SUMMARY AND CONCLUSIONS OF THE CONFERENCE

Report of the Conference President[1]
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BACKGROUND OF THE CONFERENCE

This conference was the fourth in a series of conferences on the topic of effective nuclear regulatory systems. The three preceding conferences were held in Ottawa, Canada, in 2013; Cape Town, South Africa, in 2009; and Moscow, Russian Federation, in 2006. This conference built upon the conclusions and deliberations of these preceding events to review issues and recent developments that are important to the global nuclear regulatory community and to focus on, in particular, their key role in ensuring safety and security.

Since the previous conference held in Ottawa, Canada, in 2013, there have been a number of significant events. In April 2014, the Contracting Parties to the Convention on Nuclear Safety (CNS), at the Sixth Review Meeting, discussed a number of cross-cutting issues, as well as a proposal by Switzerland to amend the CNS. A diplomatic conference to consider the Swiss proposal was convened in Vienna, Austria, in February 2015, at which the participants unanimously adopted principles to guide Contracting Parties in the implementation of the objective of the CNS, namely to prevent accidents with radiological consequences and mitigate such consequences should they occur.

The entry into force of the Amendment to the Convention on the Physical Protection of Nuclear Material (CPPNM) was secured in April 2016. The Amendment calls on States Parties to establish and maintain legislative and regulatory frameworks, designate competent authorities, and take measures necessary for the security of nuclear material and nuclear facilities.

Related issues have also been addressed at a number of other conferences and meetings, including the International Experts Meetings organized and conducted within the framework of the IAEA Action Plan on Nuclear Safety. The IAEA report on the Fukushima Daiichi accident, published in September 2015, includes a number of observations and lessons learned in the light of the accident relating to regulatory effectiveness.

The importance of maintaining strong control over radiation sources was the focus of the International Conference on the Safety and Security of Radioactive Sources: Maintaining the Continuous Global Control of Sources throughout their Life Cycle, held in October 2013 in Abu Dhabi, United Arab Emirates.

A further significant milestone since the conference in Ottawa was the adoption of a Ministerial Declaration at the International Conference on Nuclear

[1] The views and recommendations expressed here are those of the President of the Conference and the participants, and do not necessarily represent those of the IAEA.

Security: Enhancing Global Efforts, held in July 2013. The Declaration affirmed the central role of the IAEA in strengthening the nuclear security framework globally and in leading the coordination of international activities in the field of nuclear security. The Ministerial Declaration also highlighted the importance of IAEA guidance in improving and strengthening regulatory effectiveness.

Finally, this fourth conference on effective nuclear regulatory systems coincided with the tenth anniversary of the launch of the IAEA's Integrated Regulatory Review Service (IRRS) and provided an opportunity to focus on the experience of Member States and the IAEA in the implementation of lessons learned from IRRS missions. The International Nuclear Safety Group (INSAG) has re-emphasized the importance of the IAEA peer review services and the role they can play in ensuring the development of competent regulators. The Ministerial Declaration adopted at the International Conference on Nuclear Security in July 2013 also encourages States to use, on a voluntary basis, the IAEA's nuclear security advisory services and peer reviews.

CONFERENCE OBJECTIVES

The objective of this conference was to review and assess ways to further improve the effectiveness of regulatory systems for nuclear facilities and activities for both nuclear safety and nuclear security. Among the expected outcomes were:

- Enhanced safety and security of nuclear installations worldwide;
- Challenges in regulating radiation sources and radioactive waste addressed;
- Enhanced international cooperation for sustaining regulatory effectiveness;
- Strengthened and sustained regulatory competence for nuclear safety and security;
- Strategies and actions for the future identified, as well as issues for consideration by governments, regulatory bodies and international organizations.

OPENING SESSION

The conference was opened by IAEA Director General Yukiya Amano, who noted that improvements had been made throughout the world both in establishing effective regulatory systems and in improving nuclear safety generally. In the five years since the accident at the Fukushima Daiichi nuclear power plant, all countries with nuclear power programmes have taken vigorous steps to reassess all aspects of safety and to make improvements, where necessary. Additional measures have been put in place to protect against extreme natural events (such as major earthquakes and tsunamis), and some countries have reformed their regulatory systems. For its part, the IAEA, through its regular work, is continuing activities under the IAEA Action Plan on Nuclear Safety.

Mr. Amano noted that while nuclear safety and security are primarily the responsibility of individual countries, the IAEA has a vital role to play in ensuring international cooperation. The IAEA provides an international forum through which national regulatory bodies share information and experience. Strong and independent regulatory bodies, operating under a robust legal framework, are vital for ensuring a

high level of nuclear safety and nuclear security. Mr. Amano stressed that there can be no grounds for complacency on nuclear safety in any country. Continuous questioning and openness to learning from experience are essential for everyone involved in the nuclear sector.

Mr. Amano pointed out that the IAEA will begin celebrating its 60th anniversary in 2016 and that one of the most important IAEA peer review services — the IRRS — will mark its tenth anniversary during that year. This important service, in which leading practitioners share their experience and offer expert advice to those countries that request a mission, has resulted in regulatory improvements that have benefited countries throughout the world. He noted that the IAEA's expert peer review services are among the most valuable services offered by the organization and encouraged all countries to make use of the full range of peer reviews.

Mr. Amano noted that the number of countries that have adhered to the Amendment to the CPPNM has now reached the number required to allow the Amendment to enter into force. The Amendment makes it legally binding for countries to protect nuclear facilities, as well as nuclear material in domestic use, storage and transport. It will reduce the risk of a terrorist attack involving nuclear material, which could have catastrophic consequences.

Finally, Mr. Amano noted that improving nuclear safety is an issue that will never cease to require attention — and one in which regulators play an essential role. He pointed to the conference as an opportunity to reflect on how to sustain the momentum in improving nuclear safety.

In his opening remarks, Mr. Liu Hua, the President of the conference, noted that the presence of so many attendees at the conference indicated a high level of interest in effective nuclear regulation. He added that effective regulatory systems are very important in maintaining and improving global nuclear safety, and that the first conference on this topic, held ten years ago, created a valuable platform for achieving that goal. In the past decade, through the conferences held in Moscow, Cape Town, Ottawa and Vienna, the importance of effective regulation has become better understood and key elements, including independence, transparency, openness, competence and wider international cooperation, have been identified. Mr. Liu Hua pointed to specific actions proposed for governments, regulatory bodies and stakeholders, and highlighted that many of the actions had already achieved fruitful outcomes.

He also noted that many lessons had been learned and many improvements had been made in the light of the Fukushima Daiichi accident. He stressed that only by gaining a deeper knowledge of safety could nuclear energy be better understood, and that only by making nuclear energy safer could it be made stronger.

Mr. Liu Hua also reminded conference participants that doses received by the world's population from radiation sources are much greater than those from nuclear power plants, with by far the largest contributor being medical exposures, which have doubled in number in recent decades. This indicates the need to pay great attention to radiation safety, radioactive sources and radioactive waste management.

In his personal reflections regarding the development of nuclear energy and the lessons that have been learned from the Fukushima Daiichi accident, Mr. Liu Hua stressed the need to:

— Further improve government infrastructure;
— Further improve nuclear safety standards;

— Further develop regulatory capacity building and human resources;
— Further enhance knowledge and experience management and transition,
— Further foster and strengthen nuclear safety culture;
— Further improve and rebuild public confidence.

Mr. Ramzi Jammal, Vice President of the conference, noted that progress had been made since the Ottawa conference in 2013, whose theme had been 'Transforming Experience into Regulatory Improvements' and whose President had identified six key action items. Mr Jammal stated that although the IAEA and its Member States had reported on the follow-up activities undertaken as a result of the actions identified at that conference, there was a need to develop a formal reporting mechanism to enable both Member States and the IAEA to systematically report follow-up activities. Mr. Jammal gave brief status updates on the six action items identified at the Ottawa conference and challenged the participants at the present conference to provide a comprehensive report on what had been accomplished since 2013.

Mr. Jammal noted the difficulty of obtaining political acceptance of the fact that nuclear safety is as important as nuclear security and safeguards, remarking that heads of state do not meet to discuss nuclear safety in the same way they do nuclear security, and that many may have the perception that the IAEA is the international watchdog for safety.

Mr. Gustavo Caruso, in his keynote speech, noted that the IAEA Action Plan on Nuclear Safety had concluded in 2015, but that a number of ongoing activities continue under the IAEA's regular programme of work. He pointed to the more than 350 lessons that can be found in the IAEA report on the accident at the Fukushima Daiichi nuclear power plant, which are distilled into 45 key observations and lessons in the Director General's report.

Mr. Caruso noted that the adoption of the IAEA safety standards in their regulatory systems can be helpful for embarking states. He also noted that the technical elements of the Vienna Declaration on Nuclear Safety are reflected in the revised Safety Requirements, and that Safety Guides are under review so as to incorporate these technical elements.

Mr. Srivasista Chande, in his keynote speech, noted that the accident at the Fukushima Daiichi nuclear power plant led to an evacuation of the local population, and that the lesson drawn was that the displacement of a large number of people for a long period is not acceptable to society and that, therefore, there is a need for off-site actions to be limited or even eliminated. This leads to the requirement that accidents involving early or large releases be 'practically eliminated'.

KEYNOTE PANEL — A GLOBAL VISION

The Keynote Panel noted that in the three years since the Ottawa conference, many reports had been issued on the accident at the Fukushima Daiichi nuclear power plant, and the Vienna Declaration on Nuclear Safety had been unanimously adopted at a diplomatic conference. The panellists then presented and discussed their thoughts and ideas with respect to a global vision for the future of nuclear regulation.

The Keynote Panel addressed the following points:

— The observations and lessons from the IAEA report on the accident at the Fukushima Daiichi nuclear power plant are not ends in themselves but are steps that can help strengthen nuclear regulatory systems.
— The 'stress tests' that were performed on nuclear power plants by many countries following the Fukushima Daiichi accident were short term steps. Just as the accident at Three Mile Island changed how operating experience and severe accident management are dealt with, and the Chernobyl accident changed how safety culture is viewed, there are still long term lessons to be learned from the Fukushima Daiichi accident. Some potential long term lessons to be learned from the accident were discussed, including:
  - Addressing the uncertainty and magnitude of the consequences of extreme natural hazards in order to maintain the safety of nuclear installations.
  - Improving the safety of existing installations (as per the Vienna Declaration on Nuclear Safety and the European Union's Nuclear Safety Directive) as far as reasonably practicable. Eliminating the off-site impacts of accidents will be challenging, as some plants may not be able to make the necessary improvements, and difficult judgements may have to be made as to whether to continue operation or to shut the plant down.
  - Improving emergency preparedness and response capabilities to anticipate and deal with the consequences of a severe accident anywhere in the world.
— Regulatory bodies of States with established nuclear power programmes should harmonize their national requirements with the IAEA safety standards and embarking States should consider adopting these standards directly.
— International collaboration between regulatory bodies should be strengthened. Areas for further collaboration include knowledge networking as well as joint research and development and bilateral cooperation in the import or export of nuclear power plants.
— Regulatory bodies must improve safety without stifling innovation through finding the right balance between under- and over-regulation and avoiding becoming static or entrenched in their thinking (i.e. perfecting their 'regulatory craft'). The principles of good regulation should be independence, openness, efficiency, clarity and stability in the application of regulations.
— Strong nuclear safety and security cultures must be encouraged, noting that the interface between safety and security remains a challenge. While safety culture cannot be enforced, it needs to be promoted by the regulatory body. The challenge is in measuring and regulating it, and the regulatory body should strive to harmonize its approaches with those of operators.
— As medical procedures are the main source of radiation exposure to the public from human-made sources, the implications of growth in this area must be addressed.
— Various regulatory systems are possible; for example, an inexperienced regulatory body may adopt a checklist approach, whereas an experienced one could set objectives and allow the operator to decide how to meet them.
— The use of IRRS missions should continue to be encouraged, as they can serve as a barometer of a good and improving organization, and their criteria embody the principles of good regulation. Implementation of recommendations and follow-up missions were seen by conference

participants as being crucial for the success of IRRS missions. While international peer reviews are viewed as highly positive, it is believed that they should challenge the host more and focus on weak points and implementation of recommendations and on follow-up.

SESSION 1: REGULATORY LESSONS LEARNED AND ACTIONS TAKEN

This session addressed the regulatory lessons learned and actions taken following the accident at the Fukushima Daiichi nuclear power plant. The presentations reviewed the actions taken by Member States in response to the accident, discussed the parallels between the Fukushima Daiichi accident and other major nuclear accidents (e.g. the accident at Three Mile Island), and discussed the impact of the accident on the IAEA safety standards. Participants also discussed the importance of the CNS as a tool for nuclear safety as well as measures to further strengthen it.

Ultimately, the lessons learned and the actions taken to address those lessons mean that nuclear power plants are now safer. However, governments and nuclear regulators must remain committed to international cooperation through active participation in the CNS, IAEA peer reviews and the exchange of information between regulators at international events such as this conference.

The session noted the following points:

— There are parallels between some of the major nuclear accidents, including complacency in implementing lessons learned and feedback from operating experience; a lack of preparation for the unexpected; deficiencies in operator training and technical capabilities; and a poor safety culture.
— As a result of the accident at the Fukushima Daiichi nuclear power plant, Member States have undertaken specific actions to address the lessons learned. The actions taken have resulted in the significant improvement of the safety of nuclear power plants against severe accidents. In particular:
  - ‘Stress tests’ were performed by all countries with nuclear power plants. The main conclusion from these assessments was that, while there was no need for the immediate shutdown of nuclear installations, there was a need to increase facility robustness to withstand extreme situations beyond existing safety margins.
  - The accident highlighted the need for a clear separation of the regulatory body from promotional activities and the integration of all nuclear regulatory functions within the regulatory body.
— The accident highlighted the need to strengthen and harmonize approaches to emergency preparedness and response:
  - In the event of an accident, a radioactive release could affect neighbouring countries. The lack of a common approach to the implementation or execution of cross-border protective actions could lead to public confusion and concern.
  - In preparing for an emergency, the national responses of impacted countries must be coordinated, with the aim of achieving a coherent regional response to ensure proper decision making by operators, regulatory bodies and governments.

— The IAEA safety standards are the global reference for achieving a high level of safety. A review of these standards undertaken in the light of the Fukushima Daiichi accident indicated that there was no significant weakness in the existing safety standards. It was found that most of the lessons from the accident were not new and had previously been incorporated into the safety standards. A further review confirmed that the technical elements of the Vienna Declaration on Nuclear Safety were captured by the relevant IAEA Safety Requirements. In this regard, implementation of the IAEA safety standards by Member States is key. Recommendations from peer reviews also need to be implemented by Member States.
— The Contracting Parties to the CNS, which include almost all Member States operating or planning to operate nuclear power plants, have obligations placed upon them by the CNS. Compliance with these obligations varies across countries, including those with and without nuclear power plants, and those embarking on a nuclear power programme. It was emphasized that Contracting Parties must fully understand and respect these obligations. It was also noted that the procedures associated with the CNS review process had been strengthened and were agreed at the last review meeting.
— Nuclear accidents result in the loss of public trust in both the regulatory body and the operator. Therefore, regulators need to continually strive for openness and a transparent process.

SESSION 2: CHALLENGES IN REGULATING NUCLEAR INSTALLATIONS

This session addressed numerous challenges, some generally applicable and others specific to a set of individual countries, such as those embarking on a nuclear power programme. Such challenges include: ensuring an appropriate and current legal and regulatory framework; addressing ageing of the existing fleet of nuclear power plants, especially in the context of licence renewals; addressing challenges associated with the regulatory review of imported nuclear power plant designs; maintaining capacity building for continued regulatory competence; promoting safety culture; enhancing the safety and security interface; monitoring construction and start-up of operation; and ensuring openness and transparency in communication with the public.

The session noted the following points:

— The lessons learned from the focused safety assessments that were completed worldwide following the accident at the Fukushima Daiichi nuclear power plant led to many additional protective features and mitigation measures.
— Harmonizing national standards with international standards would assist in the safe and efficient introduction of new nuclear power plants.
— The regulatory bodies of embarking countries would benefit from studying the regulatory framework of the vendor country as well as other established nuclear regulatory bodies. Their regulatory bodies will need international support for building a sound regulatory framework and the competence of its staff.
— Safety oversight of ageing phenomena is needed throughout the lifetime of a nuclear power plant, starting from the early design and construction phases.

— The increasing trend for long term operation (including licence renewals) requires continuous research on ageing mechanisms and effects, including the development of detection technologies.
— An open and continuous dialogue between the regulatory body and the operator promotes safety. To the extent possible, this dialogue should be open and transparent to the public.
— International peer reviews should be used to assess a regulatory body's capabilities and performance against internationally recognized criteria, such as the IAEA safety standards.

SPECIAL PANEL: REGULATORY ASPECTS AND CHALLENGES OF HIGH LEVEL WASTE

This Special Panel presented approaches taken in, and the status of, the management of high level waste in a number of countries. It was noted that, while some countries have already decided on sites for the disposal of waste based on a voluntary process and work is progressing, other Member States are at much earlier stages in the process, namely searching for a host community.

The Special Panel noted the following points:

— The entire process of selection, siting and design, application development, and construction and operation is very long and is complicated by numerous factors that may span many decades. A strong national policy commitment is important to support high level waste management over the life of the project. Maintaining competence and resources over such long time periods is challenging.
— Stakeholder involvement, particularly host community engagement, is crucial; it is important to have the early agreement of the selected host community.
— The selection process needs to be transparent. Communication with the host community and other appropriate stakeholders is important. Regular public meetings between the operator and the regulatory body are advisable.
— The independence of the regulatory body from the operator is crucial; this may include independent research and meetings with stakeholders and the general public.
— Consideration should be given to the formation of an international working group to develop criteria to determine when a safety case in support of a high level waste facility meets regulatory requirements.

SESSION 3: CHALLENGES IN REGULATING RADIATION SOURCES AND RADIOACTIVE WASTE

This session covered a range of topical issues related to regulation of all types of radiation sources — namely apparatus generating ionizing radiation and radioactive sources — both in use and at the end of their life cycle, when they become disused or are declared as waste. The presentations dealt with a variety of challenges, including establishing and improving regulatory systems in Member States; regulating new medical technologies; dealing with disused sources; and addressing radiological accidents involving radiation sources.

This session was of key interest to a wide audience. The majority of IAEA Member States do not have nuclear power facilities, yet all States use radiation sources and have to deal with disused sources or radioactive waste. Moreover, patient exposures account for the highest human-made radiation exposure of the population, and radiation sources have caused more accidents and have led to higher exposures to more people than accidents at nuclear power facilities.

The session noted the following points:

— The IAEA safety standards, the Code of Conduct on the Safety and Security of Radioactive Sources and its supplementary Guidance on the Import and Export of Radioactive Sources are widely used by regulators and have been very effective in enhancing the safety and security of radioactive sources worldwide. The IAEA, through its technical cooperation activities and its review and advisory missions, assists Member States in establishing or enhancing their regulatory infrastructure in line with the IAEA safety standards.
— While the safety of nuclear installations and of radioactive waste and spent fuel, the physical protection of nuclear materials, and the notification of accidents and the provision of assistance in the event of an accident or incident are covered by international conventions, no similar instruments exist for radioactive sources. A legally binding international instrument (or instruments) focused on radiation sources would in the longer term bring a higher level of commitment by States and therefore facilitate the necessary governmental support of national regulatory bodies.
— Establishing a new, independent and fully functioning regulatory body requires the support of high level policy makers for both the provision of funding and the availability of competent staff. Member States, especially those at the early or middle stages of developing their radiation safety infrastructure, would, in this regard, benefit from the wide dissemination of the model strategic approach to establishing and strengthening radiation safety infrastructure.
— The management of spent or disused radioactive sources, including legacy sources and recovered orphan sources, continues to be a challenge in many countries. Noting that the long term storage of disused sources poses its own set of safety and security challenges, and that returning sources to the supplier is not always an option, disposal is being considered in some countries. Opinions differ concerning the safe lifetime for the use of radioactive sources and any extensions, and how this should be regulated.
— The integration of regulation concerning the safety and security of radioactive sources can be challenging, but it can also bring benefits in terms of efficiency and effectiveness.
— The development and introduction of new medical radiation technologies would benefit from improved communication between regulatory bodies, manufacturers, professional bodies and end users.
— Reports of accidents involving patients, workers and the public highlighted that, although prevention is the best option, there is still an ongoing need to ensure that emergency preparedness and response continues to be a high priority. It was recognized that the International Nuclear Event Scale (INES) is only one of several communication tools and it should not be used as a decision making tool.

— There are many national approaches to dealing with the import and export of both radiation generators and radioactive sources. While there may be no 'one size fits all' methodology, there may be scope for better harmonization of these approaches.

SESSION 4: STRENGTHENING INTERNATIONAL COOPERATION

This session addressed international cooperation among various stakeholders and regulatory networks for enhancing nuclear and radiation safety and security. The presentations highlighted that international cooperation covers numerous aspects in support of the enhancement of the capacity of regulatory bodies to deliver their mandates in an effective manner. IAEA peer review services were discussed as important tools available to Member States for enhancing nuclear safety and security.

A number of challenges were identified by the regulatory networks, including competing safety priorities at the national level; monitoring and assessment of progress in implementation; and dissemination of information and results of cooperative activities.

The session noted the following points:

— International cooperation in the regulatory area covers numerous topics, and benefits from the active involvement of various organizations in the promotion of the acceptance of the IAEA safety standards.
— International support contributes to improving the competence, skills and knowledge of regulatory staff.
— International and regional support cannot serve as a substitute for the activities, responsibilities and commitment of national regulatory bodies.
— The IAEA is considered to be an advisor on nuclear safety, responding to invitations for support by Member States.
— The IAEA's peer review services enhance the safety of nuclear installations by identifying opportunities for improvements and contribute to enhancing regulatory effectiveness and transparency through an increasing number of de-restricted reports. Peer review services play an essential role in the development and implementation of the safety infrastructure for a new nuclear power programme. While there has been an increase in the number of requests for peer reviews, requests for follow-up missions lag behind. Self-assessment as part of the preparation for peer review missions is recognized as valuable for a successful mission.
— Challenges faced by regulatory networks include addressing differences in the level of development from country to country, coordinating with other networks, creating and maintaining awareness of the network in member countries, and developing a qualified and experienced workforce.
— Some regulatory bodies give credit to the licensees when hosting an operational peer review mission, which avoids duplication of efforts.

SESSION 5: STRENGTHENING REGULATORY COMPETENCE

This session addressed the issue of strengthening regulatory competence together with various strategies for establishing and ensuring the sustainability of the

competence of the regulatory body and its technical support organization. The session highlighted that staff of the regulatory body need to be competent in order to discharge their technical core regulatory functions, and they need to understand the nuclear safety and security concept in order to develop the nuclear safety and security culture within the organization.

The session noted the following points:

— IAEA peer review services provide a good independent review of both regulatory competence and education and training programmes, especially those services geared specifically to education and training (e.g. Education and Training Appraisal (EduTA) and Education and Training Review Service (ETReS)). The IAEA's Guidelines for Systematic Assessment of Regulatory Competence Needs (SARCoN) methodology is useful for assessing the needed competences, identifying gaps in the existing competences, and bridging the gaps through the provision of education and training.
— The presence of an integrated management system within the regulatory body is key, and efforts are needed to enhance the regulatory body's safety and security culture.
— Regulatory bodies need to be more competent in human and organizational factors, which play an important role in ensuring safety and security.
— There is an increased need for a strong regulatory competence building programme in cases where the regulatory body has to expand, for example in the case of countries embarking on a nuclear power programme.
— Finding the appropriate balance between academic training and professional training is sometimes difficult, especially for Member States where there are few professional training capabilities.
— An adequate understanding of risk perception by the public as well as communication tools and technologies are needed to ensure an effective radiation risk communication strategy.

SUMMARY AND CONCLUSIONS OF THE CONFERENCE

Following a presentation of the session summaries by the chairs, including a summary of the Special Panel, the President of the conference presented his summary and conclusions of the conference. This included:

— General observations since the accident at the Fukushima Daiichi nuclear power plant;
— Ongoing challenges faced by regulatory bodies;
— Issues for consideration:
  - By governments;
  - By regulatory bodies;
  - For international cooperation.
— Conclusions of the conference as a whole.

General observations since the accident at the Fukushima Daiichi nuclear power plant

— The accident at the Fukushima Daiichi nuclear power plant has not stopped the use of nuclear power internationally, but its continued use will require sustaining improvements globally to maintain a high level of safety and security.
— Actions taken to address the lessons learned from the Fukushima Daiichi accident include the development and implementation of the IAEA Action Plan on Nuclear Safety, publication of *The Fukushima Daiichi Accident – Report by the Director General*, implementation of 'stress tests' (or equivalent) in most countries, and adoption of the Vienna Declaration on Nuclear Safety.
— The IAEA Safety Requirements provide a good global reference and establish a good level of nuclear safety. A review of the IAEA safety standards revealed no significant areas of weakness and found that the requirements cover the lessons learned from the accident. A small set of amendments were proposed to strengthen the requirements and to facilitate their implementation.
— While operators have the primary responsibility for safety, regulatory bodies play a vital role in sustaining nuclear safety, although some require, inter alia, additional authority, independence and transparency.

Ongoing challenges faced by regulatory bodies

— Sustaining, and in some cases establishing, strong regulatory systems in order to maintain nuclear safety and security, and public trust, regardless of the prevailing economic environment.
— Justifying safety improvements to existing plants, which will be required as countries implement the Vienna Declaration on Nuclear Safety.
— Regulatory challenges posed by emerging radiation technologies, especially in the medical field.
— Revising IAEA Safety Guides to include descriptions of how to implement the revisions to the Safety Requirements made following the accident at the Fukushima Daiichi nuclear power plant and the Vienna Declaration on Nuclear Safety.
— Increasing Member State participation in the various nuclear international instruments (e.g. the CNS) and compliance with their obligations.

Issues for consideration by governments

— Ensure the independence of the regulatory body from agencies that promote the nuclear and radiological sectors.
— Provide the regulatory body with adequate authority, resources and competent staff.
— Develop a national policy to support high level radioactive waste management or disposition over the life of the programme.
— Give the same consideration and priority to nuclear safety as is given to nuclear security and safeguards.

— Increase ratification of international legal instruments in support of safety and security.
— Strengthen the management and control of the safety and security of radiation sources.
— Strengthen cross-border harmonization of actions to protect the public after a nuclear or radiological event.

Issues for consideration by regulatory bodies

— To the extent possible, harmonize national regulatory requirements with IAEA safety standards. Embarking countries should consider adopting the IAEA safety standards directly.
— Consider hosting peer review and advisory service missions, taking action in response to recommendations; hosting follow-up missions; and encouraging operating organizations to host peer reviews.
— Encourage research on ageing mechanisms and effects to support the licensing of long term operation and the sharing of results with the international community.
— Develop an integrated management system to promote safety culture within the regulatory body and to promote, assess and improve safety culture within authorized parties.
— Anticipate and avoid future accidents by learning from international regulatory operating experience.
— Build further capacity through outreach and knowledge transfer to future nuclear professionals.
— Improve transparency and communication with the public and other stakeholders to build trust.
— Encourage regulatory bodies to interact among themselves. As medical facilities, equipment and end users are likely to be regulated by several different authorities, and in some cases in different jurisdictions (e.g. in countries with a federal system), such interaction is important for radiation safety.

Issues for future international cooperation

— Improve the interface between nuclear safety and nuclear security.
— Encourage Member States that are not Contracting Parties to the CNS or the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management to join those instruments; encourage Member States that have joined but not yet ratified to do so; and encourage those Member States that are Contracting Parties to fully comply with their obligations.
— Since all IAEA Member States use radiation sources, organizing a conference devoted to their regulation would be beneficial. Noting that the introduction of new medical technologies can be challenging for regulatory bodies, identify specific areas for support in this regard.
— Explore the feasibility of developing a legally binding instrument covering radioactive sources.

— Consider strengthening peer reviews such that they challenge the host more and focus on weak points, implementation of recommendations and follow-up.

CONCLUSIONS

— Since the previous conference, held in Ottawa, Canada, in 2013, many improvements have been made to nuclear regulatory systems.
— Sharing experience and lessons learned is key to sustaining improvements globally.
— These summary and conclusions propose issues for consideration by various bodies. The intention is for these bodies to develop actions to respond to these issues. Progress on these actions should be reported on and discussed at the next nuclear regulatory conference, to be held in three years' time. A willing Member State will be sought to host this fifth conference in the series.