

**Tokaimura Accident's Third Anniversary and TEPCO's Scandal:
The Unfinished Work for Improving Nuclear Safety Culture in Japan and Restoring
Public Confidence in the Nuclear Industry**

By:

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On Monday, September 30, Japan commemorates the third 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. Two workers died as a result of complications of acute radiation exposure, a third one was permanently injured, and more than 640 residents were exposed to radiation who could potentially suffer from long-term health problems.

I have addressed this accident in two previous articles for interested readers in Japan in *The Japan Times* which were published in October 6, 1999, and October 2, 2000. In the former article, I discussed root causes of this accident and in the latter one, I argued for and suggested the establishment of an independent nuclear regulatory safety committee in Japan. [Both these articles plus my students' critical analysis of the official investigation reports and other related studies are posted on our web site: <http://www-bcf.usc.edu/~meshkati/tefall99/toki.html>.] However, what makes Tokaimura's third anniversary especially important is the recent revelations of falsifying inspection findings and cover-ups of serious flaws in the last 16 years at 13 nuclear reactors of Tokyo Electric Power Co. (TEPCO). In accordance with the ritualized apologies that Japanese business culture demands, the president of TEPCO, Mr. Nobuya Minami and four other senior officials resigned. Their ritual is reminiscent of the apologies offered by the JCO and Sumitomo executive, which unfortunately, have not had any noticeable impact on the state of Japan's nuclear safety culture.

The serious and noteworthy nuclear safety concerns have arisen in Japan since the Tokaimura accident. They include recent plans for construction of special plants for making recycled plutonium-based mixed-oxide (MOX) fuel and then loading it in TEPCO's and other Japanese reactors. Furthermore, there have also been 25 "significant incidents" at Japan's nuclear facilities last year, ranging from reactor coolant leaks to radioactivity leaks in fuel assemblies [according to the Citizens Nuclear Information Center, as reported in the *Financial Times* of London (9/19/02)].

It is against this worrisome backdrop that Japan's citizens and government should take some bold actions concerning nuclear safety before the damages become irreparable. Japan is at a critical juncture, and the time for abandoning the "business as usual" practice of nuclear safety is NOW. Industry and government are working together and are scheduled to announce a new nuclear energy plan before the end of this year. Therefore, both industry and government should jointly depart on a journey of safety improvement, from which the ultimate beneficiary will be the Japanese people.

Blaming "human failure" for an accident, as was practiced in the Tokaimura case, will not fix anything in the system. An acceptable solution can only come from the recognition of 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, nor 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. The degree and smoothness of interactions among these three key players determine the overall safety of any technology-intensive industry.

At the governmental and public policy level, I suggest the establishment of an independent nuclear regulatory safety agency in Japan. The present safety watchdog body, the Nuclear and Industrial Safety Agency (NISA), should go through a structural transformation (or reform) and gain its independence from the Ministry of Economy, Trade and Industry (METI). Also, it is of paramount importance that this independent safety agency realizes that among 863 incidents and failures reported to METI, from 1966 to 1995, 199 human error events, which is equivalent to 23%, were identified for 49 nuclear facilities in Japan. Based on this staggering statistic, the government should require that this agency 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 agency should also proactively and explicitly address the human factors considerations as they arise in the nuclear industry. [Human factors or ergonomics is a multidisciplinary science which deals with integrated systems of human, organization and technology. Its primary objective is to reduce human error potentials and to enhance whole system's efficiency, reliability and safety.]

Moreover, possessing human factors expertise should explicitly be mentioned in the mandate and the membership requirements for the independent nuclear safety agency's board of overseers and staff in Japan. 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 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" (emphasis added).

As the 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. Japan 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's nuclear industry needs a total system analysis by concentrating on its three main composing sub-systems; human, organizational, and technological. These changes should not be taken for granted. 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.

It has been reported that Mr. Tsunehisa Katsumata, TEPCO's Executive Vice President for Corporate Planning, is expected to become TEPCO's next President and CEO. I suggest that Mr. Katsumata and his respected colleagues and counterparts in Japanese nuclear industry work with the (aforementioned suggested independent) governmental nuclear safety agency and attempt an overhaul -- a total change of the safety culture and organizational practices -- of the nuclear industry. Creating a safety culture means instilling thoughts and attitudes in organizations and individuals that ensure safety issues are treated as priorities. A nuclear utility fostering a strong safety culture would encourage employees to cultivate a questioning attitude and a rigorous and prudent approach to all aspects of their job, and would set up necessary open communication between operators, managers, regulators, and the public. Secrecy, collusion, and cover-ups have plagued Japan's nuclear industry for many years, there should be a zero tolerance standard for these unethical and damaging practices.

A common symptom of a problematic safety culture is paying disproportionate attention to "production" in comparison with "safety." It is manifested by having a high priority for maintaining a tight and unrealistic availability schedule, while not giving equal and adequate attention to preventive maintenance. Safety culture can be improved, for instance, by integrating safety into organizational practices and operations and including it in the job description of employees. This way safety becomes an integral part of a line employee's task rather than the responsibility of the plant's safety manager.

In order to restore public confidence, Japan's nuclear industry should launch an unprecedented and monumental undertaking; it will not be easy but it is feasible. Most importantly, in order to do a thorough job with long-lasting positive effects, the industry should utilize advanced multidisciplinary methodologies for improving the nuclear safety culture. Nonetheless, total respect for Japanese unique national culture should be considered, and we should bear in mind that the capabilities of neoclassical system safety management techniques, in this context, are rather limited.

It is up to the industry to adopt the most advanced research-proven methods and to reconfigure them to fit different aspects of Japan's nuclear industry. It is the government's responsibility to stay as an active, but hands-off, partner and to maintain proper technical oversight. And finally, it is incumbent upon Japan's nuclear industry to take advantage of this golden opportunity, to work with the government and public, and to institute a total safety culture improvement program; if not for the sake of the Japanese public, at least for the sake of their own survival.

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About the Author, His Research on the Tokaimura Accident, and His Freshman Seminar on Technology and the Environment:

Dr. Najmedin Meshkati, an associate professor of Civil/Environmental Engineering and Industrial and Systems Engineering at the University of Southern California (USC), Los Angeles, California, teaches, consults, and conducts research on human and organizational factors in complex technological systems. Meshkati's fall 1999 Freshman Seminar on Technology and Environment students 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.

It should be noted that this web site is number one "hit" out of more than 91,000 entries/web sites on this topic, when using key words "Japan nuclear accident" on google.com (<http://www.google.com/> which is one the most popular search engines). As of September 2002, more than 44,000 people have visited this web page and it has been linked by IAEA's International Nuclear Information System (INIS) database about this accident (entry 1340.7): <http://www.iaea.org/inis/ws/subjects/resources.html>