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MULTINATIONAL URANIUM ENRICHMENT IN THE MIDDLE EAST: AN ECONOMIC AND POLITICAL PERSPECTIVE

Ali Ahmad and Sidra Salahieh

Summary

With Iran gaining the international community's conditional acceptance of its nuclear program and the United Arab Emirates constructing three of four planned nuclear reactors, nuclear energy has become a reality in the Middle East. Turkey, Saudi Arabia, Jordan and Egypt are also at different stages of planning their first nuclear power plants. However, regardless of the economic suitability for nuclear power in the region, it is still possible that Iran's neighbors would demand having similar indigenous enrichment programs. In addition to Iran's own security concerns, this would pose a major security threat as certain nuclear fuel cycle activities such as uranium enrichment and/or reprocessing would offer states the implicit capability to develop nuclear weapons at will. It is worth noting that Israel is not included in this analysis and policy recommendations for a variety of reasons, not the least is the fact that it does not have a civilian nuclear program. One option that would offer some real security benefits is the establishment of a joint uranium enrichment facility in the Middle East. This policy brief examines the economic viability of converting Iran's uranium enrichment program into a multinational one while also discussing the underlying technical and political challenges and benefits.

MAIN FINDINGS

- The primary rationale for a multinational uranium enrichment arrangement is the added assurance that Iran's nuclear program will remain peaceful;
- There is a clear economic advantage of having a multinational uranium enrichment facility compared to having indigenous enrichment programs in the Middle East;
- Alternatively, current enrichment prices will remain low and stable for the next decade indicating that countries should purchase enrichment services from an external supplier rather than seek to establish their own enrichment programs;
- A multinational uranium enrichment facility in the Middle East could improve transparency and promote cooperation between Iran and its neighbors while simultaneously guaranteeing Iran's peaceful enrichment plans beyond the Joint Comprehensive Plan Of Action.

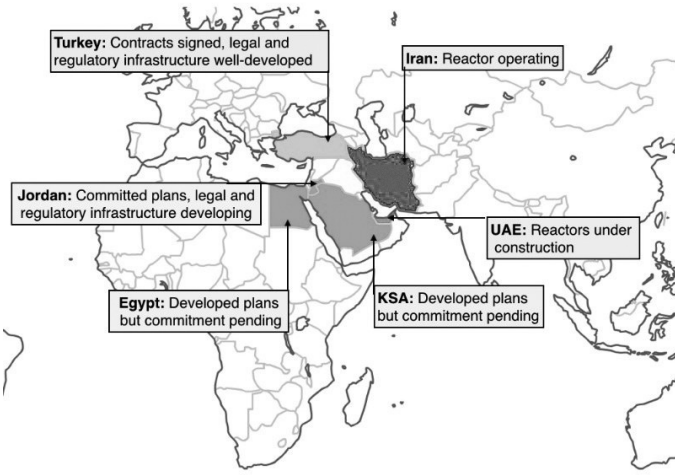
The Joint Comprehensive Plan of Action (JCPOA) agreed to by Iran and world powers in July of 2015 established constraints on Iran's nuclear program in return for lifting economic sanctions. However, this deal only freezes Iran's uranium enrichment program for the next 10-15 years after which the country plans to use it to fuel its nuclear reactors. Meanwhile, other Middle Eastern countries are developing their own nuclear power plans. See Figure 1.

While the current status of most national programs in the region are expected to include vendor contracts that both supply reactor fuel and take it back for waste storage, the concern that states may decide to acquire their own enrichment programs needs to be carefully addressed.

With the proper framework, a multinational uranium enrichment facility could add to the transparency of current and future enrichment operations taking place in Iran and in the region. This would further reassure the international community of Iran's non-proliferation promises while simultaneously promoting cooperation between Iran and its neighbors. However, the economics of a multinational enrichment plant need to be examined in order to provide the necessary financial incentives for its establishment.

Figure 1

Status of civilian nuclear programs in the Middle East



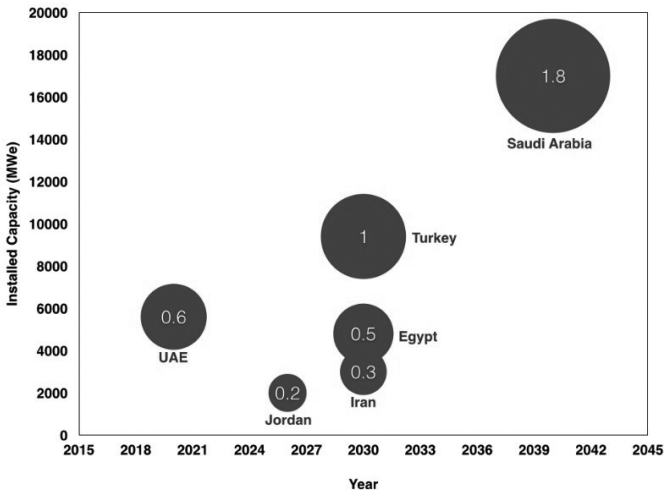
Projected enrichment capacity and costs

The projected enrichment capacity of countries within the Middle East vary according to their nuclear power capacities – amount of electricity produced by existing or proposed nuclear power capacity. See Figure 2.

The size of the circles in Figure 2 represents the enrichment capacity which are measured in million Separative Work Units (SWU) per year; these units represent the amount of effort needed to separate different isotopes of uranium into enriched and depleted streams. The size of the circles also reflects the size of the proposed nuclear program since higher amounts of fuel require higher enrichment capacity. According to current estimates, Saudi Arabia will require the highest enrichment capacity of 1.8 million SWUs/yr should it demand to make its own enriched uranium to fuel its proposed 18 reactors by 2040, while Jordan will require the smallest capacity of 0.2 million SWUs/yr.

Figure 2

Projected enrichment capacity of countries in the Middle East



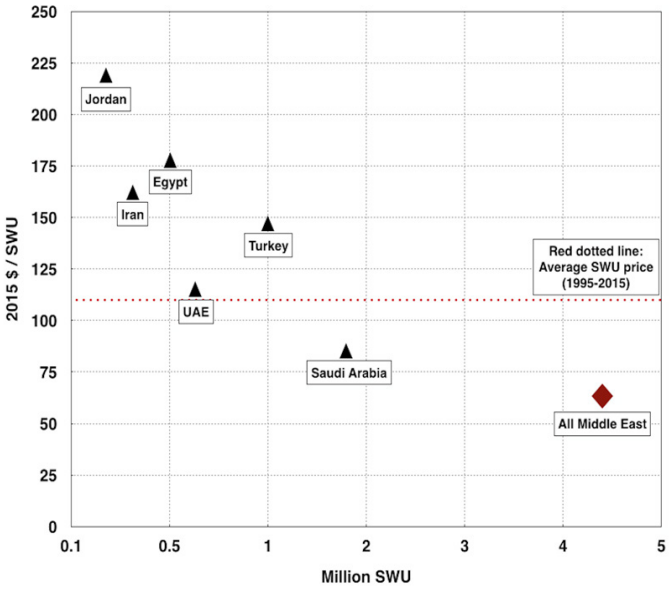
The enrichment costs associated with each of the Middle Eastern countries and the region combined are shown in Figure 3. Evidently, the cost of enrichment decreases as enrichment capacity increases, indicating economies of scale. As Jordan has the lowest enrichment capacity, it would incur the highest enrichment costs at $222/SWU while the opposite is true for Saudi Arabia which would incur the lowest enrichment costs at $86/SWU.

"The cost of enrichment incurred by a multinational facility that combines the total enrichment capacity required by the region would result in a range between $97 and $70/SWU."

It seems that if countries seek to develop their own enrichment programs, only Saudi Arabia would achieve costs below the average market price for enrichment, $110/SWU (red dotted line) that is if it decided to provide enriched uranium domestically for its 18 proposed reactors. However, if Saudi Arabia decides to build only one or two reactors, for example, its enrichment costs would be much higher. On the other hand, the cost of enrichment incurred by a multinational facility that combines the total enrichment capacity required by the region would result in a range between $97 and $70/SWU. This shows that there is an economic advantage of having a joint enrichment facility compared to having individual programs.

Figure 3

Enrichment cost of M.E. countries based on their projected nuclear capacity and discount rates



Analysis of the global enrichment market

The uranium enrichment market has been volatile during the past two decades. Prices have risen since the beginning of the 21st century until they peaked in 2009 at $177/SWU. Since then, prices have collapsed at an annual average rate of 14% to reach the current $60/SWU. One of the reasons for this collapse is due to an oversupplied enrichment market. Another reason is the recent downturn in global nuclear capacity caused by the Fukushima disaster which triggered a decrease in demand for enrichment services. Coupled with the fact that current world enrichment supply (65 million SWUs) can satisfy the IAEA's projected world demand till 2025, the above factors indicate that current enrichment prices will remain low and stable for the next decade (IAEA, 2015). Consequently, states in the Middle East that aspire to acquire nuclear power would perhaps be better off purchasing enrichment services from an external supplier rather than seeking to establish their own enrichment programs. More importantly, these countries may find it appealing to be part of a joint enrichment facility as not only would it benefit them economically but it would also offer political and security benefits as discussed below.

Political and other non-economic benefits

Beyond the economic benefits of multinational versus national enrichment, the primary rationale for a multinational arrangement is the added assurance that Iran's nuclear program will remain peaceful. The political acceptance of such a facility in the region should primarily be viewed as a confidence-building measure. Regardless of whether regional powers feel they need an additional secure source of fuel from a multinational facility for their nuclear energy programs, many – including members of the P5+1[1] – will want further assurance of Iran's intentions beyond the JCPOA.

1 UN Security Council's five permanent members, plus Germany.

If Iran expands its enrichment capacity to fuel its Bushehr-I reactor it would require an enrichment capacity of at least 100,000 SWUs. This means that it would only take Iran about a week to produce enough Highly Enriched Uranium (HEU) for a bomb.[2] If Iran intends to expand its enrichment capacity to fuel Bushehr-I, it should seek an arrangement that provides additional assurance of peaceful use. Iran should anticipate that such unilateral expansion may trigger other regional powers to begin their own national enrichment programs, and would likely bring another crisis with the international community.

"The political acceptance of such a facility in the region should primarily be viewed as a confidence-building measure."

A joint enrichment facility would improve transparency as it would require a multinational workforce in Natanz[3] which would provide assurance that hidden arrangements in the cascades that could potentially speed up the production of a bomb are absent. Such transparency measures would cultivate trust among Iran, regional nations and the international community. This trust could eventually contribute to soften the heightened alertness currently present among Iran and its neighboring countries and possibly lead them to reduce their defense spending.[4] Nevertheless, certain technical challenges such as safeguard arrangements, will need to be thoroughly studied to address the issue of proliferation-sensitive technology and knowledge.

2 That is if they use 3.5% enriched uranium as feedstock.
3 Nuclear enrichment facility currently present in Iran.
4 In 2014, Saudi Arabia's defense budget was $80 billion, Turkey's $17 billion, and Egypt's $5 billion (SIPRI, 2015).

Conclusion and Recommendations

This policy brief demonstrated that the idea of converting Iran's uranium enrichment program to a multinational one could offer significant economic and security benefits. In the context of political division in the Middle East, a joint enrichment facility could improve transparency and promote cooperation between Iran and its neighbors. Nevertheless, to achieve such a high level of technical cooperation in the region, it is imperative that the involved states possess a high level of commitment toward reducing tension, and have a strong political will to overcome serious differences.

In addition, challenges involving the potential competitiveness of the multinational facility within the enrichment market should be assessed such that the interest of potential shareholders like Russia – who currently has supplier contracts with Middle Eastern countries – are taken into consideration.

The 10-15 years freeze of Iran's nuclear program, as agreed in the JCPOA, offers a good time margin to attempt to improve relations between states in the region. However, reaching mutual political understanding could prove more challenging than providing economic incentives for multinational enrichment in the Middle East. Such an understanding could arise should nations start to view the venture as a means to guarantee Iran's peaceful enrichment plans beyond the JCPOA.

References

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The Energy Policy and Security Program

The Energy Policy and Security Program at the Issam Fares Institute for Public Policy and International Affairs was launched in 2016 as a Middle East-based, interdisciplinary, platform to examine, inform and impact energy and security policies, regionally and globally. The Program closely monitors the challenges and opportunities of the shift towards alternative energy sources with focus on nuclear power and the Middle East. The Program has been established with a seed grant support from the John D. and Catherine T. MacArthur Foundation to investigate the prospects of nuclear power in the Middle East and its potential to promote regional cooperation as a way to address the security concerns associated with the spread of nuclear power.

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AUB Policy Institute (Issam Fares Institute for Public Policy and International Affairs)
American University of Beirut
P.O.Box 11-0236
Riad El-Solh / Beirut 1107 2020
Lebanon

Issam Fares Institute Building
AUB
961-1-350000 ext. 4150
+961-1-737627
ifi@aub.edu.lb
www.aub.edu.lb/ifi
aub.ifi
@ifi_aub