

VCDNP PANEL DISCUSSION ON THE SAFE AND SECURE USE OF NUCLEAR POWER TO PROVIDE RELIABLE, AFFORDABLE AND SUSTAINABLE ENERGY FOR ALL

On 20 February 2019, the VCDNP organised a panel discussion with support from the [International Science and Technology Center](#) (ISTC) in Kazakhstan on the “Safe and Secure Use of Nuclear Power to Provide Reliable, Affordable and Sustainable Energy for All”. Thirty-seven diplomats and technical experts from 28 IAEA Member States attended. The panel comprised experts from the United Arab Emirates (UAE), Pakistan, Nigeria and the International Atomic Energy Agency (IAEA).

The experts from the UAE and Nigeria, which are in different stages of introducing nuclear power, explained what it meant to create an enabling environment for nuclear power in their countries, the role of nuclear safety and security in this regard, the challenges they faced and how they are addressing these challenges.

The expert from Pakistan explained what it meant to run nuclear facilities under IAEA safeguards for more than 45 years without a nuclear safety or security incident and how this experience is helping Pakistan to expand its nuclear power programme.

An international expert on nuclear power infrastructure development gave an overview of the IAEA’s role in supporting Member States embarking on and expanding their nuclear power programmes and talked about the importance of nuclear power for sustainable development.

Links to the presentations and useful IAEA booklets are included in the report for ease of reference.

PRESENTATIONS

THE ROLE OF THE IAEA AND THE CONTRIBUTION OF NUCLEAR POWER TO SUSTAINABLE DEVELOPMENT

Mr. Anthony Stott, an international consultant on nuclear power infrastructure development and currently the operational lead in the Nuclear Infrastructure Development Section of the IAEA Division of Nuclear Power, provided [an overview of the IAEA’s support to its Member States](#).

The [Milestones Approach](#) of the IAEA provides a comprehensive framework of guidance for the development of infrastructure for nuclear power programmes, considering 19 specific infrastructure issues, three phases and three milestones.

Nuclear safety, security, safeguards, developing a legal framework, human resource development, funding and financing are among the 19 infrastructure issues. The IAEA's [Integrated Nuclear Infrastructure Review](#) (INIR) methodology describes, for each infrastructure issue, conditions that should be met to achieve the milestone in the specific phase. In Phase 1 there are several conditions that relate to nuclear safety, security and safeguards such as: *long-term commitment made and importance of safety, security and non-proliferation recognised; nuclear security requirements recognized and the actions of all relevant organisations coordinated*. Phase 2 conditions include aspects related to *the establishment of the owner, operator and regulator*, ensuring that *the responsibilities of each have been defined and understood including their safety security and safeguards responsibilities*, as well as *management systems have been established which cover nuclear safety, security and safeguards*.

Responding to a question on how a developing country starting from scratch manages to meet all these conditions, Mr. Stott emphasised the weight of national responsibility when embarking on nuclear power. A successful nuclear power programme requires a commitment of at least 100 years. Whilst the vendor will provide the nuclear power facility the country must provide the national infrastructure, have strong national leadership and the ability to build its own competence to bring the project to fruition and sustain the nuclear power programme over its full projected lifetime. Creating the infrastructure and building the first nuclear power plant will take at least 10-15 years. Whilst the Agency identifies the milestones and provides the guidance to the country, the development of the necessary nuclear infrastructure and the implementation of the project is the responsibility of the country.

Addressing the contribution of nuclear power to sustainable development and [climate change mitigation](#) Mr. Stott noted that access to affordable, reliable and modern energy for all – [Sustainable Development Goal \(SDG\)7](#) – is central to achieving all 17 SDGs. Nuclear power, measured against the three pillars of sustainable development i.e. economic, environmental and social, is a reliable, climate neutral source of power that can play a role in energy supply diversification, as well as foster a more resilient power supply. He emphasised that the highest standards of nuclear safety, security and safeguards have to be maintained when using nuclear power.

THE UAE: THE GOLD STANDARD FOR EMBARKING COUNTRIES

Ambassador Alkaabi, Permanent Representative of the United Arab Emirates (UAE) in Vienna and the UAE's Special Representative for International Nuclear Cooperation briefed the meeting on the UAE's nuclear power programme. The UAE's efforts to pursue complete operational transparency and the highest standards of nuclear safety, security and non-proliferation in the development of

their nuclear power programme has been hailed as the gold standard for countries interested in exploring nuclear energy for the first time.

Ambassador Alkaabi explained that the UAE's demand for electricity will increase three-fold by 2020. Whilst the UAE is pursuing an aggressive solar energy strategy it still requires a base load technology. Being a net importer of natural gas the UAE decided in 2007 to develop nuclear power to meet its electricity demands. A high-level strategy was established with the following principles: Maintain high operational transparency; the highest standards of nuclear safety, security and non-proliferation; work closely with the IAEA; benefit from the expertise of others; and ensure long-term sustainability.

Ambassador Alkaabi noted that whilst the IAEA guidance provides milestones, countries have to develop everything in between. The most important part for the UAE was to identify a feasible schedule for construction. Whilst the UAE has extensive experience with project development, this was to be among the biggest industrial projects in the UAE to date. They did what they could to minimise the time it would take to construct the facility by collecting the experiences of other countries. Then the UAE developed its own roadmap strategy, the first urgent steps being the identification of the site and developing the customer capabilities to deal with the vendors. The next step was to establish the entity that would deal with the nuclear power programme. A nuclear law was enacted and an independent regulator was established that would cover nuclear safety, security and safeguards. In 2012 the first concrete was poured at the first reactor site and today there are four nuclear reactors in advanced stage of construction.

On working with the IAEA, Ambassador Alkaabi emphasised that the UAE met all its international obligations including a comprehensive safeguards agreement, an Additional Protocol, all security guidance and safety requirements including the Convention on the Physical Protection of Nuclear Material (CPPNM) and its 2005 Amendment. The IAEA conducted an INIR Phase 2 mission in the UAE in 2011 and an INIR Phase 3 mission in 2018. The UAE has completed ten major review missions in the last ten years that have proved very useful according to Ambassador Alkaabi.

Asked whether countries need to have regulatory experience before embarking on nuclear power, Ambassador Alkaabi responded that the UAE found the gathering of international expertise in reviewing, inspecting and running a nuclear power programme to be very helpful. He explained that in the UAE there has been massive investment in human capacity and that on the job training is viewed as an essential, ongoing investment. When the UAE started its nuclear project it had to import most of its expertise. Now over 60 percent of the people, for example employed in the nuclear regulator, are Emiratis, thanks to the UAE's approach and commitment to human resource development and training.

NIGERIA: CHALLENGES AND LESSONS LEARNED

Professor Matthew Agu is the Project Manager: Nuclear Power at the Nigeria Energy Commission and gave [a briefing on Nigeria's experience](#) with nuclear power. Africa's largest economy, with a population of 178.52 million, Nigeria has an electricity production of 6,500 MW electricity and a demand of 28,360 MW electricity. Nigeria made the decision in 2005 to introduce nuclear power into its energy mix. Professor Agu explained that the target date for building a reactor had been 2025, but this turned out to be unfeasible. The goal is currently to produce nuclear power by 2030. An agreement with a supplier is in place, the site has been selected and a feasibility study is underway.

Professor Agu explained that nuclear power development was hampered in Nigeria because programme execution did not follow a clearly defined roadmap. As a result implementation by various government agencies were not properly coordinated. Furthermore, the nuclear roadmap has stringent timelines for sustainable and successful implementation, but challenges in Nigeria that include funding, legal framework development and human resources development, have slowed down programme implementation. Professor Agu emphasised the importance of human resource development and pointed out that Nigeria had underestimated the amount of time it would take to train the large number of people needed to implement a nuclear power programme.

Professor Agu said that with the support of the IAEA through the technical cooperation programme, some of these challenges have been addressed by fellowships, expert missions and scientific visits. Education and training is being provided to address this shortage of human resources with the help of IAEA and other international partners. Nigeria is adopting the provisions of the CPPNM and its 2005 Amendment and the IAEA nuclear security guidance. In the past the IAEA provided support for physical security upgrades for its research reactor and gamma irradiation facility, a homeland security surveillance system and assisted in human resource development of nuclear security experts.

Asked what challenges Nigeria faces in integrating security for the facilities into the overall security plan of the country, Professor Agu said that the main challenge was that security of the facility is viewed as the responsibility of the operator. By integrating security of the facilities into that of the country any security breach of the facility would be seen as a national security threat with its attendant consequences. Security is a national responsibility but not all stakeholders currently view security as such.

PAKISTAN: MATURE AND EXPANDING NUCLEAR POWER PROGRAMME

Mr. Amer Manzoor, Minister (Technical) at the Permanent Mission of Pakistan to the United Nations in Vienna, previously the Director of the Project Management

Department for the Nuclear Power Projects of Pakistan at the corporate office of Pakistan Atomic Energy Commission, shared [Pakistan's experience with nuclear power production](#). At present five nuclear power plants (NPPs) are in operation while another two new NPPs are under construction in Pakistan.

Like the other panellists Mr. Manzoor emphasised the importance of having enough trained and experienced people for a successful nuclear power programme. Developing the necessary human resources for certain areas of operation typically takes four to five years in Pakistan's experience. He advised that a country embarking on nuclear power should know exactly how much manpower is needed from the outset. For Pakistan's first pressurised water reactor facility the total initial training at the Reference NPP was for more than 2000 man months. He noted that with the next facilities it was easier as they already had much of the experience and the skills in place.

Like the other speakers Mr. Manzoor stated that strong commitment of the government to the nuclear power programme was essential for success especially in terms of securing financing, providing sovereign guarantees, ensuring implementation of grid developments, amending legislation and providing mechanisms for compensation for nuclear damage. For Pakistan's first two facilities the financing of the project was arranged indigenously by the Government. Another important factor is public acceptance of nuclear power plant construction especially near populated cities for which a strong interaction with all stakeholders is necessary.

In terms of safety and security Pakistan has operated power plants (for 45 years), and radiological facilities, which include research reactors, agriculture and medical centres, safely and securely. All of Pakistan's NPPs are under IAEA safeguards. Pakistan has a well-established national legislative, regulatory and administrative framework. Mr. Manzoor emphasised that the elements of nuclear security include a robust command and control system led by the National Command Authority (NCA), multi-layered defence for a nuclear threat, a rigorous regulatory regime and international cooperation.

The IAEA has provided support to Pakistan for physical protection upgrades for its radiological facilities, as well as its nuclear power facilities. Pakistan is indigenising its nuclear power programme by integrating the local industry in its endeavour and ensuring development of the necessary industrial infrastructure to support this initiative. The IAEA is also providing support in this regard.

DISCUSSION

All the panellists emphasised the importance of transparency and engagement with the public. Mr Stott noted that in general transparency levels regarding nuclear power programmes are much higher now than in the past when there was

limited engagement by governments and operators with the public. According to the three country experts there has been extensive engagement with their public who are generally supportive of nuclear as they are aware of the need to produce more power to meet electricity demands.

Regarding a question on Post Fukushima modifications by the IAEA and the countries represented by the panellists, Mr Stott explained that the IAEA produced [a comprehensive report on the Fukushima-Daiichi accident](#) (with five technical volumes) that includes lessons learned that can be acted upon by governments, regulators and NPP operators. Mr. Manzoor said that, after Fukushima, the Pakistan Regulatory Authority instructed operators to carry out detailed assessments of the power plants and improvements were made accordingly.

There was also a discussion on whether private owned power plants were more successful than state owned plants and what the criteria is for choosing a supplier. Mr. Stott noted that all the nuclear power plants in newcomer countries are State driven. Regarding the differences between vendors he noted that all major nuclear reactor vendors offer safe technology and their designs meet current requirements. Mr. Stott emphasised that newcomer countries also look at the financial packages available and support for their human resource capabilities, which are more of a deciding factor than the technology provided. Mr. Manzoor added that a nuclear power programme has to be state owned in a developing country as certain assurances are required from the government. Professor Agu said that in Nigeria their choice of vendor was dictated by financial considerations. Ambassador Alkaabi briefly explained the process in the UAE. They required a consortium to build 3rd generation facilities. Out of three consortiums, the UAE chose the consortium that could meet their requirements and with a history of meeting construction deadlines. He advised that countries also consider the training packages the potential supplier can provide.

The panellists emphasised the importance of maintaining the highest standards of nuclear safety, security and safeguards and during the discussion also spoke to the importance of the interface between these specialised areas. Ambassador Alkaabi noted that it does not matter who the implementers are, the interface has to be right. There are various nuclear safety and security stakeholders but communication between these stakeholders is important to ensure that they are not operating in silos. Mr. Manzoor noted that in Pakistan nuclear safety, security and safeguards are kept separate. However, there is a higher body, the national command authority headed by the Prime Minister, where all the stakeholders are represented and where decisions are taken.

CONCLUSION

Nuclear power can play a role in energy supply diversification and foster a more resilient power supply. Embarking on nuclear power however requires at least a 100-year commitment by a country. All the panellists emphasised the need for strong national leadership and commitment to bring a programme to fruition. The infrastructure issues that received the most attention throughout the panel discussion were human resource development, maintaining the highest standards of nuclear safety, financing, security and safeguards.

Drawing on the experiences and expertise of other countries and the IAEA is hugely beneficial as demonstrated by the UAE. However, the panellists left no doubt as to the massive and ongoing national investment required to develop an indigenous skilled and competent workforce.

Working closely with the IAEA is essential as it not only provides guidance and support for meeting conditions for nuclear safety, security and safeguards, but also support for human resource development. The IAEA Milestones Approach is a programme management guideline. The Agency assists the countries embarking on new nuclear power programmes in developing the country's own implementation strategy and road map. Nevertheless, the development of the infrastructure and the implementation of the project remains the responsibility of the country. Ambassador Alkaabi also highlighted the fact that it is incumbent upon countries to develop everything in between the milestones. As Nigeria demonstrated, nuclear power development can be hampered if programme execution does not follow a clearly defined roadmap. Regarding NPP project management guidelines, it was clarified after the panel discussion that such guidelines are included in the IAEA Nuclear Energy Series No. NP-T-2.7 [Project Management in Nuclear Power Plant Construction: Guidelines and Experience](#) (IAEA, 2012).

The panel also served to highlight the importance of an effective interface between stakeholders to maintain the highest level of nuclear safety, security and safeguards. As Professor Agu noted many stakeholders consider nuclear security to be the responsibility of the operator. Nuclear security is, however, a national responsibility and a security breach of a nuclear facility would have national consequences. Judging by the experiences shared at this panel, countries have different approaches to facilitating this interface. It may be useful to consider raising more awareness and sharing more experiences around the challenges relating to the interface between these specialised areas (nuclear safety, security and safeguards) and how countries integrate the security of their facilities into national security plans.