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RESEARCH PAPER

Evolution of Iran's Nuclear Program: A Complex and Controversial Trajectory

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ABSTRACT

This study aims to provide a complete historical analysis of Iran's nuclear program and US efforts to curb Iran's nuclear ambitions. Understanding this issue is crucial to comprehending the current nuclear impasse. Iran's nuclear program has been contentious over the past few decades, with its roots tracing back to the 1950s. Since the 1950s, Iran's nuclear program has gone through significant changes. This study sheds light on Iran's nuclear ambitions and examines the effectiveness of US diplomatic efforts to address the issue for peace purposes. This study employs a qualitative approach to construct the historical trajectory of Iran's nuclear program. This study contributes to a deeper understanding of the Iranian nuclear issue that leadership ideologies and geo-strategic shifts impacted the fate of Iran's nuclear program and US responses. Ultimately, this study underscores Iran's nuclear status from the Atom for Peace to the revolutionary phase. Iran's nuclear program underwent reactivation that eventually cut off US support and raised concerns for Iranian uranium enrichment. Furthermore, the hidden nuclear sites beyond the reach of the IAEA. Shaping the US responses to impose sanctions shaped the complex phenomenon of Iran's nuclear profile. Moreover, this study also reveals that Iran's diplomacy was based on to snapback UN sanctions mechanism, in which form of JCPOA ultimately collapsed, and Iran started to breach the JCPOA. This study also emphasizes that Iran and the US should adopt the peace process through negotiations by signing the comprehensive pacts.

KEYWORDS Nuclear Program, Enrichment, IAEA, Sanctions, Diplomacy

Introduction

Iran's nuclear program has been an important thorn in global politics. With its roots in the 1950s, Iran's nuclear program has evolved into a complex phase of controversy. The genesis of Iran's nuclear program dates to the 1950s, when Iran embarked on a civilian trajectory, facilitated by for agreement from the US. This nascent endeavor was based on the notion of employing nuclear technology for peaceful purposes, with the United States and other nations providing technical assistance to achieve nuclear assistance for the nuclear program. The security vulnerabilities led to the fascination of Iran towards nuclear bombs. The Shah regime, characterized by its modernization and secularization efforts, subsequently magnified nuclear ambitions with a civilian nuclear program for civilian purposes.

In 1979, the Iranian Revolution precipitated a paradigmatic shift in nuclear policy, the revolutionary govt. opted to curtail the nuclear program due to ideological considerations. However, the Iran-Iraq (1980-1988) war and concerns over regional

security threats led to the reevaluation of Iran's nuclear strategy and priorities. From the 1980s to 1988, the Iranian nuclear policy changed and was influenced by geopolitical shifts and domestic priorities. Under the presidency of Ali Akbar Hashemi Rafsanjani in the post-war period, Iran's nuclear program gained momentum with significant focus on developing the nuclear program.

The program faced international challenges from Washington because of the military dimensions of the nuclear program. Iran's diplomacy with Russia to complete the Bushehr nuclear reactor in 1995 after facing challenges from German Kraftwerk contractors and China to complete the construction of the uranium enrichment (Khan, et. al., 2019).The Iran nuclear crisis intensified during the George W. Bush administration, marked by heightened tensions and diplomatic stalemate when Iran was eager the continue enrichment of uranium with hidden nuclear sites, which raised Washington's concern to impose UN sanctions on Iran to isolate Iran. Iran maintained the stance of peaceful purposes of nuclear weapons. Through international community concern, the Iranian nuclear program trajectory reflects broader themes of technological advancements.

Iran's nuclear program entered a new phase in 2015 when Iran and the US signed the nuclear deal with the P5 to limit the uranium enrichment and heavy water reactors to ensure the peaceful nature of Iran's nuclear program under the inspections of the IAEA. But Iran resumed the significant process of uranium enrichment when President Trump withdrew from the deal led to geopolitical dynamics of the Middle East, and the international media is always curious to renegotiate the deal for security purposes and regional stability of the Middle East.

Literature Review

Joyner focused on Iran's nuclear program and its relationship with international law, covering the shifts from conflict to negotiations. It discusses the challenges faced in non-proliferation efforts and analyzes the framework of the nuclear activities of Iran. This book also provides the legal aspects surrounding the nuclear program and international law. Ultimately, this serves as an international law and the role of negotiations. This analysis does not fully address the JCPOA and geopolitical dynamics of the US withdrawal from the JCPOA in 2018 (Joyner, 2016). However, some gaps in evolution considerations and the future of the Iran nuclear deal are identified, and this article could contribute to further understanding.

Gerli provided the detailed account of the history and trajectory of Iran's nuclear crises from the origin of the program to the Joint Comprehensive Plan of Action in 2915. Gerli divided the book into two main parts. The introduction of nuclear crises and a detailed analysis of nuclear crises. The book delves into the major milestones of the Tehran Declaration, the Brussels agreement, and fuel swap proposal, and the final negotiations that led to the signing the nuclear accord. the book also provides great insights into the strengths and weaknesses of the JCPOA and its regional implications (Gerli, 2019). But this study is based on an overemphasis on historical insights and a limited discussion of future challenges by ignoring the other Middle Eastern states' concerns, and this study addresses these limitations.

Homayouvansh shed light on the early years of Iran's nuclear program by delving into declassified archives. Homayouvansh provided a depth analysis on the nuclear program from the Shah and Eisenhower Atoms for Peace collaboration by providing

fresh perspectives. The author uncovered the fascinating story of how Iran's nuclear ambitions evolved from the 1950s to the 1970s. This book also highlighted the challenges and controversies surrounding Iran's nuclear challenges from Reza Shah Pahlavi. The author significantly focused on Iranian national desires and the Shah's anxieties to achieve nuclear power status by preventing Anglo-Soviet influence (Homayouvansh, 2017). However, this book focused on the 1950s to 1970s, and my research aimed to explore further evolving implications of Iran's nuclear program and Western concerns about peace.

Sharp examines the efforts of Obama to fulfill his approach to diplomacy, but the Iranian response was slow. Obama's rhetoric to admire Iran and the Persian Gulf. Making a transition in Iran and America's foreign policy from "Axis of Evil" to "cooperation." (Sharp, 2009). More research is needed to understand the potential pathways for renewed engagement accord and its implementation. This work contributed to a deeper understanding of the complexities surrounding the JCPOA for global security.

Nuruzzaman provided the context for understanding the Trump withdrawal from the deal with Iran to address the missiles and regional activities. This study provided a clear, concise analysis of the Iran nuclear deal in the Trump era, which led to mistrust of Iran in negotiations with the West. Moreover, this study analyzed the Trump rationale about Iran deeply (Nuruzzaman, 2020). However, this study is limited to analyzing the pressure of allies on Trump the leave the deal, and this study seeks to offer a more nuanced analysis of Trump's withdrawal from the deal.

Material and Methods

The data collection technique to study the historical background of Iran's nuclear program is based on secondary sources from different articles, reports, and websites. This study also employs the qualitative research approach to gather insights to study the key events of Iran's nuclear history.

Results and Discussion

Formative Period of Iran's Nuclear Program

This era marks to first exposure and fascination with the nuclear world, marked by curiosity. The US introduced nuclear technology to third-world countries. President Eisenhower's program "Atoms for Peace" deployed the notion to developing countries. The bruising experience of Iran from foreign invasion and soviet occupation in August 1941 shaped the perspective for socialization to nuclear technology. In 1953, the CIA and British M16 backed a coup to overthrow the democratically elected prime minister, the Mosaddeq govt. Orchestrated tensions in Iran because of his wish to nationalize the Iranian oil industry. Reza Shah Pahlavi came into power in 1941, and the Shah became increasingly aware of the vulnerabilities of the indirect invasion the communist regime. 1958 was a year of a highly securitized era because of the Arab states' alliance with the Western world. Iran began to understand the nuclear technology and capabilities to develop nuclear power. Iran was regarded as the key partner of the Central Treaty Organization (CENTO). In 1957, the US and Iran signed the first agreement, "atom for peace," marking the beginning of a peaceful nuclear partnership. This agreement came into force in 1959 for civil uses of the atom, and paved the way to the peaceful transfer of US nuclear and technical support of a 5-MWatt light water reactor and low-enriched uranium. In the 1960s, Iran was still lacking in nuclear technology capabilities. By acknowledging the hindered technological expertise, Shah appointed Dr. Akbar Etemad

to lead the Tehran Nuclear Research Centre to overcome the technical challenges to inaugurate a new facility in 1968. Iran signed the Nuclear Non- Non-Proliferation Treaty in the same year, but it was ratified in 1970 (Homayouvansh, 2017). In 1973, Shah received the "blank check" from President Nixon to purchase conventional arms from the US to boost military capabilities. Yom Kippur war OPEC oil embargo led to the quadrupling of oil prices, resulting in a significant increase in oil prices. Between 1972 to 1978, Iran signed multiple agreements with various states, including Canada, the UK, Australia, and South Africa. At this time, thousands of Iranian students were studying nuclear physics and engineering in Western universities. Iran also solidified a nuclear agreement with West Germany, which was subsequently followed by a comprehensive deal for the construction of 6 nuclear reactors, notably Kraftwerk union to build (1300 Megawatts) reactors at the Bushehr site. Iran's nuclear program underwent ambiguous shifts between 1974 to 1978. marked by the adherence to the Comprehensive Safeguards Agreement of the IAEA for peaceful inspections of the nuclear program within its sovereignty. In 1974, Shah proposed the initiation of the Middle East Nuclear Free Zone. In the same year, the International Atomic Energy Agency was established from 1974 to 1975, Shahs confirmed that "Iran was not focused on nuclear arms but might revise its policies if other countries developed them". Washington raised the concern to ambiguous statements of the Shah and wanted to negotiate new nuclear cooperation to avoid a nuclear arms race in the region. The weak economy and internal chaos led to the birth of Iran in 1979. Iran held the American embassy for 444 days led to human rights crises and cutting off the nuclear cooperation with US (Gerli, 2019).

Revolutionary Phase to Atomic Optimism

In 1979, the Iranian revolution brought a dramatic change in attitude towards the nuclear program inside Iran and the West. The new revolutionary govt. rejected the ideas of the nuclear program related to the West and distanced themselves from Shah's willingness to modernize the country. The clerics also stated that the willingness of the Shah to modernize Iran is the actual cause of the weak and struggling economy. The hostage crisis occurred, and the US imposed sanctions on Iran. Iran itself was against of country's nuclear program development and was against technology because of Khomeini's desire to cut Iran off from technology and modernization to the greatest extent. According to him, it was the source of Western technology (Joyner, 2016).West's strained relations with Iran and the overthrow of the pro-Western Shah, replacement with a theocratic regime, were greatly unsettling for US foreign policy interests. The efforts of Iran to export the revolutionary ideas were exacerbated. The relations go beyond losing Middle East oil to Iran as the US enemy. West regarded Iran as the "unambiguous enemy". The US was desiring to find its ally for its interests of regional balance. The desired ally was the leader of Iraq to undermine the revolutionary government of Iran (Shahraki, 2013). The US encouraged Iraq to engage in war with Iran to protect its ally in the Middle East against the Islamic Republic. The US provided support to Iraq during the war by removing Iraq from terrorist status terrorist status (Azad, 2023).

After the Iran-Iraq war, Tehran's cityscape and national consciousness were marked by devastation, and the civilians of Iran suffered great loss with damaged infrastructure and martyrs. A new generation of war veterans sought to reassess the regime's actions and prioritize the reconstruction of the nuclear program for the border and state. President Rafsanjani prioritized pragmatism and focus on the economy to resume the nuclear program, previously justified on ideological grounds, which was refocused as a state technical concern (Naji & Jawan, 2011). Rafsanjani, speaker of

parliament and commander in chief, emphasized the need for nuclear weapons and biological weapons because the world has failed to impose resolutions during the war. He further announced that the world is unjust. Mehdi Karroubi, speaker of the parliament in 1990, inaugurated the "Jabir Bin Hayyan" laboratory to educate in nuclear technology. The AEOI launched the first-degree program of 30 graduates of nuclear technology. Iran signed the nuclear cooperation agreement with China because China, with significant nuclear expertise, could help Iran redevelop. Iran signed the deal for 1 metric ton of uranium hexafluoride. In 1992, Iran and Russia signed the agreement on a heavy water reactor. The US introduced the Iran-Iraq arms non-proliferation act to impose sanctions on other international states that provided aid to Iran for Mass destruction weapons. Iran signed another deal in 1995 with Russia to complete the Bushehr. Washington raised the concern and imposed sanctions on Iran (Patrikarakos, 2012).

Nuclear Crises of Iran

In 2001, when Al-Qaeda attacked on US Pentagon led to the US invasion of Afghanistan in for War on Terror. The US declared Iran as "Axis of evil" in accordance with Iraq and North Korea (Biriya, 2020). In 2002, the IAEA received the secret site of uranium enrichment. The "National Council of Resistance of Iran publicly revealed the information about the Natanz facility in August 2002. This first phase of the nuclear crisis started from 2002-2005 (Gerli, 2019). From the beginning, the US did not pay attention to these revelations. Indeed, by the end of 2001, the US, British, and Israeli intelligence had probably been aware of the unveiling of nuclear facilities through the information gathered by intelligence on Pakistan's dealings with North Korea, Libya, and Iran (Gerami & Goldschmidt, 2012). The US intelligence department released the pictures of a secret nuclear site, but the Iranian foreign minister maintained the stance that the nuclear program is completely transparent and peaceful. In February 2009, Iran publicly acknowledged Iran nuclear facilities by stating the nuclear program is for civilian purposes. A few days later February 21,22, the IAEA visited Iran's nuclear sites during the inspection. IAEA was informed of the indigenous enrichment program in Natanz. The pilot fuel enrichment plan was near completion, with 100 centrifuges to install, with Iranian failure to fulfil the additional protocols. In the second nuclear crisis phase, the UN imposed massive sanctions on Iran. On January 3, 2006, Iranian informed the IAEA to resume enrichment, but the IAEA Director General raised suspicions and expressed concern about the nuclear power plant and their military purposes. In December 2006, the UN passed resolutions 1737, 1747, 1803 in 2008, and 1835 to put pressure on Iran. The Iranian president, Ahmadinejad, announced that "Iran will not stop the enrichment and will resist the supremacy of sanctions." (Gerli, 2019).

Joint Comprehensive Plan of Action

The Obama administration recalled for a new approach to negotiations for a changing landscape of the Middle East and the Iranian nuclear program by opting for diplomacy. was going to pursue diplomacy. It should be backed by coercion and military threat (Al Barasneh & Khatib, 2019). Israel strongly condemned the negotiations. The Israeli foreign minister Ephraim Sneh emphasized the uncertainties about nuclear bomb of Iran. For Israelis, the Iranian possession of nuclear weapons is typically considered a regional threat. Obama had a research reactor Fuel Deal involving P5+1 and IAEA to address concerns over the nuclear issue because Iran had been enriching uranium with the capacity of 19.75%. The proposed deal aimed to reduce the efforts to generate a nuclear bomb. The P5+1 proposed to limit the nuclear program, making it hard to

generate a nuclear bomb, and proposed a fuel swap deal. In a swap deal, Iran would send most of its low-level nuclear material (1200kg to LEU), 80% of its stockpile to Russia, and Russia would turn that into the right type of fuel for reactors, and then France would make the fuel for medical purposes (Gerli, 2019). The Iranian nuclear program entered a new phase in 2015 when Iran and the US signed the nuclear accord to limit uranium enrichment. The deal was signed between Russia, the UK, China, France, Germany, the US, and Iran. Under this, Iran's enrichment was limited to 97% to 300 kg for 15 years, with enrichment limited to 3.67%. The original core was removed and reduced to weapons-grade plutonium in the agreement (Valadbaygi, 2023). Fordow facility will be transformed into a nuclear physics and technology center, with 1044 IR-1 remaining in 6 cascades without uranium, two for stable isotopes production. Iran will limit its uranium enrichment; all centrifuges and infrastructure will be removed under the supervision of the International Atomic Energy Agency Iran (Kerr & Katzman, 2018).. In return, the US and the major powers agreed to sanctions relief except for the sanctions of terrorism and Human rights concerns. It was a great landmark in US foreign policy in the Obama and Hassan Rouhani Presidential era to overcome the nuclear arms race in the Middle East. Hassan Rouhani. And Jawad Zarif's pragmatic leadership ideology led to the success of negotiations. The deal was implemented on January 16, 2016, when the IAEA announced the complete compliance of Iran with the agreement. The agreement proponents maintained the stance that it would lessen the likelihood of war between Iran and its regional enemies, such as Saudi Arabia and Israel, by preventing a resurgence of Iran's nuclear weapons development. Negotiations between Iran and the P5+1 over Iran's nuclear program after taking office led to their dilemmas. Iran pledged greater transparency on Iranian nuclear programs, enabled a balancing settlement to secure their interests of snapback sanctions, and ultimately opened the door for choosing the nuclear agreement in July 2015 (Haung, 2016).

Collapse of the Joint Comprehensive Plan of Action

The maximum pressure policy of Trump was based on military, economic, and political pressure to block the Iranian nuclear program (Nuruzzaman, 2020). On May 8, 2018, in a White House announcement, Trump announced the US withdrawal from the Joint Comprehensive Plan of Action, also known as the nuclear deal. Trump stated that the prevention of Iran's nuclear bomb and missile program is not possible with the JCPOA agreement. While justifying his decision, he announced the complete withdrawal from the nuclear deal with Iran. He also announced the US will reimpose the sanctions on Iran's oil sector that were previously lifted in the agreement. Withdrawal from the deal was a promise of Trump during his election campaign to make "America Great." The withdrawal of the deal is confirmed by the evidence of the dismissal of the Secretary of State. Because the Secretary of State Rex Tillerson and Trump had differences on the JCPOA. He appointed Mike Pompeo as secretary in his cabinet, a strong critic of the nuclear agreement (Bera, 2019). American allies were standing with the US because of security concerns against Tehran becoming the regional power through the Mediterranean Sea and Iraq, Syria, and Lebanon to pose a threat to Israel (Nuruzzaman, 2020).

Trump claimed Iran was violating the spirit of the agreement, upholding the view that the deal is against American national interests because the Iranian regime is involved in terrorist activities and missile programs, which is a great threat to Middle East stability. Trump believed in the necessity of the long game to end nuclear power and Iranian aggression permanently. Trump also suggested negotiating a new deal to fix the crisis (Aljazeera, 2019). John Bolton's open calls for regime change in Iran underscore the

direction of U.S efforts to resolve the nuclear matter peacefully (Yazdani, 2019). . Iran also breached the restrictions on the advanced centrifuges in response to the withdrawal, escalating the tensions further between the US and Iran. Iran started to increase its low-enriched uranium stockpiles and resumed uranium enrichment to 20% and started to produce a small quantity of 60% enriched uranium, resumed activities in the Fordow facility, and installed IR-6 centrifuges at Natanz (BBC, 2021).

Conclusion

The evolution of Iran's nuclear program reflects the complex dynamic of national ambitions and non-proliferation tension. Iran's nuclear nationalism has been shaped by domestic priorities and geopolitical tensions. From its origin as a peaceful program in 1950, as an initiative supported by the US and other international partners, it has transformed into the most contentious issue in modern diplomacy. The program pathway is marked by a period of diplomacy and confrontation. Iran consistently maintained the stance "that the nuclear Program is for peaceful purposes," but disclosure of hidden sites led to a cycle of sanctions on Iran and fragile relations with other states, particularly the US. The landmark agreement in 2015 demonstrated to limit the uranium enrichment, but the 2018 withdrawal changed the whole phenomenon. Now, the Iranian nuclear program stands at various crossroads of the arms race and escalation of geopolitical tensions.

Recommendations

To solve Iran's nuclear program, Iran and the US both need to follow the diplomatic pathway to address the dimensions of the nuclear program and the global security phenomenon in accordance with NPT provisions and comprehensive deals for peace-building phenomena to reduce the tensions and pressure.

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