

**Keynote Speech**

**International Expert Conference on Nuclear  
Technology**

*Lessons Learned by the International Community to Prevent  
another “Fukushima” — Actions Taken in the Field of  
Operation, Organisation and Monitoring*

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### **Good afternoon ladies and gentlemen**

Thank you for joining us at this late afternoon session on International Developments on Actions Taken to Prevent another Fukushima Accident, the effects of which are still being felt worldwide on a daily basis.

I want to share with you some of the actions and lessons identified through the activities of the IAEA, mostly to feed the discussion during the panel, and not in a comprehensive way.

### **Fukushima Accident**

On 11 March 2011, Japan endured one of the worst combined natural disasters in its history when a massive earthquake followed by a record tsunami struck its eastern coast, resulting in the loss of thousands of lives.

Around the world, since day one, it has been “all hands on deck”, first to assist in taming the accident and its consequences, later to understand the conditions and lessons from the accident, and to share them with all stakeholders, so that Governments, the experts, the public are better armed to prevent the occurrence of another “Fukushima”, and, though I am loathe to word this, to be better prepared in case of the occurrence of another nuclear accident.

While the accident itself was not responsible for any direct casualties, it has affected the lives of tens of thousands of displaced Japanese citizens.

The consequences of the accident have affected also globally the nuclear industry and the use of nuclear energy, with various decisions taken, with immediate or delayed phasing-out in some countries, pausing for review of safety in many others.

### **The IAEA Action Plan on Nuclear Safety**

Since the accident, significant progress has been made to further strengthen nuclear safety, emergency preparedness and radiation protection around the world.

The IAEA has substantially contributed to this effort by its Action Plan on Nuclear Safety which was unanimously endorsed at the 2011 IAEA General Conference. Progress, reported periodically to IAEA Member States, continues to be made with the implementation of the Action Plan, through enhancing the IAEA peer reviews, reviewing and revising the IAEA Safety Standards, and strengthening the international Legal Framework, amongst other things.

## **IEMs**

Last month, we organised in Vienna an International Experts' Meeting on Severe Accident Management in the light of the accident at the Fukushima NPP. This was already the seventh in a series of International Experts' Meetings to analyse technical aspects of the accident and ensure that all lessons are learned and shared.

- IEM1 addressed Reactor and Spent Fuel Safety,
- IEM2 addressed Transparency and Communication Effectiveness in the Event of a Nuclear or Radiological Emergency,
- IEM3 addressed Protection against Extreme Earthquakes and Tsunamis,
- IEM4 addressed Decommissioning and Remediation After a Nuclear Accident,
- IEM5 addressed Human and Organizational Factors in Nuclear Safety,
- IEM6 addressed Radiation Protection after the Fukushima Daiichi Accident : Promoting Confidence and Understanding,
- In addition, as a “quasi IEM”, we organised in Ottawa, Canada, an International Conference on Effective Nuclear Regulatory Systems.

## **IAEA Fukushima Report**

As a major endeavour to share all lessons with the international community, Director General Amano requested us to produce an authoritative, factual and balanced assessment of the accident, addressing the causes and consequences as well as lessons learned. The IAEA Fukushima Report is on track to be finalized by the end of 2014, with the plan to share this report in 2015 to the IAEA Board of Governors and General Conference. Approximately 170 experts from over 40 Member States and relevant international organizations are involved in drafting the Report, organised around five chapters corresponding to five working groups: WG1 Description and Context of the Accident / WG2 Safety Assessment / WG3 Emergency Preparedness and Response / WG4 Radiological Consequences / WG5 Post-Accident Recovery.

## **Lessons learned**

The Fukushima Daiichi accident marks a turning point in terms of reviewing how nuclear safety is evaluated and ensured, triggering closer examination of specific site locations and designs associated with those sites. It has also compelled nuclear safety experts to confirm that the principles upon which nuclear safety have been built still remain valid—most notably the defence-in-depth

concept, but also that more needs to be done to ensure their effective implementation in all countries and all circumstances.

Much progress has been made in determining the lessons to be learned from the Fukushima accident and implementing them in nuclear facilities around the world to further strengthen nuclear safety, emergency preparedness and radiation protection – thus preventing another “Fukushima”.

While many lessons have been learned since the accident, the following refer directly to those findings regarding operation, organisation and monitoring:

### **Regulatory Framework**

- The first major conclusion of the Ottawa Conference recalled that “Although improvements in safety rely primarily on the actions of operators, regulatory oversight will be a driving force. In particular, regulatory bodies should promote continuous safety improvement processes. Regulatory independence, competence, a strong legislative authority and adequate resources are crucial to this process and are to be sustained by governments.” This goes in the same direction as obligations of Contracting Parties to the Convention on Nuclear Safety.

### **Peer Reviews**

- A need to enhance international peer review mechanisms for operators and regulators worldwide has been identified. This includes the IAEA OSART missions as well as the WANO peer reviews. For regulators, the IRRS plays a key role in supporting the enhancement of the national regulatory framework and regulatory capabilities by identifying areas that need to be improved, as well as good practices to be shared among regulators.

### **Assessment of the Plant in Relation to External Events**

- Hazards from external events contain large uncertainties, which should be managed by using peer reviews and large margins. As the science or level of knowledge improves, the hazards need to be reassessed. If the revised hazard significantly erodes the margin to safety and depending on the verification status, either interim or permanent physical modifications to the plant need to be made.
- Safety margins available in the design of NPPs against natural hazards, need to include sufficient protection against complex combinations of extreme natural hazards and the effects of these hazards on multi-unit NPP sites.

### **Assessment of the Design Features of Reactors**

- Consideration should be given to the design of systems to remove decay heat, that are independent of the normal cooling water systems. Examples of these types of systems are passive cooling systems or mobile equipment. As these systems can eventually be the last option in case of extreme events, their design must pay special attention to their robustness in case of common cause failure events.

#### **Assessment of the Treatment of Beyond Design Basis Events**

- A comprehensive probabilistic safety assessment is an essential component to verifying the safety of a nuclear power plant from internal and external hazards specific to the site. An internal flooding probabilistic safety assessment would have indicated the lack of protection from flooding of the diesel generators, battery rooms and emergency electrical switchgear.

#### **Accident Management Provisions and their Implementation**

- There is a need to strengthen prevention and mitigation. This means strengthening severe accident management practices, guidelines and regulations to be used by the operating organizations and regulatory bodies.
- It is critical that nuclear power plants maintain accident management guidance up-to-date with the latest available guidance from designers and owner's groups and that the guidance implemented at the station has a sound technical bases which is not deviated from.
- Development of accident management needs to be preferably based on plant specific analytical support using a combination of deterministic and probabilistic approaches, providing adequate input for development of accident management strategies.

#### **Assessment of Human and Organizational Factors and Safety Culture**

- All organizations "construct their own reality." Organizations must be aware of this fact and take active steps such as inviting diversity of inputs and/or alternative viewpoints to compensate for the effect of this reality-construct.
- More than ever, it is understood that a systemic approach to safety interaction between all the individual, technical and organizational (ITO) factors is necessary to complement a purely technical approach to safety. Safety culture must be a constant concern of regulators as well as operators.

#### **Assessment of the use of Operating Experience to Improve Plant Design and Operation**

- After becoming aware of a potential problem, arising from research findings or new analytical methods, it is necessary to assess the potential safety implications and to establish without delay interim compensatory actions to maintain the safety margin pending final confirmation of the problem.
- When considering the applicability of significant operating experience, it is important to go beyond the specific of the event and consider the potential for similar consequences due to different initiators.
- For an operating experience programme to be effective, it must function within a management system where nuclear safety is paramount and overrides all other demands. It is important to periodically check if the organization is effectively upholding nuclear safety as the overriding priority.

### **Convention on Nuclear Safety**

Many of these lessons and related activities have also been reported during the 6<sup>th</sup> Review Meeting of the Convention on Nuclear Safety, and gathered in the presentation of the Special Rapporteur, Mr Petteri Tiippana on 1<sup>st</sup> April on *measures taken by Contracting Parties as a consequence of Fukushima accident*. I would like to quote his conclusions:

*“Nuclear safety has improved and is improving as a consequence of measures taken after Fukushima accident:*

*–Countries have assessed safety of their NPPs and are taking measures to improve safety*

*–Countries are taking measures to improve their emergency plans and response capabilities*

*–National safety frameworks are getting better by more independent regulators, updated regulations and improved safety culture*

*–International co-operation is increasing and we are learning from others e.g. via peer reviews, by exchange of information.*

*Progress however is not consistent – E.g with regards to safety improvements on nuclear power plants, we seem to have differences in the safety objectives, priorities and implementation schedules.”*

### **Concluding Remarks**

As you can see, much has been done but more still remains. We need to continue working on preventing another nuclear accident, but we need also to continue working on preparing to respond to another nuclear accident.

I look forward to thought-provoking, productive discussions and hope to take advantage of the insights and information shared during this session and throughout the remainder of this conference.

Thank you again for your attention.