

Nuclear Security in the Middle East: Challenges, Solutions and Regional Cooperation

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Abstract

Objective: Considering the fact that nuclear power technology and facilities have recently entered the Middle East, and that more reactors are to enter the area, this article analyzes issues relating to nuclear security challenges and the cooperation of countries in the region. This is vital for Middle Eastern governments who are seeking nuclear power to implement effective national policies in order for membership in international treaties and for joining international regimes. Using library resources, the present paper, seeks to respond appropriately to the main question: what are the core nuclear security challenges in the Middle East?

Method: This research uses descriptive-analytic methodology, and the data is collected from the library resources and documents.

Results: Article findings show that nuclear security in the Middle East is confronted with the challenges posed by proliferation, increasing arsenals, expanding civilian nuclear programs, weakening nuclear export controls, domestic instability and terrorism in several Middle East countries.

Conclusion: The scenario of Middle East becoming nuclear further strengthens its instability. The Middle East is at the crossroads of growing nuclear (military and civilian) nuclear programs and increased nuclear / radioactive security threats. Therefore, there is an indirect link between nuclear facilities and nuclear weapons that prevents nuclear security. The growing trend of nuclear power plants for civilian and military use has increased the efforts to manage nuclear and radioactive materials and prevent the spread of nuclear weapons.

Keywords: Nuclear Energy, Nuclear Security, Middle East, Regional Cooperation, Challenges and Solutions.

1. Introduction

The importance of nuclear security is known globally. The international community has provided a roadmap aimed at bringing the world from a pivotal nuclear point to a relatively safe and secure nuclear world that ultimately paves the way for global nuclear disarmament. The Roadmap includes actions such as the Nuclear Non-Proliferation Treaty, bilateral treaties, multilateral efforts, workshops and international commissions.(www.icnnd.org) The Nuclear Non-Proliferation regime has convened three nuclear security summits on the threat of nuclear terrorism, which received international support for preventing the purchase of illicit nuclear material by non-state actors.(www.armscontrol.org) While some countries have lowered the reserves that could be used to produce their nuclear weapons, nuclear dangers in the Middle East seem to be gradually intensifying. The increase in nuclear arsenals, the expansion of nuclear energy programs, transport risks, vulnerabilities due to deliberate nuclear sabotage and sudden accidents have increased the potential nuclear risks in the Middle East. Nuclear energy entails deep security threats for the Middle East, but not the way you might expect. Of all the events that have caused mass deaths and massacres in the Middle East in recent years - including civil war, terrorism, ethnic cleansing and famine - there has not been any potential threat to the lives of people arising from the threat of nuclear power. However, even if the region is able to avoid these current threats, there is still a need to face a major emerging nuclear challenge: the expansion of civilian nuclear energy programs that do not enjoy adequate safety and security measures. Given that the nuclear power technology and facilities have just entered the area and more reactors are on the way, issues related to nuclear security are of vital importance. Mutual encouragement to adopt such national policies and actions is one way in which governments in the region can join this common goal. Another way is that in situations of high political problems, the Middle Eastern countries may find useful tools and mechanisms for regional coordination and cooperation. At the highest level of regional cooperation, governments may seek to create a framework for regional cooperation regarding nuclear security. (<https://ntiindex.org/>)

This article seeks to examine the following:

- the amount of nuclear insecurity in the Middle East;
- Factors affecting nuclear insecurity in the Middle East.

This article also tries to offer some recommendations that may help Middle East countries to enhance nuclear security standards.

2. Nuclear Security Culture as a Framework for Nuclear Security

Prevention, detection and response to theft, sabotage, unauthorized access, illegal transfer, or any act involving illicit nuclear material and other nuclear or radioactive substances associated with them are called nuclear security. (www.pub.iaea.org) this definition focuses less on arms control and on non-proliferation of nuclear weapons, and more on the threat of misuse of nuclear material and vandalism in nuclear facilities. The central principles of nuclear security consists in an effective security culture, which plays an important role in ensuring that individuals, organizations and institutions vigilantly have surveillance over the utilities and materials, and that they take continued and sustainable measures in order to prevent or fight with the threat of sabotage or the use of radioactive materials for destructive operations.(www-pub.iaea.org) The nuclear security culture, on the other hand, is a set of attributes, attitudes and behaviors of individuals, organizations and institutions that act as a means to protect and enhance nuclear security.(www-pub.iaea.org) The culture of nuclear security is crucial for effective governance of states with nuclear capacities and technologies. It is understandable that, as long as governments continue to maintain their nuclear weapons and nuclear facilities, they must respond to the security of their strategic assets. Nuclear countries must ensure that they can physically protect their arsenals and nuclear facilities against any unauthorized access, incidents or diversions. An effective nuclear security regime comprises rules, legislations, regulations, intelligence agencies, threat assessment agencies, cyber units, facilitation of reactions, and reduction of nuclear risks. The ability of the community of nations to make nuclear armed states able to respond the need for securing their weapons and technologies depends on proper knowledge of the structures and processes of governing and controlling nuclear weapons in these countries.(Born et al, 2010: 3) It is essential that developing countries having nuclear weapons and facilities create expert nuclear supervision, accountability, transparency, safety and security so as to facilitate the emergence of a responsive nuclear culture. This can in turn lead to trust between members of the international community regarding the effectiveness of the nuclear policies of countries having nuclear weapons and facilities. A high degree of domestic measures in the field of nuclear security can guarantee nuclear security standards at a global level. However, due to the absence of a global agreement on guidelines for effective nuclear security measures, assessing security at a global level is a difficult task to do. (Kile, 2006: 552–555) Several international legal documents have tried to set up a nuclear security-related regulations, but in international law no single and comprehensive document about nuclear security is available.

3. Nuclear Security: The Inevitable for the Middle East

The Middle East is the newly emerging center of nuclear energy and nuclear technology, where nuclear energy is rapidly increasing to meet economic challenges. Fears of nuclear incidents all over the world indicate the urgent need to enhance the safety of nuclear power plants. On the other hand, guaranteeing nuclear weapons is inevitable for human survival. Today, the world is still not on track to achieve effective security for all nuclear weapons stockpiles and nuclear materials used in nuclear weapons. (Bunn, 2010) The problem is that there is no universal law that specifies how much security there should be. There are currently more than 100 nuclear research reactors around the world that use highly enriched uranium, many of which do not have sufficient security. (Kearns, 2010:8) The transportation of nuclear material, the theft of nuclear material and the disposal of radioactive waste are a major concern in nuclear security. There are two categories of security risks associated with nuclear technology: 1-the release of nuclear radiation as a result of a terrorist attack on nuclear material or facilities that are being transmitted, and 2-the production of a hand-made nuclear device or a radioactive broadcasting equipment because of the theft of nuclear or radioactive material by non-state actors. (Sagan, 2010) Preventing access and use of nuclear bombs by terrorist groups is a priority for many policy makers because of the very unpleasant consequences. An explosion of a radiological bomb is a possible scenario, which can have serious social and economic consequences. (Zaleski, 2010:8) Why is nuclear security inevitable in the Middle East? There are several reasons highlighting the importance of nuclear security in the Middle East in the 21st century:

A) The Risk of Nuclear Terrorism

B) Ineffective nuclear safety measures

C) Energy crisis and peaceful nuclear industry

D) Nuclear security leading to nuclear disarmament and non-proliferation. (Sabat, 2013:56)

In the Middle East nuclear security status is more dangerous and more troublesome than what it seems to be. The key question we are facing is whether the Middle East countries have the ability to secure its nuclear facilities? The Middle East is confronted with numerous complex tensions and crises. Today, there are many insecure countries in the Middle East that are planning to build nuclear facilities for peaceful purposes. However, considering the specific geography of this region and the proper climate, the use of wind and solar power to provide energy and electricity seems to be more reasonable in these countries. According to studies conducted at the American University of Beirut, the development of the nuclear program in the countries around the Persian Gulf is by no means economical and requires huge costs, because of the lack of natural

uranium resources and the lack of sufficient infrastructures for exploiting nuclear energy in these countries. On the one hand, with the presence of terrorist groups and non-state actors in the region, and on the other hand, with Israel and its particular relationship with some of the countries of the region, there can be no clear future with regard to nuclear security from these countries. The issue becomes more complex when it comes to recalling that countries like Saudi Arabia, the United Arab Emirates and Qatar have relationships with terrorist groups in the Middle East such as ISIS, Nusra Front and al-Qaeda and support them. (Al Sabbagh, 2016) It can be concluded from the above mentioned points that the necessary infrastructures for the exploitation of nuclear energy in the Middle East countries, especially those around the Persian Gulf, are not available and that the possibility of nuclear facilities in these countries can be considered a major threat to the security of other countries in the region. There are blurred borderlines between military and peaceful nuclear programs that prevent the implementation of global standards so as to enhance nuclear security in the Middle East. Also the demand for nuclear energy will continue to increase, hence requiring adequate security measures to mitigate the risks of nuclear energy programs. Given the fact that an advanced economy like Japan, with all the technical power and acclaimed safety culture fails to prevent and manage nuclear incidents, it is questionable whether the Middle East can protect itself from a nuclear disaster. (Al Faraj, 2011:5) Despite the benefits of nuclear energy, including the production of nuclear power, protection and security of nuclear facilities can be a big problem for the Middle East because of the serious issues concerning safety. Consider Israel's concerns about the nuclear program in Jordan as an example. Jordan was forced to transfer its first nuclear power plant from Aqaba to Zarqa, east of Amman, because Aqaba was located in an earthquake-prone area. However, there is no guarantee that other regional governments do so, especially if they have hostile relations with their neighbors. With regard to the pattern of wind flow, any incident in nuclear power plants can lead to nuclear contamination throughout the region. All the nuclear power plants under construction are located next to the shared waters: the Persian Gulf, the Mediterranean Sea and the Red Sea. (Khaitous, 2008) Research shows that the Middle East is still not ready for nuclear renaissance. Given the real risks of terrorism and the stealing of radiological materials, nuclear sabotage and the lack of domestic expertise in nuclear security, a clear future for the security of nuclear energy in the region is not conceivable.

4. Increased Nuclear Risk in the Middle East

Today, there are several countries in the Middle East that are said to have nuclear weapons, materials or technology, and this number may increase in the future. Significantly, the Middle East remains at the core of the

expansion of nuclear energy, given its economic dynamism and the growing demand for non-fossil energy. (Dunne, 2018) The Middle East includes a country with nuclear weapons (Israel), three countries with nuclear plants in construction or in operation (Iran, Saudi Arabia and the UAE), and several countries planning to develop nuclear programs (Turkey, Jordan, Iraq, Egypt). Similarly, a nuclear-Israel may create a domino effect, and push other countries in the region to become atomic. (Gerami, 2011) Also the proliferation of nuclear weapons by Israel may further aggravate a weapons race among competing nations in the region and even promote the proliferation of conventional weapons, thus endangering nuclear security. Some nuclear power plants in the Middle East are unfortunately created in the name of "development" in the region. Nuclear innovation among the Persian Gulf states is seen against Iran's nuclear program and its uranium enrichment capability, especially as a possible plan - a nuclear defense doctrine. It seems that fear, credibility, and competition are also twisted into this topic. Geopolitical tensions make nuclear energy a very controversial issue in the region, because governments suspect that their neighbors may use their peaceful nuclear programs for military purposes. While Middle East awareness of the urgent need for a mechanism to enhance nuclear security has increased, the importance of continuing nuclear weapons and energy is a major challenge in the national security strategies of the countries of the region. (www.economist.com) In other words, the Middle East will become the center of the global nuclear activities and therefore the potential nuclear center of insecurity, with the threat of terrorist networks seeking nuclear and radiological materials for their own purposes. The growing nuclear ambitions of several countries in the region, accompanied with nuclear and radiological threats from non-state actors, have led to the essentiality of creating a nuclear security structure that is resistant to the proliferation of nuclear weapons in the region. The presence of nuclear weapons and facilities in countries with aggressive intentions (Israel) and in unstable and unsustainable political regions (West Asia) has made susceptibility to sudden accidents, miscalculations, deliberate sabotage and theft of nuclear material. The presence of several terrorist groups based around the borders and inside the Middle East countries, in addition to showing that these concerns are not unfounded, emphasizes that effective monitoring of nuclear facilities and weapons is, in fact, the most important effort to be made so as to prevent proliferation of nuclear weapons and materials. (Kile, 2006:553)

5. Expansion of Nuclear Energy in the Middle East

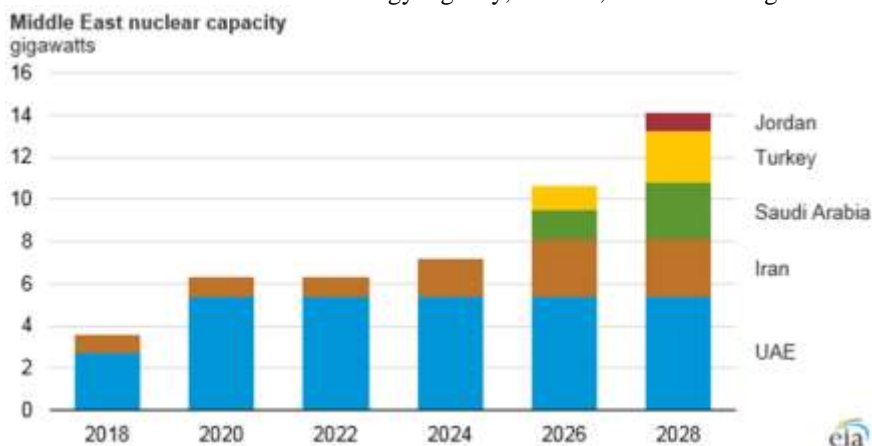
In the viewpoint of the countries' officials and analysts, nuclear energy is still respected. Nuclear power has been struggling to maintain its

economic growth for over fifty years. But its popularity has often dropped due to nuclear incidents. There might be a convincing argument against any reasoning in favor of nuclear power. Most Middle Eastern countries consider nuclear energy as a means to enhance energy security, diversify energy sources, save on fossil fuels, reduce climate change and even increase national credibility. In fact, "nuclear renaissance" in the Middle East has been excessively expanding from the outset, and the region has become the center of nuclear energy development. You cannot blame the Middle East for its consideration and investment on nuclear energy. There are legal and rational reasons for countries in the Middle East to seek alternative energy sources. The rising demand for electricity, coupled with pressures to reduce carbon emissions, has caused nuclear power plants to respond appropriately to both problems. Nuclear power can also be considered as an effective means to reduce climate change and desalinate seawater (Krane, 2015:35). Indeed, the nuclear power train in the Middle East has started to move since many years ago and does not seem to stop. Several countries in the region, including Egypt, Iran, Jordan, Kuwait, Qatar, Saudi Arabia, Turkey and the United Arab Emirates, view nuclear energy as a long-term solution to their dependence on fossil fuels. Iran's nuclear deal promotes a clear future through cooperation in the nuclear field. The development of nuclear energy in an unstable region is always taken into consideration. Low oil prices, reduced hydrocarbon resources, and additional government costs have made some Middle Eastern countries to pursue their nuclear program. Iran, Saudi Arabia and the United Arab Emirates have already begun to develop their power plants, and other countries in the region are interested in developing their nuclear program. In the next decade, newly planned nuclear power plants will begin to operate throughout the Middle East. Nuclear power plants in the Middle East have grown dramatically over the past decade. According to the World Nuclear Association, Iran's nuclear power plant in Bushehr, the first of its kind in the Middle East, began electricity production in 2011. Tehran has plans for 11 other nuclear reactors. The UAE's Baraka project will start at a total capacity of 5.6 GW, the first electricity generation unit will be launched in 2017, and the final unit will be completed in 2020 and will provide nearly a quarter of the country's needs. Saudi Arabia's ambitious nuclear program will include the construction of 16 nuclear reactors by 2032 with a capacity of more than 17 GW (which is expected to meet 15% of the country's electricity needs). Saudi Arabia's first reactor is expected to be operationalized in 2022. (Anderson, 2015:72) Jordan signed a contract with Russia's Rosatom Company to build the first Jordanian nuclear power plant with a capacity of 2,000 MW, which will be operationalized in 2023. Turkey recently announced that the construction of the Akkuyu nuclear power plant in Mersin will be completed in 2019. (www.aa.com.tr) Egypt signed a contract with

Russia's Rosatom Company to build four reactors with a capacity of 1200 MW over the next twelve years. Kuwait is studying on the construction of several nuclear power plants by 2022, and has signed contracts with Japan in this regard. Qatar also began a study to build a nuclear power plant in the construction of which France and Russia are said to be involved. The map below shows the quadrupling of nuclear power plants in the Middle East over the next ten years. Below the map there is a chart showing the growth of nuclear electricity production capacity in the Middle East by 2028.



Source: U.S. Energy Information Administration, International Energy Statistics, International Atomic Energy Agency, Reuters, and Bloomberg



Source: U.S. Energy Information Administration, International Energy Outlook 2017, International Atomic Energy Agency, World Nuclear Association

6. Upcoming Problems

The discourse of the proliferation of nuclear weapons is no longer limited to the nation-states seeking nuclear capabilities. Nuclear materials are attractive terrorist tools for terrorist groups like Al-Qaeda, which have expressed their desire to get them for destructive purposes. The risk of terrorists using nuclear material is very high and it is considered a serious threat to international peace and security. (<https://onu-vienne.delegfrance.org>) The expansion of nuclear arsenals and nuclear energy programs in the Middle East, in the absence of a security architecture, will further pave the way for terrorists to access nuclear weapons and materials. Nuclear reserves and nuclear power plants increase the risk of internal and external threats through diversion, miscalculations, sabotage and nuclear incidents. Nuclear weapons, which are meant to promote security for governments, are increasingly becoming a threat to international security (Camilleri, 1984:212). Hence, it is important to address the threat posed by identifying the dangerous elements for nuclear security in the Middle East. This paper outlines several parameters that affect the Middle East's nuclear security and emphasizes the importance of efforts to improve, strengthen and maintain nuclear security in the Middle East.

6-1. Geopolitical Challenges

The horizontal and vertical expansion of weapons and nuclear power plants in the Middle East has increased the perception of threats in the region. Nuclear security is vulnerable in the Middle East and it has contributed to the delivery of geopolitical concepts. Israel has widespread nuclear weapons and its nuclear arsenal is expanding with the US support, which has created major concerns for the Middle East. Saudi Arabia has also expressed its desire to achieve nuclear capability. Israel has stated that Iran's nuclear program poses an existential threat to Israel and that they have a military option to destroy Iran's nuclear facilities. (Kazi, 2014) An Israeli attack on Iran's nuclear facilities may destabilize the entire region. This could jeopardize the security of the region and negatively affect the oil market and, consequently, the global economy. While increasing the willingness, readiness and determination of Iran to protect their national interests and their security, such statements will aggravate the instability crisis throughout the region. (Dinucci, 2018)

6-2. the Risk of Nuclear Terrorism

The nuclear security in the Middle East is faced with a wave of terrorism that has destabilized several countries in the Middle East. 82% of the total casualties of terrorist attacks are from five countries only: Iraq, Afghanistan, Pakistan, Nigeria and Syria. Increasing mortality as a result

of terrorist attacks in the Middle East suggests that terrorists do not hesitate to take terrorist actions charging their goals with "significant costs", and that they are likely to use nuclear weapons in the future. (Kydd and Walter, 2006:51) Nuclear terrorism is frightening given that there are terrorist groups such as al-Qaeda, the Taliban, Jabhat al-Nusra and now the Islamic State of Iraq and the Levant (ISIL) acting in the Middle East. Al-Qaeda's intent for nuclear attack is almost apparent. In April 2011, WikiLeaks revealed that Khalid Sheikh Mohammed had admitted during an interrogation that al-Qaeda had a plan to carry out a "nuclear attack" in the United States. He had confessed that al-Qaeda had concealed a nuclear bomb in Europe, which in case bin Laden was killed or arrested would be exploded. (<https://wikileaks.org>) Following the death of bin Laden, al-Qaeda's current leader, Ayman al-Zawahiri, stated in his book that the nuclear intention of al-Qaeda terrorist group still remains. (Watt, 2011) Al-Qaeda's leadership in the Middle East is still active and is reported to have expanded its influence through alliances with more militant groups such as ISIL, and Jabhat al-Nusra. (Jones, 2012) In order for targeting countries with poor governments such as Afghanistan, Yemen, Morocco and Somalia, and countries possessing nuclear weapons and radioactive materials, such as Pakistan, Yemen and Syria, al-Qaeda is searching for unconventional weapons, new forces and safe havens. (Jones, 2012) The complexity of the Middle East security architecture can be a potential route for terrorist groups such as al-Qaeda to achieve their goals. The fear of nuclear terrorism should not be ignored. As Barack Obama said, the threat that terrorists can create through a nuclear bomb is "a more immediate and intense threat to global security." (Bunn, 2010) On the other hand, terrorists can produce nuclear bombs if they have enough high-enriched plutonium and uranium. (Herold, 2008:11) Al-Qaeda's relationship with Pakistan's nuclear scientists was confirmed in 2001 and 2002. According to Pakistani officials, two Pakistani nuclear scientists (Sultan Bashirudin Mahmood and Abdul Majid) had long talks on nuclear, chemical and biological weapons with Osama bin Laden in Kabul. (Khan and Moore, 2001) Considering the severe fluctuations in regional equations and the previous plans to attack energy facilities, countries in the Middle East are faced with significant threats to their nuclear infrastructures. For example, in 2006, al-Qaeda carried out a failed suicide attack on giant Abqaiq oil refineries in Saudi Arabia. (Al-Rodhan, 2006:5) In 2002, Abdul Rahim al-Nashiri was arrested, a Saudi—who as the head of the al-Qaeda branch in the Persian Gulf, and the mastermind of the USS Cole bombing in Yemen in 2000—admitted that he intended to attack the oil facilities of the United Arab Emirates. (McGrory, 2002)

6-3. Internal Threats

The challenge caused by internal threats highlights nuclear security in the Middle East. There are numerous cases of violations of nuclear security in different parts of the world and the Middle East, including Iraq and Yemen, which indicate the need for developing norms and creating a nuclear security culture. In 2010, WikiLeaks revealed that poor security national nuclear power plant of Yemen provides access to stored radioactive materials for terrorists. (McVeigh, 2010) Österreich Newspaper reported that some news from Cairo reveals the theft of radioactive material from the al-Dabaa nuclear power plant in Egypt. This Austrian newspaper further stated that, “according to reports from Egypt, it is speculated that radioactive materials might have been stolen from al-Dabaa nuclear power plant when mass protests had peaked in the country”. (www.greenprophet.com) the terror that hit the international community in February 2016 was created when radioactive waste was lost in Iraq—although eventually recovered, this condition highlighted the government protection responsibility. According to the New York Times, based on the statements of the Iraqi government officials, the United Nations stated that “the ISIL terrorist group has stolen some nuclear material in Mosul”. ISIL forces have seized control of Mosul University warehouses, which hold 90 pounds (40kg) of enriched uranium, which entails the risk ISIS using those materials in producing nuclear weapons, Reuters reported. Iraqi envoy to the UN wrote in a letter addressed to Ban Ki-moon “The ISIL terrorist group has used nuclear weapons in areas that have been out of control of the Iraqi government”. (<https://www.nbcnews.com>) Such cases highlight the need for protection against the efforts of terrorist groups to achieve nuclear material.

6-4. Weak Export Control and Nuclear Material Accounting

Poor nuclear control laws and practices pose another challenge for maintaining nuclear security in the Middle East. This intensifies the illicit transfer of nuclear technology and materials to the terrorist regimes and groups that seek to achieve nuclear capability. The uncontrolled transfer of strategic materials and technologies with dual use and poor export control systems has made the Middle East an attractive base for the purchase, sale, and theft of nuclear material. Since the advent of nuclear technology in the world, a lot of nuclear reactor incidents have occurred. New contributions to protect sensitive nuclear materials, serious efforts to eradicate black markets, identify and stop illegal transportation of nuclear materials, and the use of financial instruments to eliminate nuclear material trade are essential. China's export policies have raised concerns about the proliferation of weapons with regard to ambiguous technical assistance, promotion of military capabilities and proliferation of long-

range missiles in the Middle East.(Kan,2015:34) China is one of the main suppliers of Middle East nuclear and missile technology and is associated with Middle East nuclear and missile programs. Also Data show that countries with nuclear power in the Middle East need to improve nuclear material accounting. Nuclear material accounting is faced with challenges such as stocks of non-secured nuclear material that are outside international regular monitoring. The lack of adequate information about the nuclear material of states with nuclear weapon is due to the lack of trust between countries and international organizations involved and prevents the continuation of nuclear security. According to the International Atomic Energy Agency (IAEA), there are more than 400 confirmed cases of illicit trafficking of nuclear materials between 1993 and 2004, which include materials used to produce nuclear bombs. (www.iaea.org) the following table shows the increasing trend of illegal trafficking, theft and unauthorized possession of nuclear and radiological materials out of legal control. The lack of effective regulatory elements can reduce the effectiveness of nuclear control and increase the risk of proliferation in the Middle East.

IAEA illicit trafficking database. Incidents of nuclear and other radioactive material out of regulatory control.

	1993-2007	1993-2008	1993-2011	1993-2012	1993-2014	1993-2015
Confirmed incidents reported by the participating states and a few non-participating states	1/340	1/562	2/164	2/331	2/734	2/889
Incidents involving unauthorized possession and related criminal activities	303	336	399	419	442	454
Incidents including theft or loss of nuclear or other radioactive materials	390	421	588	615	714	762
Incidents involving other unauthorized activities	570	724	1/124	1/224	1/526	1/622
Remaining incidents (the reported information was not sufficient to determine the category of the incidents)	77	81	69	69	86	71

Source: IAEA Incident and Trafficking Database (ITDB)

6-5. Safety

After the Fukushima incident, fear of nuclear security has also come to the Middle East. Bahrain, Oman and Kuwait abandoned their nuclear energy programs. The Jordanian and Egyptian governments stopped nuclear programs in the face of significant public oppositions; however, the projects were eventually restarted. Iran went ahead and launched the reactor in Bushehr just two months after the Fukushima earthquake. The Persian Gulf states protested against the launch of Bushehr reactor on grounds of non-compliance with the safety principles (despite the widespread disagreement about Iran's uranium enrichment program at that time). However, the power plant is designed to withstand an 8.0 earthquake. A major incident in Bushehr plant could potentially affect the Arab population centers of the Persian Gulf. Concerns over Bushehr reactor show how nuclear politics and security are interwoven. (Sher, 2014:61) The UAE government has faced less opposition to its nuclear construction, because it uses every precautionary measure to ensure its safe operation, in order to ensure its people and neighbors. Abu Dhabi adopted a policy of transparency on its nuclear program, and before the construction of its power plants, it joined all the international conventions on nuclear safety and accountability. (<https://usuaebusiness.org>) Long-term storage and disposal of radioactive waste in an environmental-friendly manner is another barrier to the growth of nuclear energy in the Middle East.

6-6. Military Attacks

In areas where large wars and a military crisis are low, these concerns are relatively minor. The Middle East does not enjoy such an advantage: since World War II, several military attacks have taken place on the site of the deployment of nuclear facilities. The bombing of nuclear sites in the Middle East has been further targeted at opposing the production of nuclear weapons. Conversely, in almost every case, invading countries have provoked slow attempts aimed at acquiring nuclear weapons with these bombardments. However, invading countries often justify their fears that the nuclear sites they are bombing are trying to produce nuclear weapons. Pre-revolution Iran and Israel bombed Iraqi reactors separately; and Israel destroyed it in 1981. In the 1980s, during the Iran-Iraq war, Iraq bombed Iran's reactor site in Bushehr several times. During the 1990s, the United States bombed several Iraqi nuclear facilities. And in 2007, Israel bombed a reactor in Syria. Even today, undoubtedly, plans to attack Iran's nuclear sites are on the agenda of the US-Israeli military command centers. (Malin, 2017) Israel achieved nuclear weapons in the late 1960s and has never signed the NPT. Iraq, Iran, Syria and Libya have all signed these treaties and have committed not to produce nuclear weapons. Israel insists that it seeks peace with its neighbors, and that as a precondition for

disarmament negotiations, it should be recognized by the negotiating parties, but Arab countries and Iran disagree, stating that Israel's disarmament should precede regional peace talks. Since the 1970s, this political deadlock has continued and has weakened the readiness for the NPT review conference in 2020.(<http://iaec.gov.il>) The above parameters emphasize the need to focus on specific actions to enhance nuclear security in the Middle East.

7. Tools and Foundations to Strengthen Nuclear Security in the Middle East

Separation of politics from nuclear energy development in the Middle East is impossible. The development and expansion of acceptable nuclear power requires a joint commitment to safety, security and non-production of nuclear weapons. It also needs a degree of prevention and cooperation. Unfortunately, today all of these, is at the lowest level in the Middle East and around the world. Governments in the region can fulfill their commitments to establish sound principles for nuclear security by supporting and strengthening supervisory organizations, effective export controls, and law enforcement agencies in order to prevent the illicit sale of nuclear technology. Highest-level leaders should also personally have a commitment to continuous improvement in nuclear safety and security. All nuclear facilities should be designed in a way that it is able to protect itself against at least a small group of foreign invaders who are linked with an internal employee. Any country that strives to produce nuclear energy needs priority attention to the legal framework, safety management of nuclear power plants, safe transportation of nuclear material, radioactive waste disposal, emergency preparedness to prevent nuclear accidents, and also reconstruction in the occurrence of accidents (Goren and Tabatabai , 2014). One way to demonstrate a commitment to the development of a safe, secure and peaceful nuclear program is to join and implement the relevant international treaties including Nuclear Safety Convention, Convention on the Physical Protection of Nuclear Material, the International Convention on the Suppression of the Acts of Nuclear Terrorism, and the IAEA Supplementary Protocol for the physical protection of nuclear material. None of these conventions and agreements has been comprehensively implemented in the Middle East. Given that all countries have national interests in preventing nuclear terrorism, the countries of the Middle East may find it helpful to discuss common strategies and efforts to protect radioactive and nuclear materials. The countries of the region should be encouraged to implement four important nuclear security tools:

7-1.The Convention on the Physical Protection of Nuclear Material, adopted in 1979 and implemented since 1987, provides measures to

prevent, detect and punish nuclear material offenses. At present, the Convention on the Physical Protection of Nuclear Material has 149 members and 44 signatories. A number of countries in the region has not yet ratified the convention. (www-pub.iaea.org) In the Middle East, the convention has been accepted or approved by all countries except Egypt, Iran, Iraq and Syria.

7-2.The amendment to the Convention on the Physical Protection of Nuclear Material, which was approved by the Member States in July 2005, extends its efforts in terms of the use, storage and transportation of nuclear material. The convention also extends international cooperation in order to find and protect stolen nuclear material or smuggled nuclear material, reduce any radiological consequences of nuclear sabotage, and prevent and combat nuclear-material-related crimes. It is more than 10 years since the amendment of the Convention on the Physical Protection of Nuclear Material in 2005, but it is not yet become irrevocable. (<https://police.ge>) Although several countries have ratified the convention, it must be approved by two-thirds of the original members before it can be effective. The amendment to the 2005 Convention on the Physical Protection of Nuclear Material should be implemented without further delay. (<https://police.ge>) Among the countries of the Middle East, Algeria, Bahrain, Israel, Jordan, Libya, Saudi Arabia, Tunisia and the United Arab Emirates have ratified the documents related to this convention. The member states that have not yet ratified it include Comoros, Djibouti, Kuwait, Lebanon, Morocco, Oman and Qatar.

7-3.To ensure about neighbors, and most importantly for the safety of their citizens, all countries in the region that are building or planning nuclear power plants must sign and ratify the nuclear security convention, which will encourage all members to maintain a high level of security implementing international standards.

7-4.The International Convention for the Suppression of Acts of Nuclear Terrorism, also known as the Convention on Nuclear Terrorism, was approved by the United Nations in 2005. (www.baselpeaceoffice.org)

Three other important issues from the nuclear security conventions that have been approved by the majority, but not all, of the countries in the region include:

7-5.The Joint Convention on the Safety of spent fuel management and on the safety of radioactive waste management is another international convention that encourages all countries in the area that operate nuclear facilities to sign and ratify it.

7-6.The Convention on Early Notification of a Nuclear Accident, adopted in 1986 after the Chernobyl Nuclear Power Plant accident, provides a notification system for nuclear incidents that can expose radiation to other countries.

7-7.The Convention on Assistance in the case of a Nuclear Accident or Radiological Emergency, adopted after the Chernobyl accident, defines the framework for international cooperation in the occurrence of an incident.

The Code of Conduct on Safety and Security of Radioactive Resources is another instrument promoted by the IAEA in order to encourage countries to ensure the security of nuclear and radioactive materials. As a set of practical guidelines on how to comply with this regulation, the IAEA Board of Governors adopted a document in September 2004 entitled Complementary Guidelines on the Import and Export of Radioactive Waste. This regulation is not legally binding, but governments are encouraged to have a political commitment to them in accordance with the rules and regulations.

Seven countries in the Middle East have also benefited from joining to the Global Initiative to Combat Nuclear Terrorism, launched by the United States and Russia in 2006 in order to improve the capacity to prevent, track and respond to a nuclear terrorist attack. Partner countries host and organize workshops, conferences and exercises to share best practices for the implementation of the Statement of Principles of the Global Initiative to Combat Nuclear Terrorism.(www.state.gov) Transparency in nuclear programs and adherence to international standards are inevitable to address the concerns of neighboring countries about citizen security, environmental protection and the stability of their economies. Beyond national policies, the Middle East countries may also find it helpful to work together on nuclear security and safety, although this is easier to say than do it.(Fitzpatrick,2009:125)

8. Cooperation in nuclear programs and energy

Rather than encouraging the acceptance of international instruments related to nuclear safety and security, countries in the region may increase nuclear trust building through the sharing of nuclear technology for peaceful uses. One of the projects approved under the supervision of IAEA and the United Nations Educational, Scientific and Cultural Organization (UNESCO) was the SESAME Project, or the full name Synchrotron Radiation (cyclic particle accelerator in electromagnetic fields), in order for the empirical and applied research in the Middle East. The countries Iran, Jordan, Israel, Turkey, Palestine and Pakistan were the founders of Sesame in 2002 under the supervision of UNESCO; and now, apart from the founding countries, Bahrain, Egypt, and Cyprus are the formal members of the project. The International Atomic Energy Agency has provided regional technical assistance programs in several regions of the world to promote collaborative research on education, and development in nuclear science and technology. One of these programs is

in the Middle East, where cooperation agreement for Arab countries in Asia for research, development and trainings related to nuclear science and technology (ARASIA) in July 2002 came into force.(<http://web.aec.org.sy>)As its name implies, it is limited to Arab countries. Another example of regional cooperation in nuclear programs is a workshop that Israel plans to host under the IAEA Technical Cooperation Program for Quality Assurance in Radiotherapy for Asia and the Pacific.(<http://iaec.gov.il>) It should be noted that Iran has proposed several times to share its peaceful nuclear technology with neighboring countries, especially Egypt.(Stock,2012)

9. Recommendations

With regard to the challenges outlined above, it is clear that the Middle East countries need to work seamlessly to develop an effective nuclear security architecture and develop a nuclear security culture in order to protect the future of the region against potential nuclear risks. A set of recommendations to achieve this goal is essential:

- The three core nuclear security-related treaties, the 1980 Convention on the Physical Protection of Nuclear Material, the 2005 Amendment to the Convention on the Physical Protection of Nuclear Material and the International Convention for the Suppression of the Use of Nuclear Terrorism, should be implemented at the regional level.
- The countries of the region must accede to the Convention on the Physical Protection of Nuclear Materials.
- The countries of the region should sign the International Convention for the Suppression of Acts of Nuclear Terrorism and demonstrate their support for nuclear security.
- Careful and effective supervision and international inspections should be encouraged to investigate vulnerabilities in the nuclear sites of the countries in the region, while ensuring the protection of sensitive information.
- There should be significant cooperation on nuclear security between the countries of the region to coordinate and improve nuclear security standards in the Middle East.
- The Middle East countries should create an independent oversight mechanism and a nuclear safety center to enhance nuclear security.
- Control of the export of nuclear materials and equipment in the Middle East should be strengthened. And this should be supported by other Asian countries.
- The Middle East countries, including Iran, Saudi Arabia, the UAE, and Turkey, should form working groups to exchange technical information about any incident (accidental or intentional) that includes biological weapons or nuclear materials.

- The nuclear security culture must be improved through strong education, training programs, ongoing development, and sharing of best experiences among nuclear stakeholders.
- The IAEA's central role in facilitating national efforts to enhance nuclear security and strengthen international effective cooperation should be supported.
- Public awareness of nuclear energy should be increased in order to reduce concerns and address civil disobedience.

Ultimately, the above-mentioned commitments and limitations should be pursued through cooperation. A zone-free of weapons of mass destruction (WMD-free zone) in the Middle East is an important but far-reaching goal. Collaborating on strengthening nuclear safety and security through regional partners, discussing regional nuclear waste management and setting up regional coordinated organizations, rapid response to nuclear accidents and nuclear terrorism scenarios are steps to be taken toward cooperation. Even before creating a WMD-free zone, countries can agree to ban uranium enrichment and plutonium production.(Wolfsthal et al,2014:9) Gradually, it's possible to imagine cooperation in the Middle East, so that nuclear energy is seen as a safe, secure, peaceful and sustainable energy source. But as long as these measures have not started seriously and there are no mechanisms for security dialogue and dispute resolution, it is difficult to imagine that nuclear energy will enter the region in a significant scale.

Conclusion

The Middle East is a dynamic region. But at the same time, the scenario of Middle East becoming nuclear further strengthens its instability. The region is affected by the Israeli nuclear weapons. The Middle East is at the crossroads of growing nuclear (military and civilian) nuclear programs and increased nuclear / radioactive security threats. Therefore, there is an indirect link between nuclear facilities and nuclear weapons that prevents nuclear security. Nuclear security is a global challenge that requires a global response and uninterrupted progression in order to manage emerging threats in a complex environment. The growing trend of nuclear power plants for civilian and military use has increased the efforts to manage nuclear and radioactive materials and prevent the spread of nuclear weapons.

There is a need for effective solutions to address the existing and emerging nuclear risks in the Middle East. The Middle East countries must take major and necessary measures to eliminate the weak links between themselves and to maintain nuclear security in order to establish sustainable peace and order in the region. The enhancement of nuclear security in the Middle East will play an important role in reducing the risk

of nuclear and radioactive threats around the world. In the Middle East, although more expensive than many natural gas-based products, nuclear energy will reduce the pressure on the continent to expand its fossil fuel bases by providing a new source for power generation. Nuclear energy will allow governments to maintain exports and reduce electricity generation costs using petroleum and gas subsidies. Ultimately, from the point of view of the authoritarian regimes of the region, nuclear power may increase their external security. For them, the presence of nuclear power plants strengthens the balance of power and guarantees the support of global powers. All nuclear security issues require a coordinated international effort to improve systems determining nuclear safety and security.

However, there are no regional mechanisms in the Middle East for discussing weapons of mass destruction or other nuclear security concerns with a comprehensive representation of all countries. The ruling elites in the region can choose one of these three options. First, they can rely on existing mechanisms to deal with nuclear and radiological threats under international regimes. Second, they can create their own indigenous and regional security mechanisms. The third option is to create a hybrid framework. This region may have its own needs, but this process can be supported by existing regimes and international organizations. However, the minimal steps, toward a regional framework have been taken, including the creation of national radiological and nuclear material organizations, the identification of gaps in the criminal law of countries with regard to nuclear crimes, the creation of systems for detection of radioactive materials, setting standards and sharing the best practices to secure these materials in terms of regional capacity.

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