

Optimal Physical Protection against Nuclear Terrorism

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1. Introduction

1.1. Background

The world is in unsteady condition because of the collisions. (i.e. religion, race, ideology and desire etc.) The Korea is the only divided nation in the world is particular geopolitical situation and is encircled with powerful nations. North Korea already has an ability to make nuclear weapon is shown to the highly potential flashpoints. But many Korean are not able to recognize to keep concluding a ceasefire agreement between South and North Korea and become embroiled in a territorial dispute with marginal states because of the development of industry and a long peaceful atmosphere.

There is no attempt with nuclear weapons to attack any places for terror or military victory since the atomic bombs dropped in Hiroshima and Nagasaki. People have obviously experienced horrible destructive power of nuclear weapons and continuously remembered a terrible tragedy, lots of organizations and experts express their concerns about the nuclear terrorism and try to interchange opinions for prevention of deadly weapons. The purpose of this paper is to provide the information of nuclear terrorism and what the potential risk of Republic of Korea is and how to do the efficient physical protection.

1.2. Terrorism

Terror is from the old French *terreur*, which is derived from Latin verb *terror* meaning 'great fear'. This is a policy to suppress political opponents through using violence and repression. Many scholars have been proposed, there is no consensus definition of the term "terrorism." In 1988, a proposed academic consensus definition: "Terrorism is an anxiety-inspiring method of repeated violent action, employed by (semi-) clandestine individual, group or state actors, for idiosyncratic, criminal or political reasons, whereby - in contrast to assassination - the direct targets of violence are not the main targets. The immediate human victims of violence are generally chosen randomly (targets of opportunity) or selectively (representative or symbolic targets) from a target population, and serve as message generators." [1]

As we all know, the largest terrorist activity occurred in United States of America that Islamic extreme terrorist group al-Qaeda hijacked four passenger airliners and used them to crash the World Trade Center towers in New York City and the Pentagon in

Washington, DC on September 11, 2001. Almost 3,000 people were killed and at least \$10 billion in property and infrastructure damage lost from these attacks. And other terrorist activities have also occurred around the world, Bali car bomb attack; London subway bombings; Madrid train bombings and Norway attacks etc. These attacks showed that particular terrorists groups sought to cause heavy casualties and extreme terrorists were spontaneously prepared to make sacrifices for completion of that ultimate goal.

Characteristics	Terrorism
Unit size in battle	Small(usually fewer than 10 persons)
Weapon	Hand guns, hand grenades, assault rifles and specialized weapons, e.g. car bombs, remote-controlled bombs, barometric pressure bombs
Tactics	Specialized tactics: kidnapping, assassinations, car-bombing, hijacking, barricade-hostages, etc.
Targets	State symbols, political opponents, and the public at large
Intended impact	Psychological coercion
Control of territory	No
Uniform	Do not wear uniform
Recognition of war zones	No recognized war zones. Operations carried out worldwide
International legality	No
Domestic legality	No

<Table.1. Characteristics of terrorism, guerrilla warfare and conventional war as modes of violent struggle> [2]

2. Nuclear Terrorism

2.1. Nuclear Terrorism in 21st century

The nuclear weapons are considered as the most deadly weapon. The nuclear threat is greater today than and terrorist groups have carried out to gain them. There was rarely interchange of technology among states in times past. After World War II, invention and innovation by prominent scientists have led to advanced military technology breakthroughs to compete adversaries and many countries experienced many changes during Cold War. The nuclear weapons technology is no longer at the leading edge of science

and globalization is possible to access by terrorists to the reliable information of designs, materials and potential targets. According to the survey in 2005 to United States, 60% of total 85 security experts responded the possibility range of nuclear terrorism from 10% to 50%. Most people have already experienced that a nuclear weapon has the ability to destroy an entire city. Two other bombs that called "Little Boy" and "Fat Man" were later detonated over the Japanese cities of Hiroshima and Nagasaki where are the only cities hit by nuclear weapon. Since September 11, 2001 attacks, the U.S, government have considered nuclear terrorism poses the first threat to the international security. Al-Queda spokesman Suleiman abu Gheith stated "kill four million Americans-one million of them children-and to exile twice as many would and cripple hundreds of thousands." to let terrorists' intention know[3]. Although Osama bin Laden was already killed, we could understand his mind about attempting acquisition of the nuclear weapons with his previous interview by Al Jazeera in a 1998. "... there is a duty on Muslims to acquire them, and America knows today that Muslims are in possession of such a weapon, by the grace of God Almighty." [4] If Extreme terrorists may gain the nuclear weapons, they will not vacillate between using and disusing. In additional, the radiological accident of low level not involving explosion of the actual nuclear weapon might occur in the territory so that country could have severe economic disruption and psychological damage due to the fear of radioactivity among people. It's a real confrontation in the 21st century.

2.2. Methods of Nuclear Terrorism

In general, there are several types of nuclear and radiological terrorism to attack their targets.

- The acquisition and detonation of an intact nuclear weapon from a nation-state's arsenal
- The acquisition of weapons-usable fissile material such as highly enriched uranium or plutonium, in order to make and denote an improvised nuclear device, which is a crude nuclear explosive.
- An attack on or sabotage of nuclear facilities such as nuclear power plants, spent fuel pools, other radioactive waste storage or processing facilities, or research reactors in order to disperse radioactive material
- The acquisition of radioactive materials from commercially available devices or other radioactive materials in order to build a radiological weapon that disperses radioactive material or emits ionizing radiation[5,6].

If there are some events like the first 2 classes cases, they will be involved nuclear explosion and the most horrible incidents of nuclear terrorism. After happening, maybe thousands people could be killed or severe

damage their health by detonation and lost hundreds billions of dollars' worth caused by radioactive contamination. Some experts expect that the damage in economic activity could soar to several trillion dollars. But up to now, terrorist groups have not yet tried to a nuclear attack. These types of attack need to have technical, logistical, theoretical and financial measures. In addition radiological terrorism acts are considered inhumane and many groups don't have a lack of motivation to do. It is very burden. Nonetheless, never should not be ignored the nuclear terrorism because it is not possible to withstand the consequence.

2.3. Radiological weapon

The aim of a radiological weapon is that radioactive materials are dispersed by detonation or emitted ionizing radiation from radioactive sources over a designated area. Many people have been killed through the conventional explosion and the radioactive materials cause the potential health risk to people who are exposed such as death and severe illness.

Radiological Dispersal Device(RDD), typically called "Dirty bomb", consist of radioactive materials attached to explosives. The detonation of 'dirty bombs' in major population areas has been identified by many analysts as an easier and therefore potentially more likely mode of radiological attack.

Basic Radiological Properties of Nine Key Radionuclides for RDDs[7]						
Isotope	Half-Life (years)	Specific Activity (Ci/g)	Decay Mode	Radiation Energy (MeV)		
				Alpha (α)	Beta (β)	Gamma (γ)
Americium-241	430	3.5	α	5.5	0.052	0.033
Californium-252	2.6	540	α (SF, EC)	5.9	0.0056	0.0012
Cesium-137	30	88	β, IT	-	0.19, 0.065	0.60
Cobalt-60	5.3	1,100	β	-	0.097	2.5
Iridium-192	0.2 (74 d)	9,200	β, EC	-	0.22	0.82
Plutonium-238	88	17	α	5.5	0.011	0.0018
Polonium-	0.4 (140)	4,500	α	5.3	-	-

210	d)					
Radium-226	1,600	1.0	α	4.8	0.0036	0.0067
Strontium-90	29	140	β	-	0.20, 0.94	-

SF = spontaneous fission; IT = isomeric transition; EC = electron capture. A hyphen means not applicable. The radiation energies for cesium-137 include the contributions of barium-137 metastable (Ba-137m), and those for strontium-90 include the contributions of yttrium-90.

Characteristics of a dirty bomb incident[8]

- Disperses radioactive contaminated dust into the air and onto surfaces.
- May disperse larger projectiles of either the delivery device(bomb parts) or actual pieces of the radioactive material
- Most RDDs will use low-level radioactive materials.
- Casualties and damage mainly takes place with initial detonation and the short period thereafter. However low-level internal exposures may increase cancer risk.
- Clean up is difficult and costly.

3. Circumstances of Korea

There are some high potential risks from nuclear terrorism in Korea, but the foremost factor is the nuclear capability of North Korea. In addition, anti-nuclear movement is wide spreading all over the world since the accident of Fukushima. Especially, in response to this controversial act, debates on the necessary policy of using nuclear power plant have become heated between environmental organization with supporter and government in Korea. The anti-nuclear movement frequently points out using the same fuel sources for nuclear power plant and much of the same science as nuclear weapons. The sabotage to the nuclear facilities is not possible plan from extremists. Maybe Korea has possible threat from terrorist groups because of an ally of the United States.

3.1. North Korea

There is no open source information about the security of North Korea. Some countries that are concerned with North Korea's condition including South Korea presume the ability of nuclear technology and nuclear weapons arsenal in North Korea. Military authorities anticipate Kim Jong-un's government maybe possess between two and eight the nuclear weapons. There are various factors which might affect the possibility of attack with nuclear weapons or radiological materials. Some experts say that Kim Jong-un is not experienced and will act unpredictably. In addition, North Korea has suffered famines and food shortages since the early 1990s when its economy was stagnant owing to mismanagement and weather disasters. There is no sign of a let-up in the recession. They need

to boost economic recovery to keep their repressive dictatorship. That's the reason it is possible to deal with between North Korea officials and extreme groups that are desired to acquire WMD.

The worst case scenario would be that North Korea sells a nuclear weapon or its major components to terrorists. Although there have been no reported ties them, the al-Khibar precedent raises fresh questions concerning North Korea's nuclear behavior. The discovery of Syria's al-Khibar reactor, which built with North Korea assistance, suggests Pyongyang may not possess long-assumed, self-imposed constraints on transferring nuclear weapons technologies to other parties [9].

Also, they need to keep equilibrium their regime so pretend to be other extreme terrorists and try to do small radiological activity for confusion of South Korea.

3.2. Nuclear Facilities

Nuclear facilities are so attracted by terrorist groups because they are symbols as the public's growing fear and models of the technical-incentive advancement. While Sabotaging or attacking to the nuclear facilities, especially commercial nuclear power plant, would not lead to a nuclear detonation, the large amount radiation from damaged facilities could release outside and cause the critical damage to the society such as economic losses, social turmoil, radioactive contamination, significant numbers of fatal health problems similar to long term cancers and psychological stress nearby corresponding area. Terrorists might be motivated to damage nuclear facilities, especially commercial nuclear power plants, to offer the advantage of striking highly symbolic targets as a symbol of security system. Maybe the authority has no control over the people when this happens. It means that the most important security system is destroyed and there is no safety area. Although terrorist groups or individuals don't attempt to attack nuclear facilities directly, this threat will be very useful strategy by intimidation to a hostile country. For this reason, we have to never ignore the possibility of attacking NPP that is even extremely low.

The terrorist route to damaging a nuclear facility and causing a release of radioactivity to the surrounding environment would require the following steps[5]:

- 1) A terrorist group possessing the desire to cause significant harm to the target country and necessary technical and financial resources to execute such a scheme by damaging nuclear facilities must organize and begin operations.
- 2) The group must then choose to engage in an act of nuclear terrorism at a moderately high level of violence by attacking or sabotaging a nuclear facility to cause the release of significant amounts of radioactivity.
- 3) The terrorist organization must identify a nuclear power plant or other nuclear facility that is vulnerable to attack. To facilitate the success of their mission, the

terrorists would likely try to enlist the support of at least one insider.

4) The terrorists must decide how to strike the facility. Attack modes include airplane crashes; commando raids by land, water, or air, or cyberterrorism.

5) The terrorist must overcome the facility's protective measures and disable or destroy vital equipment at the facility or otherwise cause an off-site release of radioactivity.

Method of Activation is as following:

- Airplane crashes
- Vehicle bombs
- Commando-Type Attacks
- Insider collusion
- Cyberterrorism

4. Conclusions and Recommendations

Creation of nuclear weapons was like opening Pandora's box. Barack Obama has called nuclear terrorism 'the greatest danger we face'. Nuclear terror is one of the lethal risks. Using nuclear weapons or materials from terrorist groups is a fatal catastrophe to a targeting state though there is no accident similar like that. South Korea is no longer a safety area from nuclear terrorism. The reality of the Korean Peninsula requires a big change such as Korean mind, nuclear policy or international cooperative relationships.

Therefore, there is a need to intensify military defense. To protect activation of nuclear terrorists, ROK special force who trained nuclear terror to suppress terror activists and fire fighters are well-educated to decontaminate are stationed near nuclear facilities.

North Korea and terrorist groups are closed societies. Exact activity or aim is hard to acquire to analyze. Monitoring system is reinforced with high technology to deter their intention,

Anti-nuclear movement is spread out across the world. They mostly use the peaceful demonstration, but extreme activists try to sabotage into the nuclear facilities. The government officials watch radical anti-nuclear and malicious groups.

Nuclear facilities are very well installed security system. It is very difficult to sabotage without Insider support. The law makers have to make strong policy and for more effective prevention,

Last but not least, authority should build the good relationship through education.

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