Emergency Preparedness and Response

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Effective emergency preparedness and response programs are important for ensuring protection of the public, workers and the environment: maintaining public confidence and trust in our nuclear programs; mitigating the effects of any nuclear or radiological incident, whether a result of an accident, negligence or terrorist attack; are important to our countries and to the world. Globally, we are all concerned about the threat of nuclear terrorism. Nuclear terrorism may be the single most catastrophic threat that any nation faces and we must do everything we can to ensure against its occurrence. However, with the re-emergence of nuclear power, we must ensure that mistakes that lead to past incidents are not repeated and that effective, harmonized and compatible emergency management capabilities exist. If a nuclear accident or radiological emergency, or a nuclear terrorist event, should occur we need to be prepared to respond with emergency capabilities from around the globe. Thus, we need to ensure that emergency management training, response, international coordination, strategies and capabilities are shared to ensure compatible and harmonized programs are established worldwide. As we work to protect all nations from a potential nuclear and radiological incident or attack, emergency management systems play a key role in prevention and readiness by ensuring that we have the capability to protect the health and safety of the public, workers and to protect the environment.

Developing, upgrading and improving emergency programs is challenging, but very important to address. It is a long-term commitment that requires a dedicated effort from all countries working together to develop a common strategy to address this important issue. The components of an effective nuclear emergency program involve identification of the threat, planning, preparedness, response and recovery.

I will briefly address the threat, emergency planning, preparedness and response programs.

Nuclear Threats

In this post-Cold War world, nuclear terrorism may be the single most catastrophic threat that any nation faces - we must do everything we can to ensure against its occurrence. For nuclear terrorism, we are focused on two principal scenarios. First, state sponsors of terrorism could seek to employ indigenously developed nuclear weapons covertly in any country because of an inability, or an unwillingness, to deliver them via more traditional delivery means. Second, covert delivery by sub-national terrorist groups, either at the bidding of a state

sponsor supplying the nuclear warhead or on their own via purchasing or stealing a warhead, is also a concern.

With regard to terrorist activities, there are three main threat variants we identify in decreasing order of likelihood, but increasing order of consequence in terms of deaths, injuries, cleanup costs, etc.:

- Terrorists could acquire radioactive materials and construct devices for dispersal: so-called radioactive dispersal devices or RDDs (not a nuclear yield);

- Terrorists could acquire special nuclear materials (SNM) - plutonium or highly enriched uranium (HEU) - and build an improvised nuclear device of a few kilotons of nuclear explosive power; and

- Terrorists could acquire a nuclear weapon from a nuclear weapons state (few 10's too few 100's of kilotons).

I'm going to focus first on the latter two threats both involving nuclear yields: the threats involving plutonium or HEU and the nuclear warheads or improvised nuclear explosive devices that employ these materials. These scenarios present the greatest threat because of the potential harm that could be done and the greatest challenge in terms of detection.

The overall strategy to protect a country from terrorist nuclear weapons threats has five components:

- Prevent acquisition of nuclear weapons and special nuclear materials;

- Deter the threat if possible;

- If prevention and deterrence fail: detect, interdict and render safe the nuclear device;

- Identify the nature and source of the nuclear device; and

- Prepare for and respond to possible use.

We are working hard to prevent acquisition by:

- Strengthening physical security of nuclear weapons and weapons usable materials worldwide;

- Providing assistance to countries to strengthen protection, control, and accounting of its nuclear weapons and materials;

- Working with countries to strengthen security at civil nuclear facilities; and

- Taking more aggressive steps to interdict commerce in weapons-usable nuclear materials and related technologies via strengthened export controls, cooperation with countries through initiatives such as: The Global Initiative to Combat Nuclear Terrorism.

Keeping nuclear and radioactive materials out of the hands of terrorists - and where possible, eliminating potentially vulnerable weapons-usable materials - is the most effective means of prevention. Barriers to acquisition also provide an important element of deterrence. If terrorists believe that it will be extremely risky, or impossible, to acquire weapons or materials, they may seek other avenues of attack. While we of course want to prevent all types of terrorism, deterring a devastating nuclear detonation has particular urgency.

A key component of an overall strategy to counter nuclear terrorism is the ability to rapidly characterize and identify the source of nuclear warheads and weapons usable nuclear materials - either before or after an attack -. A state sponsor of terrorism may be deterred from conducting a covert nuclear attack or providing nuclear weapons to terrorist organizations if it believes that a credible capability to attribute such devices to their source and that there is a will to retaliate against both the state sponsor and any terrorists. An attribution capability will be critical to actions taken in response to prevent follow-on attacks, and provide as well a means for law enforcement agencies to bring perpetrators to justice. A lot of hard work remains in fleshing out both the technical and policy dimensions of attribution.

But, what if terrorists succeed in acquiring a nuclear device despite our best efforts? We cannot expect that they will be deterred by threats of retaliation. We therefore need to strengthen our capability to interrupt a terrorist attack in the making. This includes both technical means to identify a nuclear weapon, nuclear or radioactive materials, or other key components being transported around the world. A robust nuclear and radioactive material detection system not only protects our countries directly, it could also convince our adversaries that any attempt of this sort is likely to fail.

A nuclear materials detection system does not have to be perfect to be useful. And, we should not expect any nuclear detection system to be successful against all potential configurations of materials. Among other things, the low energy gamma rays emitted from U-235 can be easily shielded from radiation detectors - this reduces the standoff capability of detector systems and/or requires much greater detector time to acquire a signal. This may simply not be practical in many transportation scenarios. Of course, the mass of shielding could itself tip off an inspector to examine a shipment more closely. Other approaches - for example, neutron irradiation to cause fissions in U-235, which are more detectable - raise problems and policy issues including adding to the cost and complexity of the system, and possibly safety questions for both operators and the public. A detection system whose sensitivity is set very low in order to have high confidence of detecting nuclear material will have a correspondingly higher false positives rate from commonly occurring sources of radiation.

Finally, let me provide a short answer regarding nuclear detection. Detection of weapons usable nuclear materials - that is, plutonium and highly enriched uranium - by their radioactive decays is not a “silver bullet.” Rather, nuclear materials detection is but one tool in the broad array of ongoing activities and emerging capabilities, systems, and architectures that comprise an overall strategy to counter the nuclear threat.

At this point, I would like to discuss terrorist acquisition of radioactive materials to construct devices for dispersal: so- called radioactive dispersal devices (RDDs) or “Dirty

Bomb". I must point out two things in particular: 1) a RDD or dirty bomb will not produce a nuclear yield, and 2) while I specify terrorist acquisition, an RDD could be produced by anyone who has explosives and radioactive material. Therefore, an RDD is considered generally to be a more likely scenario than a detonation of an IND or a nuclear weapon. An RDD also has a significantly lower consequence in terms of radioactive contamination. In fact, the impact of the explosion may do more damage than the radioactive material. However, and this is a big however, an RDD will have its greatest impact in terms of mass hysteria – "public perception" identifies this as the biggest fear and thus, it is a concern that we must address.

The RDD threat is considered a higher threat in many countries throughout the world. This is based on the belief that there is a greater probability of the terrorist obtaining the necessary materials (radioactive material and explosives) to achieve the end results. Challenges to making an effective RDD are:

- Radioactive source size varies from very small to large – making it difficult to make an effective RDD
- Due to material properties of sources and device design complications duds are very likely

Because of these variables if detonated, an RDD has a very wide range of outcomes. But an effective RDD will cause disruption and damage and we believe that it will be one of the following scenarios:

- Localized dispersal which will result in higher exposure rates. This presents challenges to first responders, but dispersal would be confined to an area less than a few hundred meters.
- Widespread dispersal which will result in lower exposure rates, but dispersal area would be larger – a few kilometers – presenting potentially a large cleanup problem.
- Combination of localized and widespread dispersal which will result in a wide variation of exposure rates and complex cleanup depending on the chemistry of the source.

The bottom line is that the best strategy is what we have all been working towards: prevention, response and mitigation. Again, we have no silver bullets and I have none to offer, but we address the RDD, IND and nuclear device threats in the same manner:

- Prevent acquisition
- Detect the threat
- Interdict
- Respond
- Render safe
- Consequence management

Detection of many RDD source materials is easier than detection of nuclear material (gamma) and many nuclear device render safe and mitigation activities are applicable to the RDD threat.

While I have dwelled on the nuclear threat in terms of the terrorist, let me state that we also have a threat of a nuclear accident/incident. As Three Mile Island and Chernobyl, as well as more recent incidents such as Tokai Mora, have shown us the threat of a nuclear accident occurring is very real and we need to ensure that we have effective programs in place to address these threats as well. Thus, we must have sound effective safety programs to minimize the potential threat of nuclear accidents, incidents or emergencies and, we must have emergency programs that will ensure timely and effective mitigation of a nuclear or radiological accident, incident, or emergency.

Emergency Planning and Preparedness

Effective emergency planning and preparedness has many components; however, key components for an effective emergency-program include the following core elements:

- Development and implementation of policy and procedures;
- Communications systems and networks;
- Training programs for response and advisory personnel;
- Development and implementation of exercise programs;
- Program integration at the local, national, regional and international levels; and
- Response elements.

Emergency Policy and Procedures**:** Emergency policy and procedures ensures that all elements necessary for an effective emergency management programs meet national, regional and international standards to ensure protection of workers, the public and the environment.

- Policy ensures:
    - Laws necessary to ensure proper authority, liability and requirements for programs are promulgated.
    - Plans and procedures necessary to ensure a structured documented emergency program that identifies threats, hazards and consequences; preparedness; and response elements.

- Preparedness ensures resources, readiness assurance and response elements are in place.
    - Resources are the acquisition of fund, resources and personnel that are necessary for an effective emergency program.
    - Readiness assurance ensures programs to conduct of drills and exercises, training of response personnel and continuous evaluations of programs.

- Response is effective response to mitigate any incident at any time with or without prior notice.

- Emergency management improves with experience.
  - Thus, policies have to evolve to accommodate technological change and growing global independence.
  - The overarching goal is to build uniform emergency programs worldwide and an emergency response culture that prioritizes health and safety and protection of the environment.

Integration of policy and procedures into national, regional and international emergency programs ensures a system for worldwide notification and assistance for nuclear/radiological incidents, accidents and/or emergencies.

Communications systems and networks: Communications systems and networks are essential for ensuring early warning and notification of nuclear/radiological threats, concerns, problems, incidents and accidents; transmission of information and data; and ensuring appropriate communications between and amongst decision making officials to mitigate such situations.

- Equipment: Communications equipment and technology that enable effective, voice, data and video communications makes emergency response more effective. Communications infrastructure and crisis centers for information display modules and teleconferencing enhance emergency response effectiveness.

- Plume Modeling: Enables decision makers to decide on protective actions, such as population evacuation or destruction of foodstuff based on model projection.

  - Users must understand the models so they can evaluate output correctly, especially in cases where the models produce diverging plume predictions.
  - Systems must also support real-time comparison and evaluation capabilities during exercises and tracer campaigns.

Training**:** Emergency preparedness and response training ensures readiness to respond to a nuclear incident.

- The goal is to share respective experiences in establishing and maintaining emergency response capabilities that are appropriately tailored to our respective programs.

- Information on performance based training, drills and exercises benefits all countries, and we profit from experiences shared through lessons identified.

    - Programs and relationships with communities, local governments, offsite, national, regional and international responders provides different methods and approaches to ensure training for managing public information and dealing with the public and means for communications and most importantly enhances response effectiveness

Emergency Exercises: Exercises provide tests of emergency management systems that yield results and lessons learned/identified.

- Exercises enable continuous Improvement to emergency programs.

- Responders can factor the information into overall systems improvements, keeping track of strengths, weaknesses, and independent variables.

- Countries can conduct exercises regionally. Cooperation across borders strengthens national efforts to develop effective emergency response systems.

- Bilateral and multilateral input can make exercise outcomes more realistic, while facilitating valuable tests of international notification regimes.

Emergency Response

Nuclear and radiological incidents and emergencies can, when they occur, have significant and long lasting impacts to workers, the public and the environment. Such incidents and emergencies, while infrequent, have shown that the capabilities and resources of any country can quickly be overwhelmed and timely response assistance may be needed to minimize the consequences to workers, the public and the environment. Ensuring timely response to supplement a countries capabilities and resources can be problematic. History has shown that producing a timely response is not easy and it is even more difficult to ensure timely, effective and efficient response assistance.

Emergency response programs must ensure that the nuclear and radiological response capabilities and resources are responsive, flexible, efficient and effective. Capabilities and resources must:

- Be ready to respond to any nuclear/radiological accident or emergency;
- Employ state-of-the-art tools and techniques;
- Support national, regional and international initiatives in nuclear/radiological accidents/emergencies;
- Ensure and accelerate the deployment of mitigation tools;

- Have a technical knowledgeable of the multitude of nuclear/ radiological programs; and
- Have technical, analytical and operational expertise to accurately assess, analyze, and mitigate nuclear/radiological accidents, incidents, or emergencies.

Emergency response programs must identify existing country capabilities and resources that can be made available for timely response to a nuclear or radiological incident or emergency, and if not needed to support an in-country event, that could be made available to support a timely response to a nuclear or radiological incident or emergency in neighboring countries or other country within the region. Capabilities and resources need to include deployable resources such as monitoring and assessment teams, aircraft and sensors for radiation measuring and sampling, and medical field teams and non-deployable resources such as technical and medical expertise, assessments, and modeling support provided from a home base. Emergency response programs must enable timely leveraging of existing nuclear and radiological capabilities and resources of the countries in the region on an if needed basis, and permit countries within the region to share resources and capabilities rather than each country having their own, and in many instances, redundant resources and capabilities that are seldom used but costly to maintain. National, regional and international programs must be harmonized among country emergency preparedness and response programs within the region and internationally by promoting joint emergency planning, exercises, and sharing of information and data. A common understanding of the regional emergency response needs and when coupled with the international community, will provide for a harmonized and timely world wide response to any nuclear and/or radiological incident or emergency.

When all is said and done, however, we must recognize that there is no single "silver bullet" in preventing acquisition or in detecting and interdicting terrorist nuclear threats or in preventing a nuclear accident or radiological emergency. Rather, we must develop a comprehensive strategy that includes a broad range of initiatives, capabilities, and supporting research and development program coupled with an effective worldwide nuclear emergency preparedness and response program.

Thank you for your attention. I would be happy to take questions.