International Relations

TWO SIDES OF SECURITY: HUMAN SECURITY AND NUCLEAR SAFETY

Andreea Emilia DUTA•

ABSTRACT:
ALONG WITH THE PARADIGM OF "SUSTAINABLE DEVELOPMENT", THE PARADIGM "NUCLEAR SAFETY" IS VITAL BOTH TO THE PARADIGM OF "HUMAN SECURITY" AND THE CLASSICAL PERSPECTIVE OF SECURITY. FUNDAMENTALS OF NUCLEAR SAFETY REGIME TREAT NUCLEAR SECURITY - OBJECTIVES AND ELEMENTS - IN ACCORDANCE WITH INTERNATIONAL INSTRUMENTS AND EXPERIENCES IN THE FIELD. WHILE SAFETY AND SECURITY ARE RELATED TO HUMAN ERROR, THE SAFETY IS ADDRESSED AND DOCUMENTS PRODUCED WITH THE INTENT TO DO HARM. IT IS THE DUTY OF STATES TO ASSESS THREATS TO NATIONAL PRODUCTION OF CRIME AND UNAUTHORIZED ACTS WITH NUCLEAR SECURITY IMPLICATIONS REGIME. REGARDING NUCLEAR SAFETY STANDARDS AND MEASURES IT IS NECESSARY TO ESTABLISH GLOBAL STANDARDS OF MINIMUM SECURITY REQUIREMENTS AND LEGAL PROVISIONS OF THE MEMBER WITH ELEMENTS OF EXTRA-TERRITORIALITY.
THE STRICT CONTROL OF NUCLEAR MATERIAL, CONVERSION REACTORS USING HEU IS VOLUNTARY, SOME STATES DEMONSTRATING GOODWILL WHILE OTHERS DID NOT AGREE WITH DE PLANO THESE OBJECTIVES. THE NEGOTIATIONS ON AGREEMENTS ON NUCLEAR SAFETY OBJECTIVES ARE LIMITED, REQUIRING A LONG PERIOD OF NEGOTIATION DEPENDS ON THE FORMAT IN WHICH THE DETERMINED POLITICAL WILL AND NOT NEEDED.

KEY WORDS: HUMAN SECURITY, NUCLEAR SAFETY, NUCLEAR SECURITY, NUCLEAR REGIME SECURITY, CONVERSION TECHNOLOGY, IAEA,

The Cold War may be analized through two paradigms: the economic and military security, which is in a continuous interaction. After the end of Cold War, both channels underwent major changes being increasingly linked to the concept of human security.[1] The paradigm of "human security"[2] - a real "hot" topic in the international community - became

• University of Bucharest, Romania. Email: deea.emilia@ymail.com.

[1] The concept of human security, although new, has its beginnings in the 60s, 70s and 80s, when for the first time it was discussed the need to establish a new system of development both economic and human. In 1992, the analysis of the concept of security is extended from military dimensions and other levels: political, economic, social, environmental. See Buzan, Barry, Waever, Ole, Jaap de Wilde, *Security. A New Framework for Analisys*, Lynne Rienner Publishers, Boulder, London, 1998.

[2] The concept of human security debate was centered on four key questions: What is the objective of security? What are the dangers to security? Who has the right to ensure security? What are the ways to ensure this security? See *Sécurité humaine: Clarification du concept et approches par les organisations internationales. Quelques repères*, http://www.francophonie.org/

a true corollary for all subsequent security paradigms. The "new security" is centered on the individual, in contrast to traditional security strategies built on the edifice of the state structure.

Although there are many gaps in shaping an integrative concept, the nuclear dimension of human security is undeniable[3]; along with the paradigm of "sustainable development", the paradigm "nuclear safety" is vital both to the paradigm of "human security" and the classical perspective of security. Any security concept orbits around an individual directly or indirectly; indirect and immediately through the state security. In the case of nuclear security, the purposefulness is the individual nuclear safety, a very delicate fabric but with apocalyptic consequences if the power of games get out of control.[4]

A critic of nuclear security connection to human security is that according to international regulations, it is the responsibility of that state; but, the possibility of transporting nuclear material to other states may be a threat to anyone, anywhere could get into disharmonies cooperation to promote security interests of all states. Or take advantage of all the commandments of the international community and should be promoted with priority over national security even if human-nuclear safety connection is not supported by some literature.

Nuclear Safety Culture is an important requirement nowadays respectively to be developed systematically and progressively at all levels - national, regional and international levels,[5] as the foundation of a comprehensive system security based on nuclear security infrastructure is able to cover the whole cycle of nuclear energy and to prevent incidents in the field.[6] Culture of nuclear safety and radiation safety of taking the necessary measures mean to protect individuals, society and the environment. Achieving a high level of vigilance and measures to prevent and combat threats represent the major objectives of nuclear safety culture training.[7] Developing a culture of nuclear safety roles require more actors: states, organizations, managers of organizations, staff, the public and the international community.[8]

Nuclear safety and security are a central topic in the global diplomatic activities; the IAEA is responsible for drawing global framework but also by assisting member on

[3] Nuclear safety, nuclear security, and nonproliferation are essential enablers for large-scale nuclear energy growth. Stronger global institutions and agreements will be needed to lower nuclear risks even as nuclear activities expand. See Mathew Bunn & Martin B. Malin, A nuclear revival needs new cooperation, Bulletin of the Atomic Scientists, September/October 2008, Vol. 64, No. 4, p. 60.

[4] Although there is still a new dimension to the concept. Thus, identifying the individual and community safety part, trying to protect the living environment of the individual to the elements disruptive or destructive nature. See Croft, Stuart, Terriff, Terry (ed.), 2000, *Critical Reflections on Security and Change*, Frank, Cass, Londra, 13-17.

[5] *The convention on the Physical Protection of Nuclear Material (1987)* and its *Amendaments (2005)*; *The Convention on Early Notification of a Nuclear Accident*; *The Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency*; *The International Convention for the Suppression of Act of Nuclear Terrorism*; *Code of Conduct on the Safety and Security of Radioactivity Sources and the Supplementary Guidance on the Import and Export of Radioactive Sources*; *UN Security Council resolutions 1373 (2201) and 1540 (2004)*; *Safeguards Agreements and Additional Protocols*.

[6] See *Nuclear Security Plan 2010-2013*.

[7] See *Nuclear Security Culture*, IAEA Nuclear Security Series No. 7, Implementing Guide, Vienna, 2008, *NTI Nuclear Materials Security Index*, Belgium Country Profile, http://ntiindex.org/countries/ (accessed 10 June 2014).

[8] As of early - 2011, over 19,000 assembled nuclear weapons continued to exist in the world, along with nearly 500 tons of separated Plutonium and probably over 1,400 tons of HEU. See Matthew Bunn and Eben Harrell, *Consolidation: Thwarting Nuclear Theft*, Cambridge, Mass.: Project on Managing the Atom, Harvard University, March 2012, 36.

request and coordinating activities in the field.[9] Establishing an international safety research since the early development of nuclear material or sources and the state to be subject to this regime certainly could not be achieved due to the divergent interests of the states. The birth of an international safety through an international agreement was substituted by multilateral agreements, such as the establishment of Euratom,[10] and the bilateral nuclear security transactions. In nuclear safety, the most important issue is to declare the facilities, because the NPT is not ratified, the complications of this problem are quite serious. Although theoretical solutions are well defined by the nuclear safety, implementation is blocked for reasons related to economic interests of state sovereignty, competition and not to block a possible use for the production of bombs. However, especially after the Cold War, several states have eliminated national territories potentially usable nuclear material to nuclear weapons under international supervision, but on its own initiative and not under the rigors of an international regime on this.

A global framework (legal instruments, a general guide, a mechanism for the implementation and use) must be transposed into national safety regime. Establishing a Nuclear Safety Guide,[11] Nuclear Security Plan 2010-2013[12] and further work in this area,[13] given the reality of more than 430 nuclear reactors over 240 nuclear reactors for research and hundreds of thousands of radioactive sources used in the industry and in medical purposes. Fundamentals of nuclear safety regime treat nuclear security - objectives and elements - in accordance with international instruments and experiences in the field.

In 1975, the IAEA developed a set of recommendations for the physical protection of nuclear materials, revised five times,[14] and followed by the Nuclear Security Plan.[15] Risks related to the protection of nuclear materials and facilities related to: unauthorized removal order to build nuclear explosive devices or for subsequent dispersal or sabotage. On the other hand, the quantities of civil Plutonium held by certain countries - the U.S., Russia, France, Britain, and Japan - must be calibrated to the needs of civil, not rational to deposit such material excess. Nuclear safety is focused on prevention, detection and response to unauthorized intentional or criminal acts or involving nuclear and other radioactive materials associated activities or related activities.[16] Nuclear and radiation

[9] See *The Ministerial Declaration from the International Conference on Nuclear Security: Enhancing Global Effort*, 1 July 2013, Annex of document GOV/INF/2013/9-GC(57)/INF/6, Preamble and Para. 17. The idea of an IAEA was born as part of President Eisenhower's "Atoms for Peace" speech on December 8, 1953. In 1955, Vitro Corporation study concluded that even with a 90% probability of detecting diversion of nuclear materials, it would be possible to divert enough Plutonium for one bomb from a power reactor within a period of five years. This meant that safeguards would have to have a political and diplomatic component as well as a technological one. The study concluded that "Atoms for Peace" might contribute to proliferation, that is, atoms-for-peace could lead to atoms-for-war. See Gilinsky, Victor, "Sometimes Major Violations of Nuclear Security Get Ignored," in *Nuclear Weapons Materials Gone Missing: What Does History Teach?* ed., Henry Sokolski, 43-44.

[10] The European Atomic Energy Community – Euratom.

[11] See *Nuclear Security Fundamentals*, GOV/2012/10

[12] GOV/2009/54

[13] See *International Conference on Nuclear Security: Enhancing Global Efforts* at the Agency's Headquarters from 1 to 5 July 2013, the draft of Nuclear Security Plan 2014-2017.

[14] See *Recommendations for the Physical Protection of Nuclear Material* (1997), *The Comprehensive Plan of Action to Protect against Nuclear Terrorism* (2002), *Nuclear Security Plan* (2005, 2009).

[15] See *The Security of Material Programme*.

[16] Nuclear security focused on prevention of, detection of, and response to, criminal or intentional unathorised actsinvolving or directed at nuclear materiale, associated facilities, or associated activities. See *Nuclear Security Fundamental Obiective and Essential Elements of a State's Nuclear Security Regime*, IAEA Nuclear Security Series No.20, 2013.

safety regulations are the responsibility of the member states which decide to adopt safety standards of the IAEA and to transpose them into national law.

While safety and security are related to human error, the safety is addressed and documents produced with the intent to do harm; nuclear safety culture seeks attitudes and behaviors in specific situations out above concepts, namely to limit the risks of using nuclear and radioactive materials.

Nuclear security regime consists of legal regulations and assessments of nuclear and radioactive threats and response capacity - planning, preparation, and operative procedures. Leadership and management are the essential components of nuclear safety in the roles and responsibilities they provide. Regulations on physical protection of nuclear material and facilities by legislation are developed and improved to reduce the risk of crime.[17] Nuclear security regime for radioactive material, associated facilities and activities designed to prevent acts that may produce negative radiological consequences; radioactive material include nuclear material in all phases of the operating cycle.[18] The nuclear security regime, paradoxically, radioactive and nuclear material and its status is regulated using the concepts of "criminal act" and "unauthorized"; criminal matters, civil and administrative, intentional or unintentional that may be related to the terrorist phenomenon are required for member stated to be stipulated in a special legislation. [19] These standards related to nuclear material are not under regulatory control, lost, missing or stolen and later found that was not reported as such. They are considered to be at alarming levels and response to criminal or unauthorized acts for credible threats confirmed in materials whose control is not regulated, other than sabotage for discovering and securing material and security event management. The importance of "fundamentals" is multiple, *inter alia*, for the stability and security of the international community and safety, especially considering that nuclear terrorism has become a serious and present threat. Fundamentals are prerequisites to nuclear safety regime by proposing objectives and summaries of provisions of international instruments, States and IAEA experience in the field. The concepts of nuclear safety regime and nuclear security measures have defining event security in relation to individuals, property, society and the environment for the prevention, detection and response possible harmful consequences.[20] States have the responsibility to establish laws and regulatory framework, the implementation of administrative measures, maintain and sustain nuclear security regime for activities in this area that are under its jurisdiction; authorities, regulatory agencies, the responsibilities of authorized protection of

[17] See *Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities*, INFCIRC/225/Revision 5, IAEA Nuclear Security Series No. 13, Vienna, 2011. These guidelines were developed in 1972, revised in 1977, 1989, 1993 and 1998. Reducing the number of buildings and sites where nuclear weapons and weapons-usable nuclear material exist is a key element of preventing nuclear theft and nuclear terrorism, as the only way to completely eliminate the risk that nuclear material will be stolen from a particular location is to remove the material itself. States can achieve more effective nuclear security at lower cost if they have fewer places with nuclear weapons or weapons-usable nuclear material to protect. http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N09/523/74/PDF/N0952374.pdf? (Accesed 10 May 2014).

[18] Manufacture, supply, receipt, possesion, storage, use, transfer, import, export, transport, maintenance, and recycling or disposal. See, *Nuclear Security Recommendations on Radioactive Material and Associated Facilities*, INFCIRC/225/Revision 5, IAEA Nuclear Security Series No. 14, Vienna, 2011.

[19] Unauthorized activities, unauthorized possession, failure by a person authorized to carry out the responsibility of controlling nuclear and radioactive materials. See *Nuclear Security Recommendations on Nuclear and other Radioactive Material out of Regulatory Control*, IAEA Nuclear Security Series No. 15, Vienna, 2011. See *Physical Protection of Nuclear Material and Nuclear Facilities* (INFCIRC/225/Revision 5); and Radioactive Material and Associated Facilities.

[20] See *Nuclear Security Fundamental Obiective and Essential Elements of a State's Nuclear Security Regime*, IAEA Nuclear Security Series No. 20, 2013.

international transport of these materials to transfer to other states, setting the national law punishing violations of the security system, international cooperation and assistance for the exchange of experience and information, internal or external threats nuclear safety, treatment of sensitive, evaluation and procedure for notification of events, the response to such events. [21] Nuclear security regime intended to protect people, property, society and the environment from the negative consequences of security events by preventing, detecting and responding to such events.[22] The essential steps are: establishing a national legal framework for the establishment of competent authorities and providing the necessary resources to prevent operation, alarm and/or alert, intervention in case of a security event, punishing perpetrators. It is the duty of states to assess threats to national production of crime and unauthorized acts with nuclear security implications regime. In the event of a nuclear security event, according to international obligations or under national law, Member States shall inform the international organizations.[23]

Nuclear security risks are very complex, their management being serious importance. Some of the most serious risks are dependent on certain storage locations of nuclear material used to manufacture nuclear weapons, especially if security measures are low and intentions of potential adversaries to eliminate them from a serious threat.[24] At present, it is difficult to accept the possibility of theft of nuclear material but in terms of nuclear safety, have stopped any plans to build or expand facilities outside the safety standards that are otherwise non-proliferation.

Nuclear security threats concern: nuclear weapons, nuclear material for the manufacture of nuclear explosive available, radioactive materials including devices that affect individuals or the environment or dissemination of such materials by sabotaging installations that are working with such materials. Among the major threats to international stability and security, nuclear or radiological terrorist acts on the occasion of major public events (political and economic meetings, sports games) have become a reality.[25] IAEA standards should provide guarantees that nuclear disarmament under the auspices of the agency, removes the nuclear threat from the state subject to this procedure for other states through verifications. The confidence generated by the verification results are considered in a future strengthening of nuclear safety regime. Against the threat of "dirty" bombs - a combination of radioactive materials and explosives[26] - with potential impact particularly severe consequences, they developed a series of standards. The standars have required the

[21] International organizations are more than the sum of their members and are able to carve out elements of autonomy, often increasingly so as they mature and grow. In fact international organizations are established for the very reason that states cannot carry out certain functions and need to devolve them to a collective agency if they are to be accomplished at all. http://nnsa.energy.gov/sites/default/files/nnsa/12-13-inline-files/2013-12-12%204%20Year%20 Effort.pdf (Accesed 10 May 2014).

[22] See *Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities* (INFCIRC/225/Revision 5).

[23] The IAEA, the United Nations, ICPO-INTERPOL, EUROPOL, WHO, WCO and IMO. See *International Legal Framework for Nuclear Security*, IAEA International Law Series No. 4, Vienna 2011.

[24] When an attempt was made by the United States in its proposed 1946 Baruch Plan to block use of the veto in the case of nuclear related enforcement matters, the Soviet Union objected and the attempt failed. See Henry Sokolski, *Nuclear Weapons Materials Gone Missing: What Does History Teach?* The Strategic Studies Institute of the United States Army War College, 41.

[25] See *Nuclear Security Systems and Measures for Major Public Events*, IAEA International Law Series No. 18, Vienna 2012.

[26] The radiological dispersal device (RDD); The radiological exposure device (RED); The improvised nuclear device (IND); A sabotage attack on a nuclear facility with the intention of causing a release of radioactive material; A deliberate act to contaminate food or water supplies with radioactive material. http://cns.miis.edu/npr/pdfs/152_reistad_appendix2.pdf (Accesed 15 May 2014).

technical standards and administrative organizational structures, plans, strategies, concepts and security operations and arrangements for their implementation.

Safety standards are developed with IAEA Safety Standards Commission and Fundamentals,[27] for the requirements and guidelines in this area. Radioactive sources are classified by categories: nuclear safety, radiation safety, transport safety, waste safety and general safety.[28] Incidents related to lack of authorization, activities or events, are of three categories: unauthorized access, unauthorized transport or discovery of radioactive materials as a result of deficiencies control systems, security and storage. Ensure compliance with international standards of nuclear safety and radiation technologies and international obligations - not to be engaged in activities that may cause damage to another state. There have been reports about the existence of enriched Uranium and cobalt-60 in the goods manufactured from recycled metals used to manufacture them. Establishing a barrier to nuclear material - Significant Quantity (SQ)[29] - far below what is necessary to build a bomb is a glitch that causes big problems to a coherent safety.[30]

In 1995, the international community established a database on incidents and illicit trafficking in nuclear and radioactive substances,[31] coordinated by the IAEA and constituted on voluntary reporting of data regarding the platform Nuclear Security Plan.[32] Collect data on all types of nuclear material[33] and the incident takes place through a network of National Contact Points.[34]

On 31 December 2013, there are confirmed 2477 incidents (424 unauthorized possession or other criminal activity, 664 thefts or losses, 1337 unauthorized activities and events and 69 cases did not meet any category of incident characteristics). Illegal possession and transportation of nuclear or radioactive materials in order to sell, buy or use in illegal purposes are very critical. During this period, a number of incidents have become an international character by trying to move them across international borders of states. Note that there is a demand for such material, even if the number of transactions made is unknown.

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[27] The Commission on Safety Standards.

[28] See *Categorization of Radioactive Sources*. Safety Guide No. RS-G-1.9, IAEA, August 2005, http://www-ns.iaea.org/standards/ (Accesed 10 May 2014).

[29] The IAEA defines a *significant quantity* as *"the approximate amount of nuclear material for which the possibility of manufacturing a nuclear explosive device cannot be excluded."* AEA Safeguards Glossary, 2001 Edition, p. 23. http://www-pub.iaea.org/MTCD/publications/PDF/nvs-3-cd/PDF/NVS3_scr.pdf. (Accesed 15 May 2014).

[30] Significant Quantity (SQ), HEU) - 1SQ is defined as 25 kilograms, and for Pu, 1SQ is 8 kilograms. Weapon states have produced working weapons with significantly smaller amounts of materials. See Leonard Weiss, **"**The nonproliferation regime and its discontents", in Henry Sokolski, *Nuclear Weapons Materials Gone Missing: What Does History Teach?* The Strategic Studies Institute of the United States Army War College, 45.

[31] The IAEA Incident and Trafficking Database (ITDB). In 2010, the participating states changed the name Illicit *Trafficking Database* into *Illicit Trafficking Database; Incident of nuclearand other radioactive material aut of regulatory control* to emphasize the interest and other radioactive materials for an unregulated regime. Incidents are concerning illegal trafficking of nuclear and radioactive materials, their stealing, and loss or other unauthorized activities or events.

[32] See *IAEA Nuclear Security Plan*. 100 countries now have "Integrated Nuclear Security Support Plan" with IAEA. The nuclear security summits have been the Obama administration's signature innovation in global nuclear security governance. See Matthew Bunn, Martin B. Malin, Nickolas Roth, and William H. Tobey. *Advancing Nuclear Security: Evaluating Progress and Setting New Goals*, Cambridge, Mass.: The Project on Managing the Atom, Belfer Center for Science and International Affairs, Harvard University, March 2014, p. 57.

[33] The data reported by member states are confidential and protected and their movement is strictly regulated.

[34] POC – Points of Contact.

The lost or stolen material shortages are due to security systems and control facilities for storage or use, industrial or medical.[35] Radioactive sources can be used in industry, medicine, research and education and certain military applications involving certain risks dependent on the nature of the source, physical and chemical structure of the specific activity of the source used. Medical facilities use a wide range of radioactive materials, rated on a scale 1 to 5, the category 1 being fatal exposure of a few minutes and the category 5 as less dangerous to the human body.

The level of enrichment of Uranium U235 is a criterion that differentiates the HEU (90%) and LEU (25-40%) being significant for the production of bombs; low enrichment makes the material less attractive for the production of bombs. Either use less enriched Uranium nuclear safety is a factor. Peaceful application of nuclear energy also brings some risks of use of nuclear and radioactive materials that become a threat to international security, especially given that responsibility for nuclear safety lies with each state.[36] IAEA has developed a regulatory framework for the construction and use of nuclear energy, infrastructure required standards of competence and capabilities including the operation of nuclear waste.

Conversion HEU to LEU technology. Conversion technology based on enriched Uranium (HEU) with less enriched Uranium-based technology (LEU) [37] is the non-proliferation policies; material resulting from less enriched Uranium technology (LEU) can not be used in the manufacture of nuclear bombs. The development of a national nuclear infrastructure is based on a strategy and policy related to legislation and appropriate regulatory framework and international cooperation.[38] Nuclear material - especially HEU and Plutonium[39] - could be used both for civilian and military[40] that used for civilian purposes not enjoy security measures at the level of the military, with the potential to be

[35] It's about isotopes such as Iridium-192, Cesium-137 and Americium-241. http://nnsa.energy.gov/sites/default/files/nnsa/12-13-inlinefiles/2013-12-12%204%20Year%20 Effort.pdf (Accesed 12 May 2014).

[36] See *The Ministerial Declaration from the International Conference on Nuclear Security: Enhancing Global Effort*, 1 July 2013, Annex of document GOV/INF/2013/9-GC(57)/INF/6, Preamble and Para. 4. At the first nuclear security summit in April 2010, the assembled leaders agreed on the goal of securing all vulnerable nuclear material worldwide within four years, including consolidating Plutonium and highly enriched Uranium (HEU) to fewer locations and minimizing the use of HEU "where technically and economically feasible." See Matthew Bunn and Eben Harrell, *Consolidation: Thwarting Nuclear Theft*, Cambridge, Mass.: Project on Managing the Atom, Harvard University, March 2012, V.

[37] Low enriched Uranium - LEU. See Miles Pomper, *The 2012 Seoul Nuclear Security Summit and HEU Minimization* Washington, D.C.: U.S.-Korea Institute at the Johns Hopkins School of Advanced International Studies, January 2012, http://uskoreainstitute.org/wp-content/uploads/2012/01/USKI_NSS2012_Pomper.pdf (Accesed 15 May 2014).

[38] See *Nuclear Security Fundamental Obiective and Essential Elements of a State's Nuclear Security Regime*, IAEA Nuclear Security Series No.20, 2013.

[39] The implosion bomb that destroyed the Japanese city of Nagasaki used roughly 6 kilograms of Plutonium; a similar bomb using HEU would require roughly three times as much material. Matthew Bunn and Anthony Wier, "Terrorist Nuclear Weapon Construction: How Difficult?" *Annals of the American Academy of Political and Social Science*, Vol. 607, September 2006.

[40] Military HEU or Plutonium stockpiles exist in nine countries: the five nuclear weapon states under the nuclear Nonproliferation Treaty (NPT) - the United States, Russia, the United Kingdom, France, and China - and the four countries outside the NPT (India, Pakistan, Israel, and North Korea). Matthew Bunn and Eben Harrell, *Consolidation: Thwarting Nuclear Theft*, Cambridge, Mass.: Project on Managing the Atom, Harvard University, March 2012, 18.

stolen for illegal purposes. In an integrating vision,[41] the use of LEU, and limiting the spread of plants that enrich and reprocess nuclear material as it can produce material needed for bombs.[42] Currently, in Belarus, South Africa and Ukraine it is estimated that there is enough material to produce nuclear bombs. Isotopes production for medical use 50 kg/year HEU which after use can be directed to the manufacture of bombs. Some of the major consumers of HEU reactors are equipped naval fleets, especially ice breakers, the estimated consumption of approximately 3 tons annually enhanced the proposal that the next generation of nuclear reactors for ships to use LEU technology.[43] It is considered the limiting of civil Plutonium stocks and focus places of storage, reprocessing and fabrication. Through a concerted position which is desirable for producers of medical isotopes to avoid the use of HEU and encourage production of non-HEU isotopes.[44]

Overcoming technical barriers - LEU operation deficiencies of *steady-state* reactors, LEU conversion of isotopes production technology, the difficulties of using only LEU technology *critical assemblies* – it is possible in some cases but it is necessary to continue research and experiments; it is obvious that it is necessary to limit the HEU technologies for which there are alternatives.[45] U.S. has taken a number of measures to focus HEU nuclear material, setting only one place to process HEU (Oak Ridge Y-12 plant) as well as Plutonium (Los Alamos and Savannah River) for civilian purposes. In the military, navy uses several reactors, training or equipping ships or submarines.[46] Unlike the U.S., Russia is more circumspect reducing only two of the four plants manufacturing nuclear weapons and Plutonium production reactors having located three Siberia.[47]

Regarding nuclear safety standards and measures it is necessary to establish global standards of minimum security requirements and legal provisions of the member with elements of extra-territoriality. And international instruments to regulate the sector which is vague and ambiguous language used. [48] There are many obstacles to be considered technical, economic, politic and military to achieve these overall objectives. International recommendations have a number of general and superficial assessments because of the impossibility of influencing the lack of tools, with the cooperation[49] convincing reality tangible threat but without long-term consequences. If during the Cold War, both the

[41] Recognize that highly enriched Uranium and separated Plutonium require special precautions and agree to promote measures to secure, account for, and consolidate these materials, as appropriate. See *Communiqué of the Washington Nuclear Security Summit*, April 13, 2010.

[42] See, Anthony Wier and Matthew Bunn, "Bombs That Won't Go Off," *Washington Post*, November 19, 2006.

[43] See Matthew Bunn and Eben Harrell, *Consolidation: Thwarting Nuclear Theft*, Cambridge, Mass.: Project on Managing the Atom, Harvard University, March 2012, p. 3. http://www.nti.org/analysis/articles/past-and-current-civilian-heu-reduction-efforts/ (Accesed 15 May 2014).

[44] Canada should work to convince Russia to shift to non-HEU production for its isotope contract with Canadian firms. http://nnsa.energy.gov/mediaroom/pressreleases/materialllnl83111 (Accesed 10 May 2014).

[45] http://www.nti.org/analysis/articles/past-and-current-civilian-heu-reduction-efforts/ (Accesed 15 May 2014). See Matthew Bunn and Eben Harrell, *Consolidation: Thwarting Nuclear Theft*, Cambridge, Mass.: Project on Managing the Atom, Harvard University, March 2012,12.

[46] See "NNSA Ships Additional Special Nuclear Material from LLNL," *NNSA/DOE press release*, Washington D.C., 31 August 2011, http://nnsa.energy.gov/mediaroom/pressreleases/materialllnl83111; http://www.nti.org/analysis/articles/past-and-current-civilian-heu-reduction-efforts/ (Accesed 15 May 2014).

[47] See Oleg Bukharin, "Securing Russia's HEU Stocks," *Science & Global Security*, Vol. 7 (1998), pp. 311-331. There are still thought to be more than 200 buildings in Russia where HEU or separated Plutonium is stored or handled. This is far larger than the comparable figure for any other country and far more than Russia plausibly needs. See Matthew Bunn and Eben Harrell, *Consolidation: Thwarting Nuclear Theft*, Cambridge, Mass.: Project on Managing the Atom, Harvard University, March 2012, 19.

[48] See *2005 Amendment, Nuclear Terrorism Convention*, UNSC Resolution 1540.

[49] See Global Initiative to Combat Nuclear Terrorism – GICNT.

Soviet Union and the U.S. had placed nuclear weapons in many countries in recent decades, they have been withdrawn in their territories in 48 locations and temporary locations have been destroyed; However, Russia has about 200 locations with deposits of nuclear material to continue producing U.S. bombers, tactical nuclear weapons in five European countries. Civil HEU stocks from GTRI program are categorized according to: the original source[50] - the U.S., Russia or other sources; purpose of these materials - returning one third for those from the U.S. (Canada, Belgium and the Netherlands keeps part of HEU nuclear material in some locations) for the return of all amounts from Russia for converting HEU into LEU, raising security HEU originating in the USA but not returned.[51] In 2012, the GTRI were returned more than 30 tons of HEU used by other states in nuclear reactors producing deposits of member states.[52]

The strict control of nuclear material, conversion reactors using HEU is voluntary, some states demonstrating goodwill while others did not agree with *de plano* these objectives. India increases the production of nuclear material used in the manufacture of bombs, and Pakistan correlated with two Plutonium-producing reactors and two under construction becomes a major concern of the international community to acceptable developments in China, France, Britain, Israel and North Korea. It is expected these research reactors use a new nuclear material consisting of a mixture of Uranium and Molibdenum. The use of civilian installations in Japan, several European countries including France, Britain, India and China of over 250 tons of Plutonium in combination with Uranium[53] are a way of replacing the HEU technology. Nuclear reactors operate five times faster if you use enriched Uranium (HEU)[54] than using LEU. Global nuclear security reasons, several HEU reactors were closed.[55] Duration building nuclear power plants depends on the available resources and infrastructure of each country, but also the standards of security, safety at each stage of development of the nuclear program.

In 2011, there were 230 operational research reactors,[56] half of them using HEU technology of three types: steady-state reactors, critical assemblies and pulsed reactors. The last two types of reactors can provide material for the manufacture of bombs, two thirds of them being in Russia. Critical reactors type assemblies can use LEU instead of HEU in 2012; over 30 reactors have been converted to LEU technology will be converted to other 26 reactors. There were triggered unilateral or bilateral programs to support these

[50] To U.S. (5.2 tons as of 1996); to Russian (2.4 tons); to other countries (12-13 tons); within U.S. (20 tons as of 2011); and within Russia (20 tons as of 2011). See *IPFM, Global Fissile Material Report 2011*, p. 9.

[51] France and Germany.

[52] 1,623 kg of Russian; 1,250 kg of U.S.; 252 kg not U.S. or Russian origin. In addition, the HEU removed from Iraq by the UN in 1992; 600 kg from Kazakhstan to the US in 1994; the HEU from Georgia to UK in 1998; the HEU from Serbia to Russia in 2002. See Matthew Bunn and Eben Harrell, *Consolidation: Thwarting Nuclear Theft*, Cambridge, Mass.: Project on Managing the Atom, Harvard University, March 2012, p. 15.

[53] Uranium-Plutonium mixed Oxide - MOX.

[54] Highly enriched Uranium - HEU. The 2010 Nonproliferation Treaty review conference final document encouraged states to minimize HEU in civilian stocks, again "where technically and economically feasible." United Nations Security Council, "Resolution 1887" S/Res/1887 (New York: United Nations, 24 September 2009), http://daccess-dds-ny.un.org/doc/UNDOC /GEN/N09/523/74/PDF/N0952374.pdf?OpenElement (Accesed 15 May 2014).

[55] Encourage the conversion of reactors from highly enriched to low enriched Uranium fuel and minimization of use of highly enriched Uranium, where technically and economically feasible. See *Communiqué of the Washington Nuclear Security Summit*, April 13, 2010.

[56] http://nucleus.iaea.org/rrdb (Accesed 15 May 2014). Since 1978, some 62 HEU-fueled reactors have converted to LEU and approximately 125 have shut down without converting. http://cns.miis.edu/npr/pdfs/152_reistad_appendix2.pdf (Accesed 15 May 2014).

objectives of nuclear safety.[57] Costs related to transportation, storage, decontamination, converting *critical assemblies* and *pulse reactors* to LEU are more expensive than the continued use of the respective technology HEU reactors and the supply of processes LEU reactors are more expensive technology. By 2012, 20 states have converted HEU reactors to LEU technology. [58]

However, citing political and military reasons, several states have raised a number of objections concerning the conversion of HEU reactors, from achieving sovereignty, loss of certain military potential advantages, connecting with the issue of disarmament, with great powers and states dezechilebrele cycle through weapons neposesoare nuclear (case of Belarus, Libya, South Africa). [59] It is believed that over 15 critical assemblies and pulsed reactors HEU can not be the subject of conversion program for political or technical. HEU research reactors consume more than 700 kg annually. [60] In the U.S., there are operating more than 20 HEU research reactors, mostly under military supervision and almost all under military guard according to security standards according to categories currently, two HEU *critical assemblies* continue to operate in Nevada and Idaho and in the European Union operates five critical HEU assemblies. In Russia, the U.S. support[61] more HEU research reactors were closed, the conversion is in the discussion stage,[62] continuing to operate 27 *critical assemblies* and 15 HEU HEU *pulse reactors*. [63] Policy converting HEU

[57] The U.S. Global Threat Reduction Initiative (GTRI), established in 2004, The Material Consolidation and Conversion (MCC) HEU within Russia, The U.S. Reduced Enrichment for Research and Test Reactors (RERTR). See *Past and Current Civilian HEU Reduction Efforts*" Nuclear Threat Initiative http://www.nti.org/analysis/articles/past-and-current-civilian-heu-reduction-efforts/ (Accesed 15 May 2014).

[58] Iraq (1992), Colombia (1996), Spain (1997), Denmark (1998), Georgia (1998), Philippines (1999), Thailand (1999), Slovenia (1999), Brazil (1999), Greece (2005), South Korea (2007), Latvia (2008), Bulgaria (2008), Portugal (2008), Romania (2009), Libya (2009), Taiwan (2009), Chile (2010), Serbia (2010), Turkey (2010). Twelve countries eliminated all of their HEU during the four-year effort: Austria, Chile, Czech Republic, Hungary, Libya, Mexico, Romania, Serbia, Taiwan, Turkey, Ukraine, and Vietnam. US Department of Energy, National Nuclear Security Administration, *The Four-Year Effort: Contributions of the Global Threat Reduction Initiative to secure the world's most vulnerable nuclear material by December 2013* (Washington, D.C.: DOE/NNSA, December, 2013), http://nnsa.energy.gov/sites/default/files/nnsa/12-13-inlinefiles/2013-12-12%204%20Year%20Effort.pdf (Accesed 15 May 2014).

[59] See Miles Pomper, "Bringing Belarus Back to the Table," *WMD Junction*, 20 September 2011, http://cns.miis.edu/wmdjunction/110920_belarus.htm (Accesed 15 May 2014). Why should they give up one small stock of HEU when countries like the United States and Russia still have hundreds of tons of this material, including the material in thousands of nuclear bombs? When they have already fulfilled their obligations as non-nuclear-weapon states under the NPT, why should they go still further than the treaty requires by eliminating their HEU when the nuclear weapon states have not (in their view) fulfilled their obligation to negotiate in good faith toward nuclear disarmament? See William Potter, "Nuclear Terrorism and the Global Politics of Civilian HEU Elimination," *The Nonproliferation Review*, Vol. 15, No. 2, (July 2008), pp 135-158.

[60] Ole Reistad's Untitled Presentation at the 2nd International Symposium on HEU Minimization (Vienna, Austria: January 2012), https://www.nti.org/media/pdfs/Reistad_-_HEU_Symposium__Vienna_23_jan_2012.pdf?_=1328045837 (Accesed 10 May 2014).

[61] The Material Consolidation and Conversion (MCC). Russia's nuclear complex includes all of the types of nuclear facilities and nuclear material handling procedures that would be subject to a global system. See Dmitry Kovchegin, *Developing a nuclear material control and accounting system in Russia*, CISSM Working Paper, Center for International and Security Studies at Maryland, December 2013, 1.

[62] http://nnsa.energy.gov/sites/default/files/nnsa/inlinefiles/FY%202012%20NNSA%20Congressional%20Budget%20Submiss ion_0.pdf (Accesed 20 May 2014).

[63] See Matthew Bunn and Eben Harrell, *Consolidation: Thwarting Nuclear Theft*, Cambridge, Mass.: Project on Managing the Atom, Harvard University, March 2012, 24.

reactors to LEU replacing technology is promoted by China (converted two and closed two reactors HEU), India (converted by their own efforts reactor HEU).

Protection and control of nuclear and radioactive materials against the use for criminal purposes and response to nuclear security events required to be subject to international regulation, given the global importance of nuclear technology and radioactive.[64] Outside attention to civilian HEU material, including spaces where it is stored, nuclear safety requires attention and other deposits: for civil Plutonium, HEU and Plutonium military and nuclear weapons storage facilities.[65] A number of questions are recorded in the literature, relevant documents related to the destruction of nuclear weapons production program of South Africa, before inviting the IAEA to verify its waiver program, but especially how much nuclear material was produced. Even after more than 20 years, many of the South African government secrets about stopping the production of nuclear weapons were not clear. [66] It is the unanimous view that a global perspective is necessary for eliminating the enriched Uranium (HEU) in civilian purposes, limiting the number of states with access to nuclear materials or reducing stockpiles of nuclear material removal from vulnerable locations.[67] Great powers can and should be involved in raising nuclear safety implications given their relations with other countries in this field; Russia should pursue that return of HEU transferred to other states use; France and South Korea to ensure LEU to research reactors from HEU to LEU converted; Canada, the UK and China to support the elimination of HEU and convert HEU reactors.

Nuclear security measures to detect unauthorized criminal acts are organized in global initiative to combat nuclear terrorism, respecting the classical triad - prevention, detection, response.[68] Implementing an effective detection structures - components, procedures, concepts, and information instruments alarm/alert assessment standards and alerts - the great challenges of international nuclear safety regime.[69]

With all the achievements in the field of nuclear safety, at present we can not talk organized by level standards regarding weapons, Plutonium or highly enriched Uranium

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[64] See *Nuclear Security Fundamental Obiective and Essential Elements of a State's Nuclear Security Regime*, IAEA Nuclear Security Series No.20, 2013. Making a simple "gun-type" bomb, the easiest for terrorists to build, requires at least 50 kilograms of HEU enriched to 90% U-235.

[65] Recognizing States' rights to develop and use nuclear energy for peaceful purposes, and noting the responsibility of each State for the use and management of all nuclear materials and facilities under its jurisdiction and recognize that highly enriched Uranium and separated Plutonium are particularly sensitive and require special precautions. See *Work Plan of the Washington Nuclear Security Summit*, April 13, 2010.

[66] See Sara Kutchesfahani and Marcie Lombardi, "*South Africa" in Nuclear Safeguards, Security, and Nonproliferation: Achieving Security with Technology and Policy*, James E. Doyle, ed., Butterworth-Heinemann, 2008.

[67] In 2005, Bratislava nuclear security initiative agreed to by then-U.S. President George W. Bush and then-Russian President Vladimir Putin, Russia insisted on inserting the phrase "in third countries" in the reference to converting HEU-fueled research reactors to LEU, focusing the effort only on facilities beyond Russia's borders. See Matthew Bunn and Eben Harrell, *Consolidation: Thwarting Nuclear Theft*, Cambridge, Mass.: Project on Managing the Atom, Harvard University, March 2012, 24.

[68] The Global Initiative to Combat Nuclear Terrorism - GICNT. See Sam Kane and Kingston Reif, *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*, Washington, D.C.: Center for Arms Control and Nonproliferation, June 13, 2013.

[69] See *Nuclear security systems and measures for the detection of nuclear and other radioactive material out of regulatory control: implementing guide*, IAEA Nuclear Security Series No.21, 2013. The Convention on Physical Protection of Nuclear Materials and IAEA recommendations specify that any stock of material that contains 5 kilograms or more of U-235 in HEU, or 2 kilograms or more of Plutonium, should be considered "Category I," requiring the highest level of security. http://nucleus.iaea.org/rrdb (Accesed 20 May 2014).

(HEU) nuclear power facilities;[70] in terms of increased confidence that the other member states meet the standards of nuclear safety, can not speak of an international mechanism to deal with this problem; concerns in this regard are not constant and do not exceed the declarative level. The negotiations on agreements on nuclear safety objectives are limited, requiring a long period of negotiation depends on the format in which the determined political will and not needed. In the literature, the proposal was made by giving up nuclear power technology that uses enriched Uranium, removing the nuclear material for civilian purposes.[71] Global Nuclear Safety aims to limit the enrichment or reprocessing Plutonium or HEU to produce that can be used to make bombs, such as North Korea or Iran. Negotiating an international framework for cooperation on nuclear energy[72] though which regulate the procurement of nuclear fuel in order to reduce the possibility of building enrichment or reprocessing facilities, international tracking the entire cycle for producing nuclear energy.

It is desirable and good to be negotiated an international agreement to limit installations of obtained, processed, stored and used Plutonium or at least to be the default.[73] Nuclear material can be used both to produce nuclear energy and to the production of nuclear weapons; given the second possibility, it is safe storage outside any doubt.[74] Methodically, there are two solutions to the nuclear incident: storage and monitoring and in the case of the incident, tracking and tracing of missing material.

[70] Belarus must return to its commitment to eliminate its dangerous HEU stockpile. South Africa must eliminate the hundreds of kilograms of HEU left over from its former weapons program (and the smaller stocks of HEU in irradiated fuel and targets from the Pelindaba reactor). Japan should close or convert its Fast Critical Assembly, which also has hundreds of kilograms of weapon-grade HEU. See Matthew Bunn and Eben Harrell, *Consolidation: Thwarting Nuclear Theft*, Cambridge, Mass.: Project on Managing the Atom, Harvard University, March 2012, VIII.

[71] See Matthew Bunn and Eben Harrell, *Consolidation: Thwarting Nuclear Theft*, Cambridge, Mass.: Project on Managing the Atom, Harvard University, March 2012, 3.

[72] An International Framework for Nuclear Energy Cooperation.

[73] The nuclear future will be strongly influenced, too, by the success or failure of efforts to strengthen the international organizations and the set of agreements that comprise the system developed over time to manage global nuclear affairs. See Steven E. Miller & Scott D. Sagan, Nuclear power without nuclear proliferation? *Dædalus Fall* 2009, p. 8.

[74] It should be noted that such countries as China, France, Great Britain and India actively continue to modernize their nuclear forces and assets enhancing their warheads and their delivery vehicles. See Andrei Kokoshin, *Ensuring Strategic Stability in the Past and Present: Theoretical and Applied Question*, Belfer Center for Science and International Affairs, Harvard Kennedy School, 2011, p. 32.

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