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Nuclear Energy Development in the United Arab Emirates: A Model for Other Nuclear Energy Aspirant States?

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Abstract

The United Arab Emirates (UAE) established and largely carried out an ambitious plan to become the first Arab country to have a civilian nuclear energy program. By providing an overview of the nuclear energy development in the UAE, the study suggests that numerous important elements, including specific Emirati policies and methods, and the country's persistence in implementing these policies, would explain the country's success in building a nuclear energy program. Firstly, the UAE has worked closely with the International Atomic Energy Agency (IAEA) not only in building the scientific and technological capabilities of the country but also in legal, regulatory and institutional infrastructure. Secondly, it was critical for the UAE to join mandatory international nuclear law treaties, agreements, and even voluntary international measures for nuclear non-proliferation, safety, security, and liability. Finally, concluding various bilateral agreements with foreign governments and entities also played a major role for the success of the country's nuclear program. The study also assesses both negative and positive responses to the suggestion that the UAE's nuclear experience as a newcomer country serves as a model program for a number of other non-nuclear states interested in pursuing a peaceful nuclear energy program.

Keywords: The United Arab Emirates (UAE), nuclear energy, nuclear cooperation, nuclear non-proliferation regime
Jel Codes: F5, K3, Q4

Birleşik Arap Emirlikleri'nde Nükleer Enerji Gelişimi: Nükleer Enerji Talebinde Bulunan Diğer Ülkeler İçin Bir Model mi?

Özet

Birleşik Arap Emirlikleri (BAE) sivil bir nükleer enerji programına sahip ilk Arap ülkesi olmak için iddialı bir plan oluşturmuş ve bu planını büyük ölçüde uygulamıştır. BAE'deki nükleer enerji gelişimine genel bir bakış sunan bu çalışma, belirli BAE politika ile ülkenin bu politikaları uygulamadaki ısrarı da dahil olmak üzere çok sayıda önemli temel unsurun ülkenin nükleer enerji programı oluşturmadaki başarısını açıklayacağını öne sürmektedir. İlk olarak, BAE sadece ülkenin bilimsel ve teknolojik kapasitesinin geliştirilmesinde değil, aynı zamanda yasal, düzenleyici ve kurumsal altyapısının oluşturulmasında da Uluslararası Atom Enerjisi Ajansı (UAEA) ile yakın işbirliği içinde çalışmıştır. İkinci olarak, BAE'nin zorunlu uluslararası nükleer hukuk anlaşmalarına, sözleşmelerine ve nükleer silahların yayılmasının önlenmesi, emniyet, güvenlik ve sorumluluğa dair uluslararası tedbirlere gönüllü olarak katılması kritik önem taşımıştır. Son olarak, yabancı hükümetler ve kuruluşlarla çeşitli ikili anlaşmaların imzalanması da ülkenin nükleer programının başarısında önemli bir rol oynamıştır. Çalışma aynı zamanda BAE'nin nükleere yeni giren bir ülke olarak yaşadığı tecrübenin, barışçıl nükleer enerji programı yürütmek isteyen nükleer enerjiye sahip olmayan devletler için bir model program olarak görülmesi önerisine verilen olumlu ve olumsuz yanıtları da değerlendirmektedir.

Anahtar Kelimeler: Birleşik Arap Emirlikleri (BAE), nükleer enerji, nükleer işbirliği, nükleer yayılmanın önlenmesi rejimi
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1. Introduction

The United Arab Emirates (UAE) has established and mostly fulfilled an ambitious plan to become the first Arab nation to have a civilian nuclear energy program. According to the official statements there are several reasons behind the country's nuclear energy decision. In the short term, the UAE government intends to diversify its energy sources in response to 9% annual growth in energy consumption (ENEC, 2008). Because water is obtained through the use of desalination plants, which need significant amounts of energy, electricity becomes more vital than water. It is remarkable that the UAE, while being located in a desert, has one of the highest water usage rates in the world. With 500 liters per day, the UAE has one of the highest per capita water usage rates in the world (The US Department of Commerce, 2019). As a result, the UAE government has prioritized water production in its energy program. In this regard, nuclear energy offers a significant advantage over other energy sources. The lower cost of producing desalinated water makes nuclear power even more appealing than alternative energy sources.

In the long term, the UAE government aims to diversify it whole economy. According to the government's declarations The UAE will be able to produce more varied and ecologically friendly energy options for both domestic consumption and international distribution with the aid of the investment in nuclear energy. Nearly all of the UAE's energy needs are currently met by fossil fuels, but the country's officials are planning for long-term economic and environmental sustainability (UAE Energy Strategy, 2018). According to Hamad Al Kaabi, the UAE Ambassador to the IAEA, in order to fulfill the nation's rising energy demand, the UAE has decided to develop a nuclear power program. Thus, the UAE "chose nuclear power for its commercial and environmental competitiveness" (IAEA Bulletin, 2017:10). It is put in the country's national Clean Energy Strategy, announced in January 2017, that the UAE will make enormous investments in the development of renewable energy technologies which make up 44% of its energy mix by 2050, but renewables by themselves won't be able to meet future energy demands. According to the government's projections in the framework of this Strategy, nuclear energy will have a 6% share in the total energy mix. Furthermore, Clean Energy Strategy will involve a $163 billion investment by 2050 to attain half of its energy from nuclear power with renewables, 38% from gas, and 12% from coal (UAE Energy Strategy, 2018).

As a Middle Eastern country currently pursuing a nuclear energy program, the development and status of UAE nuclear program has been discussed from different aspects. According to some experts, aside from practical energy issues, the UAE sees its prospective use of peaceful nuclear energy as an opportunity to effect positive change on a global scale (Al Nahyan, 2008: 14-19). Furthermore, according to several government officials and experts from the UAE and abroad, the country's nuclear experience as a newcomer country presents a model program for several other non-nuclear states ambitious to pursue a peaceful nuclear energy program (Ebinger et. al; 2011; Fisher, 2021; Smithsonian Magazine). In his article titled "Nuclear Newcomer Countries—The Path of the United Arab Emirates" published in the Bulletin of Atomic Scientists, Ambassador Hamad Al Kaabi states that the UAE's program is on schedule to fulfill the country's expanding energy needs. According to the Ambassador, more importantly, it has evolved into an "a model program for ensuring that safety, security, and non-proliferation are top priorities" (2015: 52).

2. Development of the UAE's Nuclear Energy Program

In December 2006 members of the Gulf Cooperation Council (GCC) made an announcement stating that its members are interested in the establishing nuclear energy programs. In 2007, IAEA stated that it would cooperate with the member countries on a feasibility study for a regional nuclear power and desalination program (WNA, 2023). When one looks back to the year of 2006 from the 2020s, it became clear that this year was one of the hottest years in "peaceful use of nuclear energy"[2] discussions due to the Iranian nuclear program which Iran claims was started to obtain nuclear energy and its nuclear facilities

[2] According to the IAEA peaceful uses of nuclear energy can be described as the usage of nuclear science and technology to contribute to energy, health, environment, water, food, agriculture and industry fields (IAEAa).

are used only for peaceful purposes but that certain countries, mainly the US, believe was aimed to create nuclear weapons (Davenport, 2023; Rezaei, 2017; NTI, 2011). On the one side Mahmoud Ahmadinejad was affirming the country's commitment for the development of Iranian nuclear power industry and announcing that Iran has enriched the reactor-grade uranium for civilian purposes (BBC, 2006). On the other hand, the United Nations Security Council was releasing statements on Iran's nuclear program which raises serious concerns for the international community. Furthermore, there were ongoing efforts to pursue nuclear negotiations to prevent Iran from developing a nuclear weapon. There is no doubt that, international community was on pins and needles waiting to see if the negotiations would succeed or the Iranians would follow the path of a nuclear weapon. In the same year while Non-Aligned Movement countries who have a huge majority in the UN General Assembly announced their support for Iran's civilian nuclear program, UN Security Council has decided to impose sanctions on Iran (Davenport, 2023). In the light of these developments, GCC's announcement and the IAEA's quick response would be evaluated as the intension of all actors to behave in the international legal framework in order to benefit from civilian nuclear energy.

One year later, in April 2008 the UAE independently announced a thorough nuclear energy policy document titled "Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy" (known as the "White Paper") in consultation with the IAEA and major nuclear supplier governments (United States, the United Kingdom, France, South Korea, Germany and Japan) (ENEC, 2008). It can be monitored that after 2008, the UAE- a nuclear newcomer country which does not have any nuclear infrastructure beforehand, has taken quick and concrete steps in its civilian nuclear energy program. It accepted a $20 billion proposal from a South Korean corporate consortium to build four commercial nuclear power reactors in Barakah by 2020 with a combined capacity of 5.6 GWe (KEPCO). The first nuclear power plant (NPP) had its Unit 1 linked to the grid in August 2020, unit 2 in September 2021, and unit 3 in October 2022. The UAE currently has three operational reactors and one (4,019 MWe) reactor under construction as of July 2023 (WNA, 2023; ENEC, t.y.).

The content of the 2008 Emirati White Paper, released in English and Arabic, can be regarded as a significant policy paper for two major reasons. First, it outlines the country's motivations for pursuing civilian nuclear energy and assesses the feasibility of using this energy. Then, it lays out a precise plan of action including set of principles, commitments, and strategies implementation of national nuclear energy program. The UAE's White Paper presents a particular feature in terms of the country's commitments regarding its future nuclear fuel cycle activities. In this policy document, firstly, the UAE shows its support for the strengthening non-proliferation efforts by renouncing "any intention to develop a domestic enrichment and reprocessing capability"[3]. Furthermore, the country makes a commitment to "source fuel from reliable and responsible foreign suppliers" for its NPP. Finally, the UAE clearly states the country "will not be involved in nuclear fuel-cycle activities" (ENEC, t.y.). According to an influential US-based think tank, Brookings Institute, report there was an "overwhelming positive response" from the international community to the UAE's approach (Ebinger et. al., 2011:4). This positive response is significantly meaningful in order to assess the country's further non-proliferation steps and membership in global nuclear law framework. Furthermore, in its White Paper the UAE put six principles defining the policies that the country will pursue as it continues to assess the possible use of nuclear energy including the UAE's commitment to a) complete operational transparency, b) non-proliferation, c) safety and security, d) cooperation with the IAEA, e) cooperation with the foreign partners, e) long term sustainability (ENEC, 2008: 1). Furthermore, the significance of the UAE White Paper is also clear when one takes into consideration that the US and the UAE released a Memorandum of Understanding (MOU) on Nuclear Energy Cooperation just one day after its declaration stating the U.S. intent to assist the Emirates with its civil nuclear program (DOS, 2008).

[3] The ability to manufacture fuel for nuclear reactors, either by enriching uranium or reprocessing the plutonium in spent nuclear fuel, is the most vulnerable part of a nuclear energy program's fuel cycle. This is due to the fact that, whereas low-enriched uranium can be used as nuclear reactor fuel, highly enriched uranium and reprocessed plutonium can be used as both fuel (in certain types of nuclear reactors) and fissile material in nuclear bombs.

The UAE has progressed on the commitments outlined in its White Paper through the establishment of the country's nuclear institutional infrastructure. The Federal Authority for Nuclear Regulation (FANR) is established with Federal Law Concerning the Peaceful Uses of Nuclear Energy by Decree No. (6) of September 2009 (The UAE Government, 2009). The Emirates Nuclear Energy Corporation (ENEC) is established with Law No. (21) of December 2009 (IAEA, 2012). 2009 Federal Law re-emphasized above mentioned six guiding principles as well as the country's decision to forgo domestic uranium enrichment and plutonium reprocessing. As it will be discussed, although it is a nonbinding commitment, the UAE's declaration of its decision to forgo enrichment and reprocessing capabilities presents significant importance for the country's position in the non-proliferation community and its future nuclear cooperation with nuclear suppliers. FANR as an independent nuclear regulator is the critical actor in the country's nuclear energy program. In this regard, FANR is in charge of general oversight and regulation of nuclear safety, security, radiation protection, and safeguards. Furthermore the Authority has a primary responsibility to establish legal frameworks "for physical protection, emergency preparedness and response for nuclear facilities and activities" and oversight the international legal obligations in the nuclear sector entered into by the UAE (IAEA, 2022).

Following its formation in 2009, the ENEC as another critical actor, was mandated by the UAE Government to implement the Emirati Peaceful Nuclear Energy Program and to develop this program's cornerstone; the Barakah Nuclear Energy Plant. It has further duties such as to make strategic investments and to collaborate with foreign partners in the nuclear sector (ENEC, t.y.). In this framework, ENEC is responsible for contracting and constructing the NPPs, working with the government "to ensure that the nuclear energy program is aligned with industrial and infrastructure plans" of the country and to building human resource capacity in collaboration with Khalifa University and the Institute of Applied Technology as the major stakeholders (IAEA, 2022). In the very same year of its establishment, ENEC immediately took a significant step to realize the country's nuclear ambitions and awarded the Korea Electric Power Corporation (KEPCO) led consortium an approximately $20 billion bid to build four third-generation APR1400 pressurized water reactors (PWR) at a selected site. This site is announced as the Barakah site in 2012 following a two-year NPP site evaluation process including license applications and environmental assessment approvals. Construction of the Barakah NPP has started in the same year. Meanwhile, the formation of the regulatory body and related regulations for the UAE's nuclear energy program was strongly backed by Korean regulators and the IAEA. It can be said that, the IAEA's cooperation was crucial in giving help and technical support to the UAE. It is mentioned by the academics that before the initiation of its nuclear program, the UAE postponed it by two years in order to ensure that "its operator was well-trained and well-equipped" (Opatowski, 2023: 13).

While working on the international cooperation in order to construct the country's very first NPP, ENEC also established two particular boards. Firstly, Nuclear Safety Review Board which is composed of five members, all experienced actors in nuclear energy programs from Korea, Japan, and the USA. Secondly, ENEC International Advisory Board (IAB) of experts headed by Dr. Hans Blix, a former director general of the IAEA. Those steps have been evaluated as the UAE's efforts to establish a positive image among international nuclear community by gaining international nuclear experts' support and approval for its nuclear program (Early, 2010: 271; Shamsi, 2018).

In addition, the UAE took concrete steps in order to develop and manage human resources for its long-term nuclear program and to complement its nuclear energy objectives. Because the UAE has a tiny native population, international specialists from various sectors were brought to ensure that the project developed and maintained a professional nuclear cadre. As it is mentioned in the country's official declarations, the UAE places a strong emphasis on developing human resources and major stakeholders in this regard are Khalifa University and the Institute of Applied Technology. On the program, thousands of local engineers are employed, and about 70% of the regulating body's members are Emirati citizens.[4]

[4] As of January 2022, FANR employs around 251 employees of which Emirati constitute 72%. Women made up 43% of the total workforce (IAEA, 2022).

As a nuclear newcomer country with no previous infrastructure in nuclear energy, the UAE has deeply needed international cooperation to advance its nuclear energy program. Furthermore, in order to gain foreign nuclear support, it had to follow international legal rules those were established to provide peaceful nuclear energy to non-nuclear weapon states on the one hand and to prevent proliferation of nuclear weapons on the other.

3. Internationalizing the Emirati Nuclear Program: The UAE's Membership in International Nuclear Legal Framework and International Nuclear Cooperation Agreements

3.1. The UAE's Membership in International Nuclear Legal Framework

In order to take advantage of its civilian nuclear rights, the UAE took determinant steps to become a member of international nuclear law framework-in other words global non-proliferation regime which can be defined as the comprehensive international network of agreements and institutions aimed at avoiding the spread of nuclear weapons and contributing to the peaceful use of nuclear energy and advancement of arms control and disarmament (Smith, 1987; Dhanapala and Rydell, 1995). First step was becoming party to the Treaty on Non-Proliferation of Nuclear Weapons (NPT)[5]. The UAE acceded to the NPT in 1995 order to be bound by the treaty and enjoy the peaceful nuclear energy rights (NPT, 1970). Next step was establishing a close cooperation with the IAEA. As it is stated in the previous part, GCC states immediately got the Agency's support when they declared their intention to pursue civil nuclear programs. After this date, the UAE has intensively consulted the IAEA for the formation of its long term nuclear energy policy-including the country's very first White Paper on nuclear energy. In this regard, it can be said that the UAE has strictly followed the IAEA's "Milestones Approach" which covers both the "hard" infrastructure such as the electrical grid and sites and "soft'" infrastructure such as the nuclear law and regulation (IAEA, 2015; FANR, 2018). With a closer look at the UAEs institutional infrastructure it is seen that as it expands its nuclear program, the IAEA's regulations and guidelines have explicitly influenced FANR's basis and organization. As it is stated on the FANR web page, the country seeks the Agency's technical assistance in several areas including safeguards, physical protection, safety and liability (FANR). In this regard, the IAEA has been invited by the UAE and FANR to conduct several significant peer reviews as part of which foreign experts will evaluate the UAE's compliance with the IAEA requirements.

Among all of these visits Integrated Nuclear Infrastructure Review (INIR) is crucial for the UAE. INIR, a process that supplements the standards and guidelines in the Milestones document, was first carried out in January 2011 by a delegation sent by the IAEA. According to the IAEA's 2011 INIR report, the program was "progressing well." The report stated that "the UAE had followed its recommended comprehensive 'milestones' approach for such countries". Moreover it emphasized various aspects of the Emirati program which is regarded as "good practices for other countries starting nuclear power programs to consider" (IAEA, 2011). In 2018, the IAEA carried out another INIR mission to the UAE with a team of 9 international and IAEA experts in order to review the country's nuclear energy infrastructure progress since 2011 visit. Agency's 2018 visit was a Phase 3 INIR mission following Phase 1 and Phase 2 evaluations in 2011 which described as the final and third phase of the strategy covers actions to implement the first nuclear energy plant and is completed when Milestone 3 - Ready to commission and operate the first nuclear energy plant - is achieved" (FANR, 2018). The INIR mission was the first one conducted by the IAEA for a country in the last phase of the Milestones Approach. Furthermore, the UAE has developed appropriate entities, the legal and regulatory framework, and has plans for reaching

[5] The three interconnected pillars of nuclear non-proliferation, nuclear disarmament, and peaceful uses of nuclear technology are mentioned in all eleven articles of the NPT. Articles I, II, and III of the NPT govern the nonproliferation responsibilities of Nuclear Weapon States (NWS) and Non-Nuclear Weapon States (NNWS). In exchange for agreeing to sign the NPT and refrain from acquiring nuclear weapons, the NNWS are granted "the inalienable right... to develop research, produce, and use nuclear energy for peaceful purposes without discrimination" under Article IV. The NWS are required to gradually disarm their nuclear arsenal in accordance with Article VI in order to lower the overall number of weapons they possess (NPT, 1970).

operational preparedness, according to the 2018 INIR report (IAEA, 2018). 13 peer review and advisory services in total were conducted to the UAE which cover all parts of its nuclear program.

Apart from its membership to the NPT and close cooperation with the IAEA, Emirati government has entered into a range of related international treaties, agreements and conventions as it is seen in Table 1 below.

Table 1. The UAE's Membership in International Nuclear Legal Framework

	Signature	Succession/Ratification
Convention on Early Notification of a Nuclear Accident	2 October 1987	2 November 1987
Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency	2 October 1987	2 November 1987
Treaty on Non-Proliferation of Nuclear Weapons (NPT)		26 September 1995
Comprehensive Test Ban Treaty (CTBT)	25 September 1996	18 September 2000
IAEA Comprehensive Safeguards Agreement (CSA)	15 December 2003	09 October 2003
Convention on Physical Protection of Nuclear Material	16 October 2003	15 November 2003
International Convention for the Suppression of Acts of Nuclear Terrorism		10 January 2008
Convention on Nuclear Safety	31 July 2009	29 October 2009
Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste	31 July 2009	29 October 2009
IAEA Additional Protocol to the Safeguards Agreement	08 April 2009	20 December 2010
Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage of 1997		2012
Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention		2012
Convention on Supplementary Compensation for Nuclear Damage		07 July 2014

Source: Compiled by the author from the FANR website and Al Kaabi (2022)

The short time spans between the signing and ratification of the aforementioned agreements and conventions can be interpreted as the country's determination to be a part of the global nuclear non-proliferation regime, which includes commitments of nuclear non-proliferation and benefit from peaceful uses of nuclear energy on the one hand and regulations on nuclear safeguards, safety, security and liability on the other. Meanwhile, the UAE was also determent to transfer related nuclear international legal framework into its national legal system. As it is stated by Ambassador Al Kaabi, the UAE established eight new regulations for "the safe, secure, and peaceful use of nuclear applications" prior to the initiation of the Barakah NPP's first Unit, as well as devised licensing and inspection procedures (2022; 304).

Among above major nuclear law pieces, adoption of the NPT as the cornerstone of the regime was vital to be a part of international nuclear community as a NNWS and have a right to pursue a peaceful nuclear energy program in exchange of a commitment not to obtain or develop nuclear weapons (NPT, 1970). In this regard, Emirati's voluntarily adoption of the IAEA's Additional Protocol presents significant

importance due to two reasons. First, it is strengthening the country's Comprehensive Safeguards Agreement (CSA) with the IAEA by granting expanded rights to the Agency in order to verify all nuclear material in the country is being used for peaceful purposes. Second, as a nuclear newcomer country with energy ambitions in the Middle East, the UAE clearly showed its intention to follow the IAEA's guidance and keep its program transparent and more accessible for the IAEA investigations for verification of its peaceful nuclear activities (IAEA, 1997).[6]

The UAE's adoption of major international nuclear security and safety measures are also crucial to pursue its nuclear program in line with the international rules and IAEA milestones. In this regard, the UAE also took voluntarily measures in its national law system. For instance, in terms of nuclear liability, the UAE passed laws in October 2012 in accordance with the updated Vienna Convention. In addition to the IAEAs assistance the UAE needed foreign collaborations at a variety of levels, including industry and government. To this end the country has concluded several MOUs and nuclear cooperation agreements as well as agreements with foreign regulators.

3.2. The UAE's International Nuclear Cooperation Agreements

Following its initial nuclear cooperation deal with France in January 2008, the UAE negotiated nuclear cooperation agreements with several countries. The United States (US)-UAE 123 Agreement, agreed by both parties in May 2009, entered into force in the same year. Nuclear cooperation agreements with Korea, Japan, United Kingdom, Australia, Canada, Russia, Argentina and Japan have followed the US agreement. As it will be discussed in the upcoming parts, the US-UAE agreement has caught particular attention to the significant non-proliferation conditions it has covered.

Table 2. The UAE Bilateral Nuclear Agreements

	Date
Nuclear Cooperation Agreement with France	2008
Nuclear Cooperation Agreement with the US (123 Agreement)	2009
Nuclear Cooperation Agreement with Republic of Korea	2009
Nuclear Cooperation Agreement with Japan	2009
Nuclear Cooperation Agreement with United Kingdom	2010
Nuclear Cooperation Agreement with Australia	2012
Nuclear Cooperation Agreement with Canada	2012
Nuclear Cooperation Agreement with Russia	2012
Nuclear Cooperation Agreement with Argentina	2013
Nuclear Cooperation Agreement Japan	2013

Source: Compiled by the author from the FANR web site.

As it is stated among above mentioned bilateral agreements, the US-UAE 123 Agreement presents a particular case due to the UAE's commitment to forgo domestic enrichment and reprocessing activities. Following the conclusion of a MOU between the two countries in 2008, on May 21, 2009, the two nations formally signed a "123 Agreement" (a reference to Section 123 of the U.S. Atomic Energy Act of 1954). The deal was approved by the U.S. Congress and became effective on December 17, 2009 (US

[6] According to the IAEA as of 3 May 2023 there are 141 parties to the AP although there are 154 signatories. See IAEA, 1997, "Model Additional Protocol" INFCIRC/540 (Corrected), https://www.iaea.org/sites/default/files/20/01/sg-ap-status.pdf.
Adoption status of Middle Eastern states with significant nuclear activities are as follows: Algeria (signed), Iran (provisionally applied between 16 January 2016 and 23 February 2021), Iraq (ratified), Jordan (ratified), Libya (ratified), Morocco (ratified), United Arab Emirates (ratified). Egypt, Israel, Saudi Arabia and Syrian Arab Republic are have not signed the AP yet. Among those countries, Israel as a non-member of NPT has not concluded a CSA with IAEA. Furthermore, Saudi Arabia has an old version of SQP in force with the IAEA. For a detailed analysis, see John Carlson, "Nuclear Verification in a Middle East WMD Free Zone" Geneva, Switzerland: UNIDIR, 2022.

Government Printing Office, 2009; The White House, 2009). Although, originally, recipient states are not compelled to renounce enrichment or reprocessing under the 123 agreements some of these agreements include provisions for these activities. According to the US-UAE 123 agreement, the US has the right to cease its nuclear cooperation with the UAE if it "possesses sensitive nuclear facilities on its territory" or "engages in activities related to uranium enrichment or nuclear fuel reprocessing on its territory". The term "gold standard" refers to this additional non-proliferation legal commitment (Kerr et. al., 2011:17).

The "gold standard" has been regarded as a model for the future nuclear cooperation agreements particularly by the US and the UAE officials. At the signature ceremony of the 123 agreement, the UAE Ambassador Yousuf Al Otaiba stated that: "this agreement supports a new global gold standard for the development of peaceful, civilian nuclear energy". During the ceremony, Ambassador Al Otaiba further explained gold standard by mentioning the Kingdom's "commitment not to enrich uranium or reprocess spent fuel" which means "the UAE will not house these sensitive technologies" (Gulf News, 2009). It should be also noted that, the UAE's agreement with the US allows it to ship spent fuel to France or the United Kingdom for storage or reprocessing with prior US approval and no separated plutonium is returned to the UAE. 123 Agreement with the UAE also includes an "Agreed Minute" clause which would be activated if another country in the region signs a 123 nuclear cooperation agreement with US in "favorable terms" which does not include a gold standard condition in another words "improved terms" with another non-nuclear-weapon state in the Middle East. In this situation upon the request of the UAE 123 Agreement with the US would be re-negotiated and amended (US Government Printing Office, 2009).

Due to above mentioned features of the 123 Agreement, the US Under Secretary for Arms Control and International Security Ellen Tauscher Ellen Tauscher said that "the UAE model will become even more important as the world grapples with how to enforce and strengthen the non-proliferation regime" (The UAE Embassy, 2009). At a Hearing Before the Committee on Foreign Affairs in 2009, Undersecretary further stated that "I believe any future U.S. 123 agreement in the region—with Jordan, Kuwait, and other states that are seeking it—should follow this model" (House of Representatives, 2009). It can be said that following the conclusion of this 123 Agreement, it has been widely discussed whether this agreement would be model for the upcoming agreements.

4. The Emirati Nuclear Experience and 123 Agreement: A model for the Other Aspirant States?

The reasons behind the UAE acceptance of gold standard is attempted to be explained by several scholars. According to one point of view, the Emirati state is freely waiving its right to domestic uranium enrichment and reprocessing spent fuel, both of which are required to produce fissile material for nuclear weapons, as a "sign of good faith in building a bulwark against regional proliferation" (Finlinson, 2022; 113). According to another view, by "proactively engaging with the U.S. nuclear community" the UAE successfully dissuaded possible deal opponents and gained from the community's knowledge for its nuclear program (Early, 2010: 271). As Jessica Varnum states, the adherence of the gold standard is also seen as "a stamp of approval" from the US (Varnum, 2012; Squassoni, 2015).

It is being discussed particularly in the US academic circles whether this agreement would be model for the upcoming agreements in two ways: first, whether the US would be able to conclude any other agreement with a region country if the it accepts gold standard as a model condition for its future 123 agreements; second would other nuclear supplier states such as Russia and China follow the steps of the US in order to strengthen non-proliferation standards in their respective nuclear cooperation agreements. Regarding the first question, it should be noted that since its 123 agreements with the UAE, the US has not been successful to conclude any new 123 agreement with a region country. Furthermore, during the US-Saudi Arabia 123 agreement negotiations gold standard issue has become a significant obstacle in the way of the conclusion of a nuclear cooperation agreement between the countries. It can be said that, from

the US point of view taking the Emirati non-proliferation steps- such as the adherence of gold standard and Additional Protocol, as a model in its expectations and future demands has led to a deadlock in US-Saudi Arabia nuclear negotiations.

Regarding the second question, it is mostly argued that other nuclear supplier states would not follow US steps. It is put in an expert analysis from Harvard University scholars that "other suppliers are highly unlikely to follow this model" (McGoldrick et al. 2011: 49). According to the authors, because of this the effectiveness of this strategy to stop the spread of enrichment and reprocessing may be restricted to a handful of countries at most, and the likelihood that it will serve as a more widespread model is low (McGoldrick et al. 2011; 49). Moreover, according to Fred McGoldrick, who spent more than 30 years at the US State and Energy Departments, if the US insist that its cooperating partners "forswear enrichment and reprocessing", the US will "risk losing out on nuclear sales and the jobs that go with them". Thus, according to him, this so-called gold standard may turn out to be fool's gold (McGoldrick, 2010: 9).

The possible partner country may not have a clear intention to create a nuclear weapon for sure if it does not follow the Emirati stages. Rather, according to the most of the official statements from the region countries, it can be said that they are making particular emphasis on their "inalienable right" in the framework of the NPT. For instance Jordan Atomic Energy Head one stated that the UAE "has relinquished all its NPT rights to sensitive nuclear technology indefinitely. Why should we give up our rights?" He further declared that his country will be "sticking and adhering to the NPT, and full rights and privileges under the NPT (McGoldrick et al. 2011:23).

On the other hand, Kuwait makes contrary declarations. Motivated by the UAE's advancements in nuclear energy, Adnan Shihab-Eldin, the advisor to Kuwait's Nuclear Energy Commission, reportedly said that: "we considered the Emirates as an example" in the author's interview with Kuwaiti officials (Sim, 2021: 268-9). Kuwait example supports the arguments that the UAE's nuclear energy experience would be seen as a model by the region countries. According to these studies the UAE's approach exemplifies the potential rewards for nations ready to provide significant safety, security, and non-proliferation guarantees in exchange for international nuclear assistance. The UAE allayed the worries of many in the non-proliferation community who could have objected to such a contract by speaking with major nuclear suppliers at the beginning of their nuclear program and making strict non-proliferation guarantees (Early, 2010: 273-4). In parallel with these arguments the UAE Ambassador Hamad Al Kaabi stated "the UAE's commitment to the highest standards of operational transparency, safety, security, and non-proliferation", as well as the nation's collaboration with the IAEA, have allowed the UAE program to serve as a model for many countries starting their nuclear power programs (IAEA Bulletin, 2017: 15). In line with these statements, the UAE Diplomat Al Otaiba said that the UAE's voluntary pledges "exceeded commitments secured from Iran under the JCPOA," and if Iran is sincere about non-nuclear goals, "signing onto the same voluntary commitments as the UAE" would be the clearest indicator of its intentions (Finlinson, 2022: 119). It is clear that, success of the UAE nuclear energy program is significant for the Middle East countries. According to Mohamed Shaker, who was a well-respected Egyptian diplomat and authority on the NPT, the UAE "operating nuclear reactors would show that the region countries do not need a full fuel cycle in order to have their own nuclear energy programs" (Shaker, 2014: 518).[7] Shaker further states that: "Introduction of nuclear power in the Arab world would raise the question of how many elements of the nuclear fuel cycle a country should need to operate a modern … nuclear industry. Does every country need its own nuclear fuel cycle?" (2014: 518).

5. Conclusion

Following the announcement of the UAE's White Paper in 2008, in twelve year-time, the Barakah Nuclear Energy Plant went online in August 2020, making the UAE the first Arab country to build and operate a NPP. The UAE has an operational nuclear energy program as of July2023, with three reactors

[7] Mohamed I. Shaker, is the author of the seminal book "The Nuclear Non-Proliferation Treaty: Origin and Implementation, 1959– 1979", London: Oceana Publications, 1980.

connected to the grid and commercially operational and a fourth approaching completion. As it is discussed, while the UAE government plans to diversify its energy sources in the short term it intends to diversify its whole economy in the long term.

The study evaluates that relatively fast and smooth progress in the UAE's nuclear energy program includes several actors and government implementations. The White Paper can be regarded as the government's attempt to define the difficulties and processes required to establish a civil nuclear power program. The UAE's policymakers admit that there was some sensitivity in creating a document that would serve as the world community's first indication that the UAE was considering civil nuclear power. Given that the UAE and the US signed the MOU on nuclear cooperation one day after the White Paper was released, one could argue that the official declaration of Emirati peaceful nuclear intentions, combined with a concrete and comprehensive background study on nuclear energy plans, paved the way for the signing of this MOU. As a nuclear newcomer with no prior nuclear energy infrastructure, the UAE has relied heavily on international collaboration to expand its nuclear energy program. Furthermore, it had to obey international treaties and other regulations in order to gain foreign nuclear support. To this end, the UAE has constructed the physical and legal infrastructure required to ensure that its obligations under certain international treaties are met by the time they enter into force.

The study comes to the conclusion that there are a number of significant essential variables, including specific Emirati policies and tactics and persistent application of these policies by UAE, which would account for the success of the country in building a nuclear energy program. Firstly, it is evaluated that the UAE has worked closely with the IAEA not only in building the scientific and technological capabilities of the country but also in legal, regulatory and institutional infrastructure particularly. The Emirati government made it clear that its nuclear power program will adhere to the Agency's standards and will be based on the concepts described in the IAEA's Milestones document. It is seen that following the IAEA guiding milestones persistently paved the way for a smooth process for the initiation of Emirati nuclear program. As of July 2023, the IAEA has paid 13 visits to the UAE in order to see the progress and identify the gaps of the ongoing nuclear program. Additionally, the establishment of numerous foreign advisory boards and a policy of hiring renowned international specialists—such as a former head of the IAEA—added to the program's positive image by implying that those experts have been giving the Emirati nuclear program its seal of approval. Furthermore, the UAE took serious steps to create and manage human resources for its long-term nuclear program in collaboration with the Agency.

Secondly, as it is explained in detail, becoming a member of compulsory international nuclear law agreements, conventions and even voluntary international measures for the nuclear non-proliferation, safety, security, and liability was crucial for the UAE in order to advance its nuclear program. In this framework, the country has become party not only to the major ingredients of the global non-proliferation regime but also to the voluntary one such as the IAEA's Additional Protocol. The UAE's decisive efforts to join the international nuclear legislation framework were regarded positively by the international nuclear community, including nuclear suppliers. As it is put, the country's determination to be a part of the nuclear non-proliferation system can be inferred from the short time periods between the signature and ratification of the aforementioned accords and conventions.

Finally, concluding various bilateral agreements with foreign governments and entities also played a major role for the success of the country's nuclear program. The UAE has concluded numerous MOUs and bilateral nuclear cooperation agreements with foreign governments and regulators. In this regard, conclusion of a 123 Agreement with stricter non-proliferation conditions such as forgoing its right to domestic uranium enrichment and spent fuel reprocessing, goes beyond the US law can be evaluated as a significant step for both parties. Instead, the UAE committed to purchase fuel from commercial partners and transport spent fuel to abroad for reprocessing. These requirements were self-imposed and exceeded existing international norms or treaties. According to proponents of the gold standard, the existence of the gold standard under the 123 Agreement is evidence of a nation's commitment to or loyalty to the non-

proliferation regime. As a result, it will inspire other non-nuclear governments to sign a nuclear cooperation agreement that includes a gold standard. On the other hand, opponents of the gold standard view this expectation as a "naive" approach that would not apply to actual or potential US nuclear allies. As it is discussed the development and status of the UAE nuclear program have been studied from several perspectives as a Middle Eastern government currently pursuing a nuclear energy program. Furthermore, there is debate over whether this agreement will serve as a model for other 123 agreements in two ways: first, whether the US will be able to conclude other agreements with countries in the region if it accepts the gold standard as a model condition; and second, whether other nuclear supplier states like Russia and China will follow the US's lead to strengthen non-proliferation standards in their respective regions. The study evaluates negative and positive responses to both questions and elaborates whether the UAE's nuclear experience as a newcomer country would provide a model program for several other non-nuclear states interested in pursuing a peaceful nuclear energy program.

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