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Transcript

CAN NUCLEAR REGULATION BE CREDIBLE?

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ANNOUNCER

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ARIEL LEVITE

Good afternoon to you all. Thank you for joining our panel on nuclear regulation and how to make it even more effective in light of the challenges we are facing. We have an eminently qualified panel to deal with those issues.

We'll try to be a little bit challenging in pressing on those, but I think the question that was put in front of us is a bit provocative – can nuclear regulation be credible? I think it ought to have been, can nuclear regulation be more credible.

Let me try – and I think the panel members are well-known, but Allison Macfarlane who is Chair of the NRC in the United States, Jukka Laaksonen, who was the chief Finnish regulator and the head of the European Regulators Organization, and more recently has been working with ROSATOM, and Jason is actually now in active duty with the Canadian regulator and is the vice-president there.

What we will try to do together is to try and check how we are doing on a few of the most acute challenges that we see in nuclear regulation today and those span over regulation of ageing nuclear power plants, and I think we're fortunate here to have also Ambassador Rafael Mariano Grossi, who was the President of the last review of the Convention on Nuclear Safety, which very much tried to come to grips with that challenge, and so on.

That's one issue, how do we deal with the issue of nuclear waste, particularly in light of the slow pace of nuclear decommissioning, so both no nuclear waste and irradiated fuel, given that very few countries have actually moved ahead in the area of repositories and interim long term storage of waste has become a much more enduring issue for practically everybody.

That's the second issue. The new reactors, the new power plants, how do we deal with that challenge, particularly in countries that have neither experience and regulators, nor a lot of money, and I think a particular subset of the problems in those countries is can they regulate? Can they license new power plants, and can they license new power plants that are first of a kind? An issue that has come to light in quite a few of these countries and so on.

How do we deal with the situation in the nuclear world, where, unlike the FDA and the FAA on aviation and drugs, there is no harmonized standards and so on. There are some IAEA guidelines and things of that nature but on the whole, we don't have an equivalent institution of that nature.

Lastly, the regulatory challenges associated with OSMRs, particularly if you think that where they're going to get licensed and where they're going to be built, may not be exactly the same because many of them are actually intended for the export market and how would the local regulator be able to deal with this is not a trivial issue.

What we have agreed to do by way of ground rules was to have opening remarks on one or more of these issues by the panel participants, then we'll ask them to focus maybe a little bit more on one of those issues and then I'll open it for Q&A and have Ambassador Grossi at his vantage point on some of those issues as well. Without further ado, Allison.

ALLISON MACFARLANE

Is this on? Yes? Good, nods from the back of the room – that's good. Thanks, Dave, you're my check. Thank you very much, Eli, for the invitation to be here and be on this panel this afternoon. I appreciate it and I think it's an important issue and I do appreciate your edit – more credible. How do we make regulation more credible, because I think it's already credible to a degree now.

But as you point out there, I think there are a variety of challenges facing the nuclear industry right now, on the front end in terms of acquisition and construction operation of plants. In the operating side, obviously Fukushima pointed out some of the challenges there and there were a number of issues around credibility with the Fukushima accident, and regulators now are continuing to implement lessons learnt but they have to do so in a credible way.

Of course on the back end, there's no country right now with a credible final solution that has been planned all the way through, and many countries struggle. The United States is an exemplar of that struggle.

In terms of credibility, I think it's an issue of great importance and without a credible regulator, there will be no public trust of the regulator or the nuclear industry, and if there's no public trust, there won't be public support for nuclear. I think that's how it goes.

Public support is also lost when a regulator is not truly open and transparent and when the public sees different countries implementing regulations differently or having different regulations, then they start to question why, which brings us to the issue of standardization.

I think we saw an example of this issue as what happened during the Fukushima accident when different countries suggested different evacuation zones. The US and Canada suggested 80 kilometers, Japan, 20 to 30 kilometers, France essentially suggested hundreds of kilometers because they suggested their people in Tokyo evacuate. That damages credibility, I think.

This brings us to the issue of standardization, which you mentioned, and we had the recent diplomatic conference for the Convention on Nuclear Safety, in the aftermath of the Fukushima accident, where the Swiss proposed an amendment to the Convention on Nuclear Safety, which was ultimately not accepted and instead the Vienna Declaration, which I'm sure Ambassador Grossi will talk about a little bit a little later.

I think one of the fallout, if you will accept that term, of the Diplomatic Conference and of the CNS Diplomatic Conference is that there's now, in some areas, I think, an impression that there are great differences among regulators, and I think this is damaging. Some have pointed to the EC safety directive as the way to regulate and so I think we need to address this potential rift among the different regulators and I think we need to do that by working together.

There is no one correct way to regulate. There are multiple ways. There's certainly best practices; those should be shared. The wheel should not be reinvented, as I emphasized many times when I was chairman, but I think it's very important for the international regulatory community to work closely together and to learn from each other to the degree that they can.

But I think for a regulator to be credible, the most important thing is for the regulator to be independent. The regulator has to be free of political and industry influence, the regulator must be properly funded and must have adequate expertise on its personnel. It must have the full backing of the government – the government must buy into the idea of an independent regulator. It can't be seen as taking direction from parts of the government.

For instance, just because it might be in the national interest to develop nuclear power, it doesn't mean that a country can rush and acquire it without developing an adequate, independent regulator. The regulator also must have the ability to enforce the regulations, so that if they are concerned about a plant's operations, they have the ability to shut that plant down, otherwise they are not credible.

Finally, I think, a country puts itself at risk without a credible regulator, a credible, independent regulator. It puts its public health and its economic interests at risk without that, and I'll end there.

ARIEL LEVITE

Thank you very much. I gather that by putting an emphasis on what ought to be is what exists. We're not just talking about Japan pre-Fukushima, as there were some deficiencies, Jukka.

JUKKA LAAKSONEN

Yes, thank you, Chairman. Good afternoon, from those topics which our chairman suggested, I chose to make my initial input on the global regulatory challenges that are associated with existing ageing of a nuclear power plant fleet, and I'd like to make first a very short overview of the evaluation for nuclear safety since 1970 and how regulators have influenced it.

I have some background for that because I have lived through those 40 years of development in nuclear safety and I have all the time been actively involved in international cooperation.

My observation is that global evaluation of safety and regulation has had two different, quite distinct lines, so I would like to say that there is a US line which is followed especially by Japan and Korea, and then there is a European-Russian one, and it's possible that Fukushima lessons bring these two lines closer to each other. But these two lines still exist and they are quite clearly to be seen, for instance, in the IAEA safety standards.

I have concerns that the US line, I would say that it still builds safety on the robust principle which were developed already in the 1950s, 60s in this country. The US regulators trust plants which were built mostly in the 1970s, they want to keep them in a good condition by replacing ageing equipment and there is this lifetime extension from 40 to 60 years. The main focus is in ageing and in condition – the physical condition of the plant. They characterize it that they want to maintain the safety level where it has once been considered adequate.

When we think about the European Union-Russian proposition, they have learned from events by developing new, more stringent requirements, especially for new plants and then they have required backfitting of operating plans to meet, as well as feasible, the standards which have been written for the new facilities. The European common rules even say that the European approach is to strive for continuous safety enhancement and also this is reflected in continuous backfitting of plants.

Whenever there is a license review or typically every 10 years, there are certain new requirements which have to be met and implemented in those plans, so it seems that Japan has now moved to this line very strongly after Fukushima.

In the 1970s, there was not really much regulatory drive for evaluation in the safety field. Common thinking was at that time that the risk of serious accidents had been practically eliminated by smart design, and the regulators got together at that time once a year, here in Washington, and they heard about progress in research that aimed to demonstrate that a design

based [unclear] accident could be handled properly. That meant that the systems developed for handling glass-break plus a coolant accident were adequate.

This scheme changed completely after the TMI accident and it was understood that the accidents can be much more complicated than these most challenging postulated accidents, and it was learnt from TMI that licensed operators in the main control room, they have also some role in assuring safety. They have a role in managing potential accidents and they are not just bystanders who are watching how automatic systems are handling the situation, as was much expected.

This led to that only around 1980, the first time proper emergency operating procedures were developed and these regarding the operators in a variety of different situations. The 1970s were meant to be without any real good operating procedures. 1980s also saw that they got plant specific full scope training simulators, where management of many types of different accidents could be practiced.

After the TMI accident, the SNRC research meetings were not at all similar as they were before. This US model, after TMI, was followed elsewhere but at that time, the European-Russian regulators, they started to think that maybe these severe core meltdown accidents are possible and they started to require dedicated systems to defend the containment, integrated so that even the most severe core meltdown could be properly contained and there was not release of radioactive substances.

Chernobyl, of course, revealed some specific weaknesses in a certain Soviet designed reactor type, but that was a technical problem and it could be fixed, this main reason of Chernobyl could be easily fixed by technical means. But more important in the long term was that, at that time, safety also came into the picture, and Chernobyl motivated European-Russian regulators even more to pay attention to the core meltdown management.

The next important lesson was September 11th in New York, which has nothing to do with nuclear power, but it demonstrated that terrorist threat is real and has to be taken into account. Unfortunately, this had very bad development, that in the USA, these actions were done under the security regime and we didn't know anything that happened in this country, and we learnt only after the Fukushima accident that because of these lessons learnt from the September 11th event, many things have been done in the USA that we started to discuss only after Fukushima, and we discussed about these mobile diesel generators, mobile pumps, and then we learnt that the US plants have implemented them 10 years ago, but because it was under a security regime, it was not communicated to the foreign colleagues.

That was really something very surprising. Of course, from Fukushima, we learnt much but I don't want to go into those details, but I'm convinced that nuclear power plants which are in operation today, they are much safer than the same plants used to be 40 years ago because each internal phenomena are known, they are continuously addressed with replacement of old equipment, but more importantly that the revolution of a knowledge based and practical approach is to reduce the risks which have been identified in the past years. They can now make safer plans.

ARIEL LEVITE

Thank you, Jukka – Jason.

JASON CAMERON

Mr. Chair, having listened to Dr Macfarlane and Mr. Laaksonen, I actually think that maybe I should be sitting in between my colleagues up here on the panel.

What I'm going to do in my opening couple of minutes, given that I have a captive audience who may not know very much about the Canadian Nuclear Safety Commission, is to give first a very high level overview of what we do and I think what you're going to hear is typically Canadian. We're influenced heavily by, in some cases, the United States and in some cases, by Europe and you're going to hear that in the way in which I describe our regulatory regime, and then maybe touch on some of those elements that you asked us to consider at the end.

Much like the US NRC, the Canadian Nuclear Safety Commission has a mandate to regulate the use of nuclear energy in Canada and we do that to protect the health, safety and security of Canadians as well as the environment. We also have the responsibility to implement all of Canada's international obligations when it comes to international safeguards, nuclear material control, physical protection of Canadian nuclear facilities.

But we also have an interesting element mandated by our parliament, which speaks to the credibility transparency that Dr Macfarlane mentioned, and that is to disseminate objective, scientific and technical information on all of our regulatory activities in Canada, and I think that helps us in the credibility issue which was mentioned earlier.

Maybe this audience would be familiar with, but the average Canadian really doesn't know that we have a very advanced nuclear fuel cycle in Canada. Canada continues to supply approximately 25% of the world's uranium resources, primarily out of northern Saskatchewan. We regulate from the production of uranium all the way through to waste management. We have approximately 20 nuclear reactors in Canada, most of which are located in Ontario.

We're going to talk a little bit about what we're doing on waste management later in the panel and I look forward to that because we're also working through low and intermediate as well as high level waste options, which I look forward to discussing.

We regulate about 2,000 companies in Canada in regards to nuclear substance processing, industrial and medical applications, as well as everything to do with import and export controls. Just to give you scope and scale, we're much smaller than our American colleagues. We're only about 800 staff and about a budget of 140 million people located across a large country in Canada.

I just want to touch a little bit upon independence, and I think that speaks to the credibility, which is our main title, the subject. In Canada, our commission is a quasi-judicial administrative tribunal. Essentially, it puts it as a cousin of our court, in terms of the ultimate decisions that are made, that speaks a lot of the credibility. We report to our parliament through a Minister of Natural Resources, our commission members are appointed by government but they're independent. We only have one full time member. The other part time members that come together once a month have other day jobs, rendering them very independent in their own rights.

Dr. Macfarlane mentioned transparency – all of our commission meetings are webcast or available to the public and the decisions of our commission can only be reconsidered in a Federal court, and generally that's only for a process that was followed, not in terms of the actual subject, and all of that speaks to how, in Canada, we strive to ensure that nuclear regulation is independent and credible. In terms of the topics to discuss, I think that in Canada, we have a particular way in which we're enhancing nuclear safety post-Fukushima, ensuring that, very similar to our colleagues that we've already discussed and I look forward to that discussion.

As I alluded to, we have some interesting projects underway in terms of our new nuclear waste management options, new entrants and emerging countries. Canada continues to be a designer of the CANDU nuclear design that places specific obligations on the regulator, which I hope we get a chance to discuss. Canada's also a hotbed of opportunity for small modular reactors, although that may be a little further on the horizon. Given that we're in the Horizon Ballroom, that's an appropriate place to have this conversation, and harmonization and standardization is one that we continue to struggle with.

It's also as I conclude my remarks, I'd like to commend Carnegie and the members of this audience for showing up for this Nuclear Safety, Nuclear Regulation panel, and I hope we have an opportunity, particularly with Ambassador Grossi's presence here this afternoon, to talk a little bit about international governance.

I think the Carnegie Conference tends to speak to those catastrophic incidents when it comes to nuclear non-proliferation and nuclear security but I think that there's a conversation we should be having as well – a lapse or a breach when it comes to nuclear safety can be equally catastrophic and we saw that in Japan with long term economic societal consequences and there's a conversation that perhaps we should be having in terms of how we look at international governance, how we look at the Convention on Nuclear Safety, and what we can do to enhance nuclear safety going forward, so with that, Mr. Chairman, I'll conclude my remarks.

ARIEL LEVITE

Thank you very much. Let me ask all three of you the following question – we're trying to impress the newcomers into the nuclear world that they have a lot of learning to do, a lot of resources to invest and so on and people to look to, to get the insights. Yet the three major accidents all happened in advanced nuclear states, right, so it was Japan, Russia and the United States.

We have big disagreements among the nuclear stakeholders in terms of first of all independence that is not exactly the same in every one of them, but also with respect to safety standards, as you guys have already pointed out, that came out in the context of the nuclear convention. Are we the ideal role model to look at to try and impress them on how to do things?

That's one question, and second, what can we do more about standardization? What can we do in the absence of one regulatory body? We're clearly progressing rather slowly in creating universal standards of what independence actually means and so, yes, the principles are echoed in the Convention of Nuclear Safety and yet we are seeing that there is a lot of pressure.

How would you think we need to go forward in order to become really a role model? You've already alluded to the fact that best practice as distinguished from doing exactly the same, but how can we move forward on this issue?

ALLISON MACFARLANE

Want me to start?

ARIEL LEVITE

Please.

ALLISON MACFARLANE

You put a lot of things on the table so I'll just touch on a few of them. In terms of standardization, I think, as I said, it is a problem. It's a problem because when people experience Fukushima or whatever, they say that country has different regulations than we do and maybe they're better. I don't know – or, as you point out, these newcomer countries are looking at the established powers and saying you're the ones who had the accident, so that's a problem.

If you want to have some kind of standardization, the IAEA does this to a small degree. It's not their role; it has not been their role to be the arbiter of safety internationally. They safeguard nuclear materials, they have a promotional role as well, and there's a conflict of interest. You can't promote nuclear power and regulate safety at the same time. The United States discovered that in the 1970s, when they split the Atomic Energy Commission into the Nuclear Regulatory Commission and eventually the Department of Energy and that's important to keep those roles separate.

But it's not clear to me who, where you would house this. To the degree that it exists, we do it through the Convention on Nuclear Safety. It's an incentive organization; it doesn't have teeth, so it operates through peer pressure and the way peer pressure works is through participation and that was an issue with the last review conference exactly a year ago, actually, in Vienna. Out of 76 at the time, now 77, member states, 69 participated in the conference. Seven member states did not attend. Those include countries who were nuclear aspirants – Bangladesh, Kuwait, Saudi Arabia. 11 contracting parties to the convention did not submit reports. Those countries that I just mentioned and Nigeria as well, all nuclear aspirants. That's a problem.

We somehow have to normalize participation in the convention; we have to normalize some kind of general standardization, and it's very important that we do.

JUKKA LAAKSONEN

Yes, when we talk about the big picture of standardization, the situation is not that bad because we have to keep in mind that the basic safety standards we have developed in the USA in the 1960s and '70s, those are still largely in force. All these basic ideas, they come from that and all the other countries have followed this moral – also Russia, after some isolation joined the club and they have now very similar standards. Actually, they have copied many of the standards from the US regulations in the 1990s, when the country became independent from the Soviet Union.

Afterwards, the US influence has decreased but the IAEA has gradually taken that role. In the early years, IAEA had not really good standards but in the last 20 years, they have been very seriously doing that, and the standards are good and they serve as a proper model for the national regulators who are following them.

One thing is to have common standards; another thing is to apply those standards and this is something which was really revealed with the so-called stress test in Europe. We had 17 countries who compared their practices and that was a very thorough peer review, a cross-checking between the regulators and we learned that the same standards, which were in principle the same, they had been applied in very different ways in different countries.

It is not enough to have standards – you must have this cross-influence interaction between the regulators, [unclear] communication to make people understand that this is really what is meant and that's more important than just having formal standards, to apply them in a consistent manner, and in this respect these IAEA missions are very important.

ARIEL LEVITE

One, one of them.

JUKKA LAAKSONEN

Yes, of course. You mentioned industry, and I was coming to that because it's not only the regulators who make the things different. We had an interesting comparison when Areva started to build nuclear power plants in Finland, France. It was evaluated in the USA and then I asked Areva's safety guys to write me a comparison, how much those differed and where are the differences and what are the reasons for the differences.

Most differences came from the operators, not from the regulators, so that was quite a surprise because the operators, they have their own ideas what kind of plants they want to have. We cannot always blame the regulators that we have no standardization.

ARIEL LEVITE

Jason.

JASON CAMERON

Yes, the one thing maybe my colleagues haven't mentioned yet is that, I think, there's a good basis in terms of where standardization, harmonization is taking off from. Both of you have participated more heavily than me on the Multinational Design Evaluation Program under the OECD NEA, which provides another fora in which to have that conversation around harmonization.

I think there are some basic building blocks in place in which there's that conversation going on and generally, I then divide the world up into two groups. If you continue to be a vendor, designer, exporter of the nuclear power plant, you're going to have an additional obligation on you in terms of how you're going to help the new entrants step up and take that on. Maybe that's different than first of kind.

The other thing that we've got to avoid is tripping over one another in terms of supplying assistance to regulators that are participating and the IAEA has this new initiative, a regulatory cooperation fora where we can actually get together and decide how we should best assist other regulators, and I do think that there are other models. Mr. Laaksonen has the European experience; even between Canada and the US, we have instances in which we try to bring harmonization, standardization. It may not be necessarily to full-fledged reactor designs because they're different on either side of the border, but we do that on certification of flasks, transportation. There's a great deal of harmonization that goes on, so I think that there are elements within the sphere that we can build upon to advance this for sure.

ARIEL LEVITE

Before we turn to the audience, one last question I'd like to ask you is the following – we focus some on operation and some on new build. Let's turn to the end of life of nuclear power plants. Obviously we have quite a few already, with many more coming, and the decommissioning process has actually slowed almost to a screeching halt, even in the United Kingdom, certainly in Germany and so on, which had plenty of those. It's actually proving to be so expensive that even countries that put aside the money for it are running into some difficulties.

One of the big issues out there is not necessarily just what do you do with high level waste, but actually, what are you doing with the low level radioactive waste, which is by far, in terms of

quantities, the largest quantity and a significant cost driver, and there are no standardized regulations on what we do with respect to end of life.

Yes, we solved the problem temporarily by encouraging people to do more and more interim storage but that has its limitations. How should we think, given that we're looking ahead within the next 20 years, there's going to be well over 100 nuclear power plants that will be phased out, how can we simplify this by looking ahead and looking at what regulators can do to try and coordinate a line?

I particularly mention this because the end of life is such a political hot potato and Dr Macfarlane has mentioned to make regulators as much as possible immune from political pressure, that's probably the area where you'd run into the greatest political pressure, where a lot of solutions towards waste and so on have either been suspended or rolled back, and I'm not looking at you because of the Yucca Mountains. Germany has done something which is even more interesting in that respect. I'm not trying to put you on the hotspot in that respect, and imagine what we're telling others, saying, you're now building nuclear power plants. You have to think about end of life at the end of the process, and not just the Nordic solution, so to speak. Maybe just in reverse order, what would you say – 90 seconds, one thought on what do we do about end of life regulation?

JASON CAMERON

Just in the Canadian context, I'd maybe put a couple of markers down in terms of things that we're trying to do in Canada in the 90 seconds given.

First, on low and intermediate level waste, mark your calendars for approximately the first week of May of this year. You're going to see a report out of a panel in Canada that's looking at the siting of the first, and probably the only, low and intermediate level waste deep geologic repository. It's located on the shores of Lake Huron, so it does get the odd coverage from the US media, and so that's the Canadian attempt at finding a solution – a deep geologic repository solution for low and intermediate level waste in Canada.

The high level waste question is also one that we're advancing. We went from 22 communities that were looking at hosting a high level waste repository. That's been whittled down to nine communities in Canada that are still interested in participating in that. That's a process that's going to continue over the next couple of years to get down to a couple. Ultimately, the timetable is to put that in operation in 2030, 2035 so that's a subject which we could come back and discuss at Carnegie.

But also in Canada, the other thing that we're doing in terms of adopting US and European experiences is looking at our National Lab and we're moving to a new management structure of our National Lab in Canada, which you're going to see reporting on over the next 12 months or so. All that is designed to give much more focused attention – at least nationally – in terms of how we're trying to treat waste management in Canada.

ARIEL LEVITE

Jukka?

JUKKA LAAKSONEN

Yes, waste management is really an issue where the public confidence important and that's where the regulator's credibility is very important to resolve this issue. This has been found in our country where we have developed credibility of the regulator, openness since the first day

of our first plant operation, and we have never faced any problems in resolving the waste management.

The low and medium level waste repositories are on each plant so they are plant specific repositories, 100 meters underground. They are really tourist traps and people are going there and they walk down the spiral tunnel down to 100 meters and they see in the silos that waste. They feel very safe that this is the right thing to do, so nobody has ever questioned the safety of those facilities.

The next step is to put this spent fuel directly 500 meters underground and there are also tunnels which have already been excavated so the basic parts of this facility have been built and the two communities were competing – who will get that facility at the end of the day, and it is just that people have a confidence that the regulators have properly handled that and there have never been any big questions.

ARIEL LEVITE

I think people who have watched the film, the documents, the Finnish experience in this domain, all feel envious of the way you've handled it in Finland except that they're not convinced that they can actually apply that in their own countries. Allison, what?

ALLISON MACFARLANE

Four points – first of all, I'm not worried about decommissioning. The US has decommissioned, I don't know, ten, plus or minus, reactors fine, no problem. Some are green-fielded except for the spent fuel and so if there are a lot more plants to decommission, as there will be in Germany and Japan and eventually the US, the industry will step up and people will be making money on this. It will happen; that doesn't worry me.

Low level waste – many countries have already dealt with low level waste. They have low level waste storage facilities already, you guys are developing one. You're not the first one with a deep geological repository, the United States is. We have a waste isolation pilot project for, it is, defense waste, that's true, but it is intermediate level waste, so you have to give us credit – not without its problems, of course, but we'll talk about that later.

But I think the real issue remains dealing with the spent fuel and that's where the real trouble is and, yes, the Finns are setting a great example for the rest of us, the Swedes will too and France, I imagine. Canada's doing, I think, an excellent job on siting, setting a model for the rest of us of how really consent-based siting should go. I appreciate that very much but many countries still are flailing around and so I think that's it.

In the meantime, I think, Eli, you pointed out that we may be faced with situations with endless storage of spent fuel, and that's a problem because who's going to pay for it? Who's going to keep it secure? How do you ensure that those institutions last, if you're talking many decades, hundreds of years? That's an unimaginable time.

JASON CAMERON

Mr. Chair, if I can.

ARIEL LEVITE

Yes, brief, because we need to turn to the audience.

JASON CAMERON

And Dr. Macfarlane just reminded me, given that there may be some US DoE reps in the audience, we are in the middle of public hearings in Canada and holding up the waste isolation pilot project in the US as an example that would be a great model, and in the middle of 33 days of public hearings, 200 interventions and 20,000 pages of documentation, only to have those two incidents take place down South, was not overly helpful to the Canadian public hearing process.

ARIEL LEVITE

We're not going to get into North American issues, and just to make a sharp contrast here, let me turn to Ambassador Grossi here, who has many distinctions but among others, one of the most prominent among them recently has been to be the President of the Convention on Nuclear Safety Review at the diplomatic conference.

Please, why don't you share with us a little bit of light? There's a microphone here next to you.

RAFAEL GROSSI

Hello, quite clearly, maybe you are all crazy in this room but it's a fascinating topic, it really is. What was said here, and from the point of view of international governance, which is what the CNS covers and what this exercise we just had in Vienna in February through this diplomatic conference, this big question of legalizing and normalizing things versus process.

I think it's one that is worth thinking about. What we had, basically, for those who may not know this, is a proposal put forward by Switzerland, as Allison was reminding us, to modify, to codify in a different way than the CNS, which originally, from the beginning, was conceived as an incentive instrument to make certain obligations, including that of constructing and building plans that would prevent nuclear accidents from happening, how you do that.

Anyway, that was the proposal, and the proposal was, if not adopted at the six review meetings, what was agreed was that it would be to a diplomatic conference that would need to decide whether it was worth taking or not, and this was the exercise we had. In the end, what we had was the approval of the declaration, so quite clearly, what you see already is that this proposal was rejected, you could say, or not taken on board. We had a long process of preparation for over one year, that I had the pleasure to chair, and through an informal working group, we set up and during that process it was evident that there wouldn't be a consensus on that because so many questions – definitional questions, questions of scope, and others.

The issue, for us, from a regime point of view, was what to do with this. We knew we had a house divided, and deeply divided. The European view was there, the North American view was there, the rest of the world, the big South – I mean Argentina, Brazil, South Africa, India, China, I don't know where you put China, but China adamantly opposed to this.

At the end of the day, we came with this solution of a declaration, which was approved by consensus, which aims at what I said as the alternative to the more codifying or solidifying what you have, which is basically to agree on certain principles, including that of constructing and building consistent with the objective, which is very different, of preventing accidents and mitigating releases in two different categories – big releases and others.

I don't want to take this to a depth of technicality which makes it unbearable but the thing is that we decided to go for this and we also agreed that we would be making changes to the way in which we report on these things, which enhances this peer review aspect of the convention,

this peer pressure that you have whereby others are looking at you and seeing what you're doing or not doing. This is an arduous process, I would say, perhaps less tempting and heroic than changing a convention. One has to remember what happened, for example, in the other, as in nuclear security with the CPPNM, gloriously adopted, not yet into force after how many years.

We have opted for this, as I said, perhaps less fantastic or attractive road of working day to day on what we can do. Of course, the jury is out and one may say – a very distinguished regulator from a very important nuclear country, when we finished, told me, Ambassador, you're very happy because you're an ambassador and you just had a diplomatic success but this is a failure for nuclear safety. He was quite like that, and so that is the big question and what perhaps we might get views from our panelists on.

ARIEL LEVITE

Thank you, I'll just remind you that there was also the point that Dr. Macfarlane had referred to, which is how do we get active participation by all the members of the convention, as well as universalizing the convention, and there are clearly some nuclear operators that are not party to the convention.

Yes, we invite the audience now to raise questions. Please say who you are, direct the question specifically to one or more of the members and we'll try to accommodate as many of you as we can.

DMITRY KOVCHEGIN

Dmitry Kovchegin, nuclear security consultant. My question is addressed to Mr. Laaksonen – Rosatom is actually exporting to multiple countries, including newcomers and in its current capacity, Rosatom might face some conflict with strong regulation just because it imposes tougher requirements on its products and services, so my question is how do you see the role of vendors in establishing not security but nuclear infrastructure, nuclear related infrastructure in newcomers' countries and what, specifically Rosatom's approach on this and if other speakers have any perspective on this, I would appreciate, thank you.

ARIEL LEVITE

Thank you, we'll take a few questions and then get back to the panel – yes.

STEPHEN DOLLEY

Stephen Dolley with Platts. My question goes to regulatory independence. Dr Macfarlane laid out some of the criteria that the US NRC uses but despite those criteria there have still been allegations that the agency is captured by the industry that it regulates and regulators in other countries have faced similar allegations.

How can a regulator operate effectively and solidly on a day-in day-out basis with representatives of the nuclear power industry without creating the appearance that they're too cozy with that industry or that they've been captured? What sorts of institutional measures, what sort of attitudes are needed by the regulator to maintain the credibility of independent regulation?

ARIEL LEVITE

Lest anyone think that it's a specific US problem, we were supposed to have among us some other regulators who ultimately, because of political pressure, wouldn't show up because they

knew that this was one of the questions that they would have to address, but please, there is a back mike too. Why don't we take two more questions and then we go to the rest of the crowd – yes.

MATTHEW BUNN

Hi, Matthew Bunn from Harvard University. I'm wondering how we should think about assessing the performance of regulators in different countries. It's clearly not the case that more stringent is always better. It's clearly not the case that less stringent is always better, and they're different approaches. But it seems to me that it's an important question – if you look at Fukushima, as recently as 2007, the IAEA had done an integrated regulatory review service, which said that the Japanese regulator was adequately independent, which the Japanese government now acknowledges was just not so.

It seems as though our systems for detecting that we had a problem didn't succeed so I wonder how we can think about how best to review and assess the performance of different regulators in different countries.

ARIEL LEVITE

Particularly those of you who have been participating in the regulatory meetings, both on the IAEA auspices as well as the regulatory meetings, could probably shed some light. We'll take one more question and then turn back to the others – please.

SCOTT SPENCE

Great, hi, I'm Scott Spence from the London based VERTIC. My dear friend, Ambassador Grossi alluded to the CPPNM and my question is – and it wasn't raised but I'm going to raise it anyway – I think regulations for safety and safeguards are quite advanced and quite well developed. It's very well understood, especially in well developed nuclear energy countries.

I guess my question is where are we going on nuclear security? The International Nuclear Security Framework is a bit of a Frankenstein and, of course, developed nuclear energy countries are struggling with this – where are we going to go with nuclear security regulations, particularly for emerging nuclear energy producers who are may very well be struggling with the so-called Frankenstein of the International Legal Framework, thank you.

ARIEL LEVITE

Thank you, we'll go back to the panel, get their answers and then do one more run. Please, Allison.

ALLISON MACFARLANE

I'll work backwards – nuclear security regulation is a very important issue and I think not just for the emerging countries. There are many established countries that have operating reactors that have basically very, in my view, weak security regimes.

I think this is an important issue, needs to be dealt with. Very few regulators round the world actually regulate security as well. The US NRC does, but not everybody does. This is a very active issue. I don't have the silver bullet for it.

How to assess performance of regulators in other countries – good point, Matt, about Japan and the IRRS missions. The IRRS missions are an opportunity; again, it's a peer evaluation, but it

does have to have teeth. It does have to be critical and the important thing is not just to have an IRRS mission. It's to have a follow-up, and the follow-up allows an opportunity for the team to see what was implemented of the suggestions that were made, of the recommendations that were made. It's important to have that second piece – not all countries follow up and they should.

There's also the Convention on Nuclear Safety. It's another peer review piece, again we have to get buy-in from everybody, and there's also, on the operator side, WANO is really trying to expand and add more teeth to it and be more INPO-like. I think that would be very helpful.

In terms of the credibility of the independent regulator, Steve's question, how to operate daily without undue influence – I think it's very important to keep the politics out. It depends on the form of the regulator, of course. It's important not to have that revolving door with industry, or something like the Nuclear Regulatory Commission. Let me tell you, there's not much of a revolving door on these people – they come, they work there for 40 years, they don't leave.

But at the commission level it's important because this is where the politics comes in that commissioners are brought in who are as independent as possible. Again, it's important to operate transparently and openly and to share as much of your product as possible, to have frequent meetings, not just with the industry but to do those meetings with the industry in public and to meet with the public as well and be open to their concerns.

ARIEL LEVITE

Jukka.

JUKKA LAAKSONEN

Let me start from this nuclear infrastructure and there was a question on how Rosatom develops regulatory infrastructure in the customer countries. Rosatom is not really – they're not trying to influence regulatory infrastructure. Rosatom is providing to building national infrastructure, technically and also to build the utilities. But the regulators are building their own capabilities and for that purpose, there are support organisations – IAEA is very helpful.

Also European Union is providing a lot of money for developing the regulators and then there are experts and my experience is that those regulators in new entrant countries, they are not easy to handle, I would say. I have been warning my colleagues in Rosatom because they are not used yet to the real regulators. Their previous experience is with different types of countries, in different times, but now we have many projects where I'm expecting major licensing and regulatory difficulties and I have told that we have to pay attention to that.

Fortunately, the attitude among the vendors is that the vendor is personally the designer. They are ready to take into account everything which the regulators are requiring and, surprise, we have also the Russian plant now coming to licensing in Finland and I'm now on the other side, having been regulator. But then my colleagues in Russia, they very seriously look at the Finnish regulations. They try to modify the plant taking into account the national regulations, so that's very good behavior in that sense, but the problems are still ahead, I would say.

There was a question about the Japanese regulator, whether it was independent. There was a peer review but I was the deputy team leader on the regulatory review mission in Japan, 2007. We gave them very hard critiques about the independence; we gave very strong recommendations that they should develop their independence and they should make the regulators' role very clear and we were not at all happy with the situation and that is a fact which has been now also confessed by the Japanese in their own reports.

Unfortunately, when they had started to address the problem in 2009, we were preparing a new mission but then they had a government change and all this process stopped, and the rest is history.

ARIEL LEVITE

Jason.

JASON CAMERON

I'm going to pick up on Mr. Laaksonen's final point and then maybe we can move on, but the issue is that when it comes to either the issues that Dr Macfarlane noted around those countries who didn't participate in the Convention on Nuclear Safety, who didn't submit national reports, or who had IRRS missions and then didn't do the follow-up or had IRRS missions and then didn't do the recommendations.

The issue is in a lot of those cases, it went back to the regulator. There was no greater transparency, there was no reporting to a higher level. I think if we want to spend some time looking at how we might take a run at improving the Convention on Nuclear Safety – maybe it's actually exposing some of those non-responding, non-reporting elements, and I see Mr. Hibbs shaking his head, saying, never going to happen. But we heard this morning that we have to think bigger or broader in terms of some things that we need to have a look at, and maybe that's something that we need to consider.

ARIEL LEVITE

I'll give just one example, which is the sanctity of the supply chain and if regulating it as a story, it comes out in Korea, which we now understand is not confined just to Korea, and so the problems are there and thus far the name and shame hasn't worked, and the encouragement of peer reviews hasn't rubbed off on everybody. But I interrupted you – go ahead.

JASON CAMERON

I don't know – I think that what I'm saying is that maybe I agree with you but we've got to continue to try. That's where I was ending.

ARIEL LEVITE

Please.

JIM OSTROFF

Yes, hi. Jim Ostroff with Platts – Dr. Macfarlane, you had commented earlier about you felt was the need for standardization across regulatory activities and I'll ask you and the other members as well if given your druthers, what sort of organization or framework would you like to see that would work towards this standardization?

ARIEL LEVITE

Just to say, let's go to the people at the back microphone and then we'll go back and forth – go ahead.

CAITLIN MCKIBBEN

My name is Caitlin McKibben from the Center for International Trade and Security with the University of Georgia. One thing I've learned as a grad student is if you stick around long enough, people will give you more stuff to do and as a result, in the last year I've gotten the opportunity to jump from nuclear to chemical security and while there are definite profound differences between the two, there are also many similarities and my question to you is –

ARIEL LEVITE

Is to whom specifically?

CAITLIN MCKIBBEN

Anybody – while there's definitely been a lot of attention on nuclear regulations across the world, recognition of chemical security is a global issue, certainly newer, definitely not new. What lessons have you learned from nuclear security that you think can be extrapolated out and applied to other areas of CBRN security as the world turns to those issues as well?

ARIEL LEVITE

Thank you – please.

PRASAD KADAMBI

My name is Prasad Kadambi, I'm ex-NRC and I'm a consultant. Many people draw similarities between the safety issues faced by the aerospace industry and nuclear safety in general and I was very glad to see this emphasis on standardization.

I have felt for a long time that we ought to be adopting more of the standardization that is used in the aerospace industry into nuclear technology. I'd like to know from each of you if you see some benefit coming out of that approach.

ARIEL LEVITE

Thank you. We'll take one more question – is it Sinan?

SINAN ÜLGEN:

Yes, it's Sinan here. Sinan Ulgen with Carnegie – I have a question.

ARIEL LEVITE

He's our Turkish expert, by coincidence.

SINAN ÜLGEN

By coincidence, I have a question to Mr. Laaksonen – and if you can put your former hat for a second, while still remaining conscious of Rosatom's strategy. It seems to us that the business model for Rosatom going forward, especially in terms of expansion in other markets and particularly in Turkey that's been the case, is to rely on this new investment model which is build, own, operate.

My question as you're a former regulator is whether you think this particular business model, where the operator actually has not only operational risk, but has almost all the financial risk to

recoup the investment, presents a set of particular challenges to the regulator in terms of security, safety, and so on.

ARIEL LEVITE

Thank you. Why don't we take you, sir, and then we'll see if we have time for another.

ED LYMAN

Thanks, Ed Lyman from the Union of Concerned Scientists – one of the issues where there seems to be a diversity of regulatory application is in how you deal with backfits and, for instance, the US has a particularly stringent backfit rule which tends to constrain the ability to impose additional requirements on plants and even the definition of what a backfit is or when it should be used is a little unclear.

In other countries, they seem to have less of a straitjacket, so one example is I believe in Canada, the CNS – Canadian Nuclear Safety Commission – has required filtered vents for the CANDUs while the United States, after going through the wringer, that was rejected on the basis of cost benefit analysis. I wonder if someone could comment on these diversities.

ARIEL LEVITE

Jason, just one to go first.

JASON CAMERON

Just on the last one, the Canadian design and the Canadian experience tends to be a little bit different than other countries. Two things – we have the periodic relicensing of reactors and therefore an opportunity to push continuous improvement.

The other thing the designer of the CANDU reactor also at about 25 years, has a complete refurbishment. That's another subject that you're going to hear a lot about north of the border. We have about 10 reactors, a $25 billion project that's going to be taking place over the next 10 to 12 years that's going to see that refurbishment.

You see a lot of the internals come out and some opportunities for some safety enhancements. Some of the filtered venting was definitely post-Fukushima but also coincided with refurbishment, so that's perhaps a particular situation for Canada.

Just on the standardization, harmonization, I know we didn't talk a lot about small modular reactors but that's probably an area where there is an opportunity for regulators to come together. I know that there's a variety of fora that's looking at that, but I think that's probably the only way in which you're going to see the economies of scale prove their case and I think those are the only two observations I wanted to make.

ARIEL LEVITE

Jukka?

JUKKA LAAKSONEN

Yes, how to improve the standardization, I would say that this European model is now functioning very well. We have this VELDRA [?] club, which is just a voluntary club established jointly by the head regulatory bodies and this is also an indication of independence of the

regulatory bodies, that we just got together and we decided let's work together and we made common harmonization rules and committed that we will implement these rules in our own countries, and that's what everybody has done.

The first set was implemented and they worked well. VELDRA also has a very good working group for harmonization. They are the best people from all the regulatory bodies and they know each other and they trust each other and they have developed excellent documents, first for harmonization of these old reactors and then new rules for the new reactors.

In addition to that, in Europe, we have these directives which give certain guidelines, so they are very much in line with the IAEA safety standards but they have a legal status, so they are binding rules which are coming from the European Union and this gives also more power to the European regulators. This is at least in Europe.

ARIEL LEVITE

Except that those regulators will be the areas where the fewest reactors would actually get built.

JUKKA LAAKSONEN

Yes, maybe they start one day in the UK after one hesitation, but then what can we learn from the aerospace industry. Aerospace industry is very different from nuclear. There are large numbers of airplanes in the world and they are quite well standardized and look very similar. The nuclear power plants are quite few and they are all different and the same model cannot simply be applied. It has been tried many times; we have tried to learn but I have not much success.

Of course, this Turkish model, this is a model where the vendor not only builds the plant but they also operate that plant.

ARIEL LEVITE

For the lifetime, they have to own at least 51% of the lifetime of the plant [?].

JUKKA LAAKSONEN

Yes, and at least 15 years, they operate, so we have not yet seen the results, how it succeeds. A good thing is that the operating organization has taken a position that they have sent already many youngsters – 150 students – are sent to Russia to learn about this and they will start working for the power company already, before the plant is ready to operate.

This brings certain Turkish input but for the regulator it is really a challenge. I'm also very concerned how the regulator can handle that.

ARIEL LEVITE

The Turkish response is typically, Russia owns the risks.

JUKKA LAAKSONEN

Yes, but the regulators must do their work.

ALLISON MACFARLANE

If there's an accident, it's Turkey that's going to suffer, absolutely – economically, public health, environmentally.

ARIEL LEVITE

I'm just telling you what senior Turkish officials said. That's why we insisted that Russia owns 100% of the project and never goes beyond 51%. It's not that I disagree with you; I'm just pointing out what they, under political pressure, have provided the answer as a way of defusing domestic demands for doing certain things.

JUKKA LAAKSONEN

I must say that I'm also very concerned with the Turkish regulator, how they can manage this, especially taking into account the level of [overtalking].

ARIEL LEVITE

It's the first of its kind, but they also – not the Russian, but they admit they're supposed to be the regulator that licenses the first of its kind, a new design, and so what happens is their regulator that hasn't licensed nuclear power plants at all in the past is now actually supposed to license the first of its kind, which raises the question who do you actually rely on to do the work for you and how do you accommodate domestic circumstances and how do you reassure the domestic public and so on.

JUKKA LAAKSONEN

The problem is that the Turkish have less than five individuals who have solid experience in nuclear so that's really a concern, so some countries have better situations among those new entrants, especially, I still like to come back to these nuclear security regulations because I'm in an advisory group for the UAE government and I have seen how they have handled this and there is a very clear marching order that the new power regulator assists with the regulations and rules and they are just learning these security regulations also but they have very good communication with the national security organizations, both army and police forces and they work together on a weekly basis together, and this is really good cooperation. But it has been made clear that the nuclear regulator has already made, say, the rules.

ARIEL LEVITE

I think we've recognized, I think, if it's completely silent [?] there are enormous risks that security and safety would take us in different directions that would not be equal to each other.

ALLISON MACFARLANE

What sort of organization or framework would we like to see for standardization – maybe I disagree a bit with Jukka. I think we can learn something from the aerospace industry here. They have standardized safety and I don't think it's the designs of the planes or the nuclear power plants that's important, it's the processes of regulation that one can work on standardizing to a degree, but it's not going to be easy at all.

The question about nuclear security lessons for chemical security, whatever others, just general nuclear lessons from nuclear security – nuclear security needs to be inspected on a regular basis. It's very important to do that, get out there, see what they're doing, ensure that they're following regulations. They should practice. Their practice should be observed by the regulator

to ensure, and there should be consequences if they don't do well in terms of if you do a force-on-force practice.

I think a fair caution about dealing with contractors that comes more from the defense side of things in the United States, but contract – beware.

In terms of Ed's question about backfits, does that get in the way of standardization, and his example of filtered vents and cost benefit analysis, it certainly depends how you define things in your cost benefit analysis and what you define as in and out. If you just take, for example, the NRC had this big debate about qualitative versus quantitative. Again, that's all definitional. Right now, the cost of a human life is treated as a quantitative term but it seems to be pretty subjective to me, so it's really qualitative. I think you can work with the backfit and still achieve some more degree of standardization.

ARIEL LEVITE

I will turn to the panel to offer the panelists their bottom line in 90 seconds. I'll take the privilege of the chair just to leave with you three things – number one is we would like to keep this dialogue open, so if there are issues that you want to raise that we'll keep on working on together with other people here, with Mark Hibbs and Ahmed still working on those issues, myself and others, so that's point number one.

Number two, while we are focused on a lot of deficiencies, I think it all was not meant to say that there isn't progress being made so we didn't want to make the picture look excessively bleak only to say that there is a lot to be done and finally, my personal impression is that the industry will perish if there is no standardization and harmonization. When countries build large fleets at home, they were able to achieve this where now there's the ability to achieve economies of scale is based on working internationally.

If we don't get that, the industry will not survive. If we have to make every nuclear power plant different because it goes to a different country, so to the extent that we won't be able to achieve the greatest degree of standardization harmonization, and the regulators here are the key players, the industry will be in even direr straits than it currently is. But let me now turn to the panelists and ask them to give their final thoughts. Let's start in reverse order – Jason.

JASON CAMERON

Thanks, just in terms of returning to the title of the session this afternoon around credibility, I think what I'd like to emphasize is the regulators that you have probably up here on the panel are some of the most transparent nuclear regulators in the world and I think that one of the things that would ultimately build more credibility and increase credibility is transparency.

Communication transparency, that's domestically back home, and I'll still strive to say that there's some greater transparency on the international level as well, or we can talk about some of those non-responders and non-reporting countries that merit some further consideration, for sure.

ARIEL LEVITE

Jukka.

JUKKA LAAKSONEN

I think that the greatest risk to independent and effect regulation is that there is too much political influence, especially in the new entrant countries, so my concern is that some countries are interested to have a nuclear power plant but the country's political leaders don't understand what is required and they don't give independent authorities and resources to the regulators and train competent people to be in charge of that so that's much more important to me than independence from the industry.

Industry people, we have some common goals with regulators and industry-safe nuclear power plants, but the politicians don't necessarily understand it.

ARIEL LEVITE

Allison.

ALLISON MACFARLANE

I echo Jukka's comments. I too am concerned about a number of the new entrants into nuclear power. I think that their governments want it quickly, it's certainly an exemplar of modernity for them and at the same time, you can't have this kind of thing instantly.

Nuclear power operates on a very different time scale as other sources of energy and it's very important that folks understand that. I think it's important for nuclear regulators around the world to continue to work together. They do work together already but it's very important that they continue and step up their game there and to the degree that the IAEA can be helpful in that, I hope that it is.

Finally, I think it's very important for all regulators, as Jason said, to work to continue to increase public trust, gain public trust because after Fukushima, people are paying attention.

ARIEL LEVITE

I want to thank the panelists but I want to thank them on two counts. One is that they've agreed to come and participate in the panel but I want to say that all three of them, while still in office – Jason is still in office but the two others, Allison was speaking to us while she was chair of the NRC, Jukka was very helpful with Carnegie and so on, and they do their job as regulators also to engage others and be part of the debate, both with the industry and with the policy community and so on, and understood why not just transparency but dialogue was perfectly consistent with being an independent regulator.

That's not a trivial issue, clearly not a common across the community of regulators so we might want to acknowledge both their professional contribution and the personal contribution, so please join me in thanking them all.