Safety and Research after Fukushima

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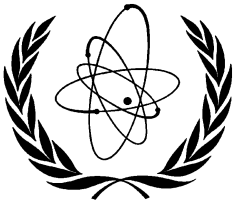

INTERNATIONAL ATOMIC ENERGY AGENCY

After 25 years without serious accident, as a result of extreme natural hazard that struck Japan East Coast on March 11th, the Fukushima Daiichi NPP was severely damaged and is still in a crisis situation. Public confidence in the safety of nuclear power has been badly shaken. However, nuclear power will remain important for many countries, so it is imperative that the most stringent safety measures are implemented everywhere, in countries using nuclear energy as well as in countries opting to phase out their nuclear power programmes, and this should be also an imperative for countries considering developing the uses of nuclear energy.

Nuclear safety is going through a major test of its capability to assess its weaknesses, to learn from the accident, and finally to rebuild global confidence in the safety of nuclear energy.

Nuclear accidents respect no borders, so an international approach to nuclear safety is essential. The IAEA is the global body which has been created to help ensure that the most robust international nuclear safety framework is established, implemented and continuously updated.

It is in this context, with a profound sense of responsibility that I address this audience

Global Perspective

I want first to mention the extraordinary mobilisation of our Japanese colleagues, the staff from TEPCO Fukushima Daiichi NPP who is still struggling to bring the four damaged reactors to a safe state, together with Japanese regulators, ministries and agencies. This mobilisation also embraced the whole international nuclear community: Governments, regulators, industry and operators around the globe, and the International Atomic Energy Agency.

The damages due to the accident have been of various natures indeed. The most visible one is to the reactors themselves. They first need to be brought to a safe stable situation. In this regard, the Company TEPCO has proposed a roadmap to recovery which it is implementing, with the inevitable difficulties linked to such a complex operation, performed in very difficult conditions. Once the four units will be safely stabilised, and when radioactive releases to the environment and to the sea will be reliably stopped, decisions will have to be taken as to the ultimate future of the crippled reactors. This will cover a very long period – decades if we can judge from the two previous severe accidents of Three Miles Island and Chernobyl.

The surrounding environment was also damaged through contamination of the soil and of the sea. As a result of the radiological situation, some 80000 local residents of the Fukushima prefecture have been evacuated, or are in the process to leave their residence. This risk to the residents close to a NPP, that some day they may have to abandon all their belongings, possibly never to return, is probably the source of most damage in terms of confidence in the safety of nuclear energy.

This understandable loss of confidence, has then spread worldwide, and has become one of the most complex damages to be addressed by the international community. The difficulties associated to providing reliable and timely information, while being in a critical situation, to neighbouring countries and the international community, contributed also to the loss of confidence of the public towards governments and many of the actors of the nuclear sector.

The remedies to this series of damages need to be found in various fields of activities: strengthening nuclear safety nationally and internationally, strengthening the Emergency Preparedness and Response framework, strengthening the global nuclear safety framework, improving nuclear technology, and improving information sharing. Some of the remedies will need to deepen our knowledge, obviously in the field of the understanding of the effect of ionising radiations on the public and on the environment, and on remediation technology. Most of these efforts will rely on increased international cooperation.

But first let me state my conviction that while some States have decided to phase out nuclear energy, and while others have decided to continue their commitment to the use of nuclear energy, there is a limited window of possibility to rebuild confidence in the sustainability of a responsible use of this energy. If no significant strengthening of nuclear safety is perceivable in the next year or two, there is a high risk that public pressure, nationally and across borders, could lead to a domino effect, and more governments will have difficulties in furthering the use of nuclear energy.

I shall now point on the main results of the IAEA ministerial Conference, then add views more specifically related to the consequences in terms of the necessity to develop Research and Development capacities.

The process to assess, learn, and rebuild confidence has already gone through many milestones in little more than three months. The Vienna IAEA Ministerial Conference was prepared by in depth consultations of IAEA Member States. It built on the detailed reports of the Japanese Government on the accident, and on the report of the IAEA International Fact-Finding Expert Mission which undertook a 10-day mission to Japan.

The participation of many ministers and over one thousand participants showed how seriously the IAEA Member States take nuclear safety. The Ministerial Declaration adopted already on the first day of the Conference outlined a number of measures to improve nuclear safety and expressed the firm commitment of IAEA Member States to ensure that these measures are actually implemented. Collectively, Member States have expressed their sense of urgency, as well as their determination that the lessons of Fukushima Daiichi will be learned and that the appropriate actions will be taken.

At the very outset of the Conference, Director General Amano made five concrete proposals:

- to strengthen IAEA Safety Standards;
- to systematically review the safety of all nuclear power plants, including by expanding the IAEA's programme of expert peer reviews;
- to enhance the effectiveness of national nuclear regulatory bodies and ensure their independence;
- to strengthen the global emergency preparedness and response system; and,
- to expand the Agency's role in receiving and disseminating information.

The Working sessions and also the plenary Statements covered a wide range of ideas, which can be organized around major themes:

- The IAEA Safety Standards,
- The safety of Nuclear Power Plants,
- The Peer Review mechanisms,
- The worldwide emergency preparedness and response framework,
- The International Cooperation,
- The Global Nuclear Safety Framework.

Strengthening the IAEA Safety Standards

From the very beginning, in the Ministerial declaration, the importance of the IAEA Safety Standards has been recognized. They represent the common reference for nuclear safety.

The results of the IAEA Fact Finding mission showed for example that the underestimation of the earthquake hazard in the original hazard study as well as in more recent re-evaluations mainly resulted from the use of recent historical seismological data while the current IAEA safety standards establish a clear time scale (going back to historical and prehistorical eras) as well as tectonic capacity considerations, in the estimation of maximum magnitudes associated with seismogenic structures.

A preliminary examination of the IAEA Safety Standards, on preparedness and response related to severe reactor emergencies indicated also that the relevant standards address the issues adequately. However, not all Member States apply them, and those States that do apply them may not always implement them fully.

As the details of the Fukushima accident will become clearer over time. The IAEA, following the call from its Director General will review and update its Safety Standards, to incorporate the lessons learned from the Fukushima accident.

Safety Reviews

The Fukushima accident has highlighted the need for thorough and transparent national safety assessments of nuclear power plants. It was suggested that the IAEA develop a service that focuses on (a) safety margins against extreme natural hazards, such as earthquakes, tsunamis and floods, and (b) the regulatory implications of the Fukushima accident.

It was further suggested that internationally harmonized review methodologies be implemented by all Member States. The IAEA could play a leading role in the development of these methodologies on a coordinated basis, and assist in carrying out peer reviews of national safety reviews, using the services of international expert teams and make the results publicly available.

Peer reviews

The role of independent international peer reviews of national regulatory frameworks and nuclear installations should be reinforced as part of the process of ensuring that there is continuous improvement of safety and proper regulation of nuclear installations. These peer reviews provide recommendations to improve safety and serve to exert peer pressure to ensure that every State with nuclear installations recognizes its safety responsibility and is able and committed to meet the IAEA Safety Standards.

In addition, the IAEA's safety review services are currently being carried out in Member States on a purely voluntary basis. The IAEA peer review services (IRRS, OSART, design review service) need to be accorded a greater profile, and an increased level of transparency to enhance public confidence in the national and international arrangements for safety. Member States with nuclear power programmes could consider giving prior consent to the IAEA to perform systematic, regular international peer reviews of regulatory effectiveness, operational safety and emergency preparedness.

Emergency Preparedness and Response – information

Legal instruments for the international emergency preparedness and response framework were adopted 25 years ago and inevitably reflect the prevailing concerns at that time. Possible ways to strengthen these instruments should be considered.

To better cope with serious emergencies, international assistance arrangements and capabilities should be strengthened by enhancing the IAEA's Response and Assistance Network (RANET) and by implementing its improved guidelines to ensure assistance compatibility and effectiveness.

The IAEA's role in response to a radiation emergency should be broadened to enable it to conduct analysis of emergency conditions, progression, possible scenarios for emergency development, consequences, associated radiological impact and response actions, and to share this analysis with Member States.

It was considered that the International Nuclear and Radiological Event Scale (INES), a communication tool, did not answer properly the expectations of the public. Review and improvement are needed to make the scale more effective from a communications point of view.

International cooperation

While recognizing that the operator has prime responsibility for nuclear safety, all parties (governments, operating organizations, regulatory bodies, technical support organizations, research organizations, WANO, OECD/NEA, etc.) which have a role to play in nuclear safety should work together, respecting their different roles and responsibilities, to maximize the benefits of the lessons learned.

The IAEA and WANO were encouraged to establish a mechanism to improve their cooperation in sharing experience, and in particular to learn lessons from the Fukushima accident, while respecting each other's roles and limitations.

Japan confronts a major challenge in the remediation of contaminated areas. The remediation should benefit from the knowledge of international experts and the experience gained should be made available to the international community

Global Nuclear Safety Framework

The existence of credible, competent and independent regulators is an essential element of nuclear safety. It was recognized that effective regulatory independence is one of the main pillars for strengthening nuclear safety. All countries were encouraged to reinforce their regulatory bodies and ensure that they are genuinely independent, with clarity of role and appropriate authority, in all circumstances, and staffed by well trained, experienced personnel.

The Convention on Nuclear Safety (CNS) could be enhanced by taking into account areas such as transparency, the independence of regulatory bodies, emergency preparedness and the peer review process. If an amendment to the Convention is undertaken, it might appropriately incorporate, among other matters, stronger requirements related to the concept of effective regulatory independence. However, the response to the Fukushima accident should not await the amendment of the Convention.

The need for Research and Development

When I took office at the IAEA in September 2010, my primary concern was that so called Newcomers countries, would need many years before they could develop their own "fabric" of scientific knowledge, based on academic research, scientific and technologic developments. I considered that in

case of an accident, the absence of this background scientific tissue of knowledge, would terribly weaken the necessary response to the accident.

Today after Fukushima, this conviction is even stronger than before. And I should add that the availability of a strong, safety oriented research body is a necessity before, during, and after the accident.

Indeed, the behaviour of nuclear fuel under severe accidental conditions has been already studied in some configurations, but the post mortem of Fukushima fuel will show that our knowledge in this field needs improvement to avoid or mitigate the consequence of long periods without cooling. As is well known, the programmes that rely on actually irradiating fuel, have to be performed in one of the very few available facilities in the world, they are very complex, and they need very long lead times. It is definitely a field for international cooperation, including technology and safety experts.

Part of the loss of confidence that I mentioned earlier, is due to our very imperfect knowledge about the effects of ionising radiations at low doses. And this is most certainly the domain that is relevant to Fukushima – low doses. Vast research programmes have been dedicated to this subject since the earlier years of the uses of nuclear energy, but their importance is greater than ever.

But today, the focus must not be only on the effects on the people. The effects on the environment are more and more part of the concerns of the public, but also more and more the subject of national or international regulations. In addition, building on the strong will expressed by the Japanese Government to recover the use of contaminated land, an opportunity opens to develop, through research programmes, decontamination techniques and processes. The scarcity of usable land in Japan is a formidable incentive to demonstrate that contaminated land is not condemned for ever.

And I would like to end this review of research by an indirect, but none the less important, incentive to develop research in the field of safety. Human resources in nuclear science have declined even faster than in Science itself. Nuclear safety expertise is not a bureaucratic activity, it is a permanent questioning. How do you attract bright young guys to the field of safety expertise? Big money? I cannot speak for everybody, but in the last decade, if you really wanted to make money, you chose business rather than science. I do not think we can compete. So it must be a challenging scientific job. This is why there is a need to include research in the day to day missions of safety organisations. Good news is that a questioning attitude is exactly what is at the heart of research.

Conclusion

Rather than a conclusion, I would like to make a plea. During these past three months, I have seen at first hand the distress of countries with little capabilities to assess the situation; I have seen the loss of confidence of the public in the capability of governments, regulators and the industry to safely manage nuclear energy; I have seen the expectations of this same public in a strong global nuclear safety framework.

We have a responsibility to demonstrate in a totally transparent way that all actors share a common vision of safety values, share the same views on the ways to continuously enhance nuclear safety, through strong and responsible operators, through improved technology, and through the overview of a strong and independent regulator.

This is why I shall conclude in saying that now is the time to strengthen the IAEA Safety Standards, consistently implement them, review the safety of NPPs and work together for the benefit of the worldwide nuclear community.