

NUCLEAR POWER IN TIMES OF CHANGE

SIX CHALLENGES FACING NUCLEAR ENERGY'S DEVELOPMENT

BY MOHAMED ELBARADEI

Six key challenges in my view will greatly influence the future of nuclear power. The IAEA is undertaking activities in response to each of them.

■ **Development of a New Generation of Nuclear Facilities.** The first challenge is to deal with an important dilemma that is facing us — on the one hand, the conclusion by the World Energy Council that a total reliance on fossil fuels and large hydroelectric facilities is not sustainable, and that the current position of nuclear power needs to be stabilized, with the possibility of future expansion — and on the other hand, the increasing scepticism of the public with respect to nuclear power as a sustainable source of energy, with the result of a projected decrease in the share of nuclear power as a source of global electricity supply.

In my view, a solution to this dilemma may depend heavily on the development of new, innovative reactors and fuel cycle technologies. To be successful, the new technology must be inherently safe, proliferation resistant and economically competitive. This means technology capable of generating electricity at competitive prices while still satisfying both regulators and investors, greater reliance on passive safety features, and passive control of nuclear materials through new fuel

configurations. To meet the emerging energy needs of developing countries, these technologies also must be suited or adaptable to a broad range of environmental and industrial settings. Small and medium sized reactors, specifically, can be a suitable choice for electricity generation — or for desalination of seawater and co-generation of heat — in remote areas or in countries with small electrical grid capacities.

The Agency's role in the development of these and other innovative designs is to facilitate information exchange, coordinate joint technology development, and assist in establishing international norms and safety standards. In May 2001, in cooperation with the Nuclear Energy Agency of the Organization for Economic Cooperation and Development and the Uranium Institute, we will hold an international seminar in Cairo on "Status and Prospects for Small and Medium Sized Reactors". The Agency also intends to establish a task force on innovative reactor and fuel cycle technologies, to assess technological demands of prospective users, identify the reactor and fuel cycle features that could meet these demands, and recommend ways to leverage existing resources and expertise. Naturally, we will work closely with other national and multinational activities in this area.

■ **Clear Global Strategies for Waste Disposal.** A second challenge will be to develop clear global strategies for the disposal of spent fuel and high level radioactive waste. While experts believe geological disposal to be safe, technologically feasible and environmentally responsible, the volume of high level waste continues to build, and the public at large remains sceptical. This dichotomy will only be resolved if we can develop clear, demonstrable strategies for the siting, construction and operation of geological repositories.

The March 1999 opening of the Waste Isolation Pilot Plant in the USA was an important step towards demonstrating geological disposal of long lived waste — in this case, 700 metres deep in a natural salt formation.

Other signs of progress are also present. A number of countries are engaged in deep disposal studies, developing underground research facilities, or publishing draft Environmental Impact Assessments. Research and development is active on new technologies that reduce actinide generation and focus on

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long lived waste transmutation. Research is also ongoing on the feasibility of retrieving wastes from geological repositories after emplacement — in case, for example, a better solution is developed in the future, or concerns arise about the safety of the repository.

The Agency's role in this area includes facilitating international cooperation in research and development and demonstration projects. In this context, I am pleased to report that the Canadian Government recently informed me of its decision to offer its underground research facility at Lac du Bonnet in Manitoba for cooperative international research and training, under the auspices of the IAEA. The Agency is also using a variety of conferences to maintain international focus on this issue, to achieve concrete plans of action, and to bridge the gap in perception between technical experts and the public at large. The fundamental challenge remains, however, of accelerating and sustaining progress towards demonstrated waste solutions.

■ **The Sustainable Energy Debate.** The third challenge affecting the future of nuclear power involves assessments of nuclear energy in relation to other energy options, in terms of factors such as economic competitiveness, environmental considerations and the emerging energy needs of developing countries. The Agency's contribution in this field ranges from symposia on reducing greenhouse gas emissions to assisting governments in the assessment of their future energy needs, and the development of

appropriate strategies to meet those needs.

One important example is the Agency's contribution to the United Nations Framework Convention on Climate Change (UNFCCC). A contentious issue currently under debate is the eligibility of nuclear power as a greenhouse gas mitigation technology under the "Clean Development Mechanism" provided for in the 1997 Kyoto Protocol. In response to Member State requests, the Secretariat organized a series of information seminars on this issue, and assisted a number of developing countries in conducting case studies on nuclear power as a Clean Development Mechanism.

The Agency is also contributing to the 9th Session of the United Nations Commission on Sustainable Development, which in April 2001 will for the first time address energy and transportation as sustainable development issues. In each of these forums, our aim is to provide objective information and to ensure that nuclear power is given a fair and full hearing.

■ **The International Safety Regime.** The fourth challenge is to remain vigilant in ensuring the continued safety of operations at nuclear facilities. While safety is a national responsibility, international cooperation on safety related matters has proven to be indispensable. The continuing positive results from international collaboration towards safety upgrades at nuclear installations in Eastern Europe is an important case in point.

The international safety regime consists of three major components: international conventions, a body of internationally agreed safety standards, and mechanisms for applying these standards. Conventions in the safety area aim to establish binding safety norms that cover activities across the entire fuel cycle. To date, the Agency has developed conventions that cover the safety of power reactors, radioactive waste and spent fuel management, early notification, assistance and physical security. The Agency continues to identify areas in which binding norms are needed, such as in the safety of research reactors and of fuel cycle facilities.

The Agency has made significant progress in the past several years on updating its overall body of safety standards — nearly 80 new or revised standards will be produced in total. To be effective, these standards must be comprehensive, internationally agreed upon and subject to regular peer review. In my view, as in the aviation field under the auspices of the International Civil Aviation Organization (ICAO), these standards once agreed upon must be uniformly applied by all States. Agency safety services — such as our operational reactor safety assessments, design reviews or regulatory reviews — also make a significant contribution to promoting a global nuclear safety culture through peer review and information exchange.

■ **Preservation of Nuclear Expertise.** The fifth challenge for the future is the preservation of nuclear expertise. Qualified, highly

trained personnel are essential not only to operate the nuclear plants that currently generate about 16% of the world's electricity, but also for waste management, power plant life extension and decommissioning. For safety reasons alone, a sizeable pool of qualified nuclear scientists, engineers and technicians must be maintained in the foreseeable future — regardless of long-term strategies for electricity generation.

In recent years, it has become increasingly obvious that a substantial portion of the knowledge base in the nuclear industry will soon be vulnerable to loss through retirement. On the supply side, most countries with advanced nuclear programmes report a decrease in the number of new graduates in nuclear related fields. In the USA, for example, statistics show a decrease of more than 60% from 1979 levels of enrolment in nuclear engineering programmes. Some societal misperceptions and the relative lack of industry growth make it difficult to motivate young people to enter the nuclear industry. This succession scenario, therefore, merits particular consideration.

The Agency will continue to focus Member State attention on this issue, and we are considering ways in which we can assist in addressing this problem. We intend to promote co-operative strategies that link relevant organizations — nuclear facilities, university programmes, nuclear professional training centres and prospective donor organizations, to develop concrete methods for attracting

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The IAEA is playing an important role in helping countries assess the next generation of nuclear technologies for electricity generation. In the November 2000 edition of *Nuclear News*, IAEA Director General Mohamed ElBaradei reviews international efforts, and the Agency's role, to explore innovative nuclear technologies. The essay is among sixteen perspectives on nuclear energy's future written by distinguished contributors from around the world. See the Web pages of the American Nuclear Society at www.ans.org for more information.

young people to nuclear careers. In this context, I am pleased that the Republic of Korea will host the second Youth Nuclear Congress in 2002, similar to the Congress held in Slovakia last April, as a forum for the younger generation to exchange views and understand the importance of nuclear energy technologies.

■ **Outreach to Civil Society.** A final challenge involves the degree of public understanding of nuclear technologies — and our ability to successfully engage civil society in a fair evaluation of the relative merits of these technologies. Improving public understanding of nuclear power is essential — promoting a more mature awareness of the comparative risks and benefits of different energy sources, the nature and effects of radiation and related topics. This improved communication can be achieved in part through conventional interactions — public forums, speeches, journal articles, etc. — but we also must consider using effectively the new tools available to us, such as the Internet.

Public understanding is a prerequisite for public acceptance. At the IAEA, we have been giving increased focus towards reaching out to our

many constituencies, in keeping with a new Agency policy which aims to engage both traditional and non-traditional partners. An encouraging illustration of the value of the new approach is the large number of non-governmental participants in the Scientific Forums held during our two most recent General Conferences. We have also sponsored very useful meetings with senior managers from nuclear research centres and with representatives from the nuclear industry, in which these groups are given an opportunity to exchange views with the Agency on issues of mutual interest. In the past year, the Agency also arranged four regional public information seminars that attracted wide attendance, as forums for dialogue on nuclear issues among technical experts, the media and members of civil society.

We live in an era of change — a time in which the global community faces many difficult economic and social issues. Nuclear technologies, in both power and non-power applications, provide optimal solutions to many of those problems. In my view, it is incumbent upon us to ensure — through addressing the above challenges — that these solutions continue to be available to society. □