Panel: Nuclear Safety and Terrorism (Grand BallroomⅢ)
Date/Time: Tuesday, February 19, 2013 /14:00-15:15
Talking Points for: William S. Charlton, Director, Nuclear Security Science and Policy Institute, Texas A&M University

All complex systems involve risk. We choose to accept the risks posed by these systems because we perceive that the benefits of the system surpass the risks. However, we still have a responsibility to engineer reasonable systems to attempt to mitigate the risks associated with these threats.

We traditionally approach risk reduction by either decreasing the likelihood that an undesirable event will occur or by mitigating the consequences associated with that event or a combination of these.

Nuclear fuel contains a potential energy that vastly exceeds that available from conventional sources. This potential energy generates the possibility for consequences that could be far-reaching. We have seen this impact from accidents like Cheronbyl and Fukushima. And while the loss of life from the reactor accidents at Fukushima was low, its economic and societal impact is still large.

Because of this, nuclear energy programs require a degree of responsibility that surpasses that traditionally required by other energy systems. We must establish systems to reliably mitigate the risks associated with nuclear energy. And I would argue that in many cases, the systems we currently have in place are inadequate.

This is partially due to a fundamental flaw in our understanding of risk mitigation when dealing with low-probability, high-consequence events. Traditionally in probabilistic risk analysis, we assume that the risk is linearly proportional to the probability of an event occurring and linearly proportional to the consequence of that event. This leads to undervaluing the impact of low-probability, high-consequence events when balanced with high-probability, low-consequence events. We then spend proportionally too little money and effort on systems that would mitigate the events that would really have a major impact and too much money on those that in reality don't matter. These low consequence events generally have little actual impact on the viability of a nuclear energy system and their consequences could likely be accounted for as a standard cost of doing business.

The high-consequence events however are those that if they occur will completely shutdown the facility and potentially have global impacts. Of course, as a manager it is difficult to continue to support a system which will most likely never be used because the probability of the event occurring is so low.

Another flaw in this understanding is in the assumption that the probability of occurrence of

these events is low. Not only does the existing case data on severe reactor incidents not appear to agree with that assumption, but these incidents do not have to be initiated by a natural disaster or unintentional human error. These events could be initiated intentionally by an intelligent and adaptable adversary. This is the cross roads between safety and security wherein both systems are attempting to mitigate the risks to society from high-consequence events at nuclear facilities. And this is the topic of this session.

The new breed of terrorism and extremism has led to very real risks to our nuclear facilities. These organizations are not hampered by the old ideals of self-protection and rational actors. Their values are not similar to ours and thus their actions appear irrational to us. They are highly organized. They meticulously plan their attacks. They make use of intelligence gathering mechanisms and employ insiders at our facilities. We must continue to ensure that nuclear facilities remain an unattractive target to this threat.

I believe that there are a number of areas in our industry that need improvement. The following are a few that I think are important:

1. Integration of safety and security in design, construction, operation, and regulation of nuclear energy systems. Too often is safety and security treated as separate and conflicting functions. These systems are fundamentally aligned. They have a common mission to protect society from threats from the nuclear energy system.

2. Enhancement of nuclear safety and security culture at all levels. When this culture exists, all employees (managers, workers, regulators, etc.) truly believe that the undesireable event could be initiated at any moment and that they will always remain vigilant against it. They would never trade off the systems to protect against high-consequence events for those that manage either the low-consequence events or for minor gains in profit.

3. Improvements in our understanding of risk analysis. We clearly have difficulty in understanding how to mitigate risks from low-probability, high-consequence events and have almost no ability to effectively estimate the likelihood of a rare event occurring.

4. Flexible nuclear safety and security systems. Our current systems are very rigid in their design, implementation, and regulation. Flexibility allows the “defenders” of the facility to adapt in the face of a crisis or when an unforeseen event occurs.

5. Better integration of nuclear emergency management globally. When these events occur, they are not limited by national boundaries. An attack on one nuclear facility is an attack on all nuclear facilities.

Through these and other methods, I believe we can continue to improve the future for peaceful nuclear energy globally.