MSc. Thesis on

Security of Pakistan's Nuclear Arsenals: Facing the Challenges

By: Muhammad Ali

Supervisor: Mr. Rasheed Khalid

Department of Defense and Strategic Studies
Quaid-i-Azam University
Islamabad
2014

QUAID-I-AZAM UNIVERSITY ISLAMABAD
Department of Defence and Strategic Studies

Dated: September19, 2014.

FINAL APPROVAL

This is to certify that we have evaluated the thesis submitted by Mr. Muhammad Ali on "**Security of Pakistan's Nuclear Arsenals: Facing the Challenges**" and it is our judgment that this is of sufficient standard to warrant its acceptance by Quaid-i-Azam University, Islamabad for the degree of M.Sc in Defence and Strategic Studies.

Mr. Rasheed Khalid
Supervisor

Dr. Noman Sattar
External Examiner

Mr. Rasheed Khalid
Chairperson

Acknowledgement

In the name of Allah Almighty the Most Beneficent and the Most Merciful.

First and foremost, I express my gratitude to my supervisor Mr. Rasheed Khalid for providing me his excellent guidance and supervision to complete this thesis well in time. He allowed me to sit in his office for hours to discuss very critical and sensitive issues openly that enabled me to produce a well organized thesis.

My special thanks to Mr. Muhammad Sadiq for providing me valuable literature on this sensitive topic. He always welcomed me in his office and appreciated me in the best possible way that enhanced my confidence.

On completing my first research thesis I think it is a point to pay my tribute to my fist teacher Mr. Jameel who put me in right direction in the beginning of my educational career that enabled me to get through so many educational steps successfully.

I am grateful to my whole family and friends, their close support and prayers had always been with me. I am thankful to my elder brother Mr. Muhammad Idrees Khan for supporting me and increasing my confidence on all points, especially at many depressed moments on which I have almost lost my all hope in my whole life.

My bundles of thanks to my all faculty members for teaching and cooperating in such an excellent and brilliant way that increased not only my knowledge and learning skills but also developed many new dimensions of thinking more reasonably.

At last, I am grateful to Allah Almighty for blessing me with an opportunity to get education in a best institute of my country.

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List of abbreviations

AG	Australia Group
ASFC	Army Strategic Force Command
BBC	British Broadcasting Corporation
C4I2SR	Command, Control, Communication, Computer, Information, Intelligence, Surveillance and Reconnaissance
CIA	Central Intelligence Agency
CNN	Cable News Network
CPPNM	Convention on the Physical Protection of Nuclear Material
CSI	Container Security Initiatives
CWC	Chemical Weapons Convention
DCC	Development Control Committee
ECC	Employment Control Committee
ESD	Environmental Security Device
FATA	Federally Administered Tribal Areas
G8	Group of Eight
GHQ	General Headquarters
GICNT	Global Initiative to Combat Nuclear Terrorism
HEU	Highly Enriched Uranium
HRP	Human Reliability Program
IAEA	International Atomic Energy Agency
ICSANT	International Convention for Suppression of Act of Nuclear Terrorism
INFCIRC	Information Circulars
ISI	Inter-Services Intelligence
ISPR	Inter Services Public Relation
ITD	Incident Trafficking and Database
JCSC	Joint Chief of Staff Committee

KPK	Khyber Paktunkhawa
KRL	AQ Khan Research Laboratory
LeT	Lashker-e-Tayyaba
MTCR	Missile Technology Control Regime
NATO	North Atlantic Treaty Organization
NBC	National Broadcasting Company
NCA	National Command Authority
NESCOM	National Engineering and Scientific Commission
NNCA	National Nuclear Command Authority
NPT	Non Proliferation Treaty
NSAP	Nuclear Security Action Plan
NSC	National Security Council
NSECC	National Security Emergency Coordination Center
NSF	Nuclear Security Fund
NSFC	Naval Strategic Force Command
NSG	Nuclear Suppliers Group
NSS	Nuclear Security Summit
NSTC	Nuclear Security Training Center
OBL	Osama bin Laden
PAEC	Pakistan Atomic Energy Commission
PAF	Pakistan Air Force
PAL	Permissive Action Link
PIEAS	Pakistan Institute of Engineering and Applied Sciences
PNRA	Pakistan Nuclear Regulatory Authority
PRP	Personnel Reliability Program
RDD	Radioactive Dispersal Device
RNSI	Regional Nuclear Security Inspector

SECDIV	Strategic Export Control Division
SNM	Special Nuclear Material
SPD	Strategic Plan Division
SUPARCO	Space and Upper Atmosphere Research Commission
TTP	Tehreek-e-Talban Pakistan
UAE	United Arab Emirates
UN	United Nations
UNSC	United Nations Security Council
UNSCR	United Nations Security Council Resolution
USA	United States of America
WMDs	Weapon of Mass Destruction

Abstract

The fear of nuclear terrorism and increasing interests of violent non-state actors in Weapons of Mass Destruction (WMDs) has forced all countries in the world to focus more on the security of their nuclear arsenals. Among WMDs security, nuclear arsenals' security is among top debates in international politics. For nuclear security, all sates with sensitive material have taken different steps to handle these threats. Because of presence of Pakistan in a region which is affected most by terrorists' attacks, there are several questions about security of nuclear arsenals. This study is based on the steps taken by Pakistan to enhance security of its "crown jewel" and its cooperation at international level for this purpose.

Introduction

Nuclear arsenals are most dangerous among weapons of mass destruction. Today human beings are living in this world with too many threats and dilemmas. To feeling insecure is one of the most prominent dilemmas which almost every state in the world is facing. There are many threats to security of states. Terrorism is one of them. The terrorists are using almost every tool in order to get their objectives. What can they do if they succeed in getting nuclear weapons? They can use these weapons as a source of blackmail and against their targets. Many developed countries in the world consider nuclear terrorism as a main source of threat for their national security. The US is one of prominent examples among these countries. According to Graham Allison when a question was asked from former US President George W Bush that, what was the most serious threat for American security? His reply was "nuclear terrorism".[1] This idea has been repeated by President Barak Obama as, "the single most important national security threat we face is nuclear weapons falling into the hands of terrorists." [2]

The question arises here, since it is impossible for terrorists to prepare fissile material and other components of a bomb as it requires a number of complex physical and chemical processes, they will try to acquire nuclear material and other components for their intended purpose by theft. From where terrorist can get these components? One important site was Russia and newly independent states from Soviet Union.[3] Today, Pakistan is considered among most vulnerable sites (of fissile material and bombs) by US and other Western countries. The general perception in the West is that nuclear installments in Pakistan are not

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1 Graham Allison (foreword in article written by Rolf Mowatt -Larssen), *Al Qaeda Weapons of Mass Destruction Threat: Hype or Reality,* (Cambridge: Haward Kennedy School, 2010)
2 Ibid.

3"Nuclear- news, Russia insecure stockpiles of nuclear weapons material," Updated February 18, 2004, http://nuclear-news.net/2014/02/19/russias-insecure-stockpile-of-nuclear-weapons-material/ .

secure. Terrorist can attack them and grab relevant material for their purpose (to hurt the West). Its reason is location of Pakistan in such a region where the war against terrorism is being fought. It is considered that roots of Al-Qaeda and Taliban are very firm and deep in this region. Today, Al Qaeda is on the top of list of terrorist organizations. They are involved in many acts of terrorism in the West and US. Al Qaeda is also accused of 9/ 11 terrorist attacks in New York. They have killed dozens of innocent people all over the world. Imagine what will happen if they succeeded to get nuclear weapons?

Some past record shows that Osama bin Laden had some vision to acquire nuclear weapons, as Robert Johnston in an article explains that Osama in an interview with the *Time* stated that it was religious duty of Muslims to acquire nuclear weapons for defense.[4]

Another important question is that why the West considers that nuclear weapons of only Pakistan are vulnerable for theft and can be used by terrorists for attack on the West. They consider that there are some sympathizers inside nuclear facilities and some are at key positions. These insiders can help these fundamentalists to acquire relevant material from Pakistani installations and can also provide important technical information as well.

These are some important western perceptions about nuclear assets of Pakistan.

Purpose

The purpose of this study is to find facts about nuclear security condition in Pakistan and the steps taken by Pakistan to maximize it. It also focuses on Pakistan's role at international level to enhance nuclear security. It also observes the challenges in detail along with their credibility and to judge future dimension of nuclear security in the presence of these challenges.

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4 "Osama Bin Laden and Nuclear Weapons," updated in September 22, 2002 , http://www.johnstonsarchive.net/nuclear/osamanuk.html

Question to be addressed

To observe the security of Pakistan nuclear arsenals, it is necessary to address few questions:

What is condition of nuclear security all across world?

What steps Pakistan has taken to improve its nuclear security?

How Pakistan is acting on international level to improve its nuclear security?

What are challenges about security of Pakistan nuclear arsenals?

What is government policy to handle threats to nuclear security in Pakistan?

If we look at the recent report of Nuclear Threat Initiative (NTI) about Pakistan's nuclear security, it can be seen that Pakistan security is somewhat better compared to that of Indian. Pakistan ranks 22 out of 25 states, whereas Indian nuclear security rank in this list is 24. Security index of both Pakistan and India falls in category of states with weak security.[5] This data demands more steps for improvement of security of both states.

This report shows that Pakistan's nuclear arsenals are in better conditions compared to Indian arsenals. The West and the US are not conscious about security of Indian nuclear arsenal but they are mostly focusing on Pakistan. Since beginning of Pakistan's nuclear program, not a single report of theft appeared in media whereas in India about 150 theft cases have been reported.[6] It means security of Pakistan's arsenals is not in as a bad condition as the West considers it. The central hypothesis of this research is that **Pakistan's nuclear**

5 "India ranks below Pakistan in n-security index," *The Hindu,* January 10, 2014, http://www.thehindu.com/news/national/india-ranks-below-pakistan-in-nsecurity-index/article5557184.ece.
6 "Safety and Security Concerns and Peaceful Nuclear Energy: Feasibility for Pakistan," published in 2012, http://www.issi.org.pk/publication-files/1361514961_23258587.pdf.

weapons are under good security and there is no chance of nuclear terrorism from Pakistan which is a stance of Pakistan government collaborated by the US.

Literature review

The literature on security of Pakistan nuclear arsenals is relatively limited. One of important books on this topic is *Eating Grass*[7] that explains about the history of Pakistan nuclear program. It gives detail of difficulties faced by Pakistan during its nuclear weapons manufacturing especially after 9/11. It also focuses on the present command control structure, steps taken for nuclear security and how it is managing its difficulties. Another book on this issue is *The Genesis of South Asian Nuclear Deterrence.*[8] This book focuses on nuclear history of both India and Pakistan, their difficulties and achievements. It also explains about security condition of Pakistan nuclear arsenals, its command and control, organizational structure and its evolution with the passage of time. It also explains the steps taken by Pakistan for its nuclear security. *Indian Nuclear Deterrence*[9] is also an important book on this issue; though it mostly focuses on Indian nuclear program but one of its chapters also focuses on command and control structure and measures taken for security of Pakistan's nuclear assets. Another book on this issue is *Nuclear Terrorism the New Terror of the 21st Century.*[10] It critically examines security situation in Pakistan and weakness in its nuclear program. In this book the writer raises several questions about security of Pakistan nuclear arsenals and explains about the chances of nuclear terrorism from Pakistan. The recently published recently book *Overcoming Pakistan Nuclear Danger* is also an important book.[11] In this book the writer analyzes the whole situation in detail, explains the vulnerabilities and addresses

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7 Feroz Hassan Khan, *Eating Grass,*(Stanford, California: Stanford University Press, 2012).
8 Naeem Salik, *The Genesis of South Asian Nuclear Deterrence*, (Karachi: Oxford, University Press, 2009).
9 Zafar Iqbal Cheema, *Indian Nuclear Deterrence*, (Karachi: Oxford University Press, 2010).
10 Reshmi Kazi, *Nuclear Terrorism the New Terror of the 21st Century*, (New Delhi: Institute for Defense Studies and Analysis, 2012).
11 Mark Fitzpatrick, *Overcoming Pakistan Nuclear Danger*, (London: Routledge, 2014).

several arguments about Pakistan's nuclear arsenals security. Websites are another important source of knowledge and most of the newly published data is available here. Some of important websites are IAEA website, PNRA, BBC other national and international websites.

Newspapers and magazines are also one of important sources of knowledge. The national newspaper; like *Dawn, The News, Express tribune,* regional newspaper; *The Hindu* and international newspapers like *The New York Times* are also important source of knowledge. Articles in magazine like *The New Yorker* and *Arms Control Today* are important source sharing the view of many important writers on security of Pakistan nuclear arsenals.

Chapter 1

International Efforts to Maximize Nuclear Security

1.1 A Brief Introduction of Nuclear Security

The concept of nuclear security evolved soon after invention of nuclear weapons. The world observed destructive capabilities of nuclear weapons when they were used in Hiroshima and Nagasaki. With the passage of time, non-state actors showed their keen interest in developing or acquiring these instruments. This increased the importance of nuclear security. The 9/11 increased the security concerns of the world. After announcement of Osama bin Laden that acquiring Weapons of Mass Destruction (WMD) is religious duty of every Muslim, this concept succeeded to get prime position in security issues. The world is very careful about nuclear security; for this purpose a lot of steps have been taken including legislation, deployment of troops around sensitive nuclear buildings and technical initiatives to maximize security.

1.2 Definitional Concepts of "Nuclear Security"

"Nuclear security" is a political term. It is actually combination of two concepts, one is "nuclear" and other is "security."

1.2.1 Concept of Nuclear

The word "nuclear" is a scientific term. It has been used in the past for a thing of vital importance. In Biology the word nuclear is relevant to nucleus of a cell. Nucleus is commonly termed as brain of a cell. From this it can be seen that how much it is important for a cell. This word in Physics and Chemistry stands for nucleus of an atom. Basically an atom consists of two parts; one is nucleus and other is outer part where electrons are present.

Nucleus has positive charge and has almost 99 percent of mass of an atom. There is immense energy in nucleus which was discovered by two Germen scientists Otto Han and Strassmann. They discovered a nuclear process known as fission. Fission in nuclear physics is a process that results if a neutron is bombarded on heavy nuclear material such as uranium 233, uranium 235 or plutonium, it disintegrates and releases a large amount of energy. This energy can be used for peaceful purpose such as power generation or for destructive purpose as in case of atom bomb. There is another process in nuclear physics known as "fusion" in which light nuclei fuse together and releases a large amount of energy. Only destructive aspect of fusion is so far known in the world. The important thing about the term "nuclear" is that the property is strictly relevant to nucleus. One property of nuclear material is that its nucleus emits radiation which has injurious effect on all living things. So, if nuclear material is spread, it can affect many living organisms badly. This property caused the spread of concept of dirty bomb or Radioactive Dispersal Device (RDD).

1.2.2 Concept of Security

The word "security" means "state of being protected".[12] The purpose of security is protection of something or some value from anything bad that may happen in future and it can have disastrous effect on it. In the world there are many visible and invisible threats and man has been continuously trying to protect it from these threats. This led to evolution of concept of security. Security is not surety of protection but it can reduce the threat of attack by inimical forces. In the world, there are different mechanisms of security. Sometimes humans are used for security purpose, as security guards are used for security and they are trained and equipped well. Whereas, other security mechanisms involve the use advance technical scientific machinery such as electronic scanner and are able to detect metals or explosives and other particular things. The purpose of all these techniques is to maximize

12 "Merriam Webster Dictionary," http://www.merriam-webster.com/dictionary/security.

protection. It is necessary for any entity that involves in security to keep itself update according to changing threats otherwise there is no surety of its protection.

1.2.3 IAEA Nuclear Security Definition

Nuclear security means the protection of nuclear instruments and installations. It is necessary to protect nuclear weapons from hostile hands because if they succeeded to acquire these weapons, they can use it for different purpose such as blackmailing or even they can use them to kill a large number of people. The protection of nuclear facilities is also necessary because it is possible that terrorist may attack some installations and can steal some weapon or fissile material.

As far as official definition of nuclear security is concerned it is defined as,

"the prevention and detection of, and response to, theft, sabotage, unauthorized access, illegal transfer or other malicious act involving nuclear material, other radioactive substance or their associated facilities."[13]

This definition clearly emphasizes prevention of theft, illegal access and transfer of sensitive nuclear and radioactive material. It also includes prevention of attack nuclear on nuclear facilities.

Nuclear and radiological material emits radiation, which is harmful for all living creature on earth. The radiation emitting property of this material (nuclear and radiological material) may last millions of years, so it is necessary that living things must not be exposed to its dozage and this material must not reach in the hands of terrorists. If this material moves out of safe hands, it will be a constant risk for all living creatures. Nowadays the importance of nuclear security has increased several times because of danger of nuclear terrorism. It is

13 "IAEA Safety Standards," last modified June 20, 2013, http://www-ns.iaea.org/standards/concepts-terms.asp.

important to note that terrorists are using all tactics and tools in order to get their objectives. This has made world fearful and conscious and it is taking all initiatives to ensure security of nuclear material and weapons, for this purpose many countries in the world are reducing fissile and other radioactive material or have completely eliminated all dangerous material from their jurisdiction.[14]

This definition also focuses on security of nuclear facilities. It means, it impresses upon a state to take all necessary steps to ensure security of all relevant places such as the place from where basic material is extracted and processed including milling factories, enrichment plants, fuel fabrication units and facilities where this material is processed for military purposes. It also requests to prevent unauthorized access to these facilities.

One of important aspect of security is to maintain secrecy. Secrecy ensures maximum protection for which sometimes confidential actions are taken.[15] These actions are to protect information from opportunists who are interested in inflicting irreparable damage either by leaking this information to enemies or to spread dismay in the society. It can also be used for propaganda purposes. If some information leaks, it is in fact failure of security and can have serious consequences. So the staff working inside these facilities must be reliable enough to keep this information in secrecy. The first effective organization created to look after nuclear affairs of countries was International Atomic Energy Agency. It successfully promoted peaceful uses of nuclear energy in many countries. It also looks after safety affairs of its members.

14"The 2014 NTI Nuclear Material Security Index," (foreword), published in January 2014, http://ntiindex.org/wp-content/uploads/2014/01/2014-NTI-Index-Report.pdf .
15 "IAEA Safety Standards," last modified June 20, 2013, http://www-ns.iaea.org/standards/concepts-terms.asp.

1.3 Role of IAEA in Promoting Nuclear Security

At global level, there is no regulatory body for nuclear security. It is IAEA, which has advisory role and it is focusing on awareness by educating and training member states.[16] For this purpose, there are several regimes, agreements and resolutions. IAEA looks after nuclear affairs of states and is responsible for promotion of peaceful uses of nuclear energy. With the passage of time, new challenges arise and actions are taken accordingly. The responsibility of security of all nuclear and radioactive material, their associated facilities and activities within a state is on that state. It is necessary for a state to create its own nuclear security regime to ensure maximum security.[17]

The evolution of nuclear security has occurred through statute of IAEA, resolutions of IAEA board of governor, general conferences and resolutions of UN Security Council and General Assembly and through practices of IAEA.[18] Article XII-3, stimulates a mechanism to maintain record of sources and fissionable material produced in project or arrangement to ensure accountability.[19]

To improve nuclear security, IAEA Board of Governor General Conference has played an important role. The first nuclear security plan including an action plan against nuclear terrorism was approved in March 2002. In this conference, an extra budgetary-nuclear security fund (NSF) was created on voluntary basis[20] to implement Nuclear Security, prevention and detection of nuclear terrorism. Its annual report was presented in 2003 and 2004. In 2005, this fund was extended and a new security plan was approved for next three

16"IAEA and Nuclear Security, Fact Sheet No. 3," last modified September 2012, http://cns.miis.edu/stories/pdfs/120911_cns_iaea_factsheet_nuclear_security.pdf,
17 "IAEA Nuclear Security Series Number 20," 1, http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1590_web.pdf
18 Ibid.
19"The Statute of the IAEA," http://www.iaea.org/About/statute.html.
20 "Nuclear Security Fund," last modified June 20, 2013, http://www-ns.iaea.org/security/nsf.asp.

years from 2006 to 2009. A new fund was approved in 2009 for next three years from 2010 to 2013.[21]

1.3.1 Nuclear Security Plan 2010-2013

According to 2010-2013 nuclear plan, it was pledged that effective steps were to be taken for security of nuclear and radiological material in addition to storage and transport facilities. In this plan, it was stated that state should have effective nuclear security structure, including legal and regulatory infrastructure having a defining responsibility for different organizations and operators. It also emphasized on human resource development and technical structure support for national nuclear infrastructure along with procedure and coordination function. In its meeting, it was also emphasized that nuclear security culture should be developed along with sub regional, regional and global response for cooperation at national and international level.[22]

1.3.2 Nuclear security plan 2014-2017

This plan was presented in 2013. It is explained in its objectives that states will be helped to build an effective and sustainable national security regime while existing regime in member state will be strengthened along with encouragement and assistance of states to carry out and implement legislation to improve their nuclear security.[23] This plan also focuses on sharing of practices, information, education and training along with request of help to maintain nuclear security of those states that have intention to promote peaceful use of nuclear material. This plan also decides to get feedback of entities like custom officials, administration of medical facilities, border guards along with law and enforcement agencies

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21 Ibid.
22 "Board of Governor General Conference, Nuclear Security Plan 2010-2013," p.1, last modified June 20, 2013, http://www-ns.iaea.org/downloads/security/nuclear-security-plan2010-2013.pdf.
23 Ibid.

of states. It is expected in this plan that development of nuclear security culture in member states will take some time and additional funds are required.[24]

1.3.3 Important Conferences on Nuclear Security

To maximize nuclear security and to control illicit trafficking of nuclear and radiological material, IAEA has held several conferences. After 9/11, the world began to think more seriously about security of radiological and nuclear material along with security of chemical and biological agents having destructive effect on life and can be used for violent purpose. The chemical weapons attack by Aum Shinrikyo made it clear that terrorist can use any instrument to destroy their targets.[25]

Two important conferences on nuclear safety and security are following.

1.3.3.1 Dijon Conference 1998

The first conference on nuclear safety and security was held in Dijon, France in September 1998. This conference was attended by 200 experts from 80 countries. In this conference attention was on detection, identification and response to detected case of illicit trafficking along with security of nuclear and radioactive material.[26]

1.3.3.2 Safety and Security Conference 2005

Another conference on safety and security of radioactive source was held in 2005 to promote exchange of information on key issues relating to safety and security of radioactive sources among countries, international movement of orphan sources (a source, that is either in control or not in control but its security is not sure and its responsible party is not known

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24 "Board of Governor General Conference, Nuclear Security Plan 2014-2017," p.4, last modified August 2, 2014, http://www.iaea.org/About/Policy/GC/GC57/GC57Documents/English/gc57-19_en.pdf.
25 John Lettice, "Homebrew chemical terror bombs, hype or terror," *The Register,* June 4, 2006, http://www.theregister.co.uk/2006/06/04/chemical_bioterror_analysis/.
26 "Dijon France, 14-18 September 1998" , last modified June 20, 2013, http://www-ns.iaea.org/meetings/rw-summaries/dijon-1998.asp.

and there is continuous threat that it can go in wrong hands). Elevation of national strategies to control, locate and recover radioactive sources, strengthening safety and security culture, training of workers and operators, management of disused source and security by improving physical design were also discussed in this conference. To control illicit traffic, it was suggested to have a strong and firm control over export and import of material. [27]

1.3.4 Orphan Source

An orphan source is a source that is either in control or not in control but its security is not sure and its responsible party is not known and there is continuous threat that it can go in wrong hands.[28] Orphan source is not under control of any country's regulatory authority and they are great source of threat and more liable to be used in radiological terrorism. With the discovery of beneficial use of radioactive isotopes, they are used in a number of industries, food processing units, in hospitals and in mining companies. It is possible that these entities may not dispose properly and they will be dangerous to all life exposed to their radiation. The reason can be carelessness or lack of awareness; as some entities use radioactive material and handle it like other waste and dispose it with other rubbish. It will affect all material exposed to its radiation. Mostly a license is given in world to authorities that want to use radioactive material for beneficial purpose. Sometime, some of these authorities are incapable to dispose this material properly.[29]

1.4 United Nations on Nuclear Security

United Nations is very active for nuclear material security. The role United Nations General Assembly and United Nations Security Council is very important in this context. Both of these agencies have passed several resolutions to maximize nuclear security.

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27 "Security and Safety Conference 2005," http://www-pub.iaea.org/mtcd/meetings/Announcements.asp?ConfID=134.
28 "Orphan Source," last modified March 29, 2012, http://www.nrc.gov/materials/miau/miau-reg-initiatives/orphan.html.
29 Ibid.

1.4.1 United Nations Security Council is 1540 Resolution

One important resolution passed by United Nations Security Council is 1540 (commonly termed as UNSCR 1540). It was passed in April 2004. It requests all member states of United Nations not to support those non-state actors, that want to "develop, acquire, manufacture, possess, transport, transfer or use nuclear, chemical or biological weapons and their means of delivery",[30] it also requests states to do legislations, so that no non-state actor may involve in any malicious act as described and if any of them attempt for bad act he must be punished.[31]

It also emphasizes to take steps to control proliferation of weapons of mass destruction and their means of delivery. For this purpose, it requests states for legislation and to develop some mechanism for: accountability and security of nuclear weapons during all stages, control moment of such material on borders, especially during export and re-export and if anybody violate this laws must be punished severely.[32]This resolution also requests states to help the countries that lack legal and regulatory infrastructure, implementing experience and financial resources to implement this resolution.[33]Another important point in this resolution is to support regional treaties and their full implementation to control proliferation of weapon of mass destruction[34]

The United Nations Security Council formed a committee for two years, consisting of members from all states (of UNSC), to submit report about its implementation in the whole world.[35] But unfortunately developing states have great institutional problems. In 2006, it found that all states did not succeed to implement this resolution and extended it for two

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30 "Resolution 1540," presented on April 28, 2014, http://www.un.org/en/ga/search/view_doc.asp?symbol=S/RES/1540%20(2004).
31 Ibid.
32 Ibid.
33 Ibid.
34 Ibid.
35 Ibid.

years.[36] In 2008, it was found once again that some the states were still unable to fulfill its basic requirements and once again UNSCR extended it for next three years, back in 2011, it was extended up to 2021. [37]

1.4.2 UNSCR 1887 Resolution

Another important resolution is UNSCR 1887 passed in 2009. It requests states to share nuclear practices to reduce risk of nuclear terrorism. It also requests states to take steps to reduce the use of highly enriched uranium for civilian purpose, to improve their national technical capabilities, to prevent illegal activates such as theft of nuclear material. It also stresses national governments to take steps to control proliferation, to strengthen export control, to secure sensitive material and to control access to intangible transfer of technology.[38]

1.5 Information Circulars

Information Circulars (INFCIRC) are released by IAEA to highlight important common issues among member states. After 9/11, security of nuclear material was one of great issue.

1.5.1 Information Circulars 225/Rev.5

Information Circulars 225/Rev.5 was released in 1975.[39] It was revised time and again and modified according to changing threats. The recent and most important form is its fifth revision. It is one of guiding booklet for nuclear security. How it maximizes security? It guides on almost important aspect.

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36 "Resolution 1673(2006)," passed in 2006, http://www.un.org/ga/search/view_doc.asp?symbol=S/RES/1673(2006).
37 United Nations Security Council, "Resolution 1977(2011)", http://www.un.org/ga/search/view_doc.asp?symbol=S/RES/1977(2011).
38 "Security Council Department of Public Information," passed on September 24, 2009, http://www.un.org/News/Press/docs//2009/sc9746.doc.htm .
39 "Information Circular," http://www.iaea.org/Publications/Documents/Infcircs/Numbers/nr201-250.shtml.

State's Responsibility

According to INFCIRC/225/Revision 5, there are three important risks to nuclear material and facilities while considering nuclear security and these risks are: unauthorized removal with intention to prepare nuclear explosive device (nuclear bomb), to spread radiation emitting material and an attempt to damage related facilities. Protection against all these risks during all stages (preparation, use, storage etc) and in transport is state's responsibility. It also requests if a facility containing nuclear or radioactive material, two set of protection should be considered and applied in order to ensure more protection.[40]

International Transport

INFCIRC/225/Revision5 explains the responsibility of state's control regime.It describes if a country is exporting some material the responsibility of its security regime extends from border to ship or aircraft until it reaches in the jurisdiction of recipient country.

International transport operation must be seen by one or more governments, organization having significant authority and skills in transport, security and proper way of transport. The shipping state must allow only material from those states that are party of Convention on the Physical Protection of Nuclear Material. It sees if state is following international guideline of physical protection. If a ship carrying nuclear and radiological material enters in other's jurisdiction in sea (other than recipient and donor), it must inform the other state in advance, so that it can take necessary steps.[41]

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40 "Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities," presented on January 2011. http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1481_web.pdf.
41 Ibid.

Regulatory Framework and Authority

A state must take suitable steps to establish its physical protection regime. The state should introduce very strict requirement for physical protection of nuclear material according to its threat perception. The state legislation should explain physical protection of material and licensee obligation to grant authority, according to its regulation. These regulations must be applicable to all nuclear material and facilities under government or private possession.

A competent authority should be established that ensures implementation of regulation and legislation and it must be provided with financial and material resources.[42]

State's Physical Protection Regime

State physical protection regime is to ensure protection of human, material and environmental aspect. It can be carried out by protection against robbery and illicit moment of nuclear material, by locating and recovering robbed and missing material. The protection of nuclear facilities and material to relieve and reduce harmful result of radiological damage is on state physical protection regime.[43]

1.6 International Convention on Physical Protection of Nuclear Material

This convention was passed in 1980 and enforced in 1987.[44] It provides guidance during international transport of nuclear material (uranium 235, uranium 233, plutonium and irradiated fuel) for peaceful purpose. After 9/11 episode, an amendment was made in this convention in 2005 and increased its scope to physical protection of nuclear material for domestic use, transport, storage and protection of nuclear facilities. This amendment

42 Ibid.
43 Ibid.
44"Fact Sheet: the 2005 amendment to the CPPNM and ICSANT," presented on June 13, 2013 http://armscontrolcenter.org/issues/nuclearterrorism/articles/fact_sheet_the_2005_amendment_to_the_convention_on_the_physical_protection_of_nuclear_material_cppnm_and_the_international_convention_on_the_suppression_of_acts_of_nuclear_terrorism_icsant/.

also increased cooperation among states to get back stolen material. This convention requests for criminalization of misusing or threats for misuse.[45]

1.7 International Convention for the Suppression of Act of Nuclear Terrorism

International Convention for Suppression of Act of Nuclear Terrorism (ICSANT) was adopted in 2005 by United Nations General Assembly. [46]

According to ICSANT, if a person possess or uses radioactive material or device with bad intention or threaten to use radioactive material or device, demands nuclear material (to use it for bad purpose) must be charged with criminal offence and punishment. It also requests states for legislation, for this purpose it requests for cooperation between states, to help where other states need it. There is need for exchange of information, coordination of administrative and other techniques to prevent nuclear material theft and other illegal activities. According to this convention Secrecy of states' information is also necessary. States are requested to remain in contact with IAEA to maximize their protection. State should take action if, such bad act take place in its jurisdiction, on its ship or airplane or offence committed by its national.[47]

1.8 Global Initiative to Combat Nuclear Terrorism

Global Initiative to Combat Nuclear Terrorism (GICNT) was created by a joint effort of Russia and US in 2006. Its first summit was held in Rabat in October 2006.[48]

45"Convention on Physical Protection of Nuclear Material, presented in 1980," http://www.nti.org/treaties-and-regimes/convention-physical-protection-nuclear-material-cppnm/.
46 "International Convention for Suppression of Act of Nuclear Terrorism," presented in 2005, https://www.oecd-nea.org/law/nlb/nlb-76/007_029.pdf.
47"Resolution Adopted by the General Assembly 59/290. International Convention for Suppression of Act of Nuclear Terrorism," presented on April 13, 2005, http://www.un-documents.net/a59r290.htm.
48 "Statement of Principles," http://www.state.gov/documents/organization/141995.pdf, accessed on April 6, 2014.

GICNT recognizes the role of IAEA and it has observatory role in all of its meetings. GICNT requests states to build and improve accounting and control system to improve protection of nuclear and radiological material, increase security of civilian nuclear facilities and to improve techniques and capabilities to control illicit trafficking. It also requests to develop some system to prevent financial and economic resources for terrorist that may not acquire nuclear or radioactive material. It also calls for legislation to prevent malicious act and to promote cooperation, information sharing to control act of nuclear terrorism. [49]

1.9 Nuclear Security Summits

Nuclear security summits are held to maximize nuclear security and to handle threats of nuclear terrorism by improving international cooperation. This idea came from Obama speech in Prague in 2009. In this speech, Obama suggested to hold nuclear security summit to secure all vulnerable nuclear material all around world in four years. [50]

Nuclear security summits are to manage technical, political and diplomatic difficulties.

1.9.1 Washington Nuclear Summit

The first nuclear security summit was held at Washington on April12-13, 2010. It was attended by forty seven national delegations across world along with heads of United Nations, IAEA and EU.[51]

In this summit, all participating leaders repeated their promise, that nuclear material under their control must be made safe up to a point that it is not diverted for nuclear terrorism and pledge to continue their efforts to improve nuclear security in the face of increasing

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49 Ibid.
50 Kelsey Davenport, "Nuclear security summit at glance," *Arms control today*, updated April 2014, https://www.armscontrol.org/factsheets/NuclearSecuritySummit, accessed April 4, 2014.
49 "Nuclear Security Summit," http://fpc.state.gov/documents/organization/140180.pdf.
51 Ibid.

challenges. In this conference, leaders also agreed to share their best practices. This summit also made it clear that all states are responsible for best security practices and if required they can ask for help and they will help other countries when required.[52]

US President in this conference once again repeated his view, to secure all vulnerable material within four years and promised to work together to achieve this goal. This summit also called for national efforts to improve nuclear security and accounting of nuclear material and strengthen national procedure for this purpose. This conference requested to pay special attention for security of highly enriched uranium and plutonium and decrease use of highly enriched uranium. It also focuses on need to encourage international treaties on nuclear security and nuclear terrorism. [53]

The summit requested IAEA to develop guidelines on nuclear security and help countries to implement it. It also encouraged nuclear industry to share best practices for nuclear security. Countries are requested for cooperation through ratification and implementation of treaties for nuclear security and nuclear terrorism.[54]

Overall, this conference was very successful. Thirty seven countries announced their measures to support the goal of nuclear summit. Chile and Ukraine decided to remove all HEU from its jurisdictions. Canada, Mexico, Vietnam, Belgium, New Zealand, Norway and British decided to change all HEU reactors. Russia decided to end plutonium production. Many countries decided to give more fund to control nuclear terrorism. Some countries such as Malaysia decided for new export control law and other such as Thailand and Vietnam decided to join Global Initiative to Combat Nuclear Terrorism. Japan decided to establish a

52 "Nuclear Security Summit," available on http://fpc.state.gov/documents/organization/140352.pdf.
53 Ibid.
54 Ibid.

center for regional support in order to improve technical capabilities to supplant nuclear security.[55]

1.9.2 Seoul Nuclear Summit

In March 2012, nuclear security summit was held in Seoul. It was attended by fifty three world leaders along with representatives of UN, IAEA, INTERPOL and EU.[56]

In this conference, states once again pledged to maintain effective security of nuclear material according CPPNM and its 2005 amendment, ICSANT, GICNT and G8 global partnership against the spread of weapons and material of mass destruction.[57]

This conference again requested world to reduce the use of HEU and to convert reactor from HEU to low enrichment uranium and to secure material during transport and to develop mechanism to handle illicit trafficking by using modern techniques as forensics and promote strong nuclear security culture. This convention also stresses to control radioactive and nuclear material through basic guideline of IAEA. [58]

It also proved successful. Many countries like Argentina, Mexico joined Global Initiative to Combat Nuclear Terrorism. Many other countries decided to convert reactor using highly enriched uranium to low enriched uranium. Ukraine decided for complete removal of HEU from its jurisdiction. Pakistan decided to open Nuclear Security Training Centre and to install Special Nuclear Material Portal to control illicit trafficking on exit and entry. Russia decided to reduce HEU equivalent to 3000 weapons to low enriched uranium.[59]

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55 "Highlights of the National Commitments made at the Nuclear Security Summit," last modified April 2010, http://www.whitehouse.gov/the-press-office/highlights-national-commitments-made-nss.
56 Ibid.
57 Ibid.
58 Ibid.
59 Ibid.

1.9.3 The Hague Nuclear Summit

Another nuclear security summit was held in The Hague from 24 to 25 March 2014 and was attended by 58 world leaders. Here the leader once again decided to take measures so that nuclear material may not reach in terrorists hands. It was based on previous nuclear summits as to reduce dangerous nuclear material and improve security of nuclear and radiological material that can be used to make dirty bomb, Improve international cooperation and mechanism to exchange information. The countries agreed to reduce nuclear material down to lowest possible point. Thirty five countries in this conference agreed to add IAEA principles in their national legislation.[60]

Nuclear security is often confused with nuclear safety. Safety is a different concept but it is related to nuclear security especially after evolution of concept of nuclear terrorism and is defined as, "[nuclear] 'Safety' is the achievement of proper operating conditions, prevention of accidents and mitigation of accident consequences, resulting in protection of workers, the public and the environment from undue radiation hazards." [61]

Simply it can be summarized as safety is more oriented to protection of people and environment from hazardous effect of radioactivity, whereas security is protection of nuclear material and facilities from human action.

Before 9/11 the world was focusing more on nuclear safety rather than security. The 9/11 changed situation and now the world is focusing more on security along with safety. International community is very keen for nuclear security, but according to report of "Incident Trafficking and Database," 2477 incident related to nuclear security were reported and 424 among these include illegal possession and related criminal activities, 664 incidents

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60 "Third Nuclear Security Summit 2014 held in Hague," *Jagran Josh shop,* March 26, 2014, http://www.jagranjosh.com/current-affairs/third-nuclear-security-summit-2014-held-in-the-hague-1395827571-1.

61 Ibid.

are of theft or loss of nuclear and radiological material and 1337 unauthorized activities include unauthorized disposable of radiological material or discovery of orphan sources were reported. As far as year 2013 is concerned 146 such incidents were reported, six involve illegal ownership and forty-seven include theft or loss and ninety-five include other illegal activates. [62]

This data is clearly showing that all nuclear and radiological material in the world is not secure and it is necessary that world should take more steps to protect it against any unpleasant accident in future.

62 "Incident and Trafficking Database," last modified April 24, 2014, http://www-ns.iaea.org/security/itdb.asp.

Chapter 2

Security of Pakistan's Nuclear Arsenals

2.1 Background

The history of nuclear use in Pakistan dates back to 1950s. It began to use nuclear energy for peaceful purpose after announcement of "Atom for Peace" program by United States. Pakistan was among major allies of United States in Asia and it supported Pakistan in technically and financially. Several Pakistani scientists visited United States to get training and contributed in using nuclear energy. Why did Pakistan go for nuclear weapon option? The reality is that Pakistan was born with several problems such as Kashmir issue forced it to fight several wars with much large India. It lost a large chunk of area East Pakistan, in 1971. In 1974 India displayed its nuclear weapons when Pakistan had not this capability. It started work to develop nuclear weapons. It displayed its nuclear weapons capability in May 1998, after Indian nuclear tests in Pokran conduct in hit to have a full fledge deterrence.

The Twin Tower incident affected Pakistan more than any country else (other than Afghanistan which was a battle field after 9/11 because of having terrorist elements that carried out attack on twin towers). The security condition in Pakistan became worsened, since Pakistan joined international community on war against terror. Some sympathizing groups of Al Qaeda and Taliban were formed in Pakistan. They committed several acts of terrorism in Pakistan. They attacked not only political, military, religious personalities and important places such as General Head Quarters (GHQ), Mehran Naval Bases and Kamra Air Complex. These acts brought a sort of instability and these terrorists' attacks especially raised several questions about strategic assets of Pakistan especially the nuclear arsenals in Pakistan. The West began to think that terrorists especially Al Qaeda may try to capture Pakistan's nuclear

arsenals to achieve their aim to kill four million people[63]. Is it possible that Al Qaeda may acquire nuclear weapons? As far as its answer is concern it can be seen that even the countries having greatest fear of nuclear terrorism have confidence in security of Pakistan's nuclear arsenals. In his press conference, after passing one hundred days of his government, President Obama told in 2009 that, "Pakistan's nuclear arsenal is secure…."[64]

According to Feroz Hassan Khan Pakistan nuclear security culture evolved after 9/11 and it improved its supervisory procedure for military and civilian manpower.[65]

2.2 Security of Pakistan Nuclear Arsenal before 1998

National Command Authority was formed soon after 1998 tests. Since it is cleared that Pakistan had acquired nuclear weapons capability much before then and what were its command and control system before 1998 test, what was its security system during weapons developing stages? According to former Army Chief General Mirza Aslam Beg, Pakistan nuclear arsenals were controlled by National Nuclear Command Authority (NNCA). It was created in 1970s and was operated by Joint Operation Centre and worked under chief executive from General Headquarters Rawalpindi. Beg further explains that decisions were made by National Nuclear Command Authority (NNCA) and it was composed of Prime Minister, President, Army Chief and three unspecified personalities. It was responsible for protection and control of various components.[66]

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63 Graham Allison (foreword in article written by Rolf Mowatt -Larssen), *Al Qaeda weapons of mass destruction threat: hype or reality,* (Cambridge: Haward Kennedy School, 2010), http://belfercenter.ksg.harvard.edu/files/al-qaeda-wmd-threat.pdf, accessed on April 12,2014.

64 "President Obama 100th day Briefing," *The New York Times*, April 9, 2009, http://www.nytimes.com/2009/04/29/us/politics/29text-obama.html?pagewanted=all&_r=0.

65 Feroz Hassan Khan, "Nuclear security in Pakistan: Separating Myth from Reality," *Arms Control Today*, July/August 2008 https://www.armscontrol.org/act/2009_07-08/khan.

66 "Pakistan Nuclear Chronology, "last update in June, 2011, http://www.nti.org/media/pdfs/pakistan_nuclear.pdf?_=1316466791.

2.3 New Command and Control System

After overt nuclearization of South Asia, Pakistan decided to form new command and control system and the development of this command and control system can be divided into four stages.

1st stage from nuclear test to October 1999

During this stage Pakistan decided to from a well-organized command and control system. A plan was presented before prime minister by army chief, he approved it with little modifications.[67]

2nd period from 1999 to 2001

After October 1999, chief executive General Pervaz Mashraff introduced further reforms and established National Security Council (NSC). NSC formed present command and control system. The important achievement of this period is division of labor among relevant strategic organizations; Pakistan Atomic Energy Commission was given the duty of mining and reprocessing, Khan Research Laboratory (KRL) was given the responsibility of enrichment and National Security Complex was assigned with the duty of further development of weapons. The important achievement of this period is that independent KRL was brought under Command and control system.[68]

3rd stage from 9/11

The 9/11 changed security dynamics of whole world. It also affected Pakistan nuclear program. Further reforms were introduced after 9/1.[69]

The 4th period begins with the discovery of A.Q. Khan Network and it made Pakistan more conscious and it took further steps for nuclear security.[70]

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67 Mark Fitzpatrick (ed.), *Nuclear Black Market: Pakistan A.Q Khan and the Raise of Proliferation Networks_ a Net Assessment,* (London: Arundel House, 2007), 107-118.
68 Ibid.
69 Ibid.

The new command and control system is controlled by Joint Chief of Staff Committee (JCSC).

It has three tiers, National Command Authority, Strategic Plan Division and Strategic Force Command.

2.3.1 National Command Authority

National Command Authority (NCA) is controlled by head of government which is Prime Minister. Four cabinet members Defense Minister, Foreign Minister, Finance Minister and Interior Ministers are also its part. The other important members are of CJCSC, Chief, Air Chief, Naval Chief and other relevant personalities are also in meetings. Basically, it consists of two committees one is Employment Control Committee and other is Development Control Committee. [71]

2.3.1.1 The Employment Control Committee

It is chaired by head of government which is the Prime Minister and the Foreign Minister is its deputy chairman. It is politico-military committee. The director of Strategic Plan Division is its secretary. All political decisions are taken by this committee.[72] Its mean it is responsible for employment and deployment of nuclear weapons. What should be their number? What should be their status? What are challenges in changing security dynamics? These all facts are closely observed by this committee.

2.3.1.2 Development Control Committee

This committee is military-scientific committee. It is also controlled by head of government and CJCSC is its deputy chairman. Its members are similar to employment control committee along with heads of KRL, PAEC and NESCOM. Its duty is to update nuclear program, related infrastructure and technologies. The technical, financial and

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70 Mark Fitzpatrick (ed.), *Nuclear Black Market: Pakistan A.Q khan and the raise of proliferation networks_ a net assessment,* (London: Arundel House, 2007), 107-118.
71 Naeem Salik, *The Genesis of South Asian Nuclear Deterrence*, (Karachi: Oxford, University Press, 2009), 235.
72 Ibid.

administrative affairs are on this committee.[73] In keeping program update, surely security demands will be discussed according to changing challenges.

2.3.2 Strategic Plan Division

Strategic Plan Division (SPD) is one of important tires of nuclear command and control authority. Here Pakistan Army plays a central role in strategic planning. It was previously known as Combatant Development Directorate. It acts as secretariat of National Command Authority, so Pakistan nuclear arsenals are under its control. It designs policy of NCA. Each and everything related to nuclear capability is handled at SPD.[74] It has wide ranging authority and it has seventy officers from three forces. The management of NCA is also on SPD as it looks budgetary, safety and security aspects of nuclear facilities and strategic assets in the short term and long term.[75]

2.3.3 Strategic Force Command

The third important tier of command and control is Strategic Force Command. The separate strategic command forces have been created in all three forces and are named as the Army Strategic Force Command (ASFC), Air Force Strategic Command (AFSC) and the Naval Strategic Force Command (NSFC). Their operational authority is under control of NCA and they act according to direction of CJCSC. The NCA is authority to carry out nuclear strike with final vote of Chairman.[76]

It is clear here, that Pakistan command and control system is not controlled by a single person but it is institutionalized. All important decisions are taken by Employment Control Committee. It is good combination of top civilian and military leadership. Except for ten permanent members, some people are invited according to need; it clearly shows on important event some other people can be invited for their suggestions. As far as orders of

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73 Ibid.
74 Zafar Iqbal Cheema, "Indian Nuclear Deterrence," (Karachi: Oxford University Press, 2010), 182.
75 Ibid, 184.
76 Feroz Hassan Khan, *Eating Grass*, (Stanford, California: Stanford University Press, 2012), 335.

nuclear attack are concerned, it is Prime Minister who has to take decision keeping in view the suggestion of committee and requirement of situation.

Command and control system has great contribution in improving nuclear security of Pakistan. Commenting on Pakistan nuclear security Mark Fitzpatrick writes that, "Pakistan's nuclear-security measures were significantly enhanced by a nuclear command-and-control mechanism...." He further explains that National Command Authority controls nuclear assets from development to employment. Its mean all relevant nuclear facilities are under control of National Command Authority.[77]

2.4 Mechanism of Security

For security of nuclear arsenals, Pakistan has taken several steps. For this purpose, it has used both conventional as well as modern means of security. As far as conventional means are concerned it has prepared a force commonly termed as Nuclear Security Division.

2.4.1 Security Division

The security of nuclear facilities, arsenals and organization is carried out by 20,000 soldiers. These soldiers are highly trained and skillful and are capable of protecting nuclear weapons and strategic facilities against any terrorist attack. This Security Division is under a two Star General.[78] This division is making valuable contribution for security of nuclear arsenals, it evolved very quickly and got its standard equal to international standards in very short time period since its formation. Under Security Division there are four directorates to look after security affairs of all important and relevant nuclear installations. These are Counterintelligence Directorate, Technical Directorate, Personnel Reliability Program

77 Mark Fitzpatrick, *Overcoming Pakistan Nuclear Danger*, (London: Routledge, 2014), 121.
78 "Report on Safety and Security of Pakistan's Nuclear Program," last modified April, 2013, http://www.thestrategicvision.com/2013/10/report-on-safety-and-security-of.html.

Directorate and Security Directorate. All directorates contribute to maximize nuclear arsenal's security.[79]

2.4.2 Intelligence and Counter-intelligence Network

SPD has 1000 personnel for intelligence of nuclear security.[80] SPD has evolved counter-intelligence network for more security. Counter-intelligence is a process to prevent leakage of information and is defined as "information gathered and activities conducted to protect against espionage..."[81]It is important to note that in order to ensure security of secrecy is necessary. This not only prevent from the reach of enemy but also from reach of many propagandist that will otherwise manipulate it and can cause problem. It is important to note that IAEA also emphasize on secrecy.

Counter intelligence is very important and SPD has evolved it to safeguard the information of its activities. Its work is also to identify external threat. It is one of important layer of perimeter security layers.

2.5 Personnel Reliability Program and Human Reliability Program

2.5.1 Personnel Reliability Program

Personnel reliability program was basically designed by US Department of Defense to judge the highest standard of personnel reliability for management of nuclear weapons and its related critical component. It involves the selection of only those people that are emotionally stable and physically capable and have proved their trustworthiness and professional capabilities. Personnel Reliability Program is defined as, "mental traits of integrity, trustworthiness; emotional stability; professional competence; and unquestioned loyalty...; physical attributes of being free from impairment that would impede, distract, or diminish the

79 Ibid.
80 Ibid.
81 "National Archive," last modified in 1978, http://www.archives.gov/federal-register/codification/executive-order/12333.html.

ability to perform that person's PRP-related duties and possess the ability to be depended upon Security of Civilian Nuclear Facilities."[82]

Pakistan formed Personnel Reliability Program soon after 9/11, when a strong religious radicalization was going on in the country. US helped Pakistan to develop its own PRP. Initially, US was not ready to provide sensitive technical information to Pakistan but its behavior changed by 2005 and it made Pakistan capable to develop its PRP.[83] According to some analysts it was done after discovery of A.Q Khan Proliferation network.

Pakistan Personnel Reliability program consists of several steps of screening.

2.5.1.1 Background and Social Status Examination

It involves back ground checking and this process is gradual and very steady and it may take years, while it is going on. It does not involve the relations of that person but it involves the inspection and monitoring of his family and relatives. [84] The slow and gradual proceeding of this process shows that all dimension of person including social status are checked in detail. Only a person with gentle background and good company (social status) are expected to choose for this job.

2.5.1.2 Religious Background and Belief Examination

Another important step of Pakistan Personnel Reliability program is that his religious background and beliefs are examined in detail. It helps to determine, that whether a person having a good affinity with religion is fundamentalist or not.[85] This step eliminates the possibility of extremists from security service of Pakistan nuclear assets.

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82 "Nuclear Weapon Personnel Reliability Program," last modified July 16, 2012, http://www.dtic.mil/whs/directives/corres/pdf/521042p.pdf.

83 "History Design and Prospects for Improving Pakistan Personnel Reliability Program (PRP)," last modified March 5, 2005, http://armscontrolcenter.org/issues/nuclearweapons/articles/pakistan_nuclear_prp/.

84 Ibid.

85 Ibid.

2.5.1.3 Monitoring of Personnel

New chosen personnel for nuclear arsenal are monitored on regular basis for several months, before joining these sensitive facilities and already serving personnel are monitoring by their working fellows while reporting their seniors on PRP.[86] This will allow only suitable people to have access to these sensitive facilities and it will also help to eliminate those unsuitable personnel that have qualified other tests.

2.5.1.4 Periodical Psychological Tests

The employs have to pass some psychological tests after every certain period of time. These tests will help to determine mental health, attitude and behavior of working employs.[87] It is important to note that in Pakistan before joining any sensitive service, candidates have to pass certain tests during their recruitment process this increased selection standards and repetition of these tests mean to keep standard up.

2.5.1.5 Monitoring of Phone and Travel Activities of Top Officials

The phone activities and travelling of top personnel working in sensitive nuclear facilities are under observation.[88] This keeps them conscious and they may not commit any illegal activity.

2.5.1.6 Repetition of Screening Process

Screening process of employees is repeated after every two years.[89] Only stable (mentally) people will be capable of qualifying these tests successfully again and again and if any person is unable to qualify this test, he will be eliminated from service of sensitive facilities.

According to Feroz Hassan Khan, Pakistan's Personnel Reliability Program was created and several persons were trained for this purpose at various US labs. Because of

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86 Ibid.
87 Ibid.
88 Ibid.
89 Ibid.

limits of cooperation, SPD developed contacts and received training and cooperation in developing its own Personnel Reliability Program procedure and kept its standard classified.[90]

2.5.2 Human Reliability Program

Human Reliability Program "is an enhanced security and safety reliability program designed to ensure that individuals in positions requiring access to certain materials, facilities, and programs meet the highest standards of reliability as well as physical and mental suitability."[91]

This definition clearly indicates that is to ensure that a person at certain position is suitable for it, physically and mentally strong and can handle stress condition in a better way. Pakistan is using this technique for security of its nuclear arsenals. "Highest standard of reliability" means that every person cannot go through this test, only very efficient person will qualify this test. It is one of important test while selecting people for key official positions in Pakistan and military has its own procedure for this purpose.

Where Personnel Reliability Program and Human reliability Program is applied?

According to Feroz Hassan Khan civilian scientist and staff undergo Personnel Reliability Program and armed forces people pass through Human Reliability Program. So, it clears where Personnel Reliability Program and Human Reliability Program are used.[92]

Personnel Reliability Program is for all persons working in sensitive nuclear facilities and SPD keeps data of all retired personnel.[93]

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90 Feroz Hassan Khan, *Eating Grass,*(Stanford, California: Stanford University Press, 2012), p 374.
91 "Human Reliability Program," https://fmt.kcp.com/OSTfederalagent/Docs/HRP.pdf.
92 Ibid.
93 Kennth Kenneth N. Lunongo and Naeem Salik, "Confidence in Pakistan Nuclear Security," *Arms Control Today*, December, 2007, http://www.armscontrol.org/act/2007_12/Luongo.

2.6 Permissive Action Link (PAL)

Permissive Action Link is a box type instrument to prevent unauthorized use of nuclear weapons. The purpose of PAL is to control illegal use by any person who is not allowed to carry out that action whether he is a terrorist or any other official. It is also helpful to prevent any accidental detonation. Historically, PALs were evolved according to need, to control illegal use of nuclear weapons and it was developed by the United States for first time to control unauthorized used by insane American officers and to hide away nuclear weapons from foreign illegal access especially from some NATO members. PALs are improved by "coded switch system." Before PALs, there were digital locks, first there were three digits locks and later they were replaced by four digits locks with several modifications and advancements and two digit codes were divided among two persons to ensure more security. These locks were still protecting several US nuclear weapons in 2001 in Europe. Latest PAL is a sophisticated machine and it accepts twelve digit codes. PAL works on cryptography mechanism.[94]

Pakistan nuclear weapons are well protected via Permissive Action Link. It has reduced the chance of illegal use of nuclear weapons. One important property of PAL is that weapons protected by them are safe and if anybody feeds them wrong code, they will become unusable.[95] Pakistan has developed its own Permissive Action Link with the help of United States. It is important to note that there was a serious debate in the US whether PAL should be provided to Pakistan or not. Many scholars argued that the transfer of this technology was illegal according to NPT. But US decided to provide this technology soon after 9/11.[96] According to Robert Windrem (senior investigative producer of NBC news) US has provided

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94"Permissive Action Link," last updated September 02, 2009, https://www.cs.columbia.edu/~smb/nsam-160/pal.html.
95 Kaushik Kapisthalama, "Guarding Pakistan Nuclear Estate," *Asia Times Online*, April 06, 2005, http://www.atimes.com/atimes/South_Asia/GD06Df04.html.
96 Ibid.
96 Ibid.

secrete training and technology to Pakistan nuclear scientists to develop its own PALs to prevent unauthorized use of nuclear weapons.[97] Another scholar Mark Fitzpatrick explains in his book that since there is trust deficit between United States and Pakistan, there is possibility of that if United States has provided PALs to Pakistan and it might have "killing Switches" to disable Pakistan nuclear weapons. So Pakistan has developed its own PALs composed of twelve- digit alphanumerical codes.[98] This information is indicating that Pakistan got technique not PAL instrument. It is important to note if Pakistan would have acquired these instruments directly, there might have some spy instrument to transfer sensitive information about these weapons and their components. To get technical information is best way to protect some instrument in desirable way rather than to get that instrument directly.

How Pakistan manages this code system? The operation of this code system will be important at the time of operation of weapons. As far as nature of codes is concerned, according to some sources this code system consists of two separate codes. One code is in the control of any civilian and other is in control of military. This clearly shows that it is a dual key system and there is two-man rule. A view exists that there is three-man rule meaning that three different persons have this code. It is possible that two-man rule is for moments of weapons and three-man rule is for employment of weapons. Who are the two or three people that have authority to use these codes secrete code they are not known.[99] This system exists for improvement of security of nuclear weapons. Surely person have these code will have passed from Personnel Reliability Program or Human Reliability Program (in case of civilian). If civilian person is some politician he will be prudent and rational person and he will be aware of the fact that how important is to maintain this secrecy.

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97 "Pakistan's Nuclear History Worries Insiders," last modified June 11, 2007, http://www.nbcnews.com/id/21660667/#.U16_F_mSwvE.
98 Mark Fitzpatrick, *Overcoming Pakistan Nuclear Danger*, (London, UK: Routledge, 2014), p. 122
99 Feroz Hassan Khan, *Eating Grass*, (Stanford, California: Stanford University Press, 2012), 335.

Expressing reliability about security of nuclear weapons a well-known Pakistani scientist Dr. Samar Mabarakmand claimed that Pakistan nuclear weapons are secure and it is impossible for evil hands to acquire these weapons. If they get any Pakistani nuclear weapon, that will be useless to them because codes are required to arm up a weapon and these codes are highly confidential and are fed during manufacturing. He even told that if a weapon is kept on road, a terrorist will unable to use and if an aircraft with nuclear weapon crushes, the weapons will not detonate as a nuclear weapon can detonate only after a certain procedure.[100] It means that if some terrorist succeeds to acquire any weapon, he will be unable to use it and carry out massive destruction.

2.7 Environmental Security Device

Environmental Security Device (ESD) has been employed by Pakistan to maximize nuclear security. The weapon in this system is armed by feeding it specific environmental condition. This system makes weapon safe and secure. A weapon which is designed for missile will be activated only when it will pass through certain physical environment through which missile has to pass[101] and the weapon designed for aircraft has to pass through a certain gravitational acceleration.

ESD is explained as devices that only explode if prescribe conditions are achieved.[102] This is clearly indicating that a stolen bomb will not detonate because it needs environmental conditions for arming up and it will be disable in normal conditions and will be activate when proper signals with proper sequence are received. Thus it increases the security of the nuclear weapons of the countries that use this system.

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100 Samar Mabarakmand interview with Hamid Mir, available at, http://www.dailymotion.com/video/x9ortt_pakistani-nukes-safe-secure-says-ch_news, (Translated and summarized by writer).

101 "National Archive," last modified in 1978, http://www.archives.gov/federal-register/codification/executive-order/12333.html.

102 "Permissive Action Link," last modified September 02, 2009, https://www.cs.columbia.edu/~smb/nsam-160/pal.html.

2.8 Dispersal of Nuclear Weapons Components

Nuclear weapons are most complex weapons. There is a fissile material core (in case of implosion devices which Pakistan has.) and weapons detonating mechanism is embedded in bomb structure. Pakistan has adopted dispersal technique to maximize security of its nuclear assets. Jonattahn Papp terms this technique as "Dispersal Strategy" and explains that Pakistan has dispersed different parts of weapons and kept apart from each other rather than in compact and ready form.[103]. It means that only relevant people in command and control system will have information where those nuclear weapons components are and if any devil actor succeeds to get one component that he will be unable to get the other and will be unable to use it. Peter Crail explains in his one of article that Pakistan has stored fissile material from trigger mechanism at separate places away from delivery vehicles.[104] According to Michel Krepon (compact) weapons provide more protection against internal threats and dispersal of weapons will increase protection against external preemptive threats.[105] In fact, Pakistan's nuclear arsenals have threats not only from internal terrorists but there are also some threats from some of other countries as well. Although Pakistan has an agreement with India that both countries will not attack each other's nuclear installations but there are some chances that some other states may attempt to attack its nuclear installations that cause Pakistan to feel threatened. The Abbottabad incident of 2nd May 2011 made Pakistan very conscious and it increased its speed to spread nuclear components. It has caused SPD to spread weapon component at more than fifteen sites.[106]

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103 Jonattahn Papp, "The Non-State Actors Threats to Pakistan Nuclear Weapons," *Nuclear Notes* 3 (August, 2013): 48-53, http://csis.org/files/publication/130904_Weiner_NuclearNotes3-1_WEB.pdf.
104 Peter Crail, "Pakistan nuclear stock safe, official says," *Arms control today,* June, 2009, http://www.armscontrol.org/act/2009_6/pakistan.
105 Michal Krepon, "Complexities of Risk Reduction in South Asia," *The Hindu*, May 29, 2009, http://www.thehindu.com/todays-paper/tp-opinion/complexities-of-nuclear-risk-reduction-in-south-asia/article292920.ece.
106 Feroz Hassan Khan, *Eating Grass,* (Stanford, California: Stanford University Press, 2012), 332.

Feroz Hassan Khan explains that Pakistan's nuclear weapons are not at hair-trigger alert but the weapons are in disassembled form and their components are stored separately at dispersal sites. Keeping weapons disassembled increase their security. After 9/11, these weapons were dispersed to six secrete locations and these locations are chosen very carefully in safe areas and are guarded by very alert and rapid reaction force which are specially trained under SPD for this purpose. Dummy locations are employed to minimize risk of capture.[107] Dummy locations will maximize security, since it will confuse attacker and it is surely for security of nuclear arsenals.

2.9 Transport Security

It is necessary to ensure security during transport, because it can be most easy target for terrorists to acquire nuclear or radiological material during transport. Pakistan has taken steps to ensure security during transport. Pakistan is carrying out best transport practices. It uses special vehicle and temper proof container for transportation and the vehicle are escorted by military soldiers to ensure best possible security.[108] The important step for improvement of nuclear arsenals during transport was taken during Mashraff regime. In an in interview Mashraff told well known journalist Semyour Hersh that Pakistan has formed deep tunnel system for storage and transport of nuclear assets. These tunnels are very deep and nuclear weapons in these tunnels are so safe that even nuclear attack cannot be harmful for nuclear arsenal there.[109]

2.10 Pakistan Nuclear Regulatory Authority

Pakistan has been focusing on nuclear safety for long time. It formed Pakistan Nuclear Regulatory Board before formation of Pakistan Nuclear Regulatory Authority (PNRA). PNRA was formed in 2001. PNRA is supposedly an independent body. Its purpose

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107 Ibid.
108 Zafar Nawaz Jaspal, "Pakistan's nuclear weapons safety and security," *The Nation*, February 23, 2013.
109 "Defending the Arsenals" *The New Yorker*, November 16, 2009.

is to ensure safety but it is also performing the duty of security as well, as PNRA Ordinance entails entils that it is responsibility of PNRA to ensure physical protection of nuclear installation, nuclear material and facilities. The most important work of PNRA from security point of view is that it issues licensee for trade of radiological material and it conduct inspect license holders as well. Applications are received at PNRA and are reviewed at Regional Nuclear Security Directorate. It also conduct inspection during use, transport and storage. It also examines physical protection around relevant facilities and provides guidance and training to strengthen these systems. It has also established a Nuclear Safety and Security Centre (NuSECC) which provides nuclear safety and security training. It works in coordination with all relevant organizations such as Custom department and seeks to track high-activity material. The management of orphan source is also on PNRA. To locate radioactive source it uses physical and nonphysical search. It is PNRA officials' duty to locate, secure and dispose such material. To ensure fool proof protection, PNRA has provided relevant organizations with necessary equipment and training. It has submitted its report to IAEA according to 1540 resolution and shown a strong commitment to prevent terrorists from obtaining nuclear weapons. It updates itself according to global needs and IAEA guidance. PNRA observes situation carefully in weak areas and recommends countermeasures. [110]

2.11 Perimeter Multilayer Security

After taking power General Mashruff in power, he introduced some reforms and developed three layer, of nuclear security. The first step of this is laboratories' own processes. Laboratories will have to go through a number of processes for this purpose. The second is SPD's procedure.SPD has its own special unit for nuclear security. It controls more

110 "Permissive Action Link," last updated September 02, 2009, https://www.cs.columbia.edu/~smb/nsam-160/pal.html.

than 10,000 personnel and has its own intelligence capabilities and is led by a two-star general. There is coordination between this organization and all intelligence agencies. The intelligence agencies will probably provide information about threats that Pakistan nuclear infrastructure may face. The outer ring is formed by ISI. It operates in close cooperation with nuclear security division. Security Division works under SPD and it is followed by four Directorates that are Counterintelligence Directorate, Technical Directorate, PRP Directorate and Security Directorate. All organizations such as NESCOM, SUPARCO, PAEC and KRL work under Security Directorate.[111]

Samuel Kane explains it as three layered approach. The inner layer is composed of highly trained guard for nuclear security and in some cases it is also accompanied by air defense, the second is outer ring which involves fencing, hurdles and electronic sensors and third is counterintelligence.[112]

Naeem Salik and Luongo has divided perimeter security in three layers and term inner perimeter as responsibility of respective organization but security here is carried out with coordination of SPD. This force receives special training and operates on permanent basis. Many such facilities are protected by air defense and they are declared as no-fly zone. The second layer they call it outer perimeter, it has been done by fencing, new technology, electronic sensors and close circuit television cameras. Third layer for this purpose is counter-intelligence team.[113]

Mark Fitzpatrick describes it as four tire approach for nuclear security. It includes physical protection, Human Reliability Program, Emerging Management System and

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111 "National Archive," last modified in 1978, http://www.archives.gov/federal-register/codification/executive-order/12333.html.

112 Samuel Kane, *Preventing Nuclear Terrorism: Nuclear Security, the Non Proliferation Regime and the Threat of Terrorist Nukes,* Global solution.org, available at http://globalsolutions.org/files/public/documents/Sam-Kane-Preventing-Nuclear-Terrorism.pdf, accessed on May 1, 2014.

113 Kaushik Kapisthalama, "Guarding Pakistan Nuclear Estate," *Asia Times Online*, April 06, 2005, http://www.atimes.com/atimes/South_Asia/GD06Df04.html.

comprehensive training. For physical protection, in addition to 20,000 personnel there are three forces including a Special Response Force, a Site Response Force, and a Marine Response Force. Besides, SPD is helped by regular air defense and infantry forces. These defense forces are equipped by modern equipment such as detection instrument, communication devices, cameras, infrared and motion sensors. Inspection involves regular and surprise inspection. There is strict management of material and facilities and material in inspected carefully.[114]

Explaining about Human Reliability Program, he explains that it is carried out by SPD with close cooperation of ISI, Military Intelligence and Intelligence Bureau.[115]
Nuclear Emergency Management System has a close coordination with Nuclear and Radiological Emergency Support Center. For comprehensive training there is a special academy of safety and security. This academy is known as Centre of Excellence and Pakistan has offered other countries to train their scientists through this academy.[116]

In short, the evolution of Pakistan's nuclear security was started equally with the start of nuclear program. The command and control system developed in 2000 has institutionalized the systems of security. In command and control system NCA is very important and its Employment Control Committee takes all political decisions and Development Control Committee takes technical decisions. Both of these committees are working under Prime Minister. SPD acts as headquarters of NCA. Strategic Force Command has important role in security and it is represented by Army, Navy and Air Force. Pakistan is using advanced Permissive Action Link and Environmental Security Device so that stolen weapons may not be detonated by non-state actors. To check reliability of personnel working in nuclear facilities, they have to go through tests like Personal Reliability Tests and Human Reliability Tests before joining duty on these sensitive facilities. To checks mental stability

114 Mark Fitzpatrick, *Overcoming Pakistan Nuclear Danger*, (London: Routledge, 2014), 118-119.
115 Ibid.
116 Ibid, 120.

PRP is repeated after every two years. Pakistan nuclear security is multilayered and these all layers are independent and contribute to strengthen the security of these arsenals.

The steps taken by Pakistan for nuclear security have maximized its capability of protection of its nuclear arsenals. It is updating itself according to changing threats and is employing best possible techniques of security. These steps are indicating a strong and firm security of Pakistan nuclear arsenals.

Chapter 3

Pakistan's Response to International Measures to Maximize Nuclear Security

Pakistan is an active member at international level. It is part of several nuclear organizations, conventions, treaties and regimes. It is important to note that Pakistan did not sign NPT but participating in global nonproliferation efforts. It did legislation to control export of nuclear and radiological material. It cooperates at international level in promoting safety. It is necessary to discuss political dimension because all vital decision are either taken or approved at political level.

3.1 Pakistan and IAEA

IAEA is responsible for promoting peaceful use of nuclear technology across the world. It also looks after peaceful safety and security affairs of member countries. Pakistan and IAEA have close cooperation since 1957 to promote peaceful use of nuclear energy. Every year, a large number of scientists and engineers are benefitting from IAEA sponsored activities and get valuable knowledge and experience.

As far as safety and security of Pakistan's nuclear arsenals is concern, IAEA declares Pakistan's nuclear program safe and secure. According to a report of daily "Dawn" in 2011, Deputy Director of IAEA appreciated the steps taken by Pakistan for nuclear safety, security, 2006 Nuclear Security Action Plan (NSAP) and financial support given by Pakistan as it is

10th largest financial contributor to IAEA and it is contributing 1.16 million dollars. Further he explained that about 200 people from Pakistan have attended different IAEA courses.[117]

Addressing International Conference on Nuclear Security in July 2013, Masood Khan (Pakistan's Permanent Representative at UN) said that Pakistan nuclear material, facilities and assets are safe. He explained that Pakistan nuclear security regime believes in multilayer defense against all threats. He further explained that Pakistan has established Physical protection measures, a strong command and control system and an effective system to control the movement of material during export. He further added that SPD has developed technical solution, personal reliability program and intelligence capabilities for efficient control.[118]

In his last visit IAEA DG, Yukiya Amano expressed his satisfaction about security of Pakistan nuclear arsenals and called Pakistan as a responsible state which is reasonably contributing in global nuclear security. In his meeting with the Minister of Science and Technology, he appreciated the safe and secure operation of nuclear power plants.[3] While visiting Center of Excellence, he was briefed on the standards adopted by Pakistan for nuclear security, and he appreciated the steps taken by Pakistan for nuclear security.[119]

3.2 Nuclear Security Action Plan

Nuclear Security Action Plan (NSAP) was developed by PNRA in July 2006. After 9/11, PNRA decided to review possible vulnerability in its nuclear security regime. It decided to establish a system in nuclear security with established response and recovery abilities, integrated with national legislation and regulation. National Security Action Plan influence five areas;

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117 "IAEA Declare Pakistan Nuclear Program Nuclear Program Safe and Secure," *Dawn*, 25 April 2011. http://www.dawn.com/news/623722/iaea-declares-pakistan-nuclear-program-safe.
118 "International Conference on Nuclear Security: Enhancing global efforts," presented on July 1, 2013, http://www-pub.iaea.org/iaeameetings/cn203p/Pakistan.pdf.
119 "DG IAEA Visits Centre of Excellence," *The News*, 13 March 2014. http://www.thenews.com.pk/Todays-News-13-29074-DG-IAEA-visits-nuclear-Centre-of-Excellence.

Radioactive Source Management

Dealing orphan source

Provision of radiation detection instrument at important point

Nuclear Security Emergency Coordination Centre

Nuclear Security Training Centre[120]

3.2.1 Radioactive Source Management

The beneficial ability of radioactive isotopes brought their use at mass level. Today radioactive isotopes are used in medicine, agriculture, industry and in many other fields. How radioactive source are used and handled here? They are usually used in sealed form. In Pakistan the responsibility of supplying radioactive material is on PNRA. It also inspects facilities that use radioactive isotopes and analyze security of the licensee holder facilities and determine their weaknesses. It also tries to promote and improve security culture. In order to increase efficiency of this program three directorate at regional level and two additional Regional Nuclear Security Inspectors (RNSI) has been set up at Peshawar and Quetta.[121]

3.2.2Dealing Orphan Source

An orphan source is defined as a source that is not possession of anybody or if it is in the possession of some authority where its security is not sure. In Pakistan, there is strict mechanism to regulate radioactive material for last many years. But there is possibility that some radioactive material may have been imported before these measures. Some source may have been stored at sites and may remain there since then or radioactive source has been

120 "Nuclear Security Action Plan," published in 2006, http://www.pnra.org/nsap.asp.
121 Ibid.

disposed in common metal scrape. NASP has plans to recover and dispose such material. A media moment was started for this purpose in 2008. Some sources were discovered and disposed properly after this plan.[122]

3.2.3 Provision of Radiation Detection Instrument at Important Point

To control illicit trafficking radiation detecting instrument has been provided to authorities like customs for examination at key strategic positions like Torkham, Chamman, Sost, Taftan, Wagha, Gawadar, Karachi and Bin Qasim. Customs officers have been trained by NSAP officials to use this instrument for detection of radiation source. There is also a plan to provide radiation detecting instrument at airports and other relevant places.[123]

3.2.4 Nuclear Security Emergency Coordination Centre

National Security Emergency Coordination Centre (NSECC) has been established to deal radiological material at such places that are out of control of PNRA. It is operating in close cooperation with government organizations. It looks after and gives its recommendations to handle situation. There are six mobile labs to handle emergency in different cities of country, are ready round the clock and can handle situation from four to six hours.[124]

3.2.5 Nuclear Security Training Centre

Nuclear Security Training Centre (NSTC) was established by PNRA with IAEA cooperation. It act as first, second and third defense line as it provides training in the field of nuclear security to prevent, detect and respond to bad act. A large number of personnel have been trained for this purpose including official at nuclear power plants, policy makers, first

122 Ibid.
123 Ibid.
124 Ibid.

responder, law and enforcement agencies officials along with other relevant professionals. PNRA is using best available instruments in its laboratory. There is close cooperation between PNRA and Pakistan Institute of Engineering and Applied Sciences (PIES). PIES has introduced special subject of nuclear security in Masters engineering program in order to get Nuclear Security expertise.[125]

3.3 UNSC 1540 Resolution and Pakistan

On April 2004, United Nations Security Council passed resolution 1540, commonly termed as UNSCR 1540. It basically denies access of non-state actors to Weapons of Mass Destructions (WMDs) and their means of delivery. This resolution has been designed so that non-state actor may not use, acquire, prepare or transfer biological, chemical and nuclear weapons or their means of delivery. It also requests states to develop a mechanism to control export of sensitive material. The resolution has increased cooperation between states against proliferation of WMDs. This UN resolution caused member countries to introduce and implement legislation in their jurisdiction. In order to analyze the situation how member states are implementing this resolution, a committee was formed under this resolution. This committee presented its report in 2006. In the report it was shown that the world was not successful in implementing this resolution. It enhanced the mandate of this committee for two years. In 2008, same problem was observed once again and the mandate was increased for three more years. In 2011, mandate of this committee has been increased for ten years.[126]

Pakistan is fully committed to UNSCR 1540 and was among first country to submit its report according to UNSCR 1540 and it submitted several reports on its infrastructure. In October 2005, Pakistan announced the list of material for Export Control Act to control

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125 Ibid.
126 "1540 committee," passed on April 28, 2004, http://www.un.org/en/sc/1540/#&panel1-2,

proliferation of biological and nuclear weapons and their means of delivery. This list is now enforceable with the help of Pakistan custom and all other relevant agencies.[127]

It clearly indicates that Pakistan is much committed to control proliferation of weapons of mass destruction and their means of delivery to non-state actors. These actors have been activated for several years and are trying to achieve them. There is an example when Aum Shrinkyo succeeded to get Sarin and used it against common people in Japan. So it is necessary to control sensitive material otherwise terrorist may acquire this material from any place and use it to achieve their objective (to kill several millions people). Pakistan has taken all necessary steps to control movement of such material out of its territory and all relevant agencies are very active for this purpose.

3.4 Export Control Act 2004

In order to increase nuclear safety, security and to control proliferation at different levels, Pakistan has taken some legislative steps like Pakistan Export Control Act of 2004. It involves the control of material, technologies, prepared biological and nuclear weapons and their means of delivery.

Its prominent points are

1) Regulate export, re-export of material, technologies and goods related to biological and nuclear weapons and their delivery system. There is also instruction to control transit of goods and trans-shipment.
2) It also prohibits diversion of forbidden technologies and material.
3) This legislation has wide jurisdiction and it is applicable to all Pakistani living in other countries, either they are visitors or workers there or foreigner in Pakistan's jurisdiction.

127 "U N Security Council Resolution 1540: achievement and challenges," Published in June 2010, http://www.sassi.org/wp-content/uploads/2012/05/RP-35-Zahir-Kazmi-UN-Security-Council-Resolution-1540-June-2010.pdf.

4) This legislation suggests that a comprehensive list should be issued for the material that should be controlled according to this legislation.
5) There should be a process of licensing and record keeping.
6) This act also suggests that license for peaceful use material must be approved and should be consider valid until government consider declared it illegal.[128]
7) **What is punishment for violator?**

This legislation is among best possible legislation. The punishment for violator is fourteen years imprisonment or 5 million rupees fine or both in severe cases. The property and assets of offender will be forfeited.[129]

This legislation shows that Pakistan is fully committed to control proliferation of nuclear and biological weapons. Chemicals weapons are missing in this legislation. It does not mean that Pakistan is not committed to control proliferation of these weapons. In fact, Pakistan is member of Chemical Weapon Convention (CWC). It accepts all obligations of CWC and it is one of its active members. In other words, one can say Pakistan is fully committed to control proliferation of biological, chemical, nuclear weapons and their relevant material. This legislation indicates the seriousness of Pakistan in this regard. One of important point of the legislation is its wide jurisdiction. It is valid in all countries in the world and any violator if he is Pakistani and involves in illegal proliferation activates of WMDs, will have to face trial according to Pakistani law. If a citizen of any other country is found involved in proliferation activates on Pakistani land, he can face same punishment as a Pakistani can face. This law asks for imprisonment of fourteen years or a fine of 5million rupees, it is equal to punishment of murder in many countries and even it is more than the

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128 "Strategic Export Control Division," passed on September 23, 2004, http://www.mofa.gov.pk/secdiv/content.php?pageID=int.
114 Ibid.

punishment of the most serious crimes in many countries. In severe cases criminal can face both imprisonment as well as fine and criminal's property and wealth can be ceased.

3.5 Establishment of Strategic Export Control Division

In order to implement Export Control Act of 2004, Strategic Export Control Division (SECDIV) was set up in 2007 in Foreign Ministry to control and monitor export controls. It is contributing efficiently for non-proliferation as well as it control sensitive material technology. Before 2007, there was a monitory board to monitor the export control of relevant material. This board also contributed for the formation of SECDIV. SECDIV is contributing in various manners. Time and again it starts awareness rising campaign and in order to raise awareness, seminar and workshops are its part. It also acts as licensee issuing body.[130]

The establishment of SECDIV is one of great step showing Pakistan's commitment to control the proliferation of WMDs and their relevant material. In order to act efficiently there are different rules and procedures. Although there is no record how it has initiated awareness campaigns. It is possible that it may have some future program to arrange seminars and workshops for its efficient working but it carried out no such activity till today. The licensee issuing responsibility is on SECDIV and before issuance of licensee of sensitive material it is necessary to check the past record of such organization to prevent anything bad from happening in future.

To issue a licensee it is up to SECDIV, either to accept or reject the application of licensee. If SECDIV feels that applicant does not have a good history, or SECDIV is suspicious about applicant it has right to reject the application of licensee. There is also a possibility that an exporter after acquiring licensee may involve in illegal activates, this

130 Ibid.

authority has right to cancel its licensee after hearing the licensee holder point of view. The goods of exporters are checked by officers at port. If he feels that some violation is taking place he can grab the goods of that person and can arrest him.[131]

Which material is controlled by Pakistan according to Export control Act 2004? The export control list issued by SECDIV is consistent with Nuclear Supplier Group (NSG), Missile Technology Control Regime (MTCR) and Australia Group. As far as Nuclear Supplier Group is concern, it focuses to control export of nuclear technology, equipment, material dual use items related to nuclear technology.[132] Missile Technology Control Regime requests to control the export of missile that can carry 500 kilogram having range more than 300 kilometer. Its mean this regime allows to export missile, which has range less than 300 kilometer.[133] MTCR is of special interest. Although it clearly says that missile having range more than 300 kilometer with 500 kilogram payload capacity must not be exported. But if payload of a missile is reduced the range of missile can increase. Its mean the missile acquired by a country for 300 kilometers it can use it against its target much further. But being a global norm Pakistan is following it. Similarly Australia Group (AG) focuses to control the chemical and biological weapons and their relevant material.[134]

3.6 Prevention of Illicit Trade

Pakistan is very serious to control illicit trafficking. Pakistan has installed several detection devices at several points to prevent illicit nuclear trafficking of nuclear and radiological material. How this system works? It can be explained in Container Security Initiative.

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131 Ministry of Foreign Affairs, "S.R.O. 450(I)/2009," passed on June 2010. http://www.nti.org/media/pdfs/4_fa.pdf?_=1316627912.
132 "Nuclear Supplier Group," http://www.fas.org/nuke/control/nsg/, accessed on May 15, 2014.
133 "The Missile Control Technology at Glance," *Arms Control Today*, last modification December 2012, https://www.armscontrol.org/factsheets/mtcr.
134 "Australia Group at Glance," *Arms Control Today*, last modified October 2012, https://www.armscontrol.org/factsheets/australiagroup.

3.6.1 Container Security Initiative

Container Security Initiatives (CSI) was introduced to control the possibility of nuclear terrorism via maritime route. It was introduced by the US in close cooperation with other countries. Initially, it includes the security examination of containers from the country form where there is possibility of nuclear terrorisms and this examination is carried out on exporter port. Pakistan readily accepted it and brought structural changes for this purpose. In Container Security Initiative (CSI) scanner are set in on cargo ports. These scanners have capability to detect nuclear and radiological material.[135]

According to a news report of the "Dawn" Pakistan reserved funds of 6 million dollars to install seven scanners. Out of these seven, four were to be installed on its sea ports, while one was to be installed at Lahore, other at Chamman and another one at Torkham. This report was also indicating that Pakistan had to increase the numbers of such scanners.[136]

This was a brilliant initiative to monitor the movement of material on important borders. The container in Lahore has to go or come from India. The relations between India and Pakistan are not good. The scanners will the scan all material before reaching India. As far as the installation of scanners on Karachi port is concern, all goods to international community is exported through this port. Torkhum and Chamman is route from Pakistan toward land locked Afghanistan. The installation of scanners on these sites means that all material exported through these routes will have no radioactive material and it will provide

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135 "How CSI works?" http://www.ptfp.com.pk/?/Transport/Supply-Chain-Security/supply-chain-security-csi-sfi/CSI-SFI, accessed on May 15, 2014.
136 "Pakistan to install 7 Container Scanners," *Dawn*, March 28, 2014, http://www.dawn.com/news/392859/pakistan-to-install-7-container scanners

nuclear security guarantee form Pakistan to international community. Similarly these scanners can be used to check the presence of radioactive substance in imported material.

3.7 Pakistan and Nuclear Security Summit

In order to increase safety, security, share techniques and cooperation, Pakistan has participated in all Nuclear Security Summit (NSS).

3.7.1 Pakistan in Washington Nuclear Security Summit

The first nuclear security summit was held in Washington in April 2010. It was attended by many leaders all across world. In this meeting Pakistan was represented by former Prime Minister, Yousaf Raza Gallini. In this conference Pakistan told world that, it had achieved a great advancement in nuclear fuel cycle and was in a position to share technology with many countries. Addressing on security achievements, Pakistan told world that it was ready to share its experience that it had gained in field of nuclear security. While addressing this conference Prime Minister said, "Pakistan is ready to share with nations its competence in the area of nuclear security, particularly prevention, detection and response to illicit trafficking."[137] In this summit Prime Minister further said that nuclear security was responsibility of state and but there was also need of international cooperation for further improvement of nuclear security. Another important point raised by Prime Minister was that regional stability was necessary for nuclear security. Further he told that it was necessary to build Strategic Restraint Regime between India and Pakistan to enhance stability in South Asia. In this address Prime Minister told that India and Pakistan must continue their dialogue.[138]

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137 "Pakistan also Offers Nuclear Security Skills to World," *Dawn*, April 16, 2010, http://www.dawn.com/news/850639/pakistan-also-offers-nuclear-security-skills-to-world.
138 Ibid.

Pakistan has several decade old nuclear programs. Its nuclear program in fact evolved in the presence of continuous threats. With the passage of time non-state actors also became very much powerful. This all provided an opportunity for Pakistan to learn how to improve nuclear security in the teeth of all these difficulties. This forced Pakistan not only to use all available techniques but it also led Pakistan to employ some better self-developed techniques for security of nuclear arsenal. The security of nuclear weapons is much complex and advanced mechanism. Pakistan offered to share its security practices with world's many countries in this conference. Here Pakistan also offered its practices to control illicit trafficking. Illicit trafficking is most vulnerable area from where terrorists can acquire the material to carry out their relevant activities. Fissile material is most dangerous material in nuclear technology. If terrorist ever succeed to acquire this material they cannot prepare a complex bomb like nuclear weapon but it is possible to carry out their relevant activity (of injuring people) by spreading this material as in the case of Radiological Dispersal Device. So it is necessary for world to control illicit trafficking and Pakistan has offered help for this purpose to the countries that face these problems. It is important to mention here that, despite presence of Pakistan in security volatile region not a single incident of illicit trafficking incident has been reported in Pakistan. Its mean, that Pakistan has best abilities in this area. It has offered the world to take benefit of its valuable experience.

Another important point of Pakistan in this conference was that, international cooperation was necessary for improvement of nuclear security. No doubt, it is responsibility of country itself to promote security of its own but maximum security cannot be guaranteed without international cooperation. There Pakistan highlighted the importance of need of international cooperation to prevent nuclear arsenals from reaching in the hands of terrorists or other non-states actors.

3.7.2 Seoul nuclear security summit

The second Nuclear Security Summit was held in Seoul and it was attended by several world leaders. Pakistan in this summit was represented by Prime Minister Yousaf Raza Galini. In this conference Pakistan told the world that it needs peaceful nuclear technology. It was told in this conference that Pakistan has taken steps to maximize its nuclear security. To maximize nuclear security there is need to take national steps and international cooperation. Prime Minister further told that Pakistan is fully committed to Global Initiative to Combat Nuclear Terrorism and Pakistan has submitted several reports according to 1540 resolution about safety and security of its sensitive material and technologies. It was also told in this conference that Pakistan has developed mechanism how to respond nuclear and radiological emergency. Prime Minister further told that Pakistan had implemented Nuclear Security Action Plan (NASP) with IAEA collaboration and it was taking further steps to ensure more security of Nuclear Medical Centre and other nuclear civilian facilities. It was also told that Pakistan has taken stress tests for its nuclear plants to avoid Fukushima type accident. It was told in this conference in order to find, control and prevents illicit trafficking nuclear and radiological material, Pakistan was deploying Special Nuclear Material (SNM) gateway. Prime Minister further explained in that Pakistan has paid attention on capacity building and communication with international community to make world free from chances of attack of nuclear terrorism. He further explained that Pakistan's steps were so excellent that there was no chance of nuclear terrorism from Pakistan.[139]

Pakistan is facing sever energy crisis and there is need of nuclear energy in Pakistan. Pakistan requested for help is of specific significance although there are some limits of cooperation between Pakistan and international community as Pakistan has not signed NPT

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139 Pakistan Need Nuclear Energy to meet its Energy needs," *Dawn*, March 26, 2012. http://www.dawn.com/nvolitile ews/705588/pakistan-needs-nuclear-technology-to-meet-energy-needs-gilani.

because of its security reasons. But now the US is going for civil cooperation with India, so there is possibility of cooperation between Pakistan and international community. Time and again several questions are asked about the Pakistan nuclear security but Pakistan is a very responsible state and it is among few states that submitted its several reports according to UNSCR 1540. Here Pakistan also told about its safety measures. It has taken several steps to maximize nuclear safety along with its security. For credible safety Pakistan took several steps such as stress tests of its nuclear power plant. The success of these tests means that seismic activities will not affect Pakistan nuclear power generation plants. Being presence of Pakistan in security of volatile region Pakistan has installed Special Nuclear Material gateway to monitor the moment of nuclear and radiological material to control illicit trafficking of radioactive material. From Seoul speech one can know how much serous is about nuclear security.

3.7.3 Pakistan in the Hague Conference

The third Nuclear Security Summit was held in The Hague March 2014. It was participated by fifty three countries. Pakistan was represented by Prime Minister Nawaz Shareef in this conference. In his address, Prime Minister told that Pakistan is considering to ratifying 2005 amendment of Convention on Physical Protection of Nuclear Material (CPPNM). Pakistan also requested for its inclusion in export control regimes especially the nuclear supplier group global agreements and other international forum to strengthen its nuclear security. In this conference Pakistan explained that Pakistan nuclear program has firm bases on five pillars. These are its strong command and control system, its intelligence system, a rigorous regulatory regime, export control regime and international cooperation. Prime Minister told that Pakistan was a responsible nuclear state. It has developed good nuclear security culture and Pakistan considers that nuclear security is its national

responsibility and global priority. He told that Pakistan has taken all measures to secure its nuclear facilities and relevant material to prevent nuclear terrorism. He also discussed the importance of protection of radiological material commonly used in peaceful facilities such as hospital. He further explained that Pakistan nuclear security regime was based on material control and accounting, physical protection, border control and radiological emergency. He also focused on the importance multilayer defense that Pakistan has. He also told that Pakistan has established centre of excellence and this centre has introduced specific courses on nuclear security and on relevant field. Here Prime Minister once again repeated Pakistan's offer to share its safety and security practices with other countries. He requested world leaders to strengthen its nuclear security.[140]

Pakistan has signed and ratified Convention on Physical Protection of Nuclear Material (CPPNM). To strengthen further security Pakistan considers signing its 2005 amendment necessary. Pakistan has participated too much in controlling proliferation and its steps in this regards have been appreciated across whole world. Nuclear export control regimes are participating at their best to transfer material useful for peaceful purpose Pakistan being not a signatory of NPT has not succeed to get their membership but few year ago some steps have been taken showing that these regimes have ignored one of basic demand that membership that its member should NPT signatory, as the US has told that it will support India membership in NSG. So Pakistan demanded that world community that it should treat all states equally and give Pakistan membership of these regimes, if membership is given to India. This will strengthen Pakistan effort to increase nuclear security. It will also help to control illicit trafficking and nuclear proliferation. As far as five pillars of Pakistan's nuclear program is concern it can be seen that all pillar have been designed to handle increasing challenges.

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140 "Pakistan for Global Efforts against Nuclear terrorism," *Dawn*, March 24,2014, http://www.dawn.com/news/1095296

1) Command and control system not only play its role in policy formulation but key it is also acting to maximize security and safety by sensing challenges, designing policy according to security requirements. The people in command and control system of Pakistan's nuclear program are chosen after a careful process and they have best practical abilities to do their job efficiently. It is important to note that command and control system of Pakistan nuclear program has both civilian and military personnel. So it is one of efficient command and control system.

2) Security

Pakistan nuclear security is fool proof and among best security system. For security of its nuclear arsenals, Pakistan has introduced multilayer security system. It is using modern and best security practices. It has introduced Permissive Action Links (PALs), Environmental Security Devices (ESD) to protect its weapons. To protect nuclear weapons usage from evil hands it has separated fissile material core and other relevant component from each other to prevent detonation. SPD has more than 20,000 active troops for security of nuclear facilities and arsenals. It is using best possible strategy for transport of nuclear material. Pakistan nuclear security system is so good that not a single event of nuclear theft has been reported.

3) Safety

To enhance safety Pakistan has formed Pakistan Nuclear Regulatory Authority (PNRA). It has designed Nuclear Security Action Plan to enhance best safety practices.

4) Strategic Export Control Division

It looks after export of material and observes that exports are consistent with Export Control Act 2004 or not.

5) International Cooperation

One of important pillar of Pakistan's nuclear program is international cooperation. Pakistan has always cooperated in the best possible way along with the protection of its right and interests. It can be seen Pakistan has offered to share its best security practices to all countries in nuclear security summit. To enhance nuclear security international cooperation is necessary. If countries will cooperate with each other it will enhance nuclear security and safety and terrorists will unable to get nuclear arsenals, fissile or radiological material. Presently, Pakistan has close cooperation with many countries and international organizations. There is a good understanding between Pakistan and IAEA. IAEA has trained several Pakistan officials and they are fully contributing for nuclear security of Pakistan nuclear facilities. IAEA is satisfied about steps taken by Pakistan for nuclear security. Pakistan is among few countries that submitted several reports according to United Nations Security Council Resolution 1540 (UNSCR 1540). The cooperation between Pakistan and United States is good. The US has also helped Pakistan to train its several scientists. It has provided Pakistan with financial and technical aid to maximize nuclear security.

In fact cooperation is very important to maximize nuclear safety and security. Pakistan is cooperating and has gained a lot from international cooperation so it can say that international cooperation is one of important dimension of its nuclear program.

The point discussed by prime minister about security of material used in civilian facilities such as hospital is important. Since, it is very difficult for terrorists to acquire or to prepare fissile material. The easy option for them is to prepare Radioactive Dispersal Device (RDD) to spread harmful radioactive material. The easy option for them is either to steal radioactive material from peaceful facilities or attack these facilities that are using these materials. So security of these facilities is necessary. There should be a strict regime to control these materials. The facilities that are using these materials in Pakistan work under

Pakistan Atomic Energy Commission (PAEC) and Pakistan Nuclear Regulatory Authority (PNRA which is an independent body) closely observe all this process.

3.8 Establishment of Centre of Excellence

Pakistan has established a centre of excellence under Strategic Plan Division (SPD) supervision near Islamabad for training purpose. It has introduced several special courses to check personnel reliability and physical protection. Pakistan Institute of Engineering and Applied Sciences (PIEAS) has introduced master program in nuclear security. A school on nuclear safety and security has been set up by PNRA. This centre is training national scientists and Pakistan is ready to train people from other countries in this school. So it can emerge national as well as regional or international centre and it can be improved further with IAEA help.[141]

In 2014 centre of excellence is planning to conduct a course under the name of "Security of Radioactive Source" at regional level.[142]

3.9 Pakistan and International Convention for Physical Protection of Nuclear Material (CPPNM)

Pakistan is a member of International Convention for Physical Protection of Nuclear Material (CPPNM). This convention guides the states to carry out safe transportation of nuclear and radiological material. Pakistan is now ready to ratify its 2005 amendment which addresses protection during storage and domestic use along with protection of nuclear facilities.

141"Nuclear Security summit," Seoul March 26-27, 2012, http://nuclearsecuritymatters.belfercenter.org/files/nuclearmatters/files/pakistan_national_statement.pdf .
142 "Latest Press Releases," issued on March 26, 2014, http://www.mofa.gov.pk/zahidan/pr-details.php?prID=1846.

In short one can say that Pakistan government has taken initiatives not only according to its national requirements but also according to international changing security dynamics. Pakistan is fully cooperating with IAEA, in spite of its financial problems it is among top fund denoting country for nuclear security. The establishment of PNRA by Pakistan is one of remarkable steps toward enhancing nuclear safety but increase also nuclear security by many indirect ways. Pakistan has submitted several reports according to 1540 resolution and fulfilled its responsibility. To control illegal export of radiological and nuclear material Pakistan has done best legislation. The punishment of the person involved in illegal radiological trade is very severing. These all steps indicate how much Pakistan is serious about nuclear security.

Pakistan nuclear program has several challenges. Some of these challenges real whereas some of problems are exploited and exaggerated by the Western media. Extremism and radicalization are serious problems according to West but extremist have never attacked nuclear installations. The attack on Kamra Base was represented as an attack by terrorist to gain nuclear weapons.

Chapter 4

Challenges to Security of Nuclear Arsenals in Pakistan

4.1 A Brief Background

Today, there are more than seventeen thousands nuclear weapons in the world.[143] There are different views about such a huge amount. There is continuous call for reduction in their amount. Among different perceptions, it is common thinking that these weapons can be used negatively if non-state actors succeeded to acquire them. The organizations working for nuclear disarmament believe in complete elimination of nuclear weapons. They are criticizing the role of nuclear deterrence in international politics. They are raising questions about their security and safety. There is a view that if non-state actors succeed to acquire these weapons, they will use them for mass murder without any discrimination.

As far as Pakistan is concern, it is present in a very security volatile region. There are several non-state actors operating in Pakistan. Although none of them has tried to acquire nuclear weapons but their allies did so. For example Tareek-E-Talban Pakistan (TTP) has very close ideological relations with Al Qaeda. Al Qaeda has committed several terrorist attacks in the whole World and TTP has been involved in several suicide attacks in Pakistan and it is a challenge for peace and stability in Pakistan, they have attacked several important defense installations so one can say that nuclear facilities are also vulnerable to them and they are challenge to nuclear security of Pakistan. These challenges requests for searching new opportunities to enhance security of these arsenals.

What are challenges to nuclear security of nuclear arsenals of Pakistan? It is necessary to review whole scenario in detail. Several political experts in Pakistan as well in

143 "World Nuclear Stockpile Report," last modified January 7, 2014, http://www.ploughshares.org/world-nuclear-stockpile-report, accessed on May 29, 2014.

the other countries have pointed out vulnerabilities for Pakistan nuclear assets' security. Most of these problems were felt after 9/11. Some important challenges are explained below.

4.2 Insurgency and Radicalization in the Country

The event of 9/11 influenced Pakistan more than any country else. It not only increased insurgency in the country but a new dimension was added in existing religious extremism. Since, Pakistan joined international community on war against terrorism. As a result several reactionary groups emerged to express their sympathy with Al Qaeda. Some of them even started armed struggle against state. The prominent among them is Tareek-E-Taliban Pakistan. It was formed in July 2007[144] and it has been involved in bomb blast, suicide attack and several other violent acts in Pakistan. As a result Pakistani state took action against them. Several military operations were conducted against insurgents them. As a reaction they began to attack important military places. Their prominent attacks include attack on Federal Investigation Authority in Lahore in March 2008, September 2008 attack on Marriot hotel, attack on Sri Lankan cricket team in March 2009, May 2009 attack on Inter-Services Intelligence in Lahore, April 2012 attack on Bannu central jail. Besides these attacks, several other attacks were carried out on important strategic places like August 2008 attack on Wah ordinance factory attack; killed seventy worker, General Head Quarter attack in October 2009, Mehran Naval base attack in May 2011 and destroyed important assets (including a surveillance plane- P-3 Orion), August 2012 attack on Minhas air base attack with destruction of one aircraft.[145] These installments were considered very secure. Terrorists continued their attack and Pakistan armed forces conducted several military operations against them. The news of operation in foreign media appeared in such a way that showed Pakistan is continuously in the state of war. It developed thinking in the mind of Western

144 Mark Fitzpatrick, *Overcoming Pakistan Nuclear Danger*, (London: Routledge, 2014), 121.
145 Ibid, 110.

scholar that terrorists may tried to acquire nuclear weapons to use them against the US and its allies. Time and again western scholars, politicians, and diplomats expressed their concern about this war like situation in Pakistan. One of former IAEA chief expressed his regrets about insurgency in Pakistan. Talking about Taliban insurgency in FATA, he said it was very agitating point that there was war in a country with nuclear weapons.[146]

Besides TTP, there are several other jihadi groups having close ideological connection with Al Qaeda and TTP. These jihadi groups are very aggressive and extreme views. One of their head (Lashker-e-Tiba) has been reported to say, that he is not reluctant to fight a nuclear war with India on Kashmir. As far as Osama Bin Laden is concern he termed it as religious duty of every Muslim to acquire Weapons of Mass Destruction.[147] This is indicating how hawkish views these non-state actors have. In 2009, Al Qaeda leader Ayman Al Zawari said that US want to capture Pakistani nuclear weapons and requested Pakistani Muslims to turn their loyalty for Al Qaeda rather than Muslims.[148]

In March 2012, one of TTP leaders Omar Khalid told that that they have no intention to attack Pakistani nuclear facilities and back in 2008 Baitullah Mehsud told that TTP has no intention to get nuclear weapons as their use involved mass killing of innocent women and children. Once again in May 2011, Ehsanullah Eshan told that TTP had no intention to attack nuclear facilities or arsenals of Pakistan.[149] In 2012, few reports revealed that TTP had a plane to attack uranium conversion facilities in Dera Ghazi Khan, it activated Pakistani security forces and a lot of police and military forces were deployed on relevant places. [150]

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146 Reshmi Kazi, *Nuclear Terrorism the New Terror of the 21st Century*, (New Delhi: Institute for Defense Studies and Analysis, 2012), 58.
147 Mark Fitzpatrick, *Overcoming Pakistan Nuclear Danger*, (London: Routledge, 2014), 111.
148 Ibid, 113.
149 Ibid, 113.
150 Ibid,114.

It raises few questions? Will terrorist be succeeded to reach nuclear installation? If they succeeded to reach these installations, is there any chance of their success to get nuclear weapons and escape away? Will they succeed to detonate nuclear weapons in Pakistan or after delivering these weapons in New York, Paris or in London?

As far the question concerns that will terrorist be succeeded to reach the facilities that are containing nuclear weapons? To reach these facilities first of all it is necessary for them to locate these sites and these sites are difficult to search. Moreover the presence of dummy location has decreased the probability for terrorist to reach nuclear weapons containing sites. Another important thing is multilayer nuclear security system of Pakistan is concern it is capable of keeping attacker away and if terrorist attack any of these facilities (chapter 2) it will be difficult for them to reach these facilities. Nuclear arsenal containing facilities are guarded by very active troops and they are trained specially according to requirement of security and changing threats. They are best trained soldiers and they are equipped with best defensive weapons and their well training make them capable to secure nuclear weapons containing facilities.

Can terrorist steal a nuclear weapon from Pakistan? Pakistan weapons are not in compact form, instead that are in dismantling form and are stored as components. It means if terrorist succeeded to reach any one of these facilities, terrorist will be unable to acquire a whole nuclear weapon. They will get just few components and will unable to detonate a nuclear device. One common argument is that terrorist have attacked several important military bases and they can attack nuclear facilities and can acquire nuclear weapons. One important thing is that none of attacker that attacked these facilities has escaped back successfully. It is very different to attack a facility, break security barrier, penetrate inside highly secure facility, take something and escape back successfully. It is almost impossible in

any case. So, if any terrorist attacked any facility, he will not be successful to steal nuclear weapons or any sensitive component.

Nuclear weapons are very complex weapons. They are very different from conventional weapons. Their detonation requires several processes. For security purpose several other processes have been added in nuclear weapons (for example Permissive Action Link, Environmental Security Devices etc). These all processes make nuclear weapons very complex to detonate. So a stolen bomb cannot be detonated. As far as question about their moment outside country is concern, terrorist cannot take them outside. Pakistan has installed several containers not only on its seaports but on Western and Eastern border as well (chapter 3). These containers are designed specifically to detect radioactive material. So, it is impossible for terrorists to carry out a nuclear bomb or relevant material outside Pakistani borders.

Radicalization in the country also has influenced people on senior official positions. It has affected people in some of very important security forces. According to one of security expert Imtiaz Gull many low rank security officials have sympathy with militant groups such as Taliban and it is one of great threat to Pakistan.[151] Mark Fitzpatrick says that when people like Zawahiri or Omar Khalid declares Pakistani nuclear arsenal as an assets for Ummah, they actually requests for cooperation from such elements.[152] In August 2012 some army officers were arrested and court martialed because of their close link with some extremist religious party (Hizb ut Tahrir).[153] The action taken against them is clearly indicating that there is no place for extremist in Pak Army. Besides the Army officers selected for some

151 Ibid, 126.
152 Ibid, 126.
153 "Hizbut Tahrir Links: Court Martial Express Initiated Against Bargaider Ali Khan," *The Express Tribune*, August 12, 2012, http://tribune.com.pk/story/334975/alleged-hizbut-tahrir-links-court-martial-initiated-against-brigadier-ali-khan/.

position in SPD or NCA has to go through PRP and HRP and it will separate people having tendency of radicalization.

After assassination of former Punjab Governor Salman Taseer by his own police guard, several questions were asked about security of nuclear arsenals. But here it is necessary to explain that the killer of former governor was belonging to police and police is not at security of nuclear sensitive facilities. The training and selection process of police and armed forces is different. The force on security of nuclear weapons and sensitive facilities are selected from Army, Navy and Air Force and go through several processes before finalizing them whereas, police do not have such procedure. So murder of Salman Taseer should not be associated with weakness of security of nuclear arsenals and facilities.

4.3 Political Instability

Pakistan is a country suffering from political instability since its creation. Time and again it can be seen that democratic governments were replaced forcefully by powerful military regimes. What is effect of this instability on security of nuclear arsenals? Some experts in the West expressed their regret about instability since beginning of nuclear program. There is strong possibility that this may lead to weakness of state and ultimately it can destroy security structure of country. This may lose the control of state on all or some nuclear arsenals and fissile material as it happened in weak Russia soon after disintegration of Soviet Union. In 2012, the security index of Pakistan was thirty one out of thirty two states. One reason mentioned for such a low rank was political instability.[154] It is clearly indicating that political instability has a firm relation with nuclear security.

154 "Nuclear Security Index 2012," presented in January 2012, http://www.nti.org/media/pdfs/NTI_2012_Annual_Report_FINAL.pdf?_=13806520.

Soon after nuclear tests in 1998 military overthrew civilian government in 1999. The important question is that, had that influenced nuclear security? Its answer is no. In fact all important steps for nuclear security were taken in this dictatorial regime even before 9/11. A firm Command and Control system was established in this time period. The legislation for nuclear security (Export Control Act) was passed in this time period. This dictatorial regime strengthened the nuclear security of Pakistan. After restoration of democracy in 2008, nuclear security remained strong because of Pakistan institutional set up. In fact the institutional set of Pakistan nuclear security is so organized and well established with its firm base that there is no influence on nuclear security whether there is democratic or dictatorial regime. Strategic Plan Division is working on its own procedure whether there is military or civilian government.

So one can simply summarize that there is no influence on nuclear security whether there is political stability or not in present system. Pakistan nuclear weapons will remain secure until Pakistan has strong armed forces and excellent command and control system as it has today.

4.4 Possibility of Links between Staff working in Nuclear Facilities and Non-state Actors

Soon after 9/11, it was discovered that two nuclear scientists Sultan Bashiruddin Mahmood and Chudary Abdul Majid met Al Qaida lead Osama Bin Laden. This made Pakistan very conscious. They were imprisoned and investigation revealed that these scientists did not reveal any sensitive information before Al Qaeda leader but one thing was proved after this investigation that Al Qaeda was interested in acquiring Weapons of Mass Destruction. This discussion also revealed that OBL discussed with these scientists how to

prepare a nuclear bomb.[155] This strengthens the common thinking that Pakistan nuclear personnel have contact with Al Qaeda or other religious extremists. In April 2010, United States ambassador in Islamabad sent a cable to his country in which she expressed her fear that the US was not bothering that militant may steal a nuclear weapon but someone working in these facilities could smuggle material outside to prepare a nuclear weapon.[156] This cable is showing that how much US was fearful of inside outside link. One of American counterintelligence expert writes expert wrote in his article, "There is a lethal proximity between terrorists, extremists, and nuclear weapons insiders."[157] This statement is clearly indicating what is perception in US about security of nuclear arsenal in Pakistan? It shows that many officials in US think that there are still some elements inside nuclear facilities that can be turned fatal at any point in future. Pakistan took several steps to prevent such type of contacts. The people that have been selected for security of sensitive facilities are very reliable. The Strategic Plan Division keeps on monitoring all relevant personnel while they are on traveling or on other relevant activates. It checks their bank balance and financial position. It also keeps patronage on retired scientists monitor them and gets benefit from their scientific skills. No foreign people are recruited by SPD. The introduction of Personnel Reliability Program (PRP) and Human Reliability Program (HRP) has made recruitment very efficient. It helps to select only mentally balance individuals and there is no chance for them to be inclined to negative activities. Explaining efficiency of this system Bargaider (R) Feroz Hassan Khan told this system can help to separate fundamentalist from pious persons.[158]

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155 Feroz Hassan Khan, "*Eating Grass*",(Stanford, California: Stanford University Press, 2012), 361.
156 "Wikileaks cable expose Pakistan nuclear fear," *The Guardian*, November 30, 2010, http://www.theguardian.com/world/2010/nov/30/wikileaks-cables-pakistan-nuclear-fears.
157 Rolf Mowatt-Larssen, "Nuclear Security in Pakistan: Reducing the Risk of Nuclear Terrorism", *Arms Control Today*, July/August 2009, http://www.armscontrol.org/act/2009_07-08/Mowatt-Larssen.
158 Reshmi Kazi, *Nuclear Terrorism the New Terror of the 21st Century*, (New Delhi: Institute for Defense Studies and Analysis, 2012), 79.

4.5 Propaganda

There is continuous propaganda in the Western media against Pakistani nuclear program. National media is not mature and united to handle this propaganda. It is important to note propaganda against Pakistan nuclear program did not start after 9/11. Its root can be found in 1970s. In 1976 a military intelligence historian Robert Wohlstetter stated that there is a strong possibility that Pakistani nuclear weapons may go in the hand of terrorists.[159] This is clearly showing that history of propaganda against Pakistani nuclear program is as older as this program itself is.

On 12 August 2012, Kamra Air base was attacked by terrorists. The Western analysts began raise question about the security of nuclear arsenals of Pakistan.[160] On the eve of Kamra attack *New York Times* correspondent in Islamabad Declan Walsh sent a story to his newspaper in which he explained that nuclear weapons were stored on Kamra air base. He even told that 100 nuclear weapons were stored on Kamara base. He further explained that those nuclear bases were actually targeted by militant that were involved in nuclear program.[161] One important aspect of this news published was that, no references had been coded by Walsh for his explanation. It is clearly indicating that it was just a propaganda element. What is the basis of these thinking? One common answer is the fact that it is largest air base in Pakistan and some analysts in the West think that Pakistan may have stored its nuclear weapons on this base to deliver it to target as soon as possible under war condition. Questions about the presence of nuclear weapons on Air Bases were asked from Pakistan's officials but Pakistani officials once again made it clear that there were no nuclear arsenals on

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159 Mark Fitzpatrick, *Overcoming Pakistan Nuclear Danger*, (London: Routledge, 2014), 56

160 Kelsey Davenport, "Militants Attack Pakistani Base", *Arms Control Today*, September 2012. http://www.armscontrol.org/act/2012_09/Militants-Attack-Pakistani-Base.

161 "Millitant Attacked Pakistani Air Force Base," The *New York Times*, August 16, 2012. http://www.nytimes.com/2012/08/17/world/asia/pakistani-air-force-base-with-nuclear-ties-is-attacked.html?_r=0.

these Air Bases and explained that no nuclear weapons have been kept on such known places. One important thing about this attack is that, it was carried out just two days after a statement was issued by US Defense Secretary Lean Panetta that Pakistan Nuclear weapons can fall in the hands of terrorists.[162] These attacks increased the importance of his words and influenced the ideas of Western analysts to think so.

4.6 Proliferation

Among challenges of nuclear security that Pakistan faced, one was of proliferation. A.Q Khan was a very prestigious personality in the history of nuclear development in Pakistan. He was considered as father of atom bomb. He was relatively a free actor. In 2003, it was discovered that A Q Khan have been involved in proliferation activates. Reports showed that Khan supplied this sensitive technology to three states that were trying to build nuclear weapons.[163] These actions raised serious question about security of nuclear program of Pakistan. This raised another important question, was Pakistan able to handle all external and internal threats to its nuclear program?[164] Feroz Hassan explains in his book "Eating Grass" that during an interview Mashraff told him that the exposure of A Q Khan network was the major crisis during his ruling time period.[165] It is important to note many other important crises emerged during Mashraff time period including 9 /11 and Pakistan India border standoff due to attack on Indian Parliament. But Mashraff considered the exposure of A Q Khan network was a major event during his time period. There is no evidence that Pakistani state was involved in A Q Khan network.[166] Its mean A Q Khan network was an independent network that operated at its own without state knowledge. State was not aware of

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162 Ibid.
163 Mark Fitzpatrick, *Overcoming Pakistan Nuclear Danger*, (London: Routledge, 2014), 141.
164 Christopher O. Clary, "The A Q Khan Network: Causes and Implications", *Naval Post Graduate School*, p. 1, http://www.fas.org/irp/eprint/clary.pdf , accessed on June 03, 2014.
165 Feroz Hassan Khan, *Eating Grass*, (Stanford, California: Stanford University Press, 2012), 359.
166 Mark Fitzpatrick, *Overcoming Pakistan Nuclear Danger*, (London: Routledge, 2014), 141.

his activities represents weakness of the state. But with the emergence of command and control system in Pakistan reforms have been taken place that has diminished the probability of further proliferation or any other such network. Khan Research Laboratory (KRL) remained independent for years but was brought under command and control system in 2001 (chapter 2). It restricted many activities of KRL. The proliferation form Pakistan was not an extraordinary event, if we look at history, it can be seen proliferation even took place from Manhattan project as well. The name of Klaus Fuchs is prominent because of proliferation activities from Manhattan Project.[167] His activities enable Soviet Union to prepare nuclear bomb but A Q Khan has not helped any country to prepare such weapons. It is possible that transfer of some component has taken place or some techniques had been taken place because of A Q Khan but there are no reports indicating that may show that Highly Enriched Uranium has been taken from Pakistan. To control these types of illegal activities, after United Nations Security Council Resolution (1540), Pakistan introduced legislation under the name of Export Control Act 2004. This legislation is indicating that strict action will be taken place against any person if he committed any illegal activity (chapter 3). Besides, after Container Security Initiative (CSI) there is no chance that sensitive material may transfer to other country. No doubt that CSI cannot control drawing or dual use instrument but it is capable of controlling the thing of prime importance.

4.7 Financial Problems

Pakistan has always been suffering from financial problems. It has sacrificed too resources much to get these weapons in order to make its defense invincible. Now it is spending money to ensure their safety despite its limited financial resources. Apparently it appears that there are no problems because of financial shortage but in fact it is one of

167 "Espionage on the Manhattan Project," http://www.mphpa.org/classic/SPY/ROSENBERG/fuchs_k.htm.

important problems. In November 2013, a report was released by BBC in which it was told that Pakistan was ready to provide its nuclear weapons to Saudi Arabia because of financial aid which has been provided by during whole period of nuclear program.[168] This report is clearly indicating that intense reports are released just because of financial problems and economic weaknesses of Pakistan. If we look at the first sentence of this report it has been published as, **"Saudi Arabia has invested in Pakistani nuclear weapons projects..."** This report is clearly indicating toughness of financial condition and it directly hit that Pakistan can go for proliferation because of its financial difficulties. Is it possible that Pakistan has an agreement with Saudi Arabia? As a proof it has been stated that Saudi Defense Minister Al Saud visited Pakistani nuclear research centre in 1999 and 2002.[169] According to Feroz Hassan Khan, the visit of Saudi Minister does not represent any type of such agreement but he admits that Saudi Arabia did support Pakistan financially.[170]

For improvement of security of nuclear arsenals many western countries have helped technically as well as financially. The important financial support is from the United States which denoted 100 million dollars to Pakistan to improve its nuclear security.[171]

4.8 Fear of External Attacks

In 1970s, when Pakistan started its nuclear program, whole world especially India, Israel and the West were against it. In 1980s, Israel planned to attack Pakistani enrichment facility, Kahuta. Israel had successfully destroyed Syrian and Iraqi nuclear plant; it was very confident and began to thinking to attack Pakistan's nuclear facilities. The Israeli Plan has been explained by two journalists of "The Asian Age" Adrian Levy and Catharine Scott-

168 "Saudi Nuclear Weapons on Order from Pakistan," Published on November 6, 2013, http://www.bbc.com/news/world-middle-east-24823846.
169 Ibid.
170 Ibid.
171 Qaiser Farooq Gondol, "Are Pakistan's Nuclear Weapons Secure?" The *Washington Times*, Published on December 8, 2011, http://communities.washingtontimes.com/neighborhood/letters-pakistan/2011/dec/8/are-pakistans-nuclear-weapons-secure/.

Clark explains in their book Israeli, "Deception Pakistan, the US and the Global Weapon Conspiracy". According to this plan, Israeli Air force had a plan to attack Kahuta from Jamnaghar airbase, Gujarat in mid 1980s. This plan was approved by Indira Gandhi but it was not carried out. Another plane explained in this book is that Israel also planned of a direct strike. This plane was designed in such a way Israeli Fighter Jets will attack directly from Israel and will be refueled in their mid-way. They had to knock down a commercial air plane and move closely in such a way that their movement must be seen as a movement of a single large plane on Pakistani radar. From there they had to attack Kahuta and enter in Jammu and Kashmir for refueling and exit. This mission was launched one night but a great surprised was given to Israeli Air Force by Pakistan Air Force (PAF) which was ready to receive them. This forced them to abort this Plan.[172]

The United States first verbally opposed Pakistan's nuclear weapon program and latter stopped providing it economic aid and military aid. This has developed negative perception about the US. A very famous and prestigious American journilist Seymour Hersh writes that, many people in Pakistan think that US true goal is not ensure more safety of Pakistan nuclear assets but to destroy them.[173]

What sort of attack on nuclear installation is possible from US? Seymour explains further that a former American intelligence officer told him that a special force have been trained by the US to remove part of separated nuclear weapons and that's size had been increased by up to a unit in 2009. He further explained that previous focus of that team was on fissile material core and later changed to trigger in order to handle harmful effect of

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172 "How Safe are Pakistan's Nuclear assets," *Dawn,* Updated on 10th Feburary 2010, http://www.dawn.com/news/881309/how-safe-are-pakistan-s-nuclear-assets , accessed on June 5, 2014.
173 Seymour Hersh, "Defending Pakistani the Arsenals," *The New Yorker,* November 16, 2009, http://www.newyorker.com/reporting/2009/11/16/091116fa_fact_hersh?currentPage=all.

radiation.[174] Giving reference of another official, he further explains that he told him that Pakistan has given vital information about location and command and control system of nuclear arsenals. This official further told him that US can collect these weapons if ever situation demanded it. In this article he also explains that estimate has been taken about the maximum number of trigger that can be placed in a cargo plan C-17[175]. As far as Pakistani response about it is concern, a Pakistani military spokesman denied these facts and told that Pakistan do not need US help for security for its nuclear arsenals nor it will accept it.[176] He further explained in his article that an intelligence report was received in summer 2009 in which it was explained that some of component of Pakistan had gone in wrong hands. As a response one of team a team flew from United States and reached in Dubai (UAE), there it got news that this report was wrong and baseless so it returned back.[177] This information explained by Seymour Hersh in his article is clearly indicating that US is not satisfied with Pakistani steps for nuclear security. Since it is clear that Pakistan has acquired these weapons after a great struggle and Pakistani nation considers them as crown jewel for itself. The US has prepared special force to collect these arsenals in case of crisis but Pakistan is not ready to surrender these arsenals. These will create a complex situation. US must revisit its policy. As far as the location of nuclear arsenals is concern, there is not a single location of these arsenals in Pakistan (chapter 2). There are more than 15 locations including several dummy locations. So nobody can say that he knows where all nuclear weapons are. The news of the summer explained by Seymour that a force even reached Dubai, UAE. Why was this force coming to Pakistan; for help or to pick up remaining nuclear weapons and relevant arsenals or to get back component from those supposed wrong hands? It is not clear. After "Operation Neptune Spear" (operation carried out to kill Osama Bin Laden) there a thinking was

174 Ibid.
175 Ibid.
176 Ibid.
177 Ibid.

developed in Pakistan that similar operation can be carried out to grab nuclear arsenals. Its mean more steps are required to ensure security of these arsenals.

Is it possible that American come and pick up those nukes and escape out? Its best Answer has been given by a Pakistani nuclear activist Pervaiz Hoodbhoy. He explains that there are dummy locations in Pakistan for security of nuclear arsenals with internal tunnel to keep these assets in motion so it is very difficult for attackers to reach these exact locations. If attackers reach any location it will be guarded by a heavy security force and it will result in heavy casualties and it will make this operation unsuccessful. He further explains that an attack on nuclear facilities by US or India will be stupidity because if a single weapon is left it can have disastrous consequence for attacker.[178]

4.9 The Role of Media

In 21st century, the role of media is very important in building perception. Sometimes media has very positive and sometime it has very negative role. The role of international media about Pakistan is very depressing. When Kamara air base was attacked, the Western media called it as an attack nuclear air base by militants. Despite denial from Pakistani officials media reports kept on displaying which represented that security of nuclear arsenals in Pakistan is at stake. As far as national media is concern sometime it has shown some responsibility whereas other times it just began to publish foreign news about nuclear security and started commenting on it. National media is actually fragmented on several issues and each media group is on its separate path. It must be united to handle propaganda like situation against Pakistan in international media. Besides it, there should be a well developed communication between Pakistani officials and international media; so that such sort news must be confirmed before displaying or publishing such material.

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178 Pervez Hoodbhoy(ed.), *Confronting the Bomb*, (Karachi: Oxford University Publisher, 2013), 200.

4.10 Transport Security

Nuclear weapons during transport are very vulnerable and it is an area where it is considered that more security is needed everywhere. Its importance increased much after theft case in Mexico, where a container carrying radioactive material was theft by some local thieves.[179] Many scholars in the West have very critical views about security during transport. Mark Fitz Patrick accepts that security during transport is very vulnerable everywhere in the world and during transport; nuclear arsenals are vulnerable to preemptive strike. He explains that transport is either carried out in helicopter or by road networks in unmarked civilian vehicles. The Pakistan road network is not good and accidents have been taking place very frequently. There is possibility that terrorist may attack it during transport. He admits that SPD is aware of these problems and have given training to its personnel accordingly.[180]

Senior Pakistani defense analyst Zafar Nawaz Jaspal explains that Pakistan is practicing best security practices during transport. He explains that transport of sensitive material is carried out in specialist vehicle and tamper-proof containers and these containers are escorted by military personnel.[181]

4.11 Questions about Security of Tactical Nuclear Weapons

There a lot of questions are asked about security and safety of tactical nuclear weapons. One argument is that because of their small size there is possibility that these weapons may handed over to military officers during crisis and may be fell in wrong hands

179 "Medical Radioactive Material Stolen in Mexico," published on December, 04 2013, http://www.bbc.com/news/world-latin-america-25212648.
180 Ibid, 29.
181 Zafar Nawaz Jaspal,"Pakistan's nuclear weapons safety and security," *The Nation*, February 23, 2013.

that can lead to unauthorized use of these weapons ultimately.[182] This point is clearly indicating that there is a question about security of tactical weapons.

4.12 Seismic Activities in the Country

Pakistan is present in such area where there is large number of seismic fault lines. These fault lines have caused very destructive earthquakes in past. The earthquake of 2005 in Khyber Pakhtun Khawa (KPK) and Azad Kashmir claimed several lives and destroyed infrastructure badly. Last year, another earth quake hit Gawadar and coastal areas of Pakistan, which had great intensity but proved less fatal because of low population density and construction in this region. If such earthquake visits the zone where nuclear facilities are present it can have destroying effect on nuclear facilities infrastructure such as Enrichment facilities or other weapon processing units. Moreover it can cause very damaging effect to nuclear power plants; especially the plants on the coast of sea are more vulnerable because earthquake in the sea can cause tsunamis. These damaged nuclear facilities can be a source of radioactive material for non-state actors; they can use this material to prepare Radiation Dispersal Device (RDD) or Dirty Bomb.

4.13 Cyber Threats

Cyber security is one of important dimension of security which has been gain popularity after arrival of internet. The cyber path has been used not only to hit other people but it has also been used as a source of theft of information and to destroy important installation. In 2010, Iran nuclear installation was attacked by stuxnet and it destroyed about $1/5^{th}$ of their nuclear enrichment facilities caused them out of control.[183] The attack on Iranian

182 Mirza Muhmood Masood, "Full Spectrum Deterrence and Strategic Stability in South Asia," *Weekly Pulse*, December 23-29, 2013.

183 Micheael B Kelly, "The stuxnet attack on Iran's Nuclear was Far More Dangerous than Previously Thought," *Business Insider*, November 20, 2013, http://www.businessinsider.com/stuxnet-was-far-more-dangerous-than-previous-thought-2013-11.

facilities through stuxnet is clear indication of the fact in future such attacks can be carried out on any country's defense installations to destroy them badly. Although Pakistan has successfully completed its work and prepared nuclear weapons but in future it is possible that cyber-attacks can affect all data, process and machinery relevant to computer. It can also influence security of Pakistan nuclear arsenal as it is based on command, control, communication, computer, information, intelligence, surveillance and reconnaissance (C4I2SR). This clearly shows that the process carried out via computer can be affected badly if somebody carries out cyber-attack on defense facilities. Although Computer has been specially explained in this code but many other processes in it are also relevant to computer, for example communication either between officials or from computer to machinery can be affected by virus or by other cyber worms. So, special attention should be paid to ensure cyber security for nuclear arsenals.

Pakistan nuclear program is in evolving stage and where it faces a lot of challenges, there are also opportunities for nuclear program for improvement.Increase in international cooperation can be beneficial but being a sensitive issue it has some limitations as well. After 9/11, Pakistan has been involved in active cooperation with many other countries such as United States. The world is well aware of the fact that if nuclear weapons go in wrong hands it can have disastrous effect. The importance of cooperation can be seen from that fact that Prime Minister Nawaz Shareef told that Cooperation is one of essential pillar of Pakistan nuclear program (Chapter 3). So it can be seen that cooperation is one of essential element in Pakistan nuclear program. The theft of nuclear weapon or material in multilayer security system is not possible. The storage of weapons as component made it impossible for terrorist to detonate a nuclear weapon. As far as question concerned about capability of non-state actors to capture government, it is impossible because government in Islamabad is very powerful. No doubt terrorists have capability to disturb law and order situation in country and

it is considered as a vital threat to existing political system of country by the Western media and political analysts, but one thing is clear that terrorist are not capable to capture political system in country. The Pakistan government capacity is enough to crush them as it has been proved in Swat operation. SPD has taken many steps to control proliferation and prevent any contact between terrorists and scientist working inside sensitive nuclear facilities. There is strict accountability of nuclear material in Pakistan and former DG, SPD has been reported to say accountability is taken place up to each gram of Uranium.[184] Transport is one of most vulnerable area and it always needs extra care. Natural calamity can also affect safety but indirectly security can be affected by them so place for such installment must be always chosen with great care and such places should be selected where the effect of these calamites are minimum. The national media should act in a responsible way and should try to manage foreign propaganda about Pakistan's nuclear security.

184 Mark Fitzpatrick, *Overcoming Pakistan Nuclear Danger*, (London: Routledge, 2014), 118.

Conclusion

The security of nuclear arsenal is one of important responsibility of state and Pakistan has taken several steps to ensure this security. Pakistan's institutional set up for nuclear security is in its evolving stage but managed several difficulties. To maximize security of nuclear facilities, material and institutions Pakistan believes in multi-dimensional approach. It focuses on each and every aspect to prevent possible bad accident. The recruitment of personnel for nuclear security is based on Personnel Reliability Program for civilian personnel and Human Reliability Program for military staff. PRP and HRP include several processes to check their tendency toward extremism, radicalization, and loyalty to profession service and to check mental and physical stability. PRP is repeated after every two years to check them again and again. These steps are expected to help in selecting very professional and loyal people that will not involve in proliferation. This will also help to protect sensitive material and information. SPD is guardian and patron of retired scientists. It ensures availability of their skills throughout their life, their security and keeps them away from reach of non-state actors that are interested in making bomb.

For physical security, highly trained, motivated and active soldiers are deployed. The employment of counterintelligence along with intelligence, it is possible to keep information secrete. For this purpose, SPD has its own force of 1000 people. In order to increase the security of weapons, Pakistan is using Permissive Action Link (PAL) which is considered reliable security system. The weapons having PALs in themselves cannot detonate until an unlocking code is fed them. These PALs systems stopped several accidents in cold war so if a terrorist succeeded to acquire these weapons he/she will be unable to detonate them. Besides, Environmental Security Device (ESD) strengthens security further. The important thing about these instruments is that Pakistan did not get these instruments directly but acquired

techniques to develop these instruments. Pakistan has not kept weapons in compact from but separated and components are stored at different places. Pakistan security is based on multilayer security approach. It includes laboratory security procedure, physical barrier modern digital system of protection, counterintelligence and ISI.

Pakistan is one of major financial contributor, at international level. It declared its Nuclear Security Action Plan in 2006 including Radioactive Source Management, dealing orphan source, radioactive source detection at important points, detection at important points, Nuclear Security Emergency Coordination Centre and Nuclear Training Centre. It did legislation according to Export Control Act 2004 and Pakistan is among those few countries that have submitted its report according to United Nations Security Council Resolution 1540. It took steps to control movement of radioactive material according to Container Security Initiative. It has established Strategic Export Control Division (SECDIV) in ministry of foreign affair.

Pakistan has participated in all nuclear security summits. In all of these summits, Pakistan presented to share its practices with other countries. In Seoul, Pakistan announced to establish a regional training center to help other less technologically advanced countries. Pakistan actively pursues International Convention for Physical Protection of Nuclear Material (CPPNM) and International Convention for Suppression of Act of Nuclear Terrorism (ICSANT).

Pakistan's nuclear program has several challenges. Some of these challenges are real whereas some of problems are exploited by the Western media. There is a lot of propaganda against Pakistan nuclear program in international media. Extremism and radicalization are serious problems according to West but extremist so far have not attacked nuclear installations. The attack on Kamra Base, however, was reported as an attack by terrorists to

gain nuclear weapons. Political instability is raised time and again but institutional set up of Pakistan's nuclear program is believed to be based on strong roots where changing governments may not impact on it. Another important point is that there is possibility of strong links between the personnel working on nuclear sites and terrorists but the personnel working in these facilities are under strict intelligence during and after their service. Natural disaster of serious level can have destructive effect on nuclear facilities so such places should be chosen for this purposes where there less chance of visit of this calamity. Cyber security is one of important dimension of security. Cyber-attack cannot reverse Pakistan achievements but it can influence working machinery which may affect future production in future.

Despite having a good security history, the world is asking serious questions about security of nuclear installations. It is actually because of presence of Pakistan in security volatile region. In past Al-Qaeda had shown interest in nuclear weapons and two of prominent nuclear scientist met with OBL which provided an opportunity to the thinking that these scientists were helping Al-Qaeda to prepare a nuclear devices. Latter investigation evinced no scientific or technical information was provided by scientists to Al Qaeda.

Pakistan's nuclear weapons are said to be under good security condition and are safe and secure like that in any other nuclear weapon states.

What are further requirements?

To thwart propaganda against Pakistan, Islamabad should have links with renowned columnists, political analysts and nuclear experts in the world. The Pakistan officials must be available to these writers to answer their each and every question, explain all nuclear aspects before them with facts and figures and tell them that Pakistan has best nuclear security system and its nuclear weapons are safe and secure.

In order to develop nuclear security culture and increase awareness workshops, seminars, TV programs and other relevant activities should be arranged especially with representatives of anti-nuclear lobby.

Pakistan must carry out its diplomatic efforts to get membership of NSG, Australia Group, Wassenaar Agreement as it can be seen the purpose of these regimes and as Pakistan is following their code of conduct and prepared its export control list according to basic principles these groups.

Visits of foreign officials to nuclear facilities (as Saudi Price visited) must not be allowed.

Polygraphy test must also be included in PRP.

Critical views on nuclear security must be welcomed for further improvements.

Radiation detection devices must be installed at airport as well.

Nuclear weapons security devices such as PAL and ESD should be designed in such a way that if somebody try to surpass these devices by removing transistor or some other electronic component that should lead to disability of whole weapon to detonate.

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