Statements of the Director General

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Nuclear Science: Physics Helping The World

Introductory Statement to the Scientific Forum by IAEA Director General Dr. Mohamed ElBaradei

Ladies and Gentlemen,

I am pleased to welcome all of you to our 8th Scientific Forum, a venue that has become one of the highlights of our annual General Conference. 2005 has been declared the World Year of Physics, in part to commemorate the 100th anniversary of Albert Einstein´s three groundbreaking papers - on the theory of relativity, the photoelectric effect, and the theory of Brownian motion. It is important to consider that many of the benefits of technology we enjoy today would have been considered near-magic only a few generations ago - and the pace of discovery is not slowing down.

Given that physics is at the core of nearly all nuclear science and technology benefits, it seemed appropriate to examine, at this year´s Scientific Forum, a number of the contributions that continued advances in nuclear physics are making towards sustainable development. The resulting Forum agenda is built around four such topics. I will comment briefly on each one.

Meeting Energy Needs

Even the most conservative estimates predict at least a doubling of energy usage by mid-century. Coupled with concerns related to the risk of climate change and the security of energy supply, this anticipated growth is creating a sense of rising expectations for nuclear power.

Innovation will play a key role in determining the extent to which nuclear energy will meet future energy needs. Advanced fuel cycles are already being developed that would, for example: use fissile and fertile materials more efficiently; employ new fuel types and configurations to strengthen proliferation resistance; and apply partitioning and transmutation to mitigate the volume and radio-toxicity of high level and long lived wastes. Innovation will also play a decisive role in determining the contribution of nuclear power to "energy currencies" other than electricity - such as hydrogen, desalination and heating.

Innovative thinking is also needed to focus explicitly on the theme of "energy for development". Per capita electricity consumption in Nigeria, where I visited recently, is only about 70 kilowatt-hours per year - more than 100 times less than the OECD average. This lack of energy in turn restricts every other aspect of development, from increasing food production to improving health care. The traditional approach to nuclear electricity generation has made it an impractical choice for many developing countries. Changing that situation will, once again, require innovation. For example, regional collaboration might be used to address issues such as: upfront capital costs, infrastructure and workforce needs and electrical grid capacity.

Turning to fusion: while some of us may be skeptics when it comes to any science that takes such a long time to develop, there is no denying that - looking further into the future - nuclear fusion promises some welcome characteristics: an inexhaustible source of energy in light nucleus atoms; the inherent safety of a nuclear reaction that cannot be sustained in a non-controlled reaction; and few negative environmental implications. With the construction of the International Thermonuclear Experimental Reactor now slated to go ahead, the international scientific community can begin devoting serious attention to this long term objective.

Developing Advanced Materials and Technologies

A key feature of modern science is its synergy - as seen in the linkages between pure and applied science, or the multi-disciplinary nature of many cutting-edge sciences, or the way in which advances in fields such as nanotechnology, bioengineering and information technology play off each other for continuously greater achievements.

The second session of this Forum will discuss examples of this synergy - and in particular, examples of how basic nuclear science is providing the foundation for the development of advanced materials and new technologies. When nuclear techniques are used for treatments and coatings to improve the corrosion resistance of metal and glass, or to harden surfaces to reduce friction and increase wear resistance, these advanced materials can have many industrial and manufacturing uses. When electrons and ion beams are used in fabricating precision structures with nanometer dimensions, the materials and methods that result could in turn have promising applications in human health, food production and many other technologies to benefit humankind. In fact, modern technology applications in both the developed and developing world generate enormous demand for such advances.

Developments of advanced radiation detection technology have traditionally been driven by industrial needs. But in recent years, the demand for greater vigilance in combating terrorism has added another dimension. Concerted efforts are under way to develop reliable, robust systems for monitoring radiation sources and for enhanced detection of trafficking in nuclear and radioactive materials. The final presentation in the second session will address this topic.

Advancing Radiation Medicine

Cancer is in many cases a curable disease. Radiotherapy offers the potential for curative or palliative benefits for over 50% of cancer patients. However, fully two-thirds of global radiotherapy equipment serves the populations of industrialized countries - and the remaining one-third is stretched among the remaining 5.5 billion people. Just this year, in visits to Ghana, Albania and Armenia, I have seen first hand the real difference the Agency can make in such countries by providing more and better centres for cancer diagnosis and treatment. The Agency´s

Programme of Action for Cancer Radiotherapy (PACT) is designed to increase our capacity to assist developing Member States, by mobilizing more resources to address personnel, infrastructure, technology and training needs.

A host of other physics based techniques are being applied in diagnostic imaging, to look inside the body without the aid of a scalpel. Magnetic resonance imaging, positron emission tomography, and ultrasound are a few such examples which - when combined with advances in information technology - give doctors far more information on which to base therapeutic decisions, and are also used after the fact to check the success of a given therapy.

Supporting Nuclear Safety

The final session, I should note, grew out of a discussion I had with Dr. Richard Meserve, the Chairman of our International Nuclear Safety Advisory Group - and is focused on topics INSAG has identified as being critical to the continued effective application of safety principles at nuclear installations.

It has long been apparent that, in order for nuclear power to have a future, it must be both economically viable and unequivocally safe. Far from being a paradox, safety indicators in recent years have made clear that high standards of safety go hand in hand with strong economic performance.

The enduring challenge for nuclear operators and regulators everywhere is to ensure that nuclear activities worldwide are conducted according to the highest levels of safety. A focused commitment is needed to ensure that lessons learned in one country are effectively and thoroughly communicated to all countries, and that these lessons are incorporated into the operational and regulatory practices of all relevant nuclear facilities.

Based on some of my recent visits to Member States, I am also convinced we must improve our performance in fixing the so-called "weak links" in the nuclear safety chain. Since the 1986 accident at Chernobyl, enormous efforts have been spent on upgrading reactor safety features, but facilities still exist that need priority attention. For such facilities, the Agency intends to move expeditiously, coordinating with other relevant organizations - such as the World Association of Nuclear Operators and the OECD Nuclear Energy Agency - to firm up the actions needed, the expected costs, and a strategy and schedule for proceeding.

Conclusion

The Scientific Forum is an opportunity to share new ideas, to learn from each other and to forge new collaboration. This brief introduction I have offered barely scratches the surface of the advances in nuclear science and their potential for addressing human needs.

We are privileged to have with us this year the Nobel Laureate, Professor Burton Richter, as both a keynote speaker and as the overall chair of the Scientific Forum. I feel confident that Professor Richter - and the other participant scholars and scientists - will make this Forum particularly interesting. I look forward to your conclusions and recommendations, which will be conveyed later this week to the plenary of the General Conference.

With these remarks I hereby open the 8th Scientific Forum, and turn the podium over to Professor Richter.

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