

August 21, 2009

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Dr. Mohamed ElBaradei
Director General
International Atomic Energy Agency
Wagramer Strasse 5
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Dear Dr. ElBaradei:

I am writing in my capacity as Chairman of the International Nuclear Safety Group (“INSAG”). INSAG’s terms of reference state that INSAG should provide “recommendations and opinions on current emerging nuclear safety issues” to the IAEA and others. This annual letter is one of the means by which I, on behalf of INSAG, seek to discharge this responsibility.

I.

There are 436 nuclear power plants (“NPPs”) in operation around the globe, meeting approximately 16 percent of the electrical generation needs of the world’s population. Because electrical power provides the foundation for economic and societal progress, NPPs make a very meaningful contribution to humankind. Moreover, because of the need to reduce the world’s dependence on carbon-emitting sources of energy – principally coal, oil and natural gas – in order to minimize the adverse consequences of growing concentrations of greenhouse gases in the atmosphere, nuclear power is of ever growing importance.

Of course, an absolute precondition for reliance on nuclear power is safe operations. It is reassuring that safety performance, in general, has been strong in recent years. Various metrics to assess safety performance – such as numbers of unplanned shutdowns, availability of safety equipment, radiation releases to the environment, and radiation exposure of workers – show quite striking improvement over the course of a decade or two, with some leveling off in recent years. Of course, strong safety performance must be maintained by all if a serious accident is to be avoided. As always, complacency presents a great danger: constant vigilance in search of accident vulnerability and of means for improvement must be and must remain part of the universal culture.

We live in a time of important change. Perhaps most noteworthy, there is substantial new construction that is either underway or likely to be undertaken in the next several years. Over 50 reactors are under construction around the globe today. Perhaps of even greater import is the interest in the acquisition of a NPP by countries that currently do not have nuclear experience. I understand that nuclear power is under serious consideration in over 30 such countries. New construction may have been delayed by the worldwide economic situation, but the interest remains high and we anticipate substantial new construction in the years ahead.

At the same time, many countries have evidenced an interest in maintaining reactors in operation that have been producing power for decades. In the United States, for example, it is expected that most of the fleet of 104 NPPs will seek and obtain license extensions that allow operation to 60 years and some are discussing the possibility of seeking further extensions to 80 years. There is similar interest in maintaining existing plants in operation in many other countries. Because for the most part these plants are operating effectively, there are strong economic considerations that favor continued operation.

In the aftermath of the terrorist attacks in recent years, there is increased attention to security at facilities of all kinds, including nuclear plants. There is an obvious need to deter or defeat a terrorist attack on a NPP and, as a result, security at NPPs has been augmented. But the security regime for NPPs is somewhat less mature than the safety regime. The regulatory system surrounding security is evolving and expanding to deal with the terrorist threat.

In sum, although nuclear power has proven to be a safe and economical source of electricity generation in recent years, the world of nuclear power is changing in many dimensions. We expect many new plants, coupled with extended life for existing plants. At the same time, security is a subject that commands growing attention. This letter will focus on the implications of these changes.

II.

There are several overlapping challenges that deserve careful consideration:

1. New Entrants. As noted above, a large number of countries without previous experience have expressed an interest in constructing and operating a NPP. Any such undertaking entails a commitment that can extend for at least a century and possibly far longer if the country must take responsibility for the long-term disposition of used fuel. This obviously entails the maintenance of financial, legal, regulatory, and technical capabilities over an extended period. Perhaps less obvious are the cultural, educational, and social components of a

successful nuclear program. INSAG has prepared a report on this subject entitled *Nuclear Safety Infrastructure for a National Nuclear Programme Supported by the IAEA Fundamental Safety Principles* (INSAG-22) (2008) that seeks to define the various elements of a new entrant's obligations at each stage of the life cycle of a NPP. It supplements various other IAEA documents on this subject. See *Milestones in the Development of a National Infrastructure for Nuclear Power* (2007) and *Considerations to Launch a Nuclear Power Programme* (2007).

The fulfillment of these safety obligations is challenging for the existing operators and will likely be even more challenging for many of the new entrants. It is in the interest of all those involved in the nuclear enterprise, however, to ensure that the new entrants are successful. This interest arises not only from a humanitarian impulse to help others avoid a serious accident, but also from the practical and direct interest in avoiding an accident that would affect the prospects for and attitudes toward nuclear power everywhere. Given that nuclear power is a vital tool in advancing economic development, providing energy security, avoiding greenhouse gas emissions, and enhancing the well-being of the world's population, it would be a tragedy if its prospects were dimmed by an avoidable accident.

This reality imposes some special responsibilities on the various participants in the nuclear enterprise.

- New entrants. The new entrants must understand that their responsibilities are extensive and endure throughout the life of the NPP. Their entry into the community that relies on nuclear power must reflect a full awareness of and commitment to meet the obligations of participants in the nuclear enterprise. The obligations include adherence to the Convention on Nuclear Safety, the Convention on the Early Notification of a Nuclear Accident, and the Joint Convention of the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. This is hard work and will involve extensive international interaction so that the new entrants can learn practical lessons from the countries with currently operating plants. In this connection, the new entrants should take full advantage of the opportunity to learn from the operational experience with existing NPPs. See *Improving the International System for Operating Experience Feedback* (INSAG-23), 2008.
- Vendors. As part of their contracts, vendors customarily provide careful assistance through design, construction, and the early stages of operation, with less intensive involvement thereafter. But the achievement of safety requires a sustained effort

throughout the life of the plant. Vendors must seek to ensure that a new entrant understands and has the capability to meet its safety commitments throughout the plant life. The vendors should help the new entrant to build and maintain the enduring national technical infrastructure that is needed for continued safe operation. This entails continuing involvement by the vendor.

- **Regulators.** Operators customarily obtain extensive assistance from the vendors, but the new-entrant regulators do not necessarily benefit from similar support. Because the regulatory capacity in the new entrant must greatly expand with the introduction of a NPP, there is an obligation of the international regulatory community to assist in developing the new entrant's regulatory competence. This obligation probably should fall most heavily on the regulators with experience with the vendor's design, which most often would include the home country of the vendor.
- **International organizations.** Resources and assistance by international organizations can help build capacity in the new entrant country. International organizations, including in particular the IAEA, should provide training and review services that are tailored to the needs of new entrants. Of course, assistance by the IAEA does not reduce the safety responsibility of the new entrant country.
- **Operators.** There may be opportunities for operators of existing plants to establish relationships in the new entrant countries that enhance safety. It might be possible, for example, for the new entrant country to establish a contractual relationship with a sophisticated operator that would enhance the transfer of knowledge and capabilities. Operators of existing nuclear plants can bring management and technical skills that could be of great assistance to the new entrant countries.
- **Technical Support Organizations.** Technical support organizations provide an important means for the exchange and implementation of safety lessons across national boundaries. The new entrants should augment internal capacity by establishing relationships with such organizations. These organizations, in turn, should recognize their special responsibility to help build capacity in the new entrant countries.

It is in the interest of all those who are involved in the worldwide nuclear industry to assure that the new entrants can meet their safety obligations. There

should be a commitment of resources that is sufficient to enable these countries to succeed.

2. New construction. In addition to the challenge of meeting the needs of the new entrants, there is the more widespread challenge that arises from the prospect of new construction occurring simultaneously around the globe. This presents several challenges.

First, there is a current shortfall in trained personnel, creating a challenge for generating companies, architect-engineering firms, vendors, suppliers of all types, and regulators. As a result, it is important that education and training capabilities are in place to meet the demands of industry and regulatory organizations. This includes not only engineers, but also the skilled craft workers who are essential to nuclear construction. One might expect that market forces will generate the necessary skilled labor over time, but there is a short-term and important need that justifies special educational efforts.

Second, the nuclear business is an international enterprise involving vendors, suppliers and service firms that are engaged throughout the world. The quality requirements for parts and components that are employed in safety systems at nuclear plants exceed the requirements for parts in normal commerce. But no one regulator, vendor, or operator can readily have scrutiny over parts that are sourced from many different countries. There is a need for strong international coordination to ensure that quality standards are satisfied.

Third, there is a legitimate concern that, with all the new construction, operators and regulators might diminish their attention on existing plants. One of the harsh lessons from several decades of experience is that continued vigilance is necessary if safety is to be achieved. Hence the organizations responsible for operations must assure that their focus on the currently operating plants is not reduced. This will be a special challenge at a time of a shortfall of experienced staff and the inevitable diversion of some staff to new construction. Somehow, appropriate focus on existing plants must be maintained.

Finally, there is a common interest in assuring that the new projects succeed. Many countries have not undertaken NPP construction in many years and, of course, the new entrant countries have never built a NPP. Recent experience has shown that undertaking new construction after a long quiet period is demanding. Efforts should be made to ensure that lessons about construction problems are learned and that best practices in construction are employed in the many new projects that are and will be underway.

3. Aging plants. Many currently operating plants were built years ago. Because of their continuing excellent performance in many cases, there is an understandable and valid economic interest in continuing their operation. These plants have been subject to careful maintenance and surveillance throughout

their lives, and many parts and components have been replaced during the years of operation in order to ensure safety and reliability. In addition, substantial backfits have been undertaken in some NPPs to improve their safety performance. Nonetheless, aging plants can present special challenges because plant and equipment can deteriorate over time through mechanisms that may not be fully understood and replacement parts may not be readily available. Moreover, the older plants do not have the extensive safety features that are part of more modern designs.

This situation means that special care must be taken to ensure that safety margins are maintained as plants grow older. The maintenance, replacement and surveillance practices may need to be significantly enhanced in an older plant from those appropriate for a new facility. Regulators and operators should be prepared to modify practices to which they have long been accustomed to meet the special needs of an increasingly geriatric population of nuclear plants. Moreover, the IAEA should encourage countries to incorporate new safety features in older plants whenever it is practical to do so. Maintaining the safety of older plants should be seen as a special challenge given the demands that new construction is imposing simultaneously.

4. Safety-security interface. As noted in Part I, one change that is substantially unrelated to the other matters discussed in this letter arises from the enhanced attention in recent years on security. In the case of a NPP, the principal security concern is a terrorist attack that might result in the release of radioactive materials to the environment. (The concern at fuel-cycle facilities also covers the possible theft of nuclear materials that might be used in a nuclear weapon.) The terrorist threat has resulted in greatly enhanced security in recent years at NPPs.

Safety and security have many common features, including a common fundamental purpose of protecting the public from a radioactive release. Moreover, both apply a philosophy of defense in depth, employing layers of features to protect the plant. Many of the features that serve to prevent or mitigate an accident also serve to provide protection against intentional acts. Most obviously, the massive concrete structures at a NPP serve both a safety and a security function. But there can be conflicts. Perhaps most obviously, access controls that are imposed for security purposes can inhibit safety through limitations on access for maintenance or on egress to escape a fire or explosion. In the event of an attack, safety considerations might require access to an area at the same time as security forces might seek to deny access.

In recognition of these facts, INSAG is evaluating the relationship between safety and security at NPPs and will shortly be releasing a document on the subject. This report was developed with the helpful assistance of the Advisory Committee on Security (AdSec). Its fundamental message is the need

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for evaluating safety and security in an integrated fashion so that an optimal balance is achieved.

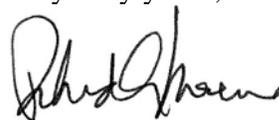
III.

The state of nuclear safety is strong. But there are important changes underway that present some special challenges. Continuing attention to safety must be maintained in the years ahead. Given the importance of new carbon-free energy sources, the stakes are high and thus increased efforts must be undertaken.

I recognize that this is the final annual assessment that I will have the opportunity to submit to you before your departure as the Director General of the IAEA. I and the other members of INSAG very much appreciate your interest in our work and the attention that you have brought to safety matters over the years of your service to the international community. We extend our best wishes to you in the years ahead.

Best regards.

Very truly yours,

A handwritten signature in black ink, appearing to read "Richard A. Meserve". The signature is fluid and cursive, with a large initial "R" and "M".

Richard A. Meserve

cc: Tomihiro Taniguchi
INSAG members