



THE PEACEFUL USE OF NUCLEAR ENERGY IN THE GCC: CHALLENGES AND OBSTACLE

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ABSTRACT: A number of GCC countries have announced their ambitions to explore nuclear power as part of their future energy alternatives. Despite the fact that the GCC countries are surrounded and geographically located in a region unstable politically they have shown their obligation to adopting a nuclear program that is intended exclusively for peaceful purposes through a number of nuclear security and non-proliferation agreements.

However, The MENA region faces unique challenges when it comes to nuclear power. The tense political environment makes nuclear power a controversial issue in the region than anywhere else in the world. Also the idea of adopting the nuclear option raises concerns over its environmental impact on the region, especially after the Fukushima incident, which prompted many states to reconsider their existing nuclear programs or future ones. Examining some aspects of the legal, political, and environmental interactions associated with notion of introducing nuclear energy in the Middle East helps in developing an understanding on the feasibility of such notion.

Key words: GCC, nuclear energy, Middle East, Political, Legal, Environmental

I. INTRODUCTION

The production of civil nuclear energy has updated the debate on the link between its military use on one side and its civil use on the other side. In this context, the promotion and use of nuclear energy imply the existence of technical rationality and a comprehensive national legislative framework to effectively structure the nuclear sector on the organizational side as well as on that of civil liability.

For the GCC countries, the peaceful use of nuclear energy is one of the paths to follow in preparing for the after oil era. In fact, the availability of significant energy resources that do not involve energy supply, does not prevent GCC countries to invest in civil nuclear industry in order to diversify their energetic resources and to ensure supply of a long term.

Yet, civilian nuclear production represents a heavy responsibility in nuclear proliferation, which means that the fuel manufacturing facilities in the Gulf could be used to manufacture pure uranium for military use. In this context, the future of the Non-Proliferation Treaty (NPT) signed in 1968 and entered into force in 1970, is at stake. The NPT consists of a three pillar system: Non-proliferation (Article 1 and 2), disarmament (Article 6) and peaceful use of nuclear technology (Article 4: paragraph 1 and paragraph 2). The recognition of the existence of a right of states to peaceful uses of nuclear energy in the NPT text refers to the question of conditions to exercise this right. In this respect, contemporary crises of proliferation (Iran, North Korea...) have put in evidence the risk that Article 4 turn into a right to enter the proliferative pathway. GCC countries conduct their nuclear activities in collaboration with the IAEA which recognizes that these countries maintain a position of transparency and are committed to facilitate the exchange on peaceful use of nuclear energy in conformity with the NPT.

The UAE and Saudi Arabia possess the most advanced nuclear power production plans. The Saudi Kingdom is planning to construct 16 nuclear power plants with a combined capacity of 17GW, one-six of the Kingdom's anticipated electricity needs by 2032. If Saudi Arabia succeeds in its plans, it would become the Middle East's largest nuclear power producer over the next 20 years. According to researchers from International Institute for Strategic Studies (IISS), the determination of Iran to speed up its nuclear program as well as its impact on the regional geopolitical order, pushed GCC states to enter the race of civil nuclear power, as it's a way for Sunni countries to counter the rise of Iranian Shiite influence in the region, and the GCC countries cannot remain the

only Muslims excluded from the nuclear technology, acquired by Turkey, Pakistan and Iran. Even if the GCC countries have announced their exclusive civilian interest in nuclear power, the possibility of diversion of nuclear energy from peaceful uses to nuclear weapons, cannot be excluded, in order to send a significant message to Iran.

The use nuclear energy is also one of the environmental concerns caused by energetic chain, whether the concerns are of accidental origin (black mare, nuclear accidents, and methane leaks) or those related to pollutants broadcasts. In the aftermath of Fukushima incident, regional and international concerns have increased significantly. The proximity of GCC countries means that accidents in one country's nuclear power plant will affect all other neighboring states as well.

This study addresses the challenges and obstacles of peaceful use of nuclear energy by GCC countries. It discusses the legal framework regarding measures taken by the GCC countries, international agreements signed by them, and their relationship with IAEA. It also discusses the political aspects related to concerns over the aspirations of the GCC countries in the exploration of civilian program as an option to meet their energy demand. In addition, the study addresses the balance between the advantage of the use of nuclear energy and the various potential risks to the environment.

1. THE LEGAL ASPECT

In relation to the risk of nuclear proliferation, it has been dealt with in the GCC region through a number of nuclear security and non-proliferation agreements that the GCC states have signed. In this regard, the UAE in particular, and the GCC states in general have been stressing to draw a line of distinction between their nuclear ambitions and the use of nuclear energy in countries like Pakistan, Israel, India, and North Korea, where a military nuclear program has been developed.

The UAE and the rest of the GCC states are all members of the IAEA and have signed all its agreements that restrict nuclear proliferation risks. In addition, they have engaged with a number of agreements with the United States and Europe that regulate dealing with sensitive technology or highly enriched materials one of was the so-called "123 Agreement" which the UAE signed with the US, and established a legal framework for civilian nuclear energy technology and material that assured the renouncement of any intention to develop domestic nuclear processing capabilities that could lead to the production of nuclear weapons.

Taking the leading role in adopting the nuclear option as an alternative for energy in the GCC region means that the UAE will be dealing with various considerations, challenges, and obstacles first hand; and the outcome from the interaction between the UAE and those considerations is integral in shaping the attitude of the rest of the GCC towards considering nuclear power as an alternative source of energy in the near future. Therefore, this section will be focusing on the role the UAE is currently playing as an initiator in the field of nuclear energy, and the main legal issues it has dealt with so far in this field.

1.1. THE PEACEFUL NATURE OF THE UAE NUCLEAR ENERGY PROGRAM

The UAE authorities have announced in April 2008 its interest in assessing nuclear energy as another source to meet the country's growing energy demands. According to (ENEC). The nuclear policy of UAE is built on the most challenging standards of safety, transparency and security, making the UAE an exemplary for nuclear energy development in the region. One of the official websites in the UAE has determined and emphasizes the six key principles for the UAE policy: Complete operational transparency, the highest standards of non-proliferation, the highest standards of safety and security, working directly with the IAEA and conforming to its standards, partnerships with responsible nations and appropriate experts and long-term sustainability

In 2008, the UAE has approved the Policy of the Peaceful Nuclear Energy. Mr. Vásquez-Maignan said that "after assessing available options to meet the growing energy needs of the country. The option chosen would cover in particular the energy needs of desalination plant projects, which are a highly energy-consuming solution to drinking water scarcity in the region".

One year later, the President of the UAE, has issued the Federal Law No. 6 of 2009, Concerning the Peaceful Uses of Nuclear Energy also known as the Nuclear Law. The law established the features of the UAE's White Paper on the Evaluation and Potential Development of a Peaceful Nuclear Energy Program, which was published in April 2008, including prohibiting the development, construction or operation of uranium enrichment or spent fuel reprocessing facilities within the borders of the UAE.

The Federal Law governs the nuclear sector of the UAE which include activities such as (possession, use, manufacture, transport, import/export and storage). The aforementioned law forbids the previous activities from being conducted by anyone in the country unless they are licensed by the Federal Authority for Nuclear Regulation (FANR). In point of fact, one of the key structures of the law is the establishment of the FANR, a sovereign nuclear safety regulatory authority, which purposes are to oversee the nuclear energy sector in the state and to boost the highest standards of nuclear protection, nuclear security and radiological protection.

The Cabinet of the United Arab Emirates issued a resolution on 16 August 2015 requiring the administrative penalties that UAE persons and organizations face for non-respecting with the Federal Authority for Nuclear Regulation's nuclear and radiation-related regulations. This resolution authorizes FANR to enforce security, safety and safeguards regulations by placing a number of penalties such as fines, suspension of FANR licenses, or corrective actions against violators. No doubt that the implementation of this key of non-proliferation obligation as an important factor in establishing the completely peaceful nature of the UAE's nuclear energy program.

1.2. THE UAE'S INTERACTION WITH NUCLEAR ENERGY RELATED INTERNATIONAL CONVENTIONS:

Since 1987 to 2009 more than nine international agreements have been signed by the UAE. UAE is considered as one of the first states that joined the Convention on Early Notification of a Nuclear Accident in 1978. In the same year the Emirates has joined the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. But the most important step has occurred in 1995 when the Emirates has joined the Treaty on Non-Proliferation of Nuclear Weapons NPT. This treaty is very important since its objective is to stop the spread of nuclear weapons and weapons technology, to endorse assistance in the peaceful use of nuclear energy and to promote the achieving general and complete disarmament. On 18 September 2000, the United Arab Emirates has ratified the Comprehensive Nuclear-Test-Ban Treaty (CTBT) and the most important article in this treaty is article I which prohibits States Parties from carrying out any nuclear explosion. Moreover, it prohibits any encouragement of or participation in the carrying out of any nuclear explosion. Simply (CTBT) bans nuclear explosions by everyone, everywhere: on the Earth's surface, in the atmosphere, underwater and underground. Furthermore, and since the UAE is considered as non-nuclear-weapon States (NNWSs) and in order to fulfill its obligations stated by NPT, the States, including the Emirates, have committed not to produce or acquire nuclear weapons and to place all of their nuclear material and activities under IAEA safeguards and to allow the IAEA to verify their commitments. For that reason, in 2003 the UAE has joined the Comprehensive Safeguards Agreement. The United Nations Security Council unanimously adopted Resolution 1540(2004) on April 2004, which confirms that the proliferation of nuclear, chemical and biological weapons and their means of delivery constitutes a threat to international peace and security. For that reason and in order to implement the provisions of the previous security council resolution through national legislation, the UAE has adopted federal act number 40 of 2006 on the prohibition of the development, production, stockpiling and use chemical weapons and its amendment and Federal act number 13 of 2007 on goods subjects to import and export control and its amendments, and federal Act number 6 of 2009 on peaceful uses of nuclear energy. Finally, the UAE has joined in 2009 the Convention on Nuclear Safety which was adopted in Vienna on 17 June 1994.

II. THE POLITICAL ASPECT

As discussed above, the GCC states have shown their commitment to adopting a nuclear program that is designed solely for peaceful purposes through a number of nuclear security and non-proliferation agreements that the GCC states have signed.

However, the reality has not changed, the GCC countries exist in a volatile region that is known for its wars and insurgencies in countries like Iraq and Syria, along with anti-government insurgencies in countries like Yemen, which could represent a threat to their nuclear infrastructure more than other countries, especially that certain groups like Al Qaida have considered the Gulf energy projects as prime targets.

This imposed reality introduces nuclear energy in the Gulf as a politically a touchy subject to a degree that certain Western circles and some politicians have shown some concerns over the Gulf nuclear ambitions. They argue that despite the fact that agreements committed to by the Gulf states regulate the formal position and actions of the states concerned, they do not exclude the possibility of involuntary proliferation of nuclear technology during wars or circumstances of unstable security. The rationale behind their concerns is that such programs in the region could trigger a nuclear race in a region that is generally considered as unstable. Other concerns relate to the always present risk of a wide spread of nuclear technology expertise that could subsequently be acquired by unwanted third parties. Such concern is clearly evident in the disastrous consequences that could have been occurred had Kuwait been in possession of nuclear technology when occupied by Iraq during the 1990/91 Gulf Crisis. This risk was reflected in a 2008 US Congress report that criticizes US political support for nuclear programs in the GCC as follows:

This growing presence of nuclear energy in the Middle East will exacerbate current global trends in which nuclear materials and technology are becoming increasingly available. Without comprehensive international reform. This increased availability of nuclear materials and technology will reduce the supply-side obstacles to acquiring a nuclear weapons capability, thereby shifting the cost-benefit analysis of many states in a dangerous direction. Increasingly, states that seek a nuclear weapons capability will have access to the knowledge and materials necessary to obtain it.

The other concern, relate to the argument that a nuclear program in the Gulf region could have the risk of triggering a nuclear race in the region, especially after Iran was recently given the green light to pursue its much debatable peaceful nuclear program, which would make an already rough region even more insecure and unstable, and the combination of fragile states, terrorist organizations, and nuclear weapons would create a horror story for the rest of the world.

Civilian nuclear programs do not represent a security threat. On the contrary, it is a given right under the Non-Proliferation Treaty (NPT) that countries explore civilian nuclear programs as an option to meet their growing energy demand. Therefore, the concerns over a nuclear race in the region is centered on the military use of nuclear power rather than the nuclear option as a whole. However, initiating a military nuclear program or converting a civil nuclear program into a military one is not an easy task, especially in the Region. To illustrate the extent of such claim that the region is capable or not in exploring its chances with a nuclear program for military purposes, it is rational to examine, under the current circumstances, the position of the main potential countries in the region that have considered, or currently considering, the development of nuclear energy, and their willingness or ability to convert such energy for military purposes.

Some countries in the region, such as Turkey, Egypt, and Jordan have declared their interest in a nuclear program, but they generally face many obstacles that make nuclear weapons development very difficult and unlikely. Although factors that could affect the ability to produce nuclear weapons vary from one country to another, those potential nuclear players share an array of technical, political, and even financial for some, restrictions that limit considerably their ability or willingness to utilize nuclear energy for the production of nuclear weapons.

It could be argued that Saudi Arabia is the country that is most likely to become a nuclear proliferators in the Middle East to counter any threat it sees possible from the recently approved Iranian nuclear program. However, this argument ignores that even if Saudi Arabia overcomes its technical shortcomings in the field of nuclear power, which is represented in their capacity to develop and operate its own nuclear infrastructure, it is still hugely influenced by political considerations and alliance settings in the region that makes any military development of nuclear energy for Saudi Arabia an unlikely option. In this regard, the position of the US, which is considered the main ally and security guarantor for Saudi Arabia, would have an influence on Saudi Arabia's decision with regards to a very sensitive issue like nuclear weapons acquisitions.

It could also be argued that Turkey has the potential to contemplate the option of nuclear weaponization as a tool to enhance its leading position in the region. However, aside from the fact that Turkey has declared that it has no plans to develop an enrichment or reprocessing capacity, and entered a safeguard agreement with the IAEA and has agreed to the Additional Protocol to support such declarations; and apart from the technical limitations it also suffers from in a field that it lacks experience in; the strategic and political aspects play an integral role in discouraging Turkey to weaponize.

The fact that Turkey is a member of NATO and a US ally makes its security needs achieved without the trouble of struggling through a resource-exhausting program of nuclear weaponization that would stain and significantly weakens its alliance with the US and considerably affect its membership in NATO, which utilized its nuclear umbrella by default to Turkey.

Egypt, on the other hand, might be considered as one of the countries with the most potential to acquire a nuclear weapon program, as it had one under development up until its defeat in the 1967 Six-Day War with Israel. It also has a nuclear infrastructure that is more developed than other nuclear candidates in the region, as it has research and development-focused reactors in addition to small scale spent-fuel-management and plutonium-separation capabilities.

The existence of some kind of technical capability, to a degree, and buried intentions of developing a nuclear weapon program that marked a certain stage of its history, could be argued by some to be the re-ignition for reinitiating its previous ambitions of becoming a nuclear country in the military sense if other countries in the region do so. After all, Egypt has been for a considerable period of time playing the leadership role of the Arab World and of the main powers in the region, and its regression in this field, unlike other countries, could be viewed by Egypt as a threat to its position in the region.

This argument, however, ignored the general climate of instability that Egypt has been suffering from after the Arab Spring, which witnessed multiple changes in government, domestic unrest, and economic near collapse, which have affected any Egyptian nuclear ambitions, at least in the near future, prompting its internal security to be its priority rather than its external one.

In fact, when security is concerned, a counter argument could also has its own rationale that brings into attention the relationship between Israel and Egypt and the sensitive peace treaty signed by them, which could stand as a considerable obstacle in the path of any Egyptian nuclear ambitions. In this regard, regardless of the peace treaty's rationale, a rational question could put the whole issue to rest, which provides that if nuclear-armed Israel, the hostile country before the peace treaty, didn't cause Egypt to pursue its nuclear weapons program, when it was in the heights of its image as the mother of the Arab identity and the protector of the Arabic cause

against Israel, why would civilian nuclear programs of other countries in the region trigger Egypt to make such move?

For those who have concerns over Jordan's ambitions for a civilian nuclear program, especially after its refusal to sign a 123 nuclear cooperation agreement with the US, the risk issue could be argued by many to be the less complicated in this case than others. In addition to the fact that Jordan lacks the technology, human resources, experience, or infrastructure necessary for a nuclear weapons program, it has been an upstanding non-proliferation advocate and a party to the Non-Proliferation Treaty. Also, its alliance with the US, and the relationship that places the US as Jordan's security guarantor to the full extent of the word, makes jeopardizing such alliance by Jordan through a military nuclear program a far from reality option. Therefore, Jordan's refusal to sign a 123 nuclear cooperation agreement with the US is merely based on pure economic considerations, as a result of Jordan's significant uranium reserves, making domestic uranium enrichment vital for an economically viable program.

The UAE was described by the World Nuclear Association in 2011 to have the most advanced civil nuclear program in the Gulf region that is supplemented by a solid legal and regulatory infrastructure. The UAE program, which has so far shown a commendable commitment towards completing operational transparency, pursuing the highest standards of non-proliferation, achieving highest standards of safety and security, and working closely with IAEA and its evaluation standards; is not only an option to fulfill its basic energy civic needs but it also empowers the GCC in political and economic terms. In this regard, the peaceful nature of the GCC nuclear ambitions is increasingly considered as a new regional model for forgoing sensitive technologies, which will strengthen the GCC strategic commitment to the non-proliferation system.

Therefore, regardless to the complexity of the political challenges in the region, the GCC investment in peaceful nuclear energy can set an example for all countries in the region on the great advantage such program represents in introducing a diversified balanced energy package to serve growing human needs.

III. THE ENVIRONMENTAL ASPECT

The use of nuclear energy is one of the environmental concerns caused by an energetic chain, whether the concerns are of accidental origin (black mare, nuclear accidents, and methane leaks) or those related to pollutants broadcasts. In this sense, civil nuclear is not neutral in terms of impacts on the environment. It represents certainly many advantages in terms of reduction of gas of emission of greenhouse effect, but it nevertheless has a significant effect on global warming, because it emits CO₂ into the atmosphere and poses many problems regarding management of nuclear waste (storage, duration of radioactivity). This hampers the protective environmental policies and goals set in Kyoto protocol and supports the idea of ecologists who believe that nuclear energy is not the right road to a proper energy.

Investments in nuclear energy are perceived of high risk and therefore are treated with suspicion. The use of nuclear energy to generate electric power and desalt sea water raises many concerns in the GCC. Despite these serious concerns, the real question is how and when nuclear energy will be inherently safe, not prohibitively expensive, and when it can be applied safely in countries at different development stages.

The GCC countries are totally dependent on oil and gas produced on their territories to run heavy industries, in addition to the operation of electricity and water production plants. In the world, the burning of fossil fuels has released so much CO₂, that when developing countries now want to increase their use of these fuels, industrialized countries tell them: *"Please don't put more CO₂ into the atmosphere. We have already filled it!"*

In the aftermath of Fukushima incident, regional and national security and environment concerns in the GCC should have increased significantly. The densely populated proximity of many GCC states implies that accidents in one country's nuclear facilities will affect all other neighboring states as well.

This section attempts to analyze the effects of use of nuclear energy by GCC states on the environment. Despite the claim of the environmental advantages of the use of nuclear energy, the risks of disasters are enormous for the environment, especially when it comes to negative aspects of water desalination, and nuclear waste management. The region itself has been volatile and still unstable, and has been subject to repeated earthquakes.

3.1. ENVIRONMENTAL ADVANTAGES OF PRODUCTION OF NUCLEAR ENERGY:

In 2004, 3 of the Gulf States: Kuwait, Qatar and UAE topped the list of countries with carbon emission, they are planning to reduce CO₂ production by diversifying methods of production of electrical energy and shifting to use nuclear energy as they believe on environmental advantages of production of nuclear energy. Benefits can be summarized by these countries in the following:

- 1- Nuclear Power Plants, are environment-friendly compared to fossil fuel-fired power plants. In fact, nuclear power is the only technology used for electricity generation which from the very beginning of its development has laid great emphasis on possible environmental impacts. The radioactivity released into the environment by a nuclear power plant is continuously monitored and is maintained well below

- permissible limits. A nuclear power plant does not produce carbon dioxide or oxides of sulfur or nitrogen, which lead to adverse environmental degradation through the greenhouse effect and acid rain.
- 2- Reduction of global warming. The reduction of carbon emission is considered as one of the main advantages of nuclear energy to produce electricity where the gases lead to global warming. In fact, the use of nuclear fuel reduces global warming, which is usually accompanied by the melting of the ice layer and glaciers in Arctic and Antarctic and increase of level of the sea surface, which could cause the sinking of many cities and installations.
 - 3- Reduction of pollution from carbon emissions. Uranium is considered as a major source of high concentrated energy because it can produce more than 4.500 Mwh of electrical energy by using one ton of natural uranium without resulting any other gases like other fossil fuels. And to produce the same amount of energy this requires burning 20,000 tons of coal or 80,000 tons of oil or 13 million cubic meter of natural gas, and this shows how it is difficult to transfer fossil oil to stations of electric energy production as well as the need for storage places. The vast amount of gases generated by traditional fuel combustion will create air pollution. In addition, the carbon emitted is one of the greenhouse gases that may dissolve seawater, making it source of pollution of marine and coral reefs.
 - 4- Costs of Damage resulting from traditional power plants. The cost of damage for each Kwh of nuclear energy is 0.04 dollars and 1.04 dollars for each Kwh of natural gas. Thus the use of nuclear power plant of which the capacity is 3000 Mw achieves a saving in the cost of environmental damages caused by the emissions from burning natural gas valued at 23.652 dollars.

The second major source of energy consumption in the GCC countries is water desalination. These countries, in general, lack water, and approximately 15.7 % of people inhabit rural areas with no access, or very limited access, to suitable water resources. Fresh water scarcity has been a serious challenge and fresh water supplies from conventional sources are unable to meet basic demands. So the desalination option- which consumes power driven by oil and natural gas-is favored, because with it the annual per capita water consumption in the GCC countries is becoming manageable.

3.2. WATER DESALINATION:

In view of scarcity of water, there is a heavy dependence on large water desalination plants on the eastern and western coasts of the Arabian Peninsula, accounting for more than half the world's total fresh water production, estimated at 32.4 million m³ daily. Water desalination plants are being built with huge capacities, with largest desalination plant in the world in Fujairah, UAE, which has a daily production capacity of 456,000 m³. The first water desalination plant to produce 1,000,000 m³ daily is being constructed at RasAzzour plant in northeast Saudi Arabia. The Saudi Water and Electricity Company estimates that the demand for water will rise to 10 million m³ daily in 2025.

The question is how to make the seawater drinkable (potable) without harming the environment?

Desalination of seawater is already a common practice in all Gulf States. Despite its advantages, its environmental impact remains a key concern. That's why its advantages and disadvantages should be evaluated in terms of costs and benefits, societal and environmental, and compared with other freshwater production process. Currently, desalination plants are mainly fueled by fossil fuel. However, fossil fuels and desalination cause air pollutants including carbon dioxide (CO₂), sulfur and nitrogen oxides and solid particles.

Desalination plants must indeed undergo chemical pretreatment and cleaning operations to avoid fouling scale formation and other nuisances. As a result, facilities can have adverse effects on the marine environment, especially if they pour brine in fragile ecosystems.

These installations cause high emissions of greenhouse and are danger to the Ozone layer. The desalination plants actively participate in the reduction of ice sheets and glaciers which provide 69% of supplies of fresh water, reducing water accessible by the usual means.

Thus, desalted water contains thousands of different micro-organisms and are automatically eradicated before desalination. World Wildlife Fund (WWF) fears that the marine food chain is disturbed if some of these micro-organisms were eliminated.

It's important to mention that Saudi Arabia throws this salt in a unique area of the Gulf, a very rich one in ecosystem, where fresh water continent mixes with salty water.

There are only two such areas in the planet, also called intermediate are: in Arabia and Vietnam. But the increase in salinity has transformed the cost into lifeless desert, causing the disappearance of villages and local fishermen.

As for nuclear waste, it is disposed by throwing them in the depth of the sea or storing them in the earth.

3.3. WASTE MANAGEMENT:

Standards of waste management on spent fuel are provided by the IAEA (International Atomic Energy Agency) to achieve safe management of radioactive waste as well as the policies adopted by the government in order to regulate the safety of nuclear plants.

The expected results of storage of nuclear waste in the depth of the earth or the sea:

- 1- Increasing the temperature of sea water which affects fish and other marine organisms;
- 2- Intervention in thermal cycles of earth's surface which represents risk for human being;
- 3- Possibility of an ecological imbalance in biology, decreasing the number of marine organisms.

In Saudi Arabia, King Abdallah Center for Atomic and Renewable Energy (KACARE) represents the kingdom at the IAEA and is responsible for Saudi nuclear energy power supervision of nuclear power production and management of nuclear waste. Kuwait unveiled plans in 2010 to tackle possible radiation accidents. A network consisting of 15 fixed and 2 mobile detection stations have been put in place nationwide to gauge the levels of radiation in the border areas as well as the residential areas. Equipment has been put in place to detect radiation levels in air, water, soil, and food samples had been provided to Kuwait laboratories as the ministry of health possesses 60 million doses of medication for treating radiation sickness.

As for UAE, it is committed to "dual track" radioactive wastes management strategy that involves developing a national storage and disposal program in parallel with exploring regional cooperation options. Used fuel will be stored in reactor ponds for up to 20 years, or may be transferred to dry storage after six years. Reprocessing in France or elsewhere internationally is an option, depending on economics. In fact, UAE which is committed to highest standards of safety and security (UAE- IAEA radioactive wastes agreement), got benefits of Fukushima accident. With regard to safety of radioactive waste, as required by the IAEA Convention on Safety of Spent Fuel Management, and in the event that the UAE deploys nuclear power plants within its territory, it will maintain a high level of safety in spent fuel and radioactive waste. In such scenario, appropriate measures would be established to ensure protection against radiological hazards at all stages of spent fuel and radioactive waste management and emergency plans would be implemented at waste management and spent fuel facilities.

But the nuclear energy presents an unavoidable and unpredictable risk, we are never safe from a natural disaster, especially when one is in an area of earthquakes.

3.4. EARTHQUAKES:

A study prepared by Al-Rai newspaper unveiled the most important natural disasters that may threaten the atomic ambition of the Gulf region.

In fact, according to Earthquake track website, areas between Oman and UAE such as Sharjah, and between Saudi Arabia and Kuwait such as Jahra City, are considered most Gulf regions which have recorded earthquakes along the last 40 years, where tremors recorded 9 earthquakes at a rate of more than 4 degrees on the Richter scale (4 tremors have been recorded in the last 4 years). That means the tremors pace is accelerating, particularly in UAE, which has recorded 6 tremors of total of 9 in the past 10 years. According to *Nature*, Iran had been subjected to 18 jerks in 2014, which raises concerns about the vulnerability of its nuclear reactors if these jerks turned into earthquakes, especially since most of the areas that have experienced earthquakes in Iran are considered close to GCC countries, especially Kuwait and UAE. The geological layers of the Earth are constantly changing, this is shown by the increase of the tremors pace, which represents a threat affecting nuclear reactors in the process of construction in the future. And the future of the region is not reassuring: increasing of demographic growth which is spreading in large parts of the land, conjugated with a lack of green spaces in addition to scarcity of ground water and the raise of high temperature, all these are signs of climate change caused by global warming.

Most of GCC populations live in desert and flat areas, any radiation explosion will have disastrous impact compared to disasters like Fukushima in Japan or Chernobyl in Ukraine.

In the event of nuclear leak, or explosion of reactors, where to escape in a region which lacks trees and forests, which can constitute a natural source reducing the level of spread of toxic gases that kill man and nature. When nuclear accidents occur, contamination of the environment affects wildlife (similar effects to humans), plants, crops and soil (transfer to humans via water and food). A scale radiation recalls that radioactivity is a natural phenomenon which is toxic at very high doses.

The GCC States should consider seriously investing in solar energy, and wind energy- available in abundance- in the Gulf, for electricity and seawater desalination, which is less expensive than nuclear energy to produce electricity and environmental friendly and which will lead to prolonging life of oil and natural gas to the use of GCC countries in their petrochemicals industry or in producing hydrogen (for local use as well for export) instead of being burnt as fuel.

Wind energy is a viable energy option for the GCC countries as well. There are rather attractive sites for wind energy on the southern coast of Oman, on the Saudi Arabian Red Sea Coast and in some remote desert zones in the core of the Arabian Peninsula. Solar energy will replace fossil fuels in conventional power stations and will prolong their availability for decades or even centuries. Time Magazine dedicated pages to renewable energy in

the Gulf. Solar and wind energy will contribute to the reduction of the high ratio of CO₂ produced per capita in the GCC of 32,000 tons per year in 1999. In fact, the emissions of each GCC country as a percent of global CO₂ production is: 0.1 percent in Bahrain; 0.4 percent for UAE; 0.1 percent for Oman; 1.2 percent for Saudi Arabia; 0.2 percent for Qatar; and 0.2 percent for Kuwait. Which means that GCC emits 2.2 percent of the world total. There is no a hundred percent safe reactor, according to “*Nature*” website, even stored, these wastes still represent a risk and will take thousands of years to disappear.

IV. CONCLUSION

For the GCC countries, producing nuclear energy in a region in turmoil raises a question: will energy security be confused with political security?

In the aftermath of the American invasion of Iraq, and after the disbandment of one of the strongest armies in the Arab World, the regional balance of power was greatly disrupted, which led to instability in the conventional balance of power. As a result, the political vacuum in Iraq gave Iran a free hand in the region and reinforced the forces allied to it. This could be viewed as a factor that might push the GCC countries to strengthen their defense by developing a nuclear deterrent that provides them with the capacity to deter any regional power able to threaten the stability of the Gulf. So the GCC States should understand that their nuclear program will not be perceived as purely peaceful and that it could eventually produce nuclear weapons.

Even if they have announced that their nuclear program is a civil one and does not include plans to enrich uranium, as well as it would be conducted within the full transparency with the IAEA, it can be understood among experts and observers of international politics that their plans are a direct reaction to Iran’s nuclear program. In case of nuclear accident or a natural disaster, the Gulf region’s future will be in danger. Changes in environmental legislations in the GCC countries are required if proper clean energy options and building construction are targeted. A mix of renewable resources (solar, wind, wave and tidal) could be a best energy option for the future of the region.

In 2007, *The Middle East Economic Digest Magazine* (Meed), conducted a survey on climate change, it was found that 91% of interviewed people thought that governments in the region should introduce rewards to encourage environmentally sustainable business practices. Low energy rewards technologies are favored by businessmen in the GCC countries. If governments can provide some support, new economic cities will be built. The result shows that 23% of the businessmen in Abu Dhabi are “extremely aware” of the environment while 8% are in Bahrain, 16% in Dubai, 10% in Kuwait, 11% in Oman, 17% in Qatar, 8% in Saudi Arabia and 5% in Sharjah. The “no awareness” accounted for 8% in Abu Dhabi, 11% in Bahrain, 10% in Dubai, 24% in Kuwait, 14% in Oman, 15% in Qatar, 23% in Saudi Arabia and 19% in Sharjah.

The GCC countries should impose a legal framework in the field of nuclear energy, rehabilitate their legislations to international standards, carry out their peaceful nuclear program by reducing negative impacts on the environment and taking into consideration the needs of coming generations.

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