

KEYNOTE

Challenges of Safety and Security in Nuclear Power Development

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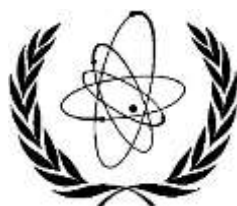
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Good morning Mr. Chairman, Ladies and Gentlemen, esteemed colleagues,

Thank you for the privilege of speaking at this important event.

I am a nuclear engineer, and I made my first steps in nuclear R&D just six months before the accident at Three Mile Island... in 1986 I was in charge of nuclear cooperation between France and the Soviet Union in Moscow when the Chernobyl accident happened... and I was appointed Head of the IAEA Department for Nuclear Safety and Security, just six months before the accident at Fukushima Daiichi.

With that pedigree, the Brazilian Ambassador to the IAEA told me one day: “Denis, you should retire and please do not come to my country!”

I have not retired, and I am strongly confident that the IAEA can assist in the continuous improvement of nuclear safety and nuclear security worldwide. Indeed, this is part of our genes at the IAEA, and I want to selectively quote from our Statute the function of the Agency: “*to establish standards of safety for protection of health and minimization of danger to life and property and to provide for the application of these standards...*”, with the objective to “*seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world*”.

Since 11 March 2011, the impact that the Fukushima nuclear accident has had on nuclear safety and on the use of nuclear power in general has led to renewed scrutiny of plant design and siting, defence in depth, severe accident management, radiation protection, waste safety regulations as well as emergency response measures. It has also impacted upon some countries’ policies on energy and their decisions about the development of nuclear power.

While the accident at Fukushima did not stop the expansion of nuclear power, it did, once again, highlight the challenges associated with safety and security underlying its development. However, increasing energy demands, coupled with concerns over climate change and the use of fossil fuels continue to be drivers in the expansion of nuclear power and we continue to see more new reactors under construction.

I would like to discuss these challenges and, specifically, the role that the IAEA plays in strengthening nuclear safety and security worldwide, the assistance IAEA provides to its Member States through continued development of IAEA safety standards and security guidance, peer reviews and advisory missions, as well as the need for a robust, science-based, development of human resources.

I want to convey three messages.

Recent progress in the expansion of nuclear power has been substantial. Investment in next generation technologies is increasing as well as venture capital being provided to developing countries to embark on nuclear power programmes. A number of Member States have set ambitious targets for those plants to come online.

Do not underestimate the effort required in building a nuclear safety and security infrastructure

That said—and here is my first message—Member States embarking on the development or the expansion of nuclear power, are often primarily focused on the activities surrounding development of nuclear industry, and do underestimate the scale of the effort required in building a sustainable foundation in nuclear safety and security infrastructure that underlies its use.

As we know, a nuclear power programme is a major undertaking requiring careful planning, preparation and a significant investment in time and human resources. While nuclear power is not unique in this respect, it is different. It is different because of the safety and security issues associated with the possession and handling of nuclear material and the long term commitment necessary to ensuring safety and security after the decision to embark on a nuclear power programme has been made. In typical terms, we are talking of over a century long commitment: 15 to 20 years to develop the first NPP, 60 years of operation, and decades for decommissioning.

In accordance with the IAEA Milestones Approach (IAEA Guide NG-G-3.1), there are three progressive phases of development, and three corresponding milestones—with 19 nuclear infrastructure issues that need to be considered for each of these milestones when developing a nuclear power programme.

IAEA SSG-16- Establishing the Safety Infrastructure for a Nuclear Power Programme, provides a roadmap for Member States to progressively apply the IAEA safety standards and other elements of the global nuclear safety regime during the various phases of the implementation of a nuclear power programme. It identifies 200 actions within these first three phases of development in order for countries embarking on nuclear power programmes to build a foundation for a high level of safety during the lifetime of the nuclear power plant, including for associated waste management and decommissioning.

Let me there open a parenthesis on one important aspect that needs to be addressed, and strategically planned, when embarking on nuclear power. Embarking on nuclear power is not only building and operating a nuclear power plant. Plans have to be established, as early as possible in the development of a nuclear programme, on the safe management of all types of waste generated during the operation and future decommissioning of the power plant.

Decommissioning itself has to be planned already at the design stage of a facility and the IAEA has developed a series of safety standards to assist Member States in the safe decommissioning of facilities, including the recently published safety requirements on decommissioning of facilities.

As well newcomers should, from the early beginning of a nuclear programme, work on establishing and implementing a policy and a strategy for safely managing all types of radioactive waste generated during the operation and decommissioning of nuclear power plants. The series of safety standards established by the IAEA provide all recommendations and guidance related to the minimization of waste, their pre-treatment, treatment, conditioning, transport, storage and ultimately their disposal. A specific attention will also have to be given to the future disposal of high level radioactive waste or spent fuel if declared as waste.

Establishing a Nuclear Security Infrastructure for a Nuclear Power Programme (as described in the IAEA Nuclear Security Series No. 19) is equally important. This Guide is designed to assist States in understanding and addressing the key actions to establish an effective national nuclear security infrastructure for a nuclear power programme. It should be read together with the Nuclear Security Fundamentals and other IAEA Nuclear Security Series publications. Such a nuclear security infrastructure needs also to be developed in conformity with the elements in the 2005 Amendment to the CPPNM, which I shall address later.

After 9/11, one of the lesser voiced lessons of the Fukushima accident was that terrorists could provoke a severe black out at an NPP, with catastrophic consequences (release of radioactivity, either through the theft of radioactive material followed by its dispersal, or through the sabotage of a nuclear facility). This recognition of the risk of sabotage makes somewhat clearer today, that the objective of nuclear security is not so much protecting facilities or material, than protecting people, the environment and society from the harmful effects of ionizing radiation. This is indeed the shared ultimate goal between nuclear safety and security.

Safety and Security, are necessary to develop the use of nuclear technology.

This leads to my second main message: Both Safety and Security, are necessary to develop the use of nuclear technology.

There are a number of important commonalities between the regulatory oversight of security and that of safety. Significant ones include:

- Importance of an independent regulatory body
- Adequate financial and human resources for the regulatory body
- Complete legislative framework
- Complete set of regulations
- Complete set of regulatory guides
- Clear regulatory expectations given to the applicant/operating organisation at relevant stages of licensing
- Communication between the regulatory body and the operating organisation
- Powers to undertake authorisation, inspection, compliance and enforcement
- Management systems
- Attention to culture
- Sustainability of systems

Additional responsibilities in the context of nuclear security require the regulatory body to have close and cooperative working relationships with other key entities of the State who have responsibilities for nuclear security, to protect and secure material and facilities under regulatory control and to prevent, detect and respond to malevolent use of material out of regulatory control.

To implement a systematic programme for developing (or upgrading) the national nuclear safety and security infrastructure progressively, and to ensure meeting these safety and security requirements at each phase, the IAEA provides a number of Peer Review Services. Some are focusing on the Industrial infrastructure as the Integrated Nuclear Infrastructure Review (INIR), others are focused on the regulatory body itself as the Integrated Regulatory Review Service (IRRS).

In relation to nuclear security infrastructure, the outcomes of INIR or IPPAS missions (the International Physical Protection Advisory Service) have resulted in the development of comprehensive nuclear security support and assistance programmes for countries embarking on nuclear power. These support and assistance programmes are contained in Integrated Nuclear Security Support Plans (INSSPs).

To help States address their national need for the development of a cadre of expert and competent nuclear security practitioners, the IAEA has crafted a comprehensive human resource development strategy for nuclear security. The main part of this strategy is to assist States, upon

request, to establish education and training programmes for nuclear security. The IAEA supports the strategy through a comprehensive training programme and through two international knowledge networks— the International Nuclear Security Education Network (INSEN), and the International Network for Nuclear Security Training and Support Centres (NSSC).¹ These networks are both repositories and generators of new nuclear security expertise. Based on the IAEA Nuclear Security Series, they foster excellence in nuclear security education, for the next generation of professionals in that field.

Among the first challenges met in the development of a nuclear power programme, are the issues of siting and design of a NPP. They are also fields where the Agency can provide guidance and assistance, first through its Safety Standards, and then through associated review services: Site and External Events Design (SEED), or Design and Safety Assessment Review Service (DSARS).

The IAEA has most recently performed an IRRS peer review missions in Jordan, Poland, UAE and Viet Nam. I would like to stress here that most of our Peer Review services are a process, not a one-off event. Requesting an IRRS mission for example, means a commitment to perform a thorough self-assessment prior to the IRRS mission, hosting the mission itself, preparing an action plan to take issues forward, and finally, some two to three years after the mission, inviting a follow up mission to evaluate progress. All these steps are essential and necessary steps in this process.

The IAEA also facilitates and promotes the provision of services from other countries through the Regulatory Cooperation Forum (RCF)—which works to strengthen the transparency, openness, independence, technical competence and effectiveness of regulatory bodies in Member States. Member States belonging to the RCF work with the IAEA and each other by sharing knowledge and expertise needed to support the establishment of nuclear safety regulatory bodies in newcomer countries. The fundamental idea is that developing mature regulatory bodies has hardly been a straightforward easy job in many countries. Such existing mature bodies are the result of history, inside an existing legal framework. Those who have gone through this sometimes long and tortuous process are best placed to assist in avoiding dead ends and unsustainable solutions. Countries currently receiving support through the RCF are: Belarus, Jordan, Poland and Viet Nam.

Concerning cooperation between regulators, I very vividly remember the conclusion of the *International Conference on Nuclear Regulatory Effectiveness*, organised in Ottawa in April last

¹ IAEA-TECDOC-1734, Establishing a National Nuclear Security Support Centre, http://www-pub.iaea.org/MTCD/Publications/PDF/TE-1734_web.pdf.

year. It contained a strong recommendation that the regulatory body of the vendor country, which has already made the assessment of the design of the nuclear power plant being sold, has a responsibility towards the regulatory body of an embarking country and has to lead assistance efforts, in particular in developing and transferring needed technical skills.

Conventions and Amendments

For a successful programme, building and maintaining national and international trust is a necessity. Part of this trust relies on being respectful of the international legally binding instruments developed along the years, surprisingly usually following major events.

The accident at the Chernobyl NPP was at the origin of the Convention on Nuclear Safety, the CNS. Today, following the Fukushima Daiichi accident, Contracting Parties are getting prepared for considering a draft amendment proposed by Switzerland. It is certainly too soon to give any prediction on the outcome of the Diplomatic Conference convened on February 9th 2015. However, the subject is tightly linked to the commitment of Contracting Parties expressed at the 2nd Extraordinary Meeting, and in particular that *“The displacement of people and the land contamination after the Fukushima Daiichi accident calls for all national regulators to identify provisions to prevent and mitigate the potential for severe accidents with off-site consequences. 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.”*

Addressing this subject, either through an amendment to the CNS or through direct commitment of Member States, should certainly be a high priority for designers, operators, and regulators alike. In all cases, countries embarking on a nuclear power programme should join the CNS (and the Joint Convention) and report their progress and challenges in a transparent manner. Indeed, the CNS Parties decided at their 6th Review Meeting to highlight those countries that did not submit reports, considering this is one of the few concrete legally binding obligations of this “incentive” Convention.

The terrorist attacks on 9/11 strengthened the commitment of Contracting Parties to the Convention on the Physical Protection of Nuclear Material to the process of amending the Convention. I was going to say “sped up the process”, but considering that this process started already in 1998, and that the amendment was adopted in July 2005, *“strengthened the commitment”* is a better description of the reality.

However, the year 2016 should see the entry into force of this amendment, which will dramatically broaden the scope of the present CPPNM, and strengthen significantly its obligations. I shall limit myself to mentioning only some of the most relevant to Newcomers:

- addressing the need for an appropriate physical protection regime applicable to nuclear material and nuclear facilities,
- addressing the need to establish and maintain a legislative and regulatory framework to govern physical protection and to establish a competent authority responsible for the implementation of the legislative and regulatory framework.
- addressing the need for an effective independence between the functions of the State's competent authority and those of any other body in charge of the promotion or utilization of nuclear energy.

We, in the IAEA, stand ready to assist in the ratification process and in the implementation of the amended CPPNM at the request of our Member States. With the advent of new countries deciding to develop peaceful nuclear energy programme, the need for a harmonised guidance and a model to build a National Security regulatory system is more important than ever, and with the development of global nuclear energy markets, the need to consolidate the international nuclear security framework is stronger than ever.

Human resources, human competences are key to a successful nuclear power programme

There is no such concept as nuclear safety and security for a “developing country” versus nuclear safety and security for “developed countries”. The IAEA Safety Standards and Security Guidance are global documents and the public everywhere expects, and deserves, commensurate levels of safety and security.

However, there are three major differences between a country with a developed Nuclear Power Programme and one without: the first is the availability of Human competences, the second is the availability of Human competences, and I believe you have understood that the third is also the availability of Human competences. Indeed, this is my third message.

Nuclear safety, nuclear security, are not administrative issues. In many cases, decisions need to be science-based. It is for this reason that within - or aside - Regulatory Bodies, the function of Technical and Scientific Support, or TSO, has been an essential factor for many years and will become ever more important, in the coming years.

While the primary responsibility for safety lies with the operator, TSOs provide the necessary scientific approaches and support to the authorities, the regulators, and even sometime to the

public, in the development of nuclear safety and security. They can provide technical evaluations that underlie regulatory decisions. They can support safety authorities in setting up and enforcing independent and competent regulatory policies. Further areas of support to both regulator and operator include training of staff and knowledge dissemination.

Considering each country's own history and experience in the nuclear field, it is understandable that the role of a TSO is not the same in every country. This is well known and not surprising. What is new, however, is the increasing importance of TSOs across national borders. New countries that do not share the same historical and technological experiences are entering the scene and are looking for support. TSOs have therefore increasingly gained importance in providing assistance to regulatory bodies with limited resources by providing comprehensive competence in all aspects of nuclear safety and security.

As the use of TSOs by the regulator and operators becomes increasingly critical, and their use varies significantly from country to country, both regulators and operators will need to clarify their expectations of the TSOs' functions, as well as to have in-house competencies to manage, review and verify their TSOs' activities, the 'intelligent customer' concept.

Traditionally many Technical Support Organizations have been focused on support for nuclear safety. However in many countries this has changed over time, particularly where a single regulatory body has responsibility for safety and security and has access to the services of a Technical Support Organization. At the last international conference on Technical Support Organizations convened in Tokyo in 2010 it was recommended that Technical Support Organization functions be extended to provide technical support to competent authorities in the field of nuclear security.

The IAEA will continue to assist Member States in developing a common understanding of the TSOs' responsibilities, needs and opportunities; to promote international cooperation and networking between TSOs; and to foster capacity building through the use of TSOs in countries embarking on nuclear power programmes, and in those with limited or extensive experience in nuclear power programmes.

After studying a year in Poland in the seventies, my first renewed contact with this country in 2009 was linked to the decision by the Polish Government to train University Professors and I recently found remnants of my welcome speech for Polish University Professors at IRSN. It started by *Szanowni Profesorowie, drodzy koledzy, to wielka przyjemność powitać was dzisiaj w Instytucie ochrony przeciw radiacji i bezpieczeństwa jądrowego.*

If I mention today this event, rather than for the anecdote, it is because human resources, human competences are key to a successful nuclear power programme.

Before concluding, just some food for thought: industry salaries are usually attractive, provided a good capacity building programme has been designed and developed (with the assistance of the IAEA of course). The regulators, their technical supports usually do not benefit of these attractive salaries, so that developing incentive packages for this sector is a wise policy, necessary to guarantee the quality of the staff with the high responsibility to control the safety and security of future NPPs, the future safety and security of the planet.

Conclusion

The production of power through nuclear energy has the potential to transform economies and societies and produce great benefits. Just as the implementation of safety measures in a State cannot lead us to the conclusion that there is zero risk of a nuclear accident, neither can security measures lead us to conclude that the material and the facilities are 100 percent secure.

However, following the implementation of the Action Plan on Nuclear Safety by the IAEA, following initiatives in nuclear security, including the IAEA International Conference on nuclear security last year which brought together some 1300 participants, we live a very special period, full of promises, where Governments at the highest levels are aware of the need for strong commitments to nuclear safety and security.

A momentum towards continuously strengthening nuclear safety and security has been developed worldwide. We, at the IAEA, certainly want to build on this momentum to perform our task of *“seeking to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world”*, in a safe, secure and sustainable way.

Thank you for your attention and I wish you a productive conference.