

August 21, 2006

Via Federal Express

Dr. Mohammed ElBaradei
Director General
International Atomic Energy Agency
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Dear Dr. ElBaradei:

I am writing to you in my role as Chairman of the International Nuclear Safety Group (INSAG). As you know, INSAG's Terms of Reference require that it provide "recommendations and opinions on current and emerging nuclear safety issues" to the IAEA and to others. This letter is one of the vehicles by which INSAG seeks to fulfill this responsibility.

In this letter I shall provide some observations on challenges that confront us as we prepare for the years ahead and then shall turn to an assessment of the current state of nuclear safety.

I.

This year constitutes the fiftieth anniversary of the establishment of the IAEA. In recognition of this milestone, we believe it is appropriate to look to the future to identify issues that in some cases may not be pressing matters for today, but which will likely emerge over time. We hope that our assessment will galvanize an early examination of such matters so that timely responses may be put in place.

The global context for nuclear power has changed radically in recent years. The scientific evidence as to the reality of climate change is now overwhelming and persuasive. Because of humankind's dependence on fossil fuels, we confront a world that is changing rapidly in ways that promise higher average temperatures, more frequent violent storms, rising sea level, acidification of the oceans, and threats to biodiversity, among many other adverse consequences. Increasing reliance on nuclear power can be an

important component, albeit only one component, of a global response to these threats. But, if the nuclear renaissance is to occur, a range of issues need to be confronted:

- Rebuild Capabilities in Experienced Countries. Construction of nuclear power plants has not occurred in some parts of the world for many years. For example, the last order for a nuclear power plant in the United States was in the 1970s. As a result, there is a need in many nations to rebuild skills relating to new construction that have not been exercised for years; indeed, many of the staff with experience in new construction may have long since retired. International cooperation could help in restoring capabilities that may have atrophied over time.
- Build Infrastructure in Less Experienced Countries. Some countries that have no past experience with nuclear power have recently indicated in interest in adding nuclear power plants to their generation capacity. These countries include Indonesia, Malaysia, Turkey, Poland, Egypt, Vietnam, and Nigeria. Given the interdependence of those involved in nuclear power, there is a common interest in ensuring that these new entrants have or acquire the necessary capabilities. In this connection, each new entrant should understand the special responsibilities that it must assume and discharge if it proceeds with nuclear power. As discussed in the recent INSAG report on Stakeholder Involvement (INSAG-20), the wide participation of a variety of stakeholders in the decision process relating to nuclear matters can enhance safety and is necessary to maintain public confidence and provide stability in decision-making. Even if a foreign vendor is responsible for the construction of a plant, the operation of that plant imposes the obligation on the operator and the recipient country to ensure the existence of a supporting infrastructure to ensure that safe operations can continue. The necessary infrastructure to start and maintain a successful nuclear program includes legal and regulatory capability, educated manpower, research skills, access to industrial capacities, and financial strength. There is also a necessity to ensure the availability of technical support and of a reliable supply of equipment and services for the lifetime of the plant. In short, potential new entrants should appreciate the wide responsibilities that arise from a commitment to nuclear power and should take appropriate and timely actions to fulfill these responsibilities. This issue is one that INSAG intends to continue to examine.

- Multinational Harmonization. The general safety goals and requirements for power plants in different countries, and the design solutions to meet them, have currently reached a state of reasonable harmony. In light of the interest in new construction, continuing efforts should be made to establish effective multinational cooperation among nuclear regulators for the safety review of new reactor designs. The chief benefit of such a system is the enhancement in safety that can arise from the coordinated reviews of several skilled regulators, with the shared consideration of the resulting insights. Additional benefits are also evident: multinational cooperation will help to harmonize the global safety approaches and increase safety in general; the process would allow greater efficiency in the use of resources; redundant work resulting from the separate safety assessment processes of different countries could be minimized and uncertainties in licensing could be reduced; and consistent regulatory positions could be developed, thereby promoting international trade in nuclear equipment and bringing cost savings to all parties.

The basic goal of a multinational safety review should be to ensure that a design determined to be safe in one country does not have to be substantially modified to meet licensing requirements elsewhere. The importance of this basic goal reflects the general expectation of the public and the industry that fundamental safety principles will be universally satisfied. The IAEA Safety Standards provide a universal point of reference that should be the foundation for establishing a harmonized international regime. Some further thoughts on this matter are provided in the INSAG report on The Global Safety Regime (INSAG -21).

- Advanced Analytical Tools. Many of the existing plants were licensed in the years before there was extensive experience with nuclear power. Licensing decisions were guided by conservative engineering judgment and the application of fundamental design principles (such as defense in depth) to ensure a robust capacity to mitigate or prevent events. But much has been learned over the years and the resulting insights should be applied more effectively than is currently the case in many countries. For example, the insights from both probabilistic and deterministic analyses should be brought together and applied so as to assure that attention to safety is focused on all important areas. Indeed, given the inevitability that advanced reactors (including fusion reactors) will depart in significant ways from the existing generation of plants, current licensing requirements will not be universally applicable and advanced tools may need to be used to guide the licensing process. The development of an international consensus on the application of these tools is important so as to facilitate common understandings and standardized

approaches. Moreover, coordinated research programs to increase knowledge bearing on advanced designs will ensure that necessary information is in place in time to facilitate decision-making.

- Reengineering the fuel cycle. A holistic reevaluation of the nuclear fuel cycle is now underway in a variety of places, including the IAEA. The immediate pressures for this reevaluation arise largely from proliferation concerns and from the challenge of waste disposal. But many other factors must be weighed in the analysis, including safety, security, economics, and extension of fuel supply. Although no one policy factor should be viewed as predominant, we do not believe that any technology will survive the test of public acceptability if safety is not assured. We welcome the reexamination of the fuel cycle, but urge that all factors be given appropriate weight in assessing the options.

Other challenges will no doubt emerge in the fullness of time. But these seem to us to be of central importance.

II.

INSAG is not in a position to provide a comprehensive assessment of global nuclear safety because of the inherent limitations of a part-time, volunteer group such as ours. Nonetheless, we are able to bring perspectives on safety from many points of the globe and from experience arising from a diversity of backgrounds. Although our evaluation is not based on a comprehensive first-hand study, we believe that it does reflect informed judgment.

Nuclear power continues to serve society as an important and beneficial source of electrical energy. There are approximately 440 nuclear power plants around the globe that contribute roughly 16% of the world's global production of electrical energy. Because electricity is a central and indispensable foundation for societal activities and economic growth, nuclear energy is making a significant contribution to the well-being of the world's people.

We appreciate that the public has special concerns about the risks that attend nuclear technology. Continuing acceptance of nuclear power is clearly dependent to a significant extent on the maintenance of safe operations. A nuclear accident anywhere will have effects everywhere, if only through the impact on public opinion. The nations of the world are thus, of necessity, bound to each other by the shared need for universal safe operations of nuclear facilities. All of those involved in the nuclear enterprise have a stake in the establishment and maintenance of a high level of safety performance at every power plant. This reinforces the obligation to maintain a high level of vigilance and to undertake aggressive efforts to enhance safety. Indeed, as noted in our recent report on Stakeholder Involvement (INSAG-20), public

confidence will erode in the absence of careful attention to safety and world-wide transparency with regard to matters of safety significance.

It is encouraging that the safety performance of nuclear power plants has generally shown steady gains over the past decade in terms of objective measures – data arising from unplanned shutdowns, radiation releases, radiation exposures, and so forth – although there has been some leveling off of performance recently. There is no single reason for the improvement; rather, it reflects experience and greater attention to operations, maintenance, training, diagnostic and assessment technology, safety culture, information sharing, and system upgrades. The record is impressive and, as a general matter, is reassuring.

Nonetheless, as we have noted before, there are continuing challenges with which all those involved in the nuclear enterprise must grapple. Some of these challenges include the following:

- Complacency. Nothing is more corrosive to the maintenance of safety than a belief that adequate safety has been achieved and that attention can turn to other matters. Operators must recognize that every nuclear power plant and fuel cycle facility needs continuing attention to and investment in staff and staff training, safety systems, and equipment. Every operator must establish and maintain a “safety culture” in which management demonstrates that safety is the overriding priority and in which every member of staff recognizes his or her individual responsibility for safety.
- Aging Plants. Many of the currently operating plants started operation years ago and some will be operated for periods longer than contemplated when the plants were first built. Extensions of operating lifetime require careful review of a plant’s safety status, incorporation of necessary safety upgrades, and implementation of augmented surveillance and maintenance programs. Nonetheless, aging plants present some unique safety challenges because plant and equipment can deteriorate over time through mechanisms that may not be fully understood, spare parts may be difficult to obtain, and older plants may not have all the safety features that are found in more modern designs. The continuing operation of old plants therefore requires close attention to aging issues and special care to ensure that adequate safety margins are maintained. At the same time, it is important to expand research to develop better understanding of aging issues and to identify appropriate responses.
- Shortage of Experts. The nuclear slowdown in many parts of the world over recent decades has resulted in a smaller cadre of suitably qualified experts, fewer graduates in nuclear disciplines, and less global

financing of safety research. The recent resurgence of interest in nuclear power will create incentives to rebuild this infrastructure, but progress has been slow. Indeed, in the interim, expanding nuclear programs may attract many of the available skilled personnel, creating special challenges for others in maintaining staff. There is a need to rebuild the inventory of skilled personnel and to ensure that existing capabilities are deployed efficiently.

- Operating Experience. Important safety information can be distilled from experience with operating reactors. It is generally observed that serious events are almost always preceded by less serious precursor events. By taking early action on the basis of the precursors, it is possible to reduce significantly the probability of a serious accident. But, to get the full benefit of operating experience, there needs to be careful and deep analysis to understand the root cause of an event and systems to facilitate world-wide sharing of information. Although some such systems are in place, they need to be improved to enhance their effectiveness. This matter is discussed in the INSAG report on The Global Nuclear Safety Regime (INSAG-21).
- The Safety/Security Interface. The threat presented by terrorism has reinforced the importance of ensuring that the world's nuclear infrastructure has adequate security to withstand plausible threats. But safety and security are intimately connected with each other. Modifications of a plant to ensure security can have impacts on safety – positive impacts in some cases, and negative in others. As a result, care is needed to ensure that modifications to enhance security are made in a way that enhance, or at the least do not degrade, safety margins.

Many other challenges warrant scrutiny, but these items seem to us to warrant special attention in the years ahead.

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I hope that these insights are helpful. As always, we would be happy to respond to any questions or to assist on any particular issues that you would like to raise with us.

Very truly yours,

Richard A. Meserve
Chairman, INSAG

cc: Tomihiko Taniguchi
INSAG members