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July 20, 2016

Director General Yukiya Amano
International Atomic Energy Agency
Wagramer Strasse 5
A-1400 Vienna
Austria

Dear Director General Amano:

I am writing in my capacity as Chairman of the International Nuclear Safety Group (“INSAG”). Our terms of reference state that INSAG should provide “recommendations and opinions on current emerging safety issues” to the IAEA and others. During my term as Chairman, I have customarily sought to fulfill this obligation not only through the various INSAG reports, but also with an annual letter. My past letters are available on the INSAG website at <http://goto.iaea.org/insag>. This correspondence constitutes this year’s installment.

My past letters have typically focused on specific issues of particular current concern. For example, my letter of August 21, 2015, focused on natural external events and the challenges they present to safety systems. This year’s letter will take a different approach. It represents a more strategic concern: namely, the need to address the institutional and cultural failures that can constitute the root cause of nuclear accidents. It provides a summary of an INSAG report that will issue on the topic shortly. *Ensuring Robust National Nuclear Safety Systems – Institutional Strength in Depth*, 2016 (in press) (INSAG-27)

As the IAEA’s comprehensive report identified, there are many technical lessons that need to be recognized and relearned as a result of the Fukushima Daiichi accident. However, the report also made an overarching observation that serves as the springboard for our further INSAG work. The report noted that “[a] systematic approach to safety needs to consider the interaction between human, organizational and technical factors.” While, of necessity, there must be rigorous and comprehensive safety standards and tools in place to deliver high levels of

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safety, it is also ultimately important to have a network of institutions and interfaces within and among them that assure that these tools and standards are diligently and effectively applied. We term this “Institutional Strength-in-Depth” (“ISiD”). ISiD complements and enhances the philosophy of defense-in-depth that guides the analysis of the layers of engineered systems to prevent or mitigate accidents at nuclear facilities. *See Defense in Depth in Nuclear Safety* (INSAG 10) (1996).

The ISiD philosophy relies on three independent institutional subsystems that serve, if effective, to prevent a nuclear accident. These institutional subsystems comprise: 1) a strong nuclear industry, 2) a capable and effective nuclear regulator, and 3) stakeholders who reinforce and ensure a robust institutional framework. The primary responsibility for safety lies with the operator, the primary responsibility for safety oversight lies with the regulator, and the stakeholders, who may be directly affected by an accident, serve to assure that the other subsystems are fulfilling their obligations. *See generally IAEA Fundamental Safety Principles* (2006). Each of the subsystems has a critical role to play and each serves to reinforce good performance by the others.

Overarching these three subsystems is a framework that is established by the Government. The Government should ensure that each system has the authority and responsibility to fulfill its clear and distinct roles and should link them together so that each subsystem strengthens and reinforces the others. That is, the Government by law establishes the obligations of the licensee/operator, creates and reinforces the regulator, and through law governing access to information, public hearings, and legal processes for challenging the regulator enables the public to oversee the entire process.

Some details of the three subsystems are described below:

Industry Subsystem. The licensee/operator has the prime responsibility for safety, which is reinforced by internal safety review processes with multiple checks and balances. Additional layers of this subsystem include peer pressure at the national or regional level, peer pressure at an international industrial level (e.g., WANO), and review at an international level (e.g., IAEA OSART missions). In

order for this subsystem to be effective, the licensee/operator should have an effective internal strength-in-depth philosophy. Its elements include: strong technical capability in which safety-related posts are filled by suitably experienced and competent staff; a management system that incorporates multiple checks on safety-related systems and action; internal independent oversight of safety that includes independent reporting lines to the top of management (including the board in exceptional circumstances); active oversight of safety performance by the board; and a vibrant safety culture that is led from the top.

Regulatory Subsystem. The regulatory subsystem should have a series of layers that are similar to those for the industry subsystem. The capacities that augment the regulatory authority include 1) panels of outside experts on technical issues (e.g., expert panels providing advice on natural hazards, digital I&C, and other complex issues) and on process and quality management issues; 2) international peer pressure (e.g., Convention on Nuclear Safety); and 3) international peer reviews (e.g., IAEA IRRS missions).

The regulator must have the authority, technical knowledge, and capacity to ensure that the protection of the public and the environment is secured at all times. This necessarily involves a regulator with institutional strength in depth that largely parallels the internal capacities of the licensee/operator. The regulator should be an example to the operator by seeking to improve, to welcome challenge both internally and externally, and to challenge itself to improve safety. At the same time, the regulator needs to interact with stakeholders by providing information, by listening, and by responding. *See Stakeholder Involvement in Nuclear Issues (INSAG 20) (2006).*

Stakeholder Subsystem. The National Government has a special role as the architect and sponsor of the overall system of institutional strength in depth and as a source and means of stakeholder influence. The layers involved in this subsystem include the national government, local government, neighbors, media, special interest groups, and even the licensee/operator shareholders. *See id.*

Stakeholders could be adversely affected by failures in the institutional structures of the operator/licensee or the regulator. Thus, the system should

properly include stakeholder involvement as a means to assure that high standards of nuclear safety are achieved and to establish a corrective feedback mechanism if failures in the other subsystems exist. While the public may not always have the technical background to judge the nuclear safety of a plant, efforts to keep the public fully informed and to respond honestly and completely to their challenges is the means by which to assure that licensee/operator and regulatory obligations are satisfied. *See id.*

The Overall System

There are several aspects to the ISiD system and of the linkages among the subsystems that deserve mention:

- Each subsystem is independent of the others, but should be open and transparent to the other subsystems. There should be effective communications within and between the various subsystems.
- For the system to work effectively, the system as a whole has to be robust. All the subsystems and all layers and components of layers have to be strong and operate effectively.
- The establishment of a vibrant safety culture is a prime responsibility of the leaders in both industry and the regulator. The cultures are interconnected. The way the industry responds to the regulator reflects the culture within the industry and, similarly, the way the regulator goes about its duties can impact the culture within the industry.
- Both industry and the regulator must have openness, transparency and accountability to stakeholders as deep-rooted value. Rather than simply providing information, leaders in industry and the regulator must welcome challenge from stakeholders, listen, respond openly, learn, and improve. In this way, trust and confidence by the stakeholders can be earned.

* * *

The INSAG report expresses the view that a holistic view of each of the three subsystems and their interactions with each other present an aspect of nuclear safety that has not previously had the comprehensive examination that the issue warrants. While existing international safety mechanisms, such as the safety standards and peer review processes are constantly challenged and enhanced, the Fukushima accident shows that these processes are not sufficient by themselves to ensure that a robust ISiD is being achieved.

We urge the Member States to pursue the following recommendations:

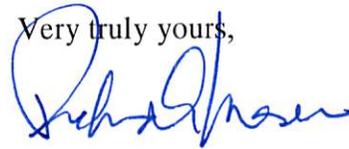
- The IAEA should develop formal ISiD guidelines that cover the overall model and the three subsystems.
- The IAEA should review existing standards, guidance and peer review arrangements to identify any gaps in the application of the ISiD model.
- The guidelines should form the basis for inclusion of ISiD in external reviews of the operator, the regulator, and the national infrastructure.
- Particular attention should be paid to new entrants. The concept of ISiD should be built into a new nuclear program at an early stage.
- Consideration should be given to encouraging the contracting parties to the Convention of Nuclear Safety and the Convention on Spent Fuel and Waste Management to report on the achievement of ISiD as part of the review arrangements.

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We hope that this letter has served to stimulate interest in the upcoming INSAG report. As always, please contact me if INSAG can offer assistance on this or other matters.

Best regards.

Very truly yours,



Richard A. Meserve

cc: J.C. Lentijo
INSAG Members