Socolow at Princeton made the famous Socolow Wedge Theory in which he showed that for based on the goals of the United Nations, climate change, reduction strategies, of what the world had to do by 2050 to by 2050 have global emissions going down. And if you go back and look at his wedge theory, the growth of nuclear power was going to be huge. Something in the neighborhood of 450-500 new nuclear power plants. And the growth of renewables was going to be huge.

But as Dr. Campbell said, I question whether if you go back and look at those numbers, whether the growth in the renewables in the pie chart that were projected, combined if renewables had to replace the loss of nuclear power in that pie chart can do the job. And singularly there was tremendous forecast in that pie chart about how the world was going to have carbon capture and sequestration in droves. Well, as you all know we have almost no carbon capture and sequestration plans for coal. And while we're rushing towards natural gas in this country, and elsewhere in the

world where shale gas, I think we ought to remember that this is a carbon emitting source and at some point we've got to prove carbon capture and sequestration works for natural gas. Or we're just postponing the day when the CO2 problem is going to come back to bite us.

So, in closing let me say I think Japan, as a major export nation, risks becoming as a high cost energy producer less competitive in global markets. I think the threats to international nuclear commerce remaining in the hands of people who have acted responsibly since the dawn of the nuclear era remains problematic with Japan and potentially the United States becoming less significant actors. And I think we need to be very sanguine about thinking that wherever we cut back on nuclear power, not only in Japan but Germany that somehow we're going to be able use lots more fossil fuels and not have major implications for global climate regime.

And if Japan were to get locked into more coal and LNG what happens if down the road a global carbon tax comes into effect and all of a sudden they become a high cost producer because they're now locked into much greater volumes of fossil fuels? Thank you.

MS. SOLIS: Thank you so much. I would like to thank the panelists for really excellent presentations and for also being very conscious about keeping their time. And that has left for us enough time to actually now have, I hope, a very spirited back and forth of questions and comments.

And once I open to the floor, I know that I may not have a chance so I want to put my two questions how. And then the floor will be yours.

And my first question was really inspired by these interesting framing, I think, that Llewelyn put forward about the noisy politics. So, my question here is if that is the new normal? Have we crossed the threshold whereby now this degree of larger

inclusion of public opinion will be the way in which the government conducts many of these key important decisions? Or do we think that over time there could be a reversion back to the more technocratic way of addressing these questions.

And the second related question, but it's really for everyone in the panel, is quite simply can the public trust be regained? I think that it was really striking to see also Llewelyn from your graph that the percentage of people that said they want to reduce nuclear went down quite significantly from 90 to 50. Why is this the case? Is it just that we have to give it more time for people to learn more about the facts? Or do we think that there's a hardcore view of people in Japan that will not be persuaded that nuclear power can be safe?

And I say this because I think that now the government commissions that have looked at the Fukushima incident have concluded, government and non-government commissions, that it was a manmade accident. And therefore in theory if we were to raise the standards of security, safety, design and so forth, we could perhaps envision a nuclear plant that's more resilient and therefore that these public concerns could be addressed. But I'm not sure that these people can be reached. I'm not sure that they will be persuaded. There is this concern with the nuclear village. And certainly the way in which we have been hearing all kinds of things from the Japanese government lately that doesn't create assurance that, you know, we have a very objective coherent way of making these decisions.

So, I would like to collect a couple of more questions from the audience and then give the panelists an opportunity to respond and to also address each other. And then, we'll go to a second round of Q and A.

So, Mr. Fleming please.

MR. FLEMING: Thank you. Very, very interesting panel, I think

particularly the information on the politics, the new politics in Japan which really are revolutionary. My question is regarding the economics. You know in my view, even the nuclear phase-out plan that was put forward by the Cabinet is really still, you know, very, very cautious and I think, you know, a much slower transition than it really needs to be based on what's happened in other companies in the world that have taken the kind of sort of ambitious commitment that Japan has taken.

And of course, you know, the most obvious example of that is Germany which had a commitment and interestingly it was also spurred by a nuclear catastrophe. They got a fair amount of radiation out of Chernobyl and that was it as far as the public was concerned about nuclear in Germany. And they have taken renewables from four percent of the electricity supply in 1995 to 10 percent in the year 2000, and over 20 percent today. And almost all of that addition is either wind or solar. Now, I just ask why can't it be argued that Japan is not capable of doing what Germany did. I mean they're both very, very strong industrial companies. Both have fabulous technology.

Japan actually has substantially better renewable resources than Germany is really sort of third rate in terms of its resources. Japan has excellent renewable resources plus Japan has relatively high electricity costs, some of the highest in the world which makes the renewables more economical. And then here's the real clincher. Germany started to do all of this 20 years ago when things like wind and solar were fabulously expensive.

The cost of solar just in the last three years has declined by two-thirds. You know over that whole period it's declined by more than 90 percent and wind has probably gone down by at least 50 percent over that period. So, particularly given where public opinion is in Japan, and Japan is a democratic country no matter what the nuclear village wants to do I think ultimately in a democratic country the people are going to

prevail. So I just am curious as to why the Japanese government is not taking a more ambitious forward looking approach here.

MS. SOLIS: Thank you very much, Mr. Fleming. So, I'll let the panelists respond and then we'll go for more Q and A. And I would like to ask you to please identify yourselves as I ask you to pose your question. Thank you.

Reactions? Would you like to --

MR. OKUYA: Regarding the introduction of the renewable. Now I showed the cost of structure of each primary energy in my presentation in the last slide. Renewable still is very expensive. So, as I mentioned in 2003 that we introduced a new system. METI gave the obligation to the utility companies to introduce a certain amount of renewable.

And we are trying. Of course, after the first oil shale and the second oil shale, we started a various kind of energy projects to push renewable, other energy conservation. Logically speaking, we have an interest to introduce renewable, no question about that. But on the hand, so our geopolitical situation is very different from Germany, frankly speaking.

In the case of the Germans, they are involved into the broader great system in Europe and they are introducing gas from Russia by pipeline. So, the structure is very different and to use wind for example, so I am not an expert about that area but we also try to use, introduce wind in some areas. But how about the efficiency and how about the cost of structure is still questionable. So, because we have big (inaudible @ 00:56:13) speaking. But we try to break through the cost of structure of renewable. Because of that we decide to introduce a (inaudible @ 00:56:18) system.

So, we are serious and we introduce a (inaudible) to introduce what's a (inaudible @ 00:56:32) in renewable industry but we need the time. So, thank you.

DR. HUGHES: So, it's a really interesting question. We've already had a range of very different opinions put on the table. There are different ways, I guess, to answer the question and I'm only qualified to answer some of those.

There's the technological constraints, there are potential economic constraints which was the gist of the first part of your question. There's also the kind of public policy constraints and one of the complaints of industry groups which represent particularly the wind association, that is non-solar renewables let's say, is they have had a difficult time in getting connection to the grid.

And so, part of the argument that the DPJ has made is that power sector reform is crucial to increasing the role of renewables within Japan's electricity market. That is by revitalizing the wholesale market it does exist but their volumes are very, very low, and so, revitalizing that including by increasing the powers of an independent regulator to regulate the management of that particular market.

But I mean that's one set of constraints, right which, from a kind of public policy perspective. You know the relative bargaining power of groups which might want to shift the regulatory structure that would enable the faster uptake has traditionally been very weak within the Japanese system.

The other piece of it and these targets are very aggressive. The subsidies are great but there are also a whole set of problems which will be laid out, associated with access to the lands where a lot of wind power projects in Hokkaido and in Tohoku, particularly Hokkaido which is one of the areas where wind power has got the best prospects according to industry, that there needs to be a series of regulatory changes associated with access potentially to national parks and for geothermal, also national parks and also the kind of Onsen areas and so on and so forth.

So, there are a number of kind of regulatory sticking points which take

time to get through aside from the market power questions which you could also talk about. You perhaps Charlie or others might have a point about the difference between nuclear running as base load and the kind of intermittent supply that solar and wind represent. I know the government has been promoting battery technologies for a long time, for example, as their answer to that because they're not indeed Germany and next to France's nuclear power stations.

MR. CAMPBELL: If I could just make one quick comment. I actually used to be a wind power developer in Germany. I was Vice-Chairman of a little Dubai based company. And we built a wind farm in Bremerhaven in conjunction with the Government. The tax credits and the green credits at that time were so generous that we amortized our investment in about 13 months.

Now the Germans, and I'm not putting them down. They've done wondrous things with renewables. Created new industries and employed people and so forth but you hear a lot of Germans say, you know it didn't raise tariffs for consumers. And this is true for residential consumers mainly and small commerce. But it raised, the German government has by last estimates, it may be higher now, has put something in the neighborhood of 70 billion euros into subsidies for wind and solar.

So, it's been costly somewhere along the line. Now they made a political decision and I think Chris is right to point out that was perhaps a courageous one. But this idea that somehow feed in tariffs occur without costs to somebody, if it's not an individual consumer or rate payer, it's the federal government or the state government. And so, I just want to caution that when you start talking about these very generous feed in tariffs that Japan has, it's going to costly to somebody in society.

MS. SOLIS: Okay, so now who would like to ask another question? Yes, please. And I think we have a microphone coming your way.

MS. SCHMITZ: Thank you. My name is Mariko Schmitz. I work for JICA. I'm also a former student of Professor Ebinger's. Just a point of clarification, Professor Ebinger. About the LNG and coal exports, you said that if there is increase in exports of LNG and coal coming out of Southeast Asia, it would be problematic for Japan to fill their gap.

Now, why is that?

DR. EBINGER: Excuse me. If that's I said, I misspoke. What I was trying to say is that the market is going to be very competitive for both LNG and coal, which is the idea that everybody in Asia seems to think because we have low costs natural gas at the well head that we're going to cost export low cost natural gas to them. I think lower costs than they're currently paying.

I would rather suggest that we'll probably export it lower than the competition but not at a low cost. If it's $14 in Japan we aren't going to give it away at 9.75. We'll charge 12.75. And so, this idea that it's going to be a cheap source, US LNG exports are going to be a cheap source, I think has to be reexamined.

You've got India clamoring for LNG. You've got China clamoring for LNG. Increasingly Vietnam, so you know the price is going to be very difficult for Japan and it's going to mean that Japan is dependent on high cost energy imports for oil, for coal, for LNG, forgoing this. That was the point I was trying to make.

MS. SCHMITZ: Thank you.

MS. SOLIS: Thank you. Yes Jennifer? Right here.

MS. SKLAREW: Hi, Jennifer Sklarew with George Mason University. Several of you mentioned global warming as one of the issues that would come into play in the future of Japan's energy scenario. And as Dr. Hughes mentioned there's a new process emerging which may or may not stick in which there are voices on different sides

of issues that are coming out.

And so I'm wondering what you all think of the role of global warming and energy in Japan in the future. Because up until now, it's been a priority but there's definitely been some press in Japan indicating that that may no longer be the case across government industry and the public.

MS. SOLIS: Okuya-san we all look at you, so.

MR. OKUYA: So, it's (inaudible @ 01:03:36) so I have not decided a career target, how to manage the global warming issue. So, it means that we have not yet changed our position. But on the other hand sort of because we cannot apprise the previous conditions to Japan's present situation so we have to think. We have to think.

But all panelists presented about how complicated and how serious programs we have now. So, that now, I'm sorry but I cannot provide a correct answer to you, a tangible answer. So, the expansion of renewable in Japan and the try to accelerate energy saving is one of the ways but of course, we have already introduced one of the best systems in the world. Still, in the case of renewable maybe we have room. So that in this strategy, in just come the strategy that we mentioned that we will push the expansion or renewable. But because of the financial position that still we need time. I'm sorry but actual situation is like this.

MR. CAMPBELL: I might just add to that myself. I think we have to understand too that the debate is just getting underway. Fukushima was, scared a lot of people. The polls are very adverse to nuclear power but that will change over time as it did with the BP offshore crisis we had. It will take a lot longer because we learned from the BP experience that we didn't destroy the Gulf and we didn't destroy the Florida beaches and so opinion softened.

We just now have seen the business community weigh in in Japan in the

last month. And it changed, I think, the course of the Cabinet's decision-making a bit and delayed any premature action. I think this is a long process and the Japanese are meticulous in their decision-making. As Llewelyn pointed out, their sort of technocratic approach to things, they have a very systematic way of working issues.

And I think it's going to take quite a while. Also, it remains to be seen how much damage was done. We know it was apparently human error rather than technological error so the technology's okay. The question can you regain the public trust of people who manage this process and I think that can be done over time. But debate will continue and I think it's a bit premature to suggest that these high antinuclear sentiments will stay on as people begin to factor in the climate change, jobs, competiveness, the economy, the competitiveness of abroad. And I think all those factors will start coming to play and they're just now starting to come up. It's going to take a while.

DR. HUGHES: So, if you look at the evidence so far when the question has been asked about whether the government will choose competiveness or climate, then they've fallen on the side of competiveness rather than the climate. That is a very aggressive statement about Japan's climate targets I think it was 25 percent from 1990 figures by 2020, never going to happen but the Japanese language is great at sub clauses. And there was a sub clause included in this statement which said as so long as other states also came to the party.

And so, there's a kind of get out of jail free card associated with taking on the economic costs with what was a very, very perhaps overly aggressive target. If you look at the way the climate is dealt with in the proposal that's been put here, once again climate has come off second best relative to the other public policy goals. That is coal has been included as a potential base load and replacement of nuclear power. And the

way to manage the kind of chrism of the climate externalities associated with that is to promote Japanese coal technology internationally.

That is to kind of internationalize the fact that Japan would be significantly increasing its emission. So, once again, it's a non-answer but I think what it demonstrates is when those pocketbook issues or domestic issues take precedence every time.

MS. SOLIS: Yes, Kevin?

MR. MAZUR: Thank you. Kevin Mazur with the Energy program here at Brookings. Thank you for your presentations and your perspectives so far. My question also relates to climate. Charlie mentioned the Socolow, Pacala Socolow wedges and it was clear even before Fukushima that by any measure the global economy was not meeting its stated climate targets.

And if you'd sat around in early 2011 and had to try to devise a scheme or a scenario under which the necessary technologies were developed to address global warning, you would probably have to say that something massive would have to happen. Some one, major economy would have to find itself in a position where it would have to divert hundreds of billions of dollars of investment into green technology to bring the cost to increase the distribution and adoption of those technologies.

So, it seems obviously Fukushima was a disaster by every measure. But in the wake of that, in the wake of the nuclear discussion now in Japan, it seems like there is a platform for a country that is on the cusp of or in the position where it can allocate hundreds of billions of dollars, the necessary hundreds of billions of dollars to renewable energy development.

Is there any way, I'd be interested in the views of the panel on this, is there any way that Japan's situation could be seen as an opportunity for the global

renewable energy industry and to Llewelyn's last point the link between climate and competiveness as a source of future competitiveness for a global economy that has to become lower carbon if it's going to be around.

MS. SOLIS: Thank you very much. Before you answer that question, I would like to take two more questions just to make sure. Time is beginning to run short. I have two hands here. One right next -- you, sir and then the other person in the row behind.

And then I'll ask the panelists to be very concise in their answers so we can then go to other people as well. So, I think he already has the microphone. Yes, sir?

SPEAKER: So, we've talked a lot about the economic and environmental costs. There is also a geopolitical cost to importing a lot of energy. I would like it if some of you could address that.

MS. SOLIS: Thank you.

MR. WINTERS: Steve Winters local researcher. I'll make this short. Recently a Court in the US has overturned the ruling decision of the Nuclear Regulatory Commission here on the grounds that you just can't postpone dealing with how to dispose of the spent fuel on the assumption that decades from now we'll find some solution to this. So, I'd heard the head Commissioner speak on this and of course she's quite perturbed by that development.

But obviously this is the same situation in Japan with the spent fuel rods and so forth and so on that we hear about at Fukushima. In fact the real danger of Fukushima is probably what might happen if they have another major earthquake there and that pool collapses and gets on fire and so forth and so on. So, the question is here for decades we have said, okay we're going to find some technical solution to what to do with all this spent fuel. But we haven't gotten it yet. But you know technology will find a

solution and so we're going to go ahead with the nuclear program on the assumption that someday we're going to find a technical solution.

And my family worked decades at Hanford Facility in the US trying to figure out a way to deal with our spent fuel and they never found it. So, the question is on that line of reasoning, the argument against renewables is well they haven't quite become expensive. But honestly speaking, if you think about it what is more likely and to connect to this question. If the same effort were put into advancing the technology on renewables and so forth and so on that would be necessary to solve another technical problem, what to do with all this spent fuel, which is more likely to succeed? And I don't think anybody could honestly say it isn't more likely that that effort put into renewables would succeed.

MS. SOLIS: Okay, thank you very much. So, very concise answers from the panelists please and then we'll go to one last question at least.

MR. CAMPBELL: Geopolitics, I think it's a very serious issue. If Japan is importing more oil, more coal, and more natural gas, excuse me. If Japan is importing all three major fossil fuels in greater quantities, this is occurring at time of growing Chinese bellicosity about sea lanes in the South China Sea. I would be deeply worried as a Japan foreign policy strategist that my country is going to become even more dependent on fuel that is may be subject to political disruptions by a potential adversary.

MR. OKUYA: So, mainly I would like to make a comment to the renewable expansion as presenting innovations, opportunities like that. Maybe yes from the one aspect but on the other hand the (inaudible @ 01:12:12) innovation that we have to (inaudible @ 01:12:16) the industrial activity in Japan as well. So, firstly, so from the economic perspective in general we have a lot of programs, energy program and a higher in operation and the competiveness of our other mainly Asian countries. And such a kind

of situation, we have to keep our living, industrial activities like that, that we have to introduce a balanced answer to give our answer to such a kind of complicated situation.

So, we would like to push new industry through the renewable expansions like that. So because of that, the strategy of course mentioned on the amount of the coming investment to push renewable or energy savings are like that. So we have, we would like to introduce such a kind of effect of course but we have a lot of programs that we have to find solutions.

And regarding geopolitical risk yes that's a very serious problem as Dr. Ebinger mentioned. So because of that we talk with American friends to introduce their energy. Of course, Russia, Australia is the way we will be able to pass straight to America. Also the Middle Eastern situation will likely give a serious impact on Japanese economy as well as other East Asian countries as well. So, we have to take it seriously that we have to discuss how to introduce robust energy supply structure over the world, that's one of the big, big (inaudible @ 01:16:05). So, we are going to have a discussion with our American friends how to manage this program.

This program is not only for Japan but also other Asian-Pacific countries facing similar kind of problem. So because of that nuclear is one of the solutions and renewable may be one of the solutions. We have to see that all programs that originally why Japan started to introduce nuclear is from the geopolitical situation, geopolitical problem. No question about that.

DR. HUGHES: I would just add to all of that that we're looking at an international system which is going nuclear at least in the production of power with a nuclear renaissance around the world. Not in United States obviously because of cheap gas and for a lot of other reasons. But I think Brookings has just done or about to release a study and I don't want to step on your toes here, I'd like to hear about it. But apparently

a study of the capability of emerging countries and economies and governments in developing countries that want nuclear power, their capabilities they have to maintain the safety culture, to provide the expertise, to manage safely run nuclear power plants.

And if that is the minimus and the United States and Japan are not at the table and the Russians are selling it, what kind of world do you get? But I think it's very interesting. You might want to comment a little bit on that Charlie.

DR. EBINGER: Just very quickly that's exactly what our study shows. It's focused primarily on the Middle East and some bordering countries to the Middle East. But it basically shows there is no technical capacity at the sufficient level to run these and if they aren't run by the international vendors who have historically been in the forefront of safe operation and dealing with issues relating to waste and security, it's not a pleasant world to think about.

DR. HUGHES: And I would submit that in a dangerous world with terrorist organizations and terrorist networking and all of that, that we could have a nightmare scenario in the international system in the next 20 years if this is the future.

MS. SOLIS: So, I would like for you to make your question please?

MR. USHIJIMA: My name is Ushijima from JVIC and my question is related to the regulatory issues as also the lessons from Fukushima. And I understand there is three different bodies in Japan has completed their review of the Fukushima events and now there is several findings. And so I guess in the future, the Japanese government or regulatory body will say something based on those findings.

And at the same time I think when we discussed the law of the nuclear power and also the public acceptance in the Japanese society probably we had better about what is the new regulatory system. And honestly speaking probably there is some general distrust toward the government as well as the regulatory system so far. So now,

the Japanese government decides how to set up the new regulatory body but probably the government as well as the regulatory body need to talk to the Japanese people. And then increase their public acceptance of the safety of the nuclear issues.

So, I want to know, so that is my basic understanding and so what I want to know is actually what is the two occasions, what is the government's plan in that regard? And also, I want to know the other panelists' opinion to the extent possible, is there any possibility between Japan and United States to work with in that area because I understand you have NRC a very robust regulatory body and also you have the association among the operators. So there are the three dimensions, regulatory, operator and (inaudible @ 01:20:42).

So, for those three dimensions how our two countries can work together?

MS. SOLIS: Thank you so much. Such an excellent question. Less than one minute left for our panelists to address it. So whoever would like to take and start peeling the onion for us?

MR. OKUYA: So, thank you very much. And this question is related to Mireya-san's questions regarding how to build the public credibility on the nuclear issues. This is a personal view that after three months the United States introduces a lot of way that introduce (inaudible @ 01:21:16).

And Japan also believes that we learned a lot of things from the American experience after the three months but now we recognize we have to strengthen the communication with the public. And we succeeded in introducing a new regulatory authority and that also, that committee that has a very independent position from the Cabinet to let's say to receive the credibility from the public. But maybe we need time to build the credibility to the regulatory agency firstly. And also we have to strengthen; we have to introduce a new way to communicate with the public about not only nuclear but

also other areas.

Actually, DPJ government also makes a lot of effort trying to introduce a national dialogue style to discuss about the energy programs like that. We tried various things. Right or wrong, no one has the answer now but we are trying and we have to push. And this area is one of the most promising areas to make a corporation with the United States.

MS. SOLIS: Thank you so much. We really are out of time. But if you, Dr. Hughes if you want to make a superfast comment because they are about to kick us out I'm sure.

DR. HUGHES: So, the typical model for regulating industries in Japan has not been an independent regulatory authority. And the Fair Trade Commission if you're talking about antitrust is an occupational import which has historically been extremely weak in Japan.

There is an example of a successful independent regulatory body which was established in the last 10 years though and that's the Financial Supervisory Agency. So, to my mind what you need to look for is the number of personnel but also what the incentives for those who are working within the organization itself actually are. So, in addition to talking to colleagues in the US and so on and so forth, there are some interesting lessons perhaps to learn how the FSA in Japan managed to achieve a relative degree of independence. Perhaps there's something to take from that for the nuclear regulation as well.

MS. SOLIS: Thank you so much. I would to ask you to please join me in thanking the panelists. They've done a terrific job. Thank you.

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