Strategy Research Project

The Iran Nuclear Deal: The Verification Challenge

by

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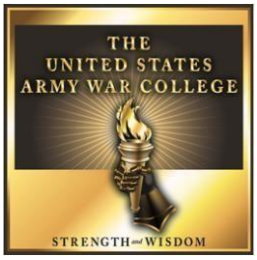

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Abstract

On July 20, 2015, the United Nations Security Council (UNSC) endorsed the Joint Comprehensive Plan of Action (JCPOA), an international agreement on the nuclear program of the Islamic Republic of Iran, hereafter referred to as Iran. The JCPOA was negotiated between Iran and the five permanent members of the UNSC, plus Germany (P5+1) to eliminate Iran's path to the development of a nuclear weapon. The signatories to the JCPOA state the agreement puts in place safeguard measures that prevent Iran from developing a nuclear weapon or weapons-grade nuclear material. The JCPOA is the first agreement to limit fissile material and uranium enrichment capability since the Nuclear Nonproliferation Treaty entered into force in 1970. As a historic agreement and one that affects the Middle East, and possibly global, security, it is appropriate to analyze its safeguard provisions to determine if deficiencies in coverage exist and the ramifications of such deficiencies. This analysis will demonstrate that P5+1 claim that the JCPOA has completely, and indefinitely, blocked Iranian attempts to develop a nuclear weapon is not verifiable.

The Iran Nuclear Deal: The Verification Challenge

> No system of safeguards that can be devised will of itself provide an effective guarantee against production of atomic weapons by a nation bent on aggression.
>
> —Harry S. Truman, C.R. Atlee, and W. L. Mackenzie King[1]

Three months following the bombing of Hiroshima and Nagasaki, President Harry S. Truman and his British and Canadian counterparts issued a statement highlighting the limitations on the international community to prevent nuclear weapons development. Although the International Atomic Energy Agency (IAEA) did not exist in 1945, President Truman invoked a term that twelve years later became enshrined in IAEA processes; the term is "safeguards," defined as measures taken to ensure that states do not use nuclear material to manufacture nuclear weapons.

Seventy years later, negotiators from the United States, the United Kingdom, France, Germany, Russia, and China, along with the European Union (P5+1) announced completion of a comprehensive nuclear agreement with Iran, known as the Joint Comprehensive Plan of Action (JCPOA).[2] From the start of JCPOA negotiations in 2003 through completion of the deal in 2015, the P5+1 maintained a consistent goal: to keep Iran as a non-nuclear state, as part of an indefinite commitment to the Nuclear Nonproliferation Treaty (NPT).[3] In 2014, lead U.S. negotiator for the JCPOA, Wendy Sherman, said that the only measure of success is that Iran never obtains a nuclear weapon.[4] In that context, the P5+1, led by the United States, pursued an agreement based on the assumption that such an agreement was the only effective way to stop the Iranian nuclear program.[5] In doing so, the international community demonstrated its preference for a diplomatic solution instead of coercing Iran through continued sanctions or military action.

Additionally, it is clear from P5+1 statements and the Obama administration's published JCPOA summary that they contend that they achieved the objective of preventing Iran from ever developing a nuclear weapon.[6] It is questionable whether that objective was met. It is also clear from official statements that the P5+1 nations are confident that the JCPOA provisions are completely verifiable through IAEA safeguard measures. This level of confidence raises the question as to whether the P5+1 fully considered the limitations of arms control verification. IAEA verification and compliance arrangements are designed to detect and deter undeclared nuclear weapons activity, but they are not perfect. During the Reagan administration, Fred C. Iklé, Under Secretary of Defense for Policy, suggested the effectiveness of verification as a deterrent was debatable in light of repeated charges of Soviet violations.[7] Certainly, the IAEA has come a long way in strengthening and adapting safeguards to detect violations, but there has also been a diffusion of nuclear technologies and the introduction of smaller, scalable, and portable activities that can undermine such advancements.[8] In 2014, Olli Heinonen, former Deputy Director General of Safeguards at the IAEA, stated that IAEA detection, prevention, and deterrence activities "should, at best be understood as without absolute guarantee."[9] Considering today's risk of covert nuclear proliferation, any uncertainty about compliance assumes greater importance; it is vital that negotiating parties be precise when defining terms such as verification.[10]

With these points in mind, this paper analyzes the safeguard provisions in the JCPOA in terms of their ability to satisfy P5+1 objectives. It begins with a general discussion of the current nuclear safeguards framework designed to prevent the proliferation of nuclear weapons. The next section delineates the JCPOA’s provisions

and is followed by an analysis of the JCPOA's deficiencies with respect to the agreement's verification regime. The paper's conclusion is that the P5+1 claim that the JCPOA has completely blocked Iranian attempts to develop a nuclear weapon is not verifiable.

The Nuclear Safeguards Framework

On July 14, 2015, the P5+1 and Iran finalized two years of negotiations with a formal agreement on terms in the JCPOA, nine years after the P5+1 made its first proposal to Iran, and thirteen years after Iran's clandestine nuclear activities were first discovered. Less than a week later, the United Nations Security Council (UNSC) passed Resolution 2231 endorsing the JCPOA.[11] On January 16, 2016, the P5+1 certified that parties to the agreement had reached "Implementation Day" under the JCPOA. Implementation Day marked the point at which the IAEA verified that Iran completed all of its required commitments under the JCPOA to dismantle its nuclear program. On the same day, and in return, the United States and the European Union took actions to lift nuclear-related sanctions, as specified in the JCPOA.

The JCPOA is now fully implemented and has a targeted, gradual expiration of its provisions over a 25-year period. The JCPOA restricts Iran's ability to stockpile excess plutonium and limits its ability to enrich uranium. In addition, the agreement eliminates Iran's weapons-grade plutonium and uranium, and forbids Iran from developing new weapons-grade material for 15 years.[12] By eliminating fissile material, the key ingredient for nuclear fission or nuclear fusion, negotiators say they have eliminated Iran's pathway to a nuclear weapon.

Since July 2015, analysis of the JCPOA has focused principally on what the provisions require and what they do not require. White House and State Department presentations contain lists with check marks denoting what was removed, blocked, or limited in Iran's nuclear program. Yet, the question rarely analyzed with sufficient depth is: How will the P5+1 and the broader international community verify that weapons-grade fissile material and its production is absent from Iranian territory? This is a vitally important question, because fissile material is the foundation of the broader nuclear weapon problem. The UN-chartered IAEA is responsible for verifying JCPOA provisions and objectives through its safeguards program. Although the IAEA safeguards program began with nuclear reactor operations in the first three decades following World War II, the IAEA applies the same verification regime to the prevention of nuclear weapon activities today as it did decades ago when the NPT entered into force.

The 1970 NPT provides the legal basis for negotiation of safeguards agreements between the IAEA and affected states.[13] Article III.1 of the NPT requires each state that is party to the treaty, which includes Iran, to enter into a safeguards agreement with the IAEA.[14] In 1997, the IAEA Board of Governors (BOG) approved an Additional Protocol, a supplement to the Safeguards Agreement, which significantly expanded the scope of safeguards measures for NPT States.[15]

The IAEA defines safeguards as a set of internationally-approved technical and legal measures to verify that states do not use nuclear material to manufacture nuclear weapons.[16] The IAEA safeguards program is applied to facilities or “activities” and is enabled by the three components of the safeguards process: (1) inventory, (2)

containment and surveillance, and (3) environmental sampling. (Figure 1 provides a general depiction of the IAEA Safeguards Framework.)

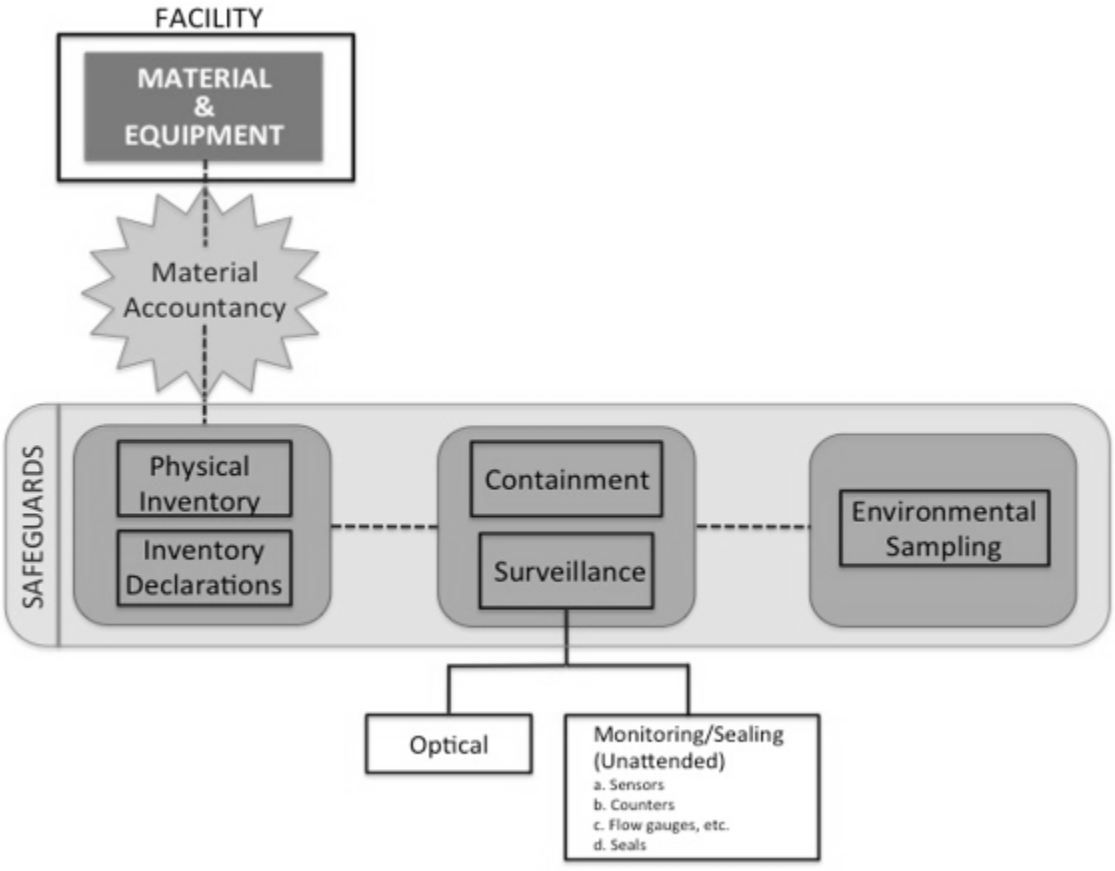

Figure 1: IAEA Safeguards Framework.[17]

The cornerstone of the safeguards framework is nuclear material accountancy, accountancy for fissile material as well as equipment related to uranium enrichment and the nuclear fuel cycle. The Statute of the IAEA defines nuclear material as special fissionable material or source material. This material includes plutonium-239, uranium enriched in the isotopes uranium-233 or uranium-235, natural uranium, depleted uranium, and thorium.[18] Under a safeguards agreement, a state provides the IAEA with initial declarations of inventory on a material balance report (MBR) and subsequent

changes to inventory on inventory change reports (ICR).[19] In addition, states with an Additional Protocol in force must maintain records on the operational status and annual production for mines, mills and concentration plants for uranium and thorium.[20] The IAEA uses state's MBR's and ICR's, along with Additional Protocol declarations, to draw conclusions on the non-diversion of declared material. A state's declared material establishes the baseline for continued containment and surveillance.

Nuclear material accountancy is enabled through containment and surveillance measures. Containment is the process by which "accountable" nuclear material is confined within a facility or within a room. The containment of nuclear material occurs through facility and equipment features that prevent access to or movement of nuclear material or IAEA monitoring equipment in a facility. Complementing containment are surveillance measures that maintain the integrity of containment by monitoring the movement of nuclear material inside a containment facility. Surveillance measures include two categories of devices: optical devices and monitoring systems.

Optical devices use single or multi-camera systems to record fixed interval, random, or triggered photography and video to provide continuous observation of facilities or activities.[21] Monitoring systems consist of seals, monitors, and counters. A seal is a tamper-indicating device used to join two moveable segments of a containment facility or vessel, while monitors and counters consist of sensors or gauges used to provide information on the flow and movement of nuclear material, such as uranium hexafluoride (UF_6). The IAEA defines the goal of containment and surveillance as two-fold: no diversion between inventories and no diversion between inspections.[22]

The IAEA uses on-site inspections to audit a facilities' inventory against MBRs provided as part of state declarations to the IAEA. On-site inspections are also used to validate IAEA containment and surveillance data, to verify the accuracy of a facility operator's measurement systems, and to conduct environmental sampling of facilities, equipment, soil or vegetation.[23] For states with an Additional Protocol in force, the IAEA has access beyond "strategic points" in a facility where measurements are taken or where containment or surveillance measures are in place. This expanded inspection regime includes all stages of the nuclear fuel cycle, from uranium mines to nuclear waste. The Additional Protocol also allows for expanded environmental sampling and monitoring at locations specified by the IAEA.[24] Therefore, on-site inspections allow the IAEA to provide assurance of the absence of undeclared nuclear material and activities. The results of on-site inspections are aggregated with IAEA off-site activities to develop estimates and reports for the IAEA Board of Governors, the governance body that reports its conclusions to the UNSC.

Off-site activities consist of activities at IAEA Headquarters in Vienna, Austria, as well as the IAEA Safeguards Analytical Laboratory (SAL) in Seiersdorf, Austria. IAEA headquarters personnel validate state declarations as well as information and data received from safeguards cameras and monitoring equipment. Headquarters personnel also collect and analyze satellite data, data from open sources, and data from intelligence sources. The SAL is augmented by the IAEA's Network of Analytical Laboratories (NWAL), a group of 18 laboratories in IAEA member states that have been approved to analyze safeguards samples and to assist the SAL in analysis of nuclear material and environmental samples. The data received in Vienna are analyzed and

forms the basis for Nuclear Material Accountancy Reports and the annual Safeguards Implementation Report submitted to the IAEA Board of Governors.[25] The collective work of the IAEA through on-site inspection activities, containment and surveillance activities, and off-site activities are key components of the IAEA safeguard process.

JCPOA Safeguard Provisions

The JCPOA between the P5+1 and Iran is anchored in nuclear material accountancy, as are all such agreements. It contains four accountancy elements: (1) fuel (fissile material), (2) centrifuges, (3) ore, and (4) heavy water reactors. However, the JCPOA introduced inventory declaration, reductions, and limits across all stages of the nuclear fuel cycle that were not covered under the existing Safeguards Agreement or in the Additional Protocol. Specifically, the agreement increases the number of IAEA inspectors to 130-150 personnel, requires daily access to "relevant buildings" at Natanz Fuel Enrichment Plant (NFEP), Natanz Pilot Fuel Enrichment Plant (NPFEP), and Fordow Fuel Enrichment Plant (FFEP) for a period of 15 years and generates significant reductions in fissile and non-fissile material.[26] Figure 2 illustrates the locations of Iran’s nuclear activities.

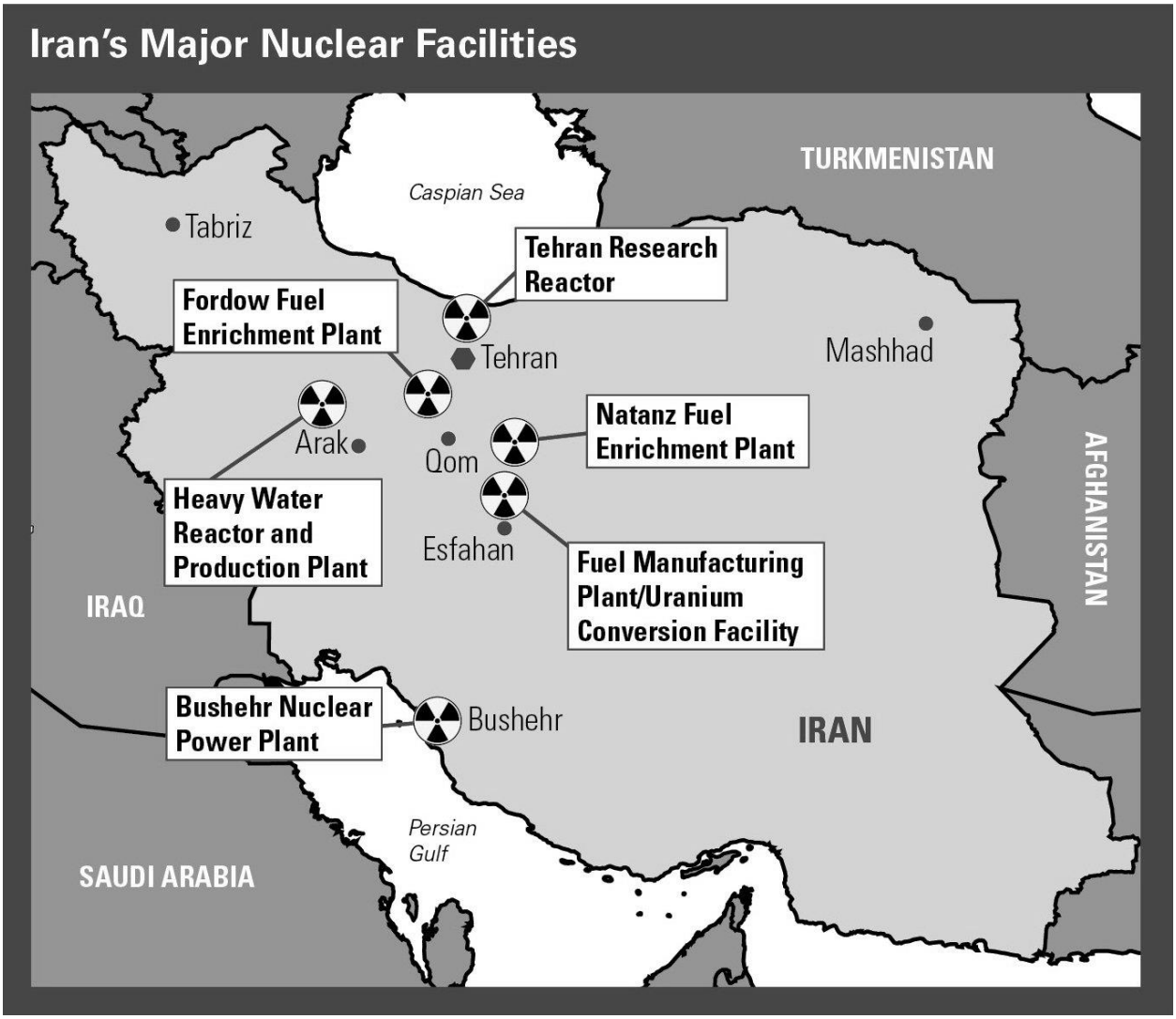

Figure 2: Iran's Nuclear Facility Locations[27]
(Used with Permission)

The JCPOA's requirement for declaration of centrifuges and centrifuge manufacturing is a requirement that is not part of the Safeguards Agreement or the Additional Protocol, agreements that are primarily focused on fissile material. The JCPOA requires Iran to provide an initial declaration of inventory and subsequent changes to inventory for centrifuges, centrifuge rotor tubes, and bellows. The initial declaration must include equipment and equipment locations used to manufacture

centrifuge rotors and bellows. Moreover, the JCPOA reduces Iran's operational centrifuges from more than 19,000 before the agreement, to 6,104 after the agreement. Iran must allow IAEA inspectors to perform on-site verification of the initial declaration of centrifuges, rotor tubes, and bellows. Additionally, Iran must permit on-site inspection, containment, and surveillance of stored and idled centrifuges for 15 years and containment and surveillance of removed centrifuge rotors and bellows for 20 years. The agreement requires daily access to FFEP to verify stable isotope production and to verify the absence of undeclared activity.

To remove the uranium route to a nuclear weapon, the JCPOA reduces Iran's low-enriched uranium stockpiles from 7,154kg to 300kg and eliminates uranium enriched at or above 3.67 percent U-235. Uranium that exceeds 3.67 percent enrichment must be down-blended or remanufactured into fuel plates for the Tehran Research Reactor (TRR) under continuous IAEA monitoring. Enriched uranium that exceeds the upper limit for on-hand stocks (300kg) must be down-blended or sold under IAEA monitoring. For 10 years, the agreement requires IAEA verification that Iran is not withdrawing enriched and depleted uranium from IR-6 and IR-8 (advanced) cascades at the PFEP. The agreement also eliminates all weapons-grade plutonium, reactor-spent fuel, and places limits on heavy-water production. Finally, the agreement restricts enrichment to one facility (Natanz) under continuous inspection, containment, and surveillance.[28]

To eliminate the plutonium route to a nuclear weapon, the JCPOA requires Iran to allow the IAEA to inspect the Arak Heavy Water Reactor (AHWR) re-design to verify construction and installation of a new reactor calandra that does not produce weapons-

grade plutonium. Iran must allow the IAEA to verify that the original calandra is modified to make it inoperable. Finally, Iran is prohibited from conducting spent fuel reprocessing or reprocessing research and development (R&D) activities at the Heavy Water Production Plant (HWPP) for 15 years, and must also allow the IAEA to monitor heavy water stocks and the amount of heavy water produced.[29]

In an effort to limit uranium enrichment capacity, the JCPOA limits uranium enrichment and centrifuge R&D activities to the NPFEP and places stringent limits on the amount of R&D allowed. Mechanical testing of advanced centrifuges is limited to two of each type centrifuge, and testing with uranium is limited to one of each type of advanced centrifuge for a period of 10 years. Centrifuge R&D activities must be conducted in such a way that enriched uranium is not accumulated. The agreement indefinitely prohibits weapons development activities such as designing, developing, or fabricating multi-point detonation systems, explosive diagnostic systems, or explosively driven neutron sources.[30]

In an effort to control source material, the JCPOA requires Iran to provide an initial declaration of production and inventory for all uranium ore concentrate (U_3O_8/yellowcake) produced in Iran or obtained from any other source for a period of 25 years. For the same period, it requires containment and surveillance of uranium ore from mines to verify that all ore produced is transported to the uranium conversion facility (UCF) in Esfahan, or to any future uranium conversion facility that Iran might decide to build within the 25-year period.

Lastly, the agreement expanded material that is subject to on-site inspection beyond fissile material, to include centrifuges, centrifuge manufacturing equipment,

uranium ore concentrate, spent fuel, and heavy-water production. However, the agreement prohibited U.S. citizens from being part of the team of on-site inspectors. The agreement also introduced a new enforcement mechanism through "snap-back" economic sanctions to compel Iran to provide access when requested by the IAEA, but once again, there was an undesirable trade-off. As a result of negotiations, the P5+1 accepted a long access adjudication timeline through the UN Joint Commission.[31] The Additional Protocol required IAEA access within 24 hours.[32] The JCPOA delays the access time for up to 24 days. In spite of the fact the JCPOA expanded the inspection provision by applying the criteria across all stages of the fuel cycle, it weakened the access timelines contained in the Additional Protocol.

Deficiencies in the JCPOA

The reduction in centrifuges and enriched uranium and plutonium, coupled with expanded surveillance and IAEA presence represents significant progress in verification. Yet, it is important to point out the P5+1 obtained reductions in material that the IAEA already knew existed. The P5+1 also obtained permission to monitor facilities, material, and equipment that were not included in the Safeguards Agreement or Additional Protocol; but once again, the expanded monitoring permissions affect material the IAEA was already tracking. These steps prevent diversion of material already declared to the IAEA, a goal of safeguards, but it does not address the possibility of hidden material. Small quantities of hidden nuclear material are considered one of the biggest challenges to the safeguards regime.[33] Although the number of inspectors allowed in Iran was increased, the IAEA already had access to declared facilities under the Safeguards Agreement and to undeclared facilities under the

Additional Protocol. Unlike the provision for centrifuges that requires verification of the initial declaration, the JCPOA does not require the IAEA to verify the completeness of Iran's initial declaration of uranium ore concentrate.[34] This aspect is critical since uranium ore is the feeder product for conversion to UF_6, a notable gap in JCPOA language obscured by debates over quantities of centrifuges and fissile material.

The completeness of Iran's declarations of material and equipment remains one of the greatest risks inherent to the JCPOA, because Iran does not have a history of full and open disclosure. The JCPOA requires Iran to implement fully the IAEA "Road-map for the Clarification of Past and Present Outstanding Issues regarding Iran's Nuclear Programme" by answering questions related to the possible military dimensions (PMD) of its nuclear program.[35] On December 2, 2015, following discussions between Iran and the IAEA, the IAEA issued its final report concerning the PMD of Iran's nuclear program. Of 12 areas of concern outlined in the IAEA Director General's November 2011 report, Iran provided no response in two areas, denial of activities in eight areas, and limited access to payload integration workshops in another area. The IAEA concluded its final report by confirming that a range of previously undeclared activities relevant to the development of a nuclear weapon occurred in Iran through 2009, with no credible indications of similar activities after 2009. Iran's responses, interviews, and limited disclosure provided in the report do not demonstrate a new spirit of openness and full disclosure.[36] While the P5+1 secured reductions of known fissile material and equipment, and increased the number of IAEA inspectors, it gained nothing new to help close the gap on determining the completeness of Iran's nuclear material declarations.

Accuracy versus Completeness

The efficacy of the JCPOA to prevent Iran from developing a nuclear weapon or pursuing nuclear weapons technology is inextricably linked to the relationship between the "accuracy" of declarations to the IAEA and the "completeness" of material being tracked by the IAEA. The IAEA attempted to close the procedural gap between accuracy and completeness in 1997 with approval of the Additional Protocol. The Additional Protocol represented a fundamental shift in IAEA focus from verifying the accuracy of a state's declared data to placing more emphasis on the completeness of a state's data.[37] In spite of this modification, the Verification Assessment, submitted by the Obama administration to Congress under the Iran Nuclear Agreement Review Act of 2015 stated that full disclosure of Iran's past nuclear weapons activity was unlikely and was not relevant for purposes of verifying commitments going forward.[38] Yet, throughout the first half of 2015, the Central Intelligence Agency's director and the Secretary of Energy contradicted the Administration's own report by testifying that it had a complete understanding of all ongoing nuclear activity in Iran.[39] This contradiction is an important consideration in analyzing the JCPOA, because a lack of completeness produces two risks: the risk of covert pre-existing material, and the risk of covert development activities. The JCPOA cannot be judged solely on the number of centrifuges removed or sidelined by the deal; a conclusion on its efficacy must consider the risk of undetected covert development activities.

Clandestine Activity

The IAEA and the international community do not have a good record of detecting clandestine activity, and the JCPOA offered little improvement. Supporters of

the JCPOA claim that it would be impossible for Iran to pursue a clandestine program. They assert Iran would have to duplicate its entire uranium enrichment program and the associated facilities.[40] The fact is that Iran has already demonstrated the ability to hide its activities from the IAEA and the international community. Olli Heinonen, who oversaw inspections for the IAEA from 1999 to 2005, cited two cases where Iran maintained an undetected clandestine nuclear program. The first case involved the Lavisan-Shian facility, an undeclared facility located in north Tehran that housed the Physics Research Center from the late 1980s to at least 1998. Lavisan-Shian is reported to have contained at least one whole body radiation counter with plans to run a number of fuel cycle activities, including gas centrifuges, uranium mining, uranium conversion, and heavy water activities.[41] Fearful of inspection by the IAEA in 2003, Iran reportedly destroyed the buildings, leveled the site, and removed and disposed of the soil. When the IAEA visited the site in 2004, it could not find a trace of nuclear materials.[42]

In a second case, Kalaye Electric in Tehran was an undeclared centrifuge R&D site in the 1990's that produced small amounts of enriched uranium. In a fashion similar to the Lavisan-Shian site, Iranian technicians sanitized the facility and the surrounding area, leaving the building intact. If it were not for a small remnant of uranium detected by the IAEA in a ventilation duct, the activity at Kalaye would have gone undetected.[43]

A third case may also exist. At the Parchin military complex, located 30 kilometers southeast of Tehran, the IAEA believes Iran installed a large explosives containment vessel to conduct hydrodynamic experiments for neutron initiator development, a device that is used in nuclear weapons. IAEA information shows the

explosives chamber was installed in 2000, but it was not identified by the IAEA until 2011.[44] Moreover, the secret program was not disclosed by the IAEA, but by an Iranian opposition group.[45] Following an IAEA request to visit the complex in 2011, Iran started large-scale activities to sanitize the site to prevent the IAEA from finding incriminating evidence. Commercial satellite imagery of the Parchin site taken after the signing of the Joint Comprehensive Plan of Action (JCPOA) showed signs of activity that was absent from imagery taken before the JCPOA was signed.[46] On September 20, 2015, the Director General of the IAEA, Yukiya Amano, visited the suspect facility at Parchin and noted that all equipment had been removed and the facility had undergone extensive renovation work. Amano stated that renovation work of such magnitude "undermines the Agency's ability to conduct verification."[47]

In an effort to dismiss the possibility of undetected clandestine activity, JCPOA advocates emphasize advances in containment, surveillance, and environmental sampling as measures that will prevent a repeat of undetected activity. It is an argument based on obsolete theories that assume Iran will pursue large, complex nuclear operations. This shortcoming was a principal finding of the 2014 Defense Science Board's (DSB) report, "Assessment of Nuclear Monitoring and Verification Technologies," which indicated that even among today's experienced monitoring and verification professionals, most tend to address the problem as an extension of approaches used in past treaties and agreements.[48] In fact, Iran is not likely to pursue covert activity that requires a large footprint, because today's satellite coverage would detect large operations such as uranium conversion plants, large centrifuge plants, spent fuel re-processing plants, and high-explosive work with natural uranium. Instead,

Iran is most likely to conduct smaller clandestine operations in three areas: operation of a small centrifuge plant with advanced, smaller centrifuges; operation of a small centrifuge manufacturing plant; and high-explosive testing related to nuclear weapons.[49] Thomas Shea, a 24-year veteran of the IAEA's Department of Safeguards, notes that considering Iran's knowledge of satellite imagery capabilities, it would likely hide smaller clandestine facilities in cities, possibly under industrial facilities, hospitals, shopping malls, or on military bases rather than build them underground in remote parts of the country.[50] The DSB reached similar conclusions noting that state adversaries will be more adaptive in hiding or obscuring what they are doing, citing the ease with which nations can hide low-level weaponization activities within nominally civilian facilities.[51]

Detection of smaller operations embedded in cities will be more challenging than the clandestine activity discovered at Parchin in 2005 or the FFEP in 2006. Heinonen states that equipment used in smaller operations can be removed overnight. The P5+1 routinely contends it is not possible to remove plutonium, uranium or uranium enrichment equipment from a site and sanitize the location before detection.[52] Yet, the 2014 DSB assessment reached the same conclusion as Heinonen, stating that current technologies used for treaty verification and inspections are inadequate for future monitoring realities. The DSB study mentioned the future use of undeclared facilities to conduct testing below detection thresholds or the use of non-traditional technologies that present ambiguous signatures.[53]

Environmental sampling is vital to the detection of clandestine activity, but it is not foolproof. With respect to the Lavisan-Shian site, the IAEA pointed out that the “detection of nuclear material in soil samples would be very difficult in light of the razing

of the site."[54] The IAEA has also assessed various types and quantities of uranium releases from gas centrifuge plants and determined that Iran could move and disguise many small-scale nuclear weapon-related activities.[55] Further weakening the effectiveness of environmental sampling as a safeguard is a confidential implementation agreement between the IAEA and Iran that allows Iran to collect its own samples for shipment to IAEA laboratories.[56] The IAEA indicates there have been more than 40 instances of letting a country use its own nationals to do the sampling, yet Heinonen knows of no case where a country under investigation for possibly trying to make nuclear weapons was permitted to use its own personnel to collect environmental samples as part of the investigation.[57] Such a step is contrary to the standard the arms control community has heretofore deemed sacred and that has been in existence for nearly five decades. During Strategic Arms Limitation Treaty (SALT) II negotiations, negotiators stated, "Verification that was not solely the responsibility of the verifying side would amount to 'self-inspection' and was unacceptable."[58]

Further, the use of intelligence, surveillance, or reconnaissance (ISR) for detection of clandestine activity has its own limitations. Thomas C. Moore, a former professional staff member specializing in arms control and non-proliferation for the U.S. Senate Foreign Relations Committee, says supporters of the JCPOA who argue that ISR capabilities are a complete hedge against potential clandestine activity ignore political reality.[59] Information collected by the United States through ISR is prone to challenge from states that did not share in its collection. As two scholars have observed during the Cold War, "While unilateral methods of monitoring agreements have generally enabled powers to address problems in a rigorous manner, they have failed to

provide the broader international community with means to judge the seriousness of potential breeches."[60] The credibility problem with intelligence estimates coupled with a history of undetected clandestine activity in Iran illustrates why the trade-off of anytime, anywhere inspections in favor of intelligence and surveillance is not an even trade.

Delay for Inspector Access

The JCPOA creates a 24-day adjudication process for special access to Iranian sites, which is problematic and one of the most controversial provisions. This situation is not surprising given that the UNSC's record of dealing with compliance disputes is not encouraging.[61] Still, those who defend the 24-day provision assert it is more realistic than a concept of anytime, anywhere (24-hour) access. Dr. Edward Ifft, a former U.S. arms control official, states that an effective verification system must have intrusive inspections. He notes that intrusive inspections always encounter opposition on the grounds of national sovereignty, but they are necessary to maintain the credibility of international safeguards.[62] Nevertheless, it is important to remain cognizant of the real point of inspections; inspections are not for collecting evidence admissible in a court of law. As Jurgen Altman and Joseph Rotblat state, "human beings believe most in what they can see and touch; on-site inspection has an incomparable psychological appeal that…cannot be matched by a hundred highly precise satellite pictures."[63] A requirement for anytime, anywhere access, whether allowed or not, provides a deterrent effect. It removes a degree of psychological uncertainty, and it strengthens international confidence.[64] For this reason, arms control experts remain troubled by the manner in which the JCPOA weakened access requirements contained in the Additional Protocol—provisions that still apply to 126 states in the world.[65] In essence, the 24-hour

access requirement in the Additional Protocol was sacrificed in the JCPOA to gain the economic sanction enforcement mechanism.

The Obama administration and JCPOA negotiators viewed the economic sanctions enforcement mechanism as the “crown jewel” of JCPOA provisions. Yet, for the last 20 years, the preeminent standard for arms control agreements was anytime, anywhere access. Therefore, the more important issue is: how do you "snap back" sanctions if you cannot assure the international community and the United Nations that a violation occurred? The U.S. National Intelligence Estimate published in 2007 declared with high confidence that Iran’s clandestine nuclear weapons program ended in 2003, a point the Administration underscored for the next 8 years. Yet, on December 2, 2015 and after several years of analysis, the IAEA furnished evidence that Iran continued its nuclear weapons program until 2009.[66] Such an inconsistency is why nuclear non-proliferation experts contend that anytime, anywhere access is the basis for building international confidence in non-proliferation programs. Moreover, the IAEA Guiding Principles define the primary role of safeguards as a confidence-building measure and early warning mechanism.[67] The 24-hour access provision incorporated into the Additional Protocol was a landmark provision to provide an inherent deterrent value for signatories and a measure of assurance to the rest of the international community. The P5+1 compromise on access sacrificed more than just time; it forfeited the assurance and deterrence benefit that anytime, anywhere access provides the international community.

Conclusion

In many respects the JCPOA is more comprehensive than the Safeguards Agreement or the Additional Protocol, but the agreement does not accomplish everything the P5+1 claims it does. The reductions in declared fissile material and centrifuges are significant. The elimination of declared low-enriched uranium and weapons grade plutonium is worthwhile; and the extension of safeguards across all elements of the nuclear fuel cycle is unprecedented. Unfortunately, every one of the provisions expires by specified dates. More importantly, the crown jewel of the agreement, the economic sanctions provision, expires after 10 years.[68] Furthermore, the agreement compromised a long-standing U.S. position that there be no uranium enrichment in Iran, and it sacrificed long-standing international precedents on access and the collection of environmental samples. In fact, the White House continues to have difficulty explaining its continued refusal to acknowledge Iran's right to enrich uranium under the NPT, given its concession on the enrichment issue in the JCPOA.

The negotiation process for the JCPOA focused almost entirely on the "breakout time" for Iran to develop a nuclear weapon. The Obama administration states the JCPOA increases the time it would take Iran to acquire enough material for one bomb from 2-3 months to at least one year.[69] This claim is only true if Iran is forthcoming in its initial declarations of fissile material and weapon development activities, a proposition that seems particularly naïve considering that in December 2015 the IAEA experienced a lack of cooperation and transparency by Iran regarding the details of its nuclear program. The Administration later acknowledged that declarations of Iran's past activity will likely be incomplete, but characterized the issue as not relevant to JCPOA

verification. Yet the JCPOA allows Iran to continue to enrich uranium and to continue development work on advanced centrifuges. Why does all of this matter? Although fissile material and enrichment activities are under surveillance and monitoring, the Obama administration did not provide any analysis of Iran's ability to avoid the terms of the agreement by using undeclared technology, material, or activity.[70] Moreover, the Administration maintains the JCPOA blocks covert attempts to produce fissile material, a claim that is not 100 percent verifiable.[71] Experts state that if Iran is allowed to enrich uranium and the IAEA cannot gain immediate access on demand, the only alternative for ensuring compliance is to rely heavily on human intelligence (HUMINT)—an activity that falls outside the role of the IAEA.[72] A recommendation in the 2014 DSB assessment declared that using all types of intelligence collection measures are critical to monitoring and it recommended the Director of National Intelligence (DNI) increase support for nuclear counter-proliferation by adopting new and expanded collection capabilities.[73]

The Obama administration holds that the JCPOA is not built on trust, but on verification. Yet, the third paragraph of the JCPOA states: “The E3/EU+3 envision that the implementation of this JCPOA will progressively allow them [P5+1] to gain confidence in the exclusively peaceful nature of their program.”[74] Exponents of this vision argue the JCPOA will show Iran the benefits of becoming a trusted member of the international community. Businesses will invest in Iran, more contacts will occur between Iran and other countries, and after eight and a half to 10 years, Iran will have completed its transition to a responsible state the same time every single provision begins to expire.[75] In fact, the belief that Iran will moderate its policies is the narrative upon which the entire JCPOA is based.[76] As the *Washington Post* editorial board noted:

“If the transformation of Iranian behavior the President hopes for does not occur, the deal on its nuclear program may ultimately prove to be a poor one—a temporary curb that, when it lapses, will enable a dangerous threshold nuclear state that poses a major threat to the United States and its allies.”[77]

According to a Chinese saying, "gold cannot be pure, and people cannot be perfect."[78] The IAEA can no more verify that Iran is in full compliance with the JCPOA than it can know the current or future intentions of a state. Contrary to statements by the Obama administration, the JCPOA is built on the basis of trusting Iran’s willingness to comply with the agreement. However, one month following the JCPOA agreement, Iranian President Rouhani stated, “We will buy weapons from anywhere we deem necessary. We won’t wait for anybody’s permission or approval and won’t look at any resolution. And we will sell weapons to anywhere we deem necessary.”[79] Edward Ifft warned of the consequences of overreliance on misguided trust, “The consequences of attempting to eliminate nuclear weapons by failing to establish an effective and trusted system of monitoring/verification/compliance could be very serious. Such a failure might make actual cheating more likely.”[80] In the final analysis, the prevailing guidepost for the P5+1 seems to be, "The JCPOA agreement is better than no agreement at all." Ordinarily that might be a reasonable stance, but considering on January 16, 2016, the United States released billions of dollars in unfrozen assets to Iran as it begins implementation of the JCPOA, and hundreds of billions more dollars over the life of the agreement, many critics believe the P5+1 could have done better.

In a profound question to the international community, U.S. Representative Ted Lieu (D-CA) asked: “Should the U.S. agree to a deal that gives Iran massive and

continuing sanctions relief with no restrictions on the number and type of centrifuges that Iran can spin, no snapback sanctions, no arms embargo, and no ballistic missile ban? That's what this deal looks like after year 10."[81] Successful arms control agreements require complete and accurate declarations of nuclear and nuclear weapons material, coupled with transparency provisions that provide assurance to the international community, and create fear of international exposure in states pursuing clandestine activity. In the JCPOA, the United States obtained neither.

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