ASME:
FORGING A NEW NUCLEAR SAFETY CONSTRUCT
WORKSHOP

Opening Plenary Session:

Partnerships in Strengthening and Expanding

the Global Nuclear Safety Framework

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Welcome and Introduction

Good morning Chairman Diaz, dear colleagues, ladies and gentlemen. It is my distinct pleasure to be able to participate in this workshop dedicated to the consideration of a new global nuclear safety construct, along with distinguished guests representing la crème de la crème of the international nuclear community.

NUCLEAR SAFETY: a work in progress

Twenty six years ago, in 1986, I was a young nuclear attaché in the French embassy in Moscow, Soviet Union. Seven years ago I was a mature nuclear counsellor in the French embassy in Moscow, Russia. As probably most of us, I was repeatedly asked whether, since my first stay and given my first-hand experience of living and working through the Chernobyl accident, I could say that Russian NPPs were now safe.

My constant answer was that since Chernobyl, I did not know any ex-Soviet NPP which had not received advice or assistance from the international nuclear community, and I did not know any of these NPPs where at least one of the staff had not been involved in international safety programmes. My conclusion was that through this widespread international engagement, the use of nuclear energy in CIS countries had become safer.

Absent a way of assessing in the absolute the safety of these facilities, I relied on my deepest conviction and understanding that nuclear safety is a work in progress, and not a status that is reached once and forever.

Twenty seven months ago, I had the privilege to join the IAEA with the awesome responsibility to facilitate, promote, assist strengthening and expanding the global nuclear safety framework worldwide. Today, when asked a similar question about the safety of NPPs in Ruritania, I add to my initial answer that this plant has (or has not) received so many OSART missions which gives us inter alia an understanding of the safety culture at the plant. I add also that we were able (or we were not able) to identify strengths and weaknesses of the regulatory body, through international peer reviews, against the benchmark of our safety standards.

The IAEA Action Plan on Nuclear Safety

Following the March 2011 Fukushima Daiichi accident in Japan twenty one months ago, enhancing nuclear safety has become one of the high priorities in the world. This is a collateral benefit of the

crisis. September last year, the Agency's 152 Member States approved the IAEA Action Plan on Nuclear Safety consisting of 12 main actions to guide both our actions and the Member State actions. It is aimed, broadly speaking, at strengthening the safety of NPPs through strengthened actions with operators and regulators; it is aimed at learning lessons from the accident, it is also aimed at strengthening Emergency Preparedness and Response. Since its adoption, we, at the Agency, have been working diligently with Member States, with Regulators and Policymakers, with Operators and Support organisations and with International Experts and key members of the nuclear community on implementing the Action Plan.

A lot has been done already and progress —taking into account lessons learned from this accident — has been made in many areas of Nuclear Safety such as assessments of safety vulnerabilities of nuclear power plants (NPPs), strengthening of the Agency's peer review services, improvements in emergency preparedness and response capabilities, strengthening and maintaining capacity building, and widening the scope and enhancing communication and information sharing with Member States, international organizations and the public. These have contributed to the enhancement of nuclear safety at a global level.

Significant progress has also been made in reviewing the Agency's safety standards, which continue to be widely applied by regulators, operators and the nuclear industry in general, with increased attention and focus on vitally important areas such as accident prevention, in particular severe accidents, and emergency preparedness and response.

But a considerable amount of work still remains to be done.

In December, the Fukushima Ministerial Conference on Nuclear Safety, organised by the Government of Japan and the IAEA, will take place in Fukushima Prefecture. This Conference will be a good opportunity for participants from abroad to learn first-hand lessons from the accident. For the IAEA, it will be an occasion to redouble our efforts at promoting, strengthening and expanding nuclear safety worldwide.

The Global nuclear safety framework

Our best tool in the Agency to strengthen nuclear safety worldwide is to use, strengthen, support all the components of the global nuclear safety framework. Its basis relies on the Member States infrastructure covering the operator, indissolubly tied to its prime responsibility for safety, the

regulatory infrastructure, research and development and scientific fabric in the country. This is complemented by regional infrastructure and networks.

The top tier of the framework is constituted by the international instruments, while, as a link between the basement and the top, the Agency produces safety standards and security guidance, and provides for their application through peer reviews, advisory services and education and training.

Yes, regulating safety is a national responsibility. This is strongly stated in our standards. But today nobody could argue that this national responsibility can be defined and assumed in an international vacuum, without considering the international community. Nuclear safety today is a global concern, and a global concept. It can progress only through a greater effort aimed at reaching a high level of safety everywhere, with the same level of confidence. I will surprise nobody in adding that indeed the IAEA safety standards reflect an international consensus on what constitutes a high level of safety for protecting people and the environment against ionising radiation.

However, standards are only effective inasmuch as they are effectively implemented in practice. To assist Member States in applying these standards and enable valuable experience and insights to be shared, the Agency provides a variety of Advisory Services and Peer Review missions on design, siting and engineering safety, operational safety, radiation safety, safe transport of radioactive material and safe management of radioactive waste, as well as governmental organization, regulatory matters and safety culture in organizations.

To continuously improve these standards, we gather feedback from Member States on their implementation and then incorporate this information into subsequent revisions of the standards, thus, ensuring that they continue to meet Member States' needs. The process used for the review and revision of our standards in the wake of the Fukushima accident is not different in essence. This is another illustration of safety as a work in progress. As the IAEA safety standards represent a harmonized, and globally accepted body of guidance, requirements and standards, further development and revisions of these standards may certainly contribute to reaching the goals set by the ASME Task Force.

One essential element of the global nuclear safety framework indeed is the Convention on Nuclear Safety. At its second Extraordinary Meeting last August, its Contracting Parties agreed, "that nuclear power plants should be designed, constructed and operated with the objectives of preventing accidents and, should an accident occur, mitigating its effects and avoiding off-site contamination. The

Contracting Parties also noted that regulatory authorities should ensure that these objectives are applied in order to identify and implement appropriate safety improvements at existing plants."

Safety goals for the twenty first century (now) and beyond, need to be strongly reflected in the Safety Standards. As a first step leading to strengthened SS, arriving in 2010 at the Agency, I had suggested that INSAG prepares a report on this subject, to foreshadow the work of the SS committees. Fukushima confirmed the need for a solid work on these safety goals for the twenty first century and beyond.

The leitmotiv heard across all major meetings since the accident can serve as a useful starting point: accident mitigation capabilities should be enhanced to adequately complement the already extensive nuclear power plant accident prevention features, but the proposed additional measures to mitigate the impact of severe accidents do not mean reducing attention to the prevention of accidents. The constant and full compliance of nuclear power plants with their licensing basis should continue, to provide assurance that safety margins are guaranteed.

I would like now to address some concrete elements already reached through the implementation of the Action Plan, including particularly during the three International Experts Meetings that we have already conducted.

Beyond Design Basis scenarios

As was witnessed at Fukushima Daiichi, rare or infrequent natural and human induced events of severe intensity can occur within the operational life of a nuclear facility. Though the outcome of the accident was driven by many factors, one of the key drivers was a rare combination of correlated hazards: severe ground motion in combination with site inundation. This led to a scenario beyond the design basis of Fukushima Daiichi, for which no defence in depth feature was engineered. The loss of the switchgear by flooding left no means to power essential systems even if power could be restored to the facility within the early hours of accident progression, leading to the more fundamental issue that there existed "cliff-edges" within the plant system that were not identified by the traditional safety analysis and hence remained as points of no return once lost.

Since the accident, the designs of many **existing** nuclear power plants, as well as the designs for new nuclear power plants, have been enhanced. This includes additional measures to mitigate the consequences of complex accident sequences involving multiple failures and of severe accidents. Complementary systems and equipment with new capabilities have been back fitted to many existing

nuclear power plants to help in the prevention of severe accidents and the mitigation of their consequences. Guidance on the mitigation of the consequences of severe accidents has been provided at all existing nuclear power plants as all vendor Owners Groups have developed generic Severe Accident Management Guidelines (SAMGs) to be used as basis for the development of plant specific SAMGs. The IAEA is strongly promoting plant specific development through our peer review missions.

The design of **new nuclear power plants** now explicitly includes the consideration of severe accident scenarios and strategies for their management.

Comprehensive deterministic safety assessments and probabilistic safety assessments are carried out throughout the design process for a nuclear power plant to ensure that all safety requirements on the design of the plant are met throughout all stages of the lifetime of the plant, and to confirm that the design, as delivered, meets requirements for manufacture and for construction, and as built, as operated and as modified. The question how far is far enough in expanding or going beyond the design basis has already been addressed by the inclusion of the **design extension conditions concept** in our newly published Safety Requirements SSR-2/1 on Design which defines the design extension conditions as:

> *"a set of design extension conditions […] on the basis of engineering judgement, deterministic assessments and probabilistic assessments for the purpose of further improving the safety of the nuclear power plant by enhancing the plant's capabilities to withstand, without unacceptable radiological consequences, accidents that are either more severe than design basis accidents or that involve additional failures. These design extension conditions shall be used to identify the additional accident scenarios to be addressed in the design and to plan practicable provisions for the prevention of such accidents or mitigation of their consequences if they do occur."*

The IAEA's Safety Standards also highlight the need for integrated assessment for decision making. In particular, GSR Part 4, on Safety Assessment for Facilities and Activities, states that

> *"The results of the safety assessment have to be used to make decisions in an integrated, risk informed approach, by means of which the results and insights from the deterministic and probabilistic assessments and any other requirements are combined in making decisions on safety matters in relation to the facility or activity."*

Probabilistic safety assessment and probabilistic safety targets provide risk metrics to support decisions related to nuclear safety and to strengthen their basis. Many risk informed applications have been successfully employed for purposes of considering and comparing the safety of alternative design solutions and operating practice. Deterministic and probabilistic analyses yield outputs that are complementary to each other.

Strengthening operators – strengthening safety culture

In the wake of the two previous NPP accidents, INPO then WANO have been created. They have similar mandates and missions, they both were created to be a utility self-policing organisation, aiming at improving reactor performance; they both establish performance objectives, criteria and guidelines for the nuclear power industry; they both conduct regular detailed evaluations of nuclear power plants; and they both provide assistance to help nuclear power plants continually improve their performance.

Until recently, the Agency was perceived to be quasi exclusively focussed towards regulators. As another collateral benefit of the Fukushima accident, the IAEA-WANO cooperation has been strengthened, and visibly so. During the 56th IAEA General Conference, IAEA and WANO have signed a new Memorandum of Understanding to reflect increased cooperation between the two organizations following the Fukushima Daiichi accident of March 2011. The new agreement enables the two organizations to work more closely together to support the safe and reliable operation of nuclear power plants worldwide, and to enhance information exchange on operating experience and other relevant areas.

The two organizations will also cooperate and coordinate work on their respective performance indicator programmes and will work towards exchanging information and support in the event of a serious event at a nuclear power plant or fuel cycle facility. In addition to this, the IAEA and WANO will supply staff to each other's review teams when appropriate, and will regularly exchange documents relating to operating experience.

One of the key elements of operating safely a nuclear power plant had long been recognized as a strong safety culture. Its weakness in Japan has been identified by the Governmental investigation Committee (the Hatamura Committee), which mentions in its report: "*in view of the reality that safety culture was not necessarily established in our country, the Investigation Committee would strongly require rebuilding safety culture of practically every stakeholder in nuclear power generation such as*

nuclear operators, regulators, relevant institutions, and government advisory bodies". Hence, strengthening safety culture appears to be more relevant than ever in all aspects of nuclear safety.

Emergency Preparedness and Response

The accident at Fukushima Daiichi was a wake-up call for many. It reminded that nuclear accidents can happen, they do happen. Our common goal, in the Agency as well as in the wider international community, is that nuclear accidents become less and less likely. Our goal is also that, would an accident happen, all measures for minimizing its consequences would be available, exercised, and effective.

Furthermore, we know that an emergency preparedness and response programme adequate to mitigate the emergency and protect people and the environment from any resulting radiological effects must be in place and exercised to ensure its adequacy. The IAEA, with its Member States, has established international requirements and guidance on emergency preparedness and response to include recommendations for the distances of emergency zones. A review of the Fukushima accident and latest research suggest that the IAEA guidance on emergency zones needs to be refined to provide a basis for more specific distances. The review also showed it should be emphasized that monitoring needs to be conducted and restrictions on ingestion should be implemented beyond the evacuated zones. The Fukushima accident confirmed the necessity of predetermined criteria for taking protective and other response actions from the start of the emergency until the return to normality. It also demonstrated the importance of communicating with the public and decision makers the risk to health and answering the principle concern: "Am I safe?".

Concluding Remarks

A questioning attitude is a necessity if we are to strengthen and expand the Global nuclear safety framework. I have said that safety is an ever progressing subject, and I am convinced that the famous quote from the **bridge on the river Kwai** applies: *"As I've told you before, in a job like ours, even when it's finished there's always one more thing to do."*

Standards, guides and codes are necessary for the safe operation of nuclear facilities, they are vital, but are not enough. Their implementation and mechanisms for experience feedback are also indispensable.

The prime responsibility of operators needs to be implemented fully, in a proactive way, with a permanent vigilance to the safety culture of staff, from top to bottom. But this is not enough. Without a strong, competent, independent and knowledgeable national control, there is a risk that safety will stop being an overall priority.

Here also, as prominently exposed in the wake of Fukushima, a strong involvement of the international community is necessary to ensure that the organizations set up for regulatory control answer the expectations of neighbours, of the public, answer our standards.

In conclusion, your strong commitment to forge a comprehensive safety construct for strengthening should meet the continuous work of the IAEA in strengthening and expanding the global nuclear safety framework.

I am looking forward to contributing to the exchange of information in this working meeting and advancing our collective knowledge as a result of it. Thank you for your attention.