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**Tokaimura Accident's First Anniversary:
Japan's Obligation to the Victims**

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On Saturday, September 30, Japan commemorates the first anniversary of its worst nuclear disaster since the inception of its nuclear power industry. Tokaimura, approximately 87 miles northwest of Tokyo, experienced a criticality accident around 1030 hours when employees of JCO Co., a subsidiary of Sumitomo Metal Mining Company Limited, poured 35 pounds of uranium into a purification tank containing nitric acid, instead of the 5.2 pounds normally used. Three workers were critically injured - Mr. Hisashi Ouchi, Mr. Masato Shinohara, and Mr. Yutaka Yokokawa – with dozens more irradiated albeit at a lower degree. Mr. Ouchi and Mr. Shinohara both subsequently died as a result of complications of acute radiation exposure, while Mr. Yutaka Yokokawa still is confined due to massive irradiation.

Two prominent reports have surfaced in the accident's aftermath. The International Atomic Energy Agency (IAEA), a United Nations specialized agency, released its findings in a report published November 1999, while Japan's Nuclear Safety Commission (NSC) released its report December 1999. The IAEA report continually reiterated the agency's conclusion that the accident presented no significant off-site risk (IAEA, Foreword). The NSC report further validates the limited impact of the criticality accident on the residents of Tokaimura.

The IAEA and NSC in their final analyses squarely placed the cause of the accident on the (injured and later dead) front-line workers and considered their actions as the "direct cause of the accident." Moreover, the NSC report continually asserted the naive or oversimplified assumption that "it is difficult to see how the company's efforts toward betterment of business management in the international competition lead to the criticality accident." The NSC report

also focused on the need for education for all operators involved with the nuclear industry. The report cited that “in order to prevent this type of problem in the future, it is important that operators provide employees with proper education and *training*, reinforce the administration of field workers, and improve safety and quality control.” (emphasis added). One cannot help but to put this accident investigation report in the context of Yale University Professor Charles Perrow’s succinctly stated analytical prophecy in 1986 that:

“Formal accident investigations usually start with an assumption that the operator must have failed, and if this attribution can be made, that is the end of serious inquiry. Finding that faulty designs were responsible would entail enormous shutdown and retrofitting costs; finding that management was responsible would threaten those in charge, but finding that operators were responsible preserves the system, with some soporific injunctions about better training.”

Blaming the “human failure” for an accident will not fix anything in the system. An acceptable solution can only come from the recognition and genuine commitment by the industry that it must operate with a diligent conscience for safety, environmental considerations, and a realization by governmental regulatory agencies of the importance of active partnership with the industry. The safety problems of complex technological systems cannot be solved by further decoration, legislation, accusation, or litigation.

The safety of complex technological systems – e.g., nuclear power and processing plants -- is analogous to a three-legged stool; it is a function of cooperation and coordination among systems designers and manufacturers; operating companies, operators (company management and the trade unions); and service providers; and related governmental and independent regulatory agencies and institutions. The degree and smoothness of interactions among these three key players determine the overall safety of any technology-intensive industry.

We recommend the establishment of an independent nuclear regulatory safety committee in Japan. It is of paramount importance that this independent safety committee realize that among 863 incidents and failures reported to Ministry of International Trade and Industry (MITI), from 1966 to 1995, 199 (23%) human error events were identified for 49 nuclear facilities in Japan. Based on this staggering statistic, the government should require that this committee allocate at least 20% of its budget to human factors-related activities so as to commensurate the significant role of human factors in the safety and operations of Japan's nuclear industry. This independent committee should also proactively and explicitly address the human factors considerations as they arise in the nuclear industry.

Moreover, possessing human factors expertise should explicitly be mentioned in the mandate and the membership requirements for the independent nuclear safety committee’s board of overseers and staff. A good working model or source of inspiration, which gives adequate and undeniable attention to the importance of human factors, is the U.S. National Transportation Safety Board (NTSB). According to the Section 303 (b) of the United States Independent Safety Board Act of 1974: “At any given time, no less than three (out of total five) members of the Board shall be individuals who have been appointed on the basis of technical qualification, professional standing, and demonstrated knowledge in the fields of accident reconstruction, safety

engineering, *human factors*, transportation safety, or transportation regulation” (emphasize added).

Despite the current economic problems transpiring in Japan, its nuclear industry and the respective government regulatory agencies need to recognize the burgeoning need for nuclear safety, for its current laws and operations are ultimately stilted and prohibitive of any sustainable future growth. Any further blatant ignorance of safety and human factors issues will only inhibit Japan in its quest to progress in energy independence and diversity of supply.

As notable American philosopher William James has said, “great emergencies and crises show us how much greater our vital resources are than we had supposed.” Japan can and should be able to utilize its vital resources to operate its technological systems safely in the new Millennium. It may need an overall paradigm shift in dealing with system design, construction, operation, and regulatory oversight. Furthermore, it needs to continually improve the safety culture of its industries and proactively address human and organizational-related factors. Japan needs a total system analysis of the whole system by concentrating on its three main composing sub-systems; human, organizational, and technological. These changes shouldn’t be taken for granted; Japan has paid a big price for them in terms of the death and injury to its citizens, as well as a damage to its national pride. More importantly, Japan owes taking these bold nuclear safety improvement initiatives to the memory of Mr. Ouchi and Mr. Shinohara; both of whom are watching from the heavens.

About the Authors:

Najmedin Meshkati, a professor of engineering at the University of Southern California (USC), Los Angeles, California, conducts research on human and organizational factors in complex technological systems. Joseph Deato, a sophomore student in the USC Marshall School of Business, is the first freshman recipient of the USC Undergraduate Research Fund in 2000.

Meshkati’s fall 1999 Freshman Seminar on Technology and Environment students, which included Deato, worked on the “Tokaimura Accident” as a class project. They have also designed a popular site for this accident on the World Wide Web that includes their project, copies of related reports by Japan Nuclear Safety Commission (December 24, 1999), the International Atomic Energy Agency’s *IAEA Preliminary Report on the Tokaimura Accident* (released November 26, 1999), their thorough critiques of these reports, and other related links:

<http://www-bcf.usc.edu/~meshkati/tefall99/toki.html>