



## Verification of the Joint Comprehensive Plan of Action

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One of the most important aspects of the Joint Comprehensive Plan of Action (JCPOA) is its monitoring and verification requirements. Its provisions greatly expand what the International Atomic Energy Agency (IAEA) can do in Iran and place additional requirements on Iran in terms of access, monitoring, and provision of information. The success of this agreement depends largely on whether the verification provisions are adequate and enforceable.

The JCPOA contains detailed verification provisions, several of which are outlined and evaluated here:

- Possible Military Dimensions (PMD)
- Additional Protocol
- IAEA access to Suspect Sites
- Monitoring the Implementation of Iran's Enrichment Related Measures:
  - Long-term IAEA presence in Iran
  - IAEA monitoring of uranium
  - Containment and surveillance of centrifuge rotors and bellows
  - Use of IAEA approved and certified modern technologies
- IAEA Role in the Procurement Channel
- Prohibitions on Iran's Engagement in Nuclear Weapons Related Activities

Collectively, the verification requirements, if fully implemented, are designed to deter Iranian cheating and provide assurance that violations will be detected promptly, leaving time for a response. Several of the provisions are innovative. All aim to create an intrusive verification environment, backed up by the resources of the E3+3.

The verification provisions have weaknesses, however, and some must be remediated or compensated for if the agreement is to be verifiable. Moreover, without stringent long-term limits on Iran's sensitive nuclear programs, such as uranium enrichment activities, these verification conditions, some of which are also of limited duration, are unlikely to be sufficient. Thus, as a general finding, the verification provisions, with some remediation of their implementation or compensation for expected issues, are likely to be adequate during the first ten to fifteen years of the agreement but will be inadequate afterwards if Iran implements its plan to expand its centrifuge program and possibly start a reprocessing program.

## Possible Military Dimensions (PMD)

The JCPOA appears to require Iran to resolve the IAEA's concerns about the possible military dimensions (PMD) to Iran's nuclear programs. The JCPOA explicitly requires Iran to complete a set of agreed upon steps with the IAEA prior to Adoption Day, which falls in October 2015, and well before Implementation Day. By mid-December, the IAEA will issue a final assessment on the resolution of all past and present, outstanding PMD issues. The public portion of the agreement is not specific regarding what constitutes Iran satisfactorily addressing the IAEA's PMD concerns. For example, the IAEA could report in December that Iran had a nuclear weapons program, parts of which may have continued, and Iran has cooperated adequately with the IAEA's investigation. This should be sufficient to allow an interpretation that the IAEA has initially addressed its PMD concerns. (A longer IAEA investigation would be required to reach a broader conclusion about the peacefulness of nuclear activities in Iran which could proceed until Transition Day or year 8). But what if the IAEA reports that its concerns remain unaddressed in whole or in part, or Iran denies access to sites sought by the IAEA? Or a more complicated possibility, what if the IAEA provides an ambiguous answer? As a consequence, the PMD provisions may be left to an interpretation by the parties that is not yet clear to publics.

The conditions in the agreement allow any member of the E3+3 to not lift sanctions on Implementation Day if Iran has not met its obligations. Whether Iran is addressing the IAEA's concerns should be apparent well before that day. If it does not, and Implementation Day happens nonetheless, this failure could undermine the IAEA's credibility and cast a long shadow on this agreement. The E3+3, and in particular, the United States, should not back down regarding the linkage of these two issues and abandon all leverage of sanctions relief.

U.S. lawmakers are skeptical that the U.S. administration will require Iran to address the IAEA's PMD concerns prior to Implementation Day, or ever in fact. In documents the administration submitted to Congress under legislative requirements, the administration wrote: "An Iranian admission of its past nuclear weapons program is unlikely and is not necessary for purposes of verifying commitments going forward."<sup>1</sup> While stating that Iran conducted nuclear weapons activities in the past, the administration claims it knows enough about Iran's past nuclear weapons work, and has shared relevant information with the IAEA, to "enable inspectors to establish confidence that previously reported Iranian [nuclear weaponization] activities are not ongoing."<sup>2</sup> But the flaws in this argument include that U.S. knowledge may be incomplete, particularly on the key questions of what continued after Iran halted its structured nuclear weapons program in 2003, how far has Iran gotten in learning to build nuclear weapons, where did it carry out this work, and who conducted these activities? Then, there is the issue of the IAEA's credibility, which means that a pass on Iran addressing the IAEA's concerns prior to Implementation Day will signal to Iran, and any other state for this matter, that it can expect that intransigence on verification issues will succeed. In essence, the agreement would start off already weakened and set a dangerous precedent.

A separate [ISIS report](#) discussed the PMD issues in more detail, and the reader is referred to that report for a detailed treatment of the PMD issue.

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<sup>1</sup> Jay Solomon, "Lawmakers Say Iran Unlikely to Address Suspicions of Secret Weapons Program," *Wall Street Journal*, July 26, 2015. See also: Unclassified Verification Assessment, submitted by Obama administration to Congress under the Iran Nuclear Agreement Review Act of 2015 (INARA). Delivered to Congress on July 19, 2015.

<sup>2</sup> Ibid.

## Additional Protocol and Modified Code 3.1

The JCPOA states in point 13 of the main agreement that Iran will fully implement Code 3.1 of the Subsidiary Arrangements to its Safeguards Agreement, provisionally apply the Additional Protocol, and proceed with its ratification by (or after) Transition Day (the language is unclear) as specified in Annex V. The JCPOA states in Annex V in the implementation timetable that at Adoption Day, which occurs 90 days or sooner after the new UN resolution is passed to endorse the JCPOA, Iran will “officially inform the IAEA that, effective on Implementation Day, Iran will provisionally apply the Additional Protocol, pending its ratification by the Majlis (Parliament), and will fully implement the modified code 3.1.” On Transition Day, which is when the IAEA reaches a broader conclusion or eight years after Implementation Day, whichever occurs first, “Iran will seek, consistent with the Constitutional roles of the President and Parliament, ratification of the Additional Protocol.”

Implementation of Modified Code 3.1 requires Iran to provide early design information about nuclear facilities as soon as a decision is made to construct them and to allow on-going design information verification (DIV) visits. This provision of the JCPOA will bring Iran back into compliance with this safeguards obligation. Iran provisionally implemented the modified code from 2004-2006. Prior to 2004, Iran implemented the past version of Code 3.1. However, the IAEA said that Iran was not allowed to revert unilaterally to the earlier version after its 2006 decision. Under the past version of Code 3.1, Iran was required to report the construction of nuclear facilities only 180 days prior to the introduction of nuclear material. Iran used this loophole to justify secret, major construction progress on key nuclear sites, such as the Natanz centrifuge plant in 2003. Although Iran claimed the same exemption for the secret Fordow centrifuge plant in 2009, the IAEA did not recognize this exemption.

Iran’s provisional implementation and the planned ratification of the Additional Protocol represent a stronger, legally binding status of Iran’s commitment to the agreement compared to its past “voluntary implementation” of the Additional Protocol from 2003-2006. Application of the Additional Protocol of its Comprehensive Safeguards Agreement will allow the IAEA greater inspection tools including expanded access to sites and information to more effectively ensure the absence of undeclared activities in Iran. Therefore, Iran’s provisional application of the Additional Protocol is a central strength of the JCPOA.

The fact that the Majlis will not seek ratification of the Additional Protocol until Transition Day, or approximately eight years after Adoption Day, raises the question of what will occur if the Majlis votes against ratification? Would the entire agreement terminate? A straightforward reading of the agreement would lead to that expectation. Moreover, lack of ratification would be expected to lead to a snapback of sanctions and perhaps worse. However, it is far from clear that the E3+3 would put sanctions back in place or terminate the agreement over a failure by the Majlis to ratify the Additional Protocol.

In general, we understand that provisional application of the Additional Protocol is binding on Iran, even if it never ratifies. Nonetheless, IAEA safeguards precedents have included full ratification. According to Olli Heinonen, former IAEA Deputy Director of Safeguards and now at Harvard University’s Belfer Center:<sup>3</sup>

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<sup>3</sup> Olli Heinonen, *Testimony on ‘The Iran Nuclear Deal and Its Impact on Terrorism Financing’ before the Committee on Financial Services Task Force to Investigate Terrorism Financing*, U.S. House of Representatives, July 22, 2015.

*Implementation of the Additional Protocol (AP) remains provisional until the time when the IAEA has reached a “broader conclusion” on the peaceful nature of Iran’s nuclear program. This contradicts current safeguards practices. Such conclusions have only been drawn by the IAEA when an AP is in force and ratified. This is not a matter to easily dismiss as we need to be mindful of potential complications down the road should Iran seek to leverage, pull back, or dilute some of its obligations at some point in time under its ‘provisional’ status.*

Given Iran’s long attitude and practice of not cooperating with the IAEA, the E3+3 and other states should anticipate many problems in implementing the Additional Protocol and as the IAEA seeks to reach a broader conclusion. These problems could be lessened if the E3+3 announce on Implementation Day, or better beforehand, that non-cooperation, let alone non-compliance, will not be tolerated. The E3+3 must be prepared to rapidly start non-compliance procedures, up to and including snapback of sanctions. As discussed in another [ISIS report](#) responses to non-cooperation or violations should include a range of repercussions, including withholding civil nuclear energy cooperation, refusing to approve exports in the procurement channel, and the snapback of sanctions.

The stakes are quite high. Iran’s failure to fully comply with the Additional Protocol would undermine the JCPOA and without doubt render important parts of it unverifiable.

## **IAEA Access to Suspicious Sites**

The JCPOA in Annex I, section Q, describes a procedure, which will last for 15 years, designed to ensure IAEA access to Iranian nuclear sites and other sites where undeclared activities are reported. Under the Comprehensive Safeguards Agreement and the Additional Protocol, the IAEA has the right to access any site in Iran, and it can expect access promptly to suspicious sites, in some cases in 24 hours.

But the IAEA cannot depend on a reliable mechanism that enforces its request for access. And Iran has routinely denied IAEA access requests to suspicious sites. The access provision in the JCPOA provides a new mechanism that enforces IAEA access requests. However, to obtain that concession from Iran, the United States had to accept a much longer time frame for this access.

Iran conceded this access provision but demanded several other conditions, such as the provision lasting for only 15 years, not indefinitely, and that requests for access are “the minimum necessary to effectively implement the verification responsibilities under this JCPOA,” and not “aimed at interfering with Iranian military or other national security activities.” It should be noted, however, that this latter language attempts to recognize Iran’s request to discourage inspectors seeking routine access to military sites without affecting the access provisions.

In cases of requests for special access to resolve issues of concern, the JCPOA states, as summarized:

- The IAEA will provide Iran with its basis for concerns and request clarification;
- If Iran’s explanations do not resolve the concerns, the IAEA may request access to locations to verify the absence of undeclared nuclear materials and activities inconsistent with the JCPOA, and will provide Iran in writing the basis for its requests and information about the concerns;
- Iran can propose to the IAEA an alternative means for resolving the concerns;

- If the IAEA and Iran are unable to reach agreement for access within 14 days of the IAEA's original request, the Joint Commission would become involved in the dispute;
- In the absence of agreement between the IAEA, Iran, and the Joint Commission regarding access, the Joint Commission would by consensus or by a majority of 5 or more of its 8 members, decide that access be granted. This process would not exceed seven days; and
- Iran would implement the demand within 3 additional days.

The requirement for a five vote majority assumes that Britain, France, Germany, the United States, and the European Union (which is a member of the Commission) would all vote as a block. China and Russia cannot be relied upon; they could either vote against or abstain. However, years from now, Western solidarity may or may not exist. As such, the long term effectiveness of this access provision depends wholly on maintaining Western unanimity on what could become a controversial issue.

If Iran does not comply, a member of the E3+3 can initiate a process to snap back sanctions. Thus, the access requirement has the benefit of containing a specific, significant enforcement mechanism, unlike safeguards agreements, which Iran has often violated with few immediate consequences. Moreover, Iran has also routinely rebuffed the IAEA requests to visits sites, such as the Parchin military site, with few consequences. Now, if Iran refused an IAEA request for access, the consequences can be severe. Individual states could immediately re-impose their suspended sanctions and start the UN Security Council snapback process, which admittedly takes a few months.

The IAEA access provision includes a 24-day timetable whereby the Joint Commission could demand that Iran allow the IAEA to inspect a site of concern related to undeclared nuclear activities. One can ask why 24 days? As far as we could determine, it was a compromise between Iranian demands for three months and reasonable demands for at most a few days. To any partner who said 24 days is too long, we were told the U.S. answer was that 24 days was what was possible to achieve in the agreement.

The 24 day condition has stimulated a controversial public debate about whether it is too long. Twenty-four days could be enough time, presumably, for Iran to relocate undeclared activities or to hide evidence that would not necessarily leave a trace in environmental sampling but which could include activities that would be in violation of the JCPOA.

This case poses special challenges because of Iran's long experience in hiding its nuclear activities. In that sense it is practiced at defeating IAEA and U.S. detection methods. Iran would be expected to plan ahead in case access is sought for any undeclared activity. This could include the use of specially-designed equipment and facilities aimed at defeating the constraints in the JCPOA's verification rules. Iran could anticipate and plan to implement an effective way to defeat IAEA methods in case access was requested to a site conducting undeclared activity. When requested for access, Iran could rapidly try to hide its activities and avoid leaving any evidence for the IAEA.

Heinonen, who oversaw inspections in Iran and is familiar with at least two cases in 2003 in which Iranian technicians covered up uranium enrichment including at the secret Kalaye Electric centrifuge R&D site, concluded that evidence of certain banned nuclear work could be removed from a small secret facility in 24 days.<sup>4</sup> "Much of this equipment is very easy to move," he said. "Then there is this dispute settlement time which is 24 days: you will use that to sanitize the place, make new floors, new tiles on

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<sup>4</sup> Jonathan Landay, "Here are key issues Congress will air as it debates Iran nuclear deal," McClatchy DC, July 22, 2015. <http://www.mcclatchydc.com/news/nation-world/world/article28364314.html>

the wall, paint the ceiling and take out the ventilation.”<sup>5</sup> He added: “Something very similar happened in a couple of cases in 2003, where the IAEA didn’t find any whiff of enriched uranium in certain places where it should have been present.”<sup>6</sup> In these cases, Iran did not have to hide its activities within 24 days, as it would in the future. However, it gained valuable experience useful in sanitizing its activities more rapidly.

Three cases are note-worthy and they provided Iran experience that would be valuable in the future, if it decided to build undeclared facilities:

- Kalaye Electric, an undeclared centrifuge research and development site. It produced relatively small amounts of enriched uranium and was still not sanitized adequately after six months of efforts. In 2003, enriched uranium was detected in IAEA sampling of a ventilation duct that Iran had mistakenly not replaced during the clean-up;
- The Lavizan-Shian facility, a site alleged to have housed in the 1990s the Physics Research Center and its undeclared military nuclear program. Likely out of fear of the IAEA asking to visit this site and take samples, Iran decided in late 2003 to eliminate the entire site. It had many months to destroy the buildings and level the site, including scraping the earth. When the IAEA eventually asked to go the site, it found no evidence of nuclear materials at the site, which was eventually rebuilt as a sports center; and
- The Parchin Site, linked to high explosive work related to nuclear weapons. One allegation is that the site was used to test a nuclear weapons neutron initiator made with uranium deuteride. Its sanitization status is unknown, but efforts at sanitization ostensibly have been ongoing for three years, likely to hide traces of uranium.

These experiences, plus others, mean that Iran has extensive experience hiding its nuclear activities and importantly learning from its mistakes, in essence evolving its sanitization strategies. Kalaye Electric was a huge embarrassment for the Iranians, who were caught cheating on their safeguards agreement because of an oversight in sanitization. The next case chronologically, Lavisan-Shian, involved Iran destroying everything and carting away the rubble and earth. It subsequently refused an IAEA request to examine and sample the rubble. The Parchin case is more subtle, where the Iranians know that they cannot credibly destroy the key buildings where the tests are alleged to have occurred. Instead, Iran appears to have opted for a strategy of cleaning up and rebuilding the major buildings at the site.

Although Iran so far has not needed to hide its activities within 24 days, it is experienced enough to be able to do so in the future for certain nuclear and nuclear-related activities. In the past, Iran could delay access with few consequences, and not surprisingly it took time to sanitize its facilities. Moreover, Iran needed this time since it did not anticipate getting caught in these three cases. It had to implement sanitization steps on facilities that were in no way prepared ahead of time for a rapid clean-up. With the JCPOA, it no longer has the option for a lengthy clean-up. But that does not mean Iran cannot adjust its strategies to plan for a rapid evacuation and sanitization of undeclared sites. The IAEA and the E3+3 should certainly anticipate Iran modifying its tactics of deception.

What could Iran potentially hide or disguise in a 24-day time period? At ISIS, over the years, we have conducted several assessments on countries such as Iran, North Korea, and Iraq which have all cheated

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<sup>5</sup> Ibid.

<sup>6</sup> Oren Dorell, “Four key questions about the Iran deal,” *USA Today*, July 23, 2015, <http://www.usatoday.com/story/news/world/2015/07/23/four-key-questions-iran-deal/30566577/>

on their safeguards obligations. We have assessed the types and quantities of uranium releases from gas centrifuge plants as part of official safeguards studies and evaluated many cases where environmental sampling was used to uncover undeclared activities or failed to do so. Based on this work, we assess that Iran could likely move and disguise many small scale nuclear and nuclear-weapon-related activities. These include:

- High explosive testing related to nuclear weapons;
- Small centrifuge manufacturing plant;
- Small centrifuge plant that uses advanced centrifuges (in this case, we assume a facility of tens of, or at most a few hundred, centrifuges organized in specially designed facilities suitable for rapid removal and with a containment system.).

Activities that would be difficult to hide successfully would include:

- Large-scale uranium conversion;
- Centrifuge plants holding thousands of gas centrifuges;
- A reactor or reprocessing plant;
- High explosive work with natural uranium as a surrogate.

As can be seen, larger scale activities are more vulnerable to detection, as are those that use significant amounts of tell-tale nuclear materials, such as uranium or plutonium. But small-scale activities matter and this is one of the key reasons why inspectors want prompt, or anytime, anywhere access. Inspectors had this type of access in Iraq in the 1990s and early 2000s. South Africa provided the IAEA anywhere, anytime access “within reason,” which was explained to one of the authors of this report as a request only to not ask to go to a site in the middle of the night. In practice, the IAEA could get access to any South African facility soon after the request.

What can be done within the confines of the agreement? The IAEA should use the access provision to ensure that Iran will comply, and the agreement is sound. Soon after Implementation Day, it should request access to sites associated with the PMD issue.

For their part, Western nations are going to have to dedicate considerable resources to discovering reliably and promptly any secret nuclear activities in Iran. This task has gotten harder since Iran has tightened its security and intensified its counter-intelligence efforts in recent years.

Their evidence will likely be critical in exposing any Iranian cheating and defining where the inspectors should request access. To that end, Western intelligence will have to share information more routinely with the IAEA, and the IAEA will have to be more willing to act using this information and provide any results to the E3+3. It must be a two-way street, with both assigning a high priority to the detection of any suspect Iranian nuclear activities.

In the first few years of the agreement, one would expect all the key countries working to achieve these goals. But this entire process may become harder for some of the E3+3 countries as trade expands and relations with Iran improve. The IAEA may also encounter renewed internal resistance from member states who balk at intrusive inspections and information sharing in general.

## Assessment of Transparency Provisions:

The JCPOA states in the main text under paragraph 15 the broad role of the IAEA in verifying and monitoring Iran's implementation of its commitments:

*Iran will allow the IAEA to monitor the implementation of the voluntary measures for their respective durations, as well as to implement transparency measures, as set out in this JCPOA and its Annexes. These measures include: a long-term IAEA presence in Iran; IAEA monitoring of uranium ore concentrate produced by Iran from all uranium ore concentrate plants for 25 years; containment and surveillance of centrifuge rotors and bellows for 20 years; use of IAEA approved and certified modern technologies including on-line enrichment measurement and electronic seals; and a reliable mechanism to ensure speedy resolution of IAEA access concerns for 15 years, as defined in Annex I.*

Annex I details these specific areas of IAEA verification and monitoring (summarized) with commentary and analysis in italics:

- **Monitoring of Implementation of Iran's Enrichment Related Measures:** For 15 years, Iran will permit the IAEA to implement continuous monitoring, including through containment and surveillance measures, as necessary, to verify that stored centrifuges and infrastructure remain in storage, and are only used to replace failed or damaged centrifuges; for 15 years, Iran will permit regular access, including daily access as requested, to buildings at Natanz including all parts of the FEP and PFEP; for 15 years, Natanz will be the sole location for all enrichment and safeguarded R&D activities; Iran will apply nuclear export policies and practices in line with the internationally established standards for the export of nuclear material, equipment and technology and only engage in enrichment related exports with approval of the Joint Commission (see also ISIS's report on Procurement Channel –to be published soon).
- **Long-term IAEA presence in Iran:** Iran must authorize needed long-term visas for IAEA inspectors and provide appropriate working space at nuclear sites or near them; Iran must allow the increase of designated IAEA inspectors in Iran to a range of 130-150 within 9 months from the Implementation Day; Iran will allow inspectors from nations that have diplomatic relations with Iran.
  - *This excludes U.S. nationals.*
- **IAEA monitoring of uranium ore concentrate (*But is the initial uranium declaration complete?*)** Iran will permit the IAEA to monitor, through agreed measures that will include containment and surveillance measures, for 25 years, that all uranium ore concentrate in Iran, including any obtained elsewhere, is transferred to the Uranium Conversion Facility at Esfahan or any other future facility.
  - *There do not appear to be any requirements for Iran to allow the IAEA to determine the completeness of its initial uranium declaration. The IAEA can assert that it has to conduct this completeness exercise under the Additional Protocol but it is unclear if Iran will cooperate or the consequences for not cooperating.*
  - *It should be noted that any undeclared stocks of uranium would be a violation of the JCPOA.*



- **Containment and surveillance of centrifuge rotors and bellows (*But is initial rotor and bellows declaration to be verified as complete?*)** IAEA can perform containment and surveillance on centrifuge rotor tubes and bellows for 20 years; Iran will provide an initial inventory of all existing centrifuge rotor tubes and bellows and provide reports on changes in the inventory, as well as allow the IAEA to count and number them; Iran will declare locations and equipment, such as flow forming machines, filament winding machines and mandrels used in the production of rotor tubes and permit IAEA continuous monitoring regarding their use.
  - *The IAEA is allowed to verify the inventory of existing rotor tubes and bellows by item counting and numbering. These conditions are not sufficient to determine whether the declaration of the number of rotor tubes and bellows is complete. Iran does not appear obligated to provide information, such as the amount and type of raw materials procured historically, that would allow a verification that Iran is not hiding a significant number of rotor tubes or bellows. The value of the procurement information in verifying the centrifuge inventories is that Iran obtained many key goods abroad. In several cases, it only procured goods abroad, such as maraging steel and carbon fiber used in its centrifuges. The IAEA can check with the supplier and member state to verify the amounts sent to Iran and can also ask about other possible procurements as well. Once Iran's declaration of imported key goods is verified as complete, the IAEA can determine much better whether Iran's declaration of centrifuge rotors and bellows (along with other components) is complete. Without such information, checking its declaration of centrifuge rotors and bellows will depend on member state information, which may or may not exist in sufficient amounts or quality for the IAEA to verify or challenge Iran's declaration.*
- **Use of IAEA approved and certified modern technologies:** For 15 years or longer, the IAEA will monitor the JCPOA and will be permitted to use on-line enrichment measurement and electronic seals which communicate their status within nuclear sites to inspectors, as well as other IAEA approved modern technologies. Iran will facilitate the collection of IAEA measurement recordings and sending to the IAEA.

### **IAEA Role in the Procurement Channel: End-Use Checks on Direct-Use Nuclear Goods, but not Explicit Checks on Dual-Use Goods**

The JCPOA states that “Iran will provide to the IAEA access to the locations of intended use of all items, materials, equipment, goods and technology set out in INFCIRC/254/Rev.12/Part 1” or the NSG direct-nuclear use list, “imported following the procedure under Section 6 of this Annex.” It also states that “Iran will permit the exporting state to verify the end-use of all items, materials, equipment, goods and technology set out in INFCIRC/254/Rev.9/Part 2” or the NSG nuclear dual-use goods list, “imported following the procedure...”

The fact that the IAEA cannot verify that a dual-use good is at its declared end user is a short-coming. It can be partially mitigated. The IAEA can use the Access provision (see above), for example, if it became concerned that a dual-use good was being used for undeclared or otherwise prohibited activities. This issue is discussed more fully, along with a broader discussion of the strengths and weaknesses of the Procurement Channel, in another ISIS report.

## Prohibitions on Iran's Engagement in Nuclear Weapons Related Activities

Paragraph 16 of the JCPOA main text states that "Iran will not engage in activities, including at the R&D level, that could contribute to the development of a nuclear explosive device, including uranium or plutonium metallurgy activities." Quoted from Annex I are the following restrictions on nuclear weapons related activities, which are indefinite in duration:

- No research on designing, developing, acquiring, or using computer models to simulate nuclear explosive devices;
- No designing, developing, fabricating, acquiring, or using multi-point explosive detonation systems suitable for a nuclear explosive device, unless approved by the Joint Commission for non-nuclear purposes and subject to monitoring;
- No designing, developing fabricating, acquiring, or using explosive diagnostic systems (streak cameras, framing cameras and flash x-ray cameras) suitable for the development of a nuclear explosive device, unless approved by the Joint Commission for non-nuclear purposes and subject to monitoring; and
- No designing, developing, fabricating, acquiring, or using explosively driven neutron sources or specialized materials for explosively driven neutron sources.

These provisions are supplemented by one in the Arak section of Annex 1 that for 15 years, any Iranian work on plutonium or uranium metallurgy is banned. This condition is important because nuclear weapons typically use metal forms of separated plutonium, highly enriched uranium, or natural uranium. Specifically:

- For 15 years, Iran will not engage in producing or acquiring plutonium or uranium metals or their alloys, or conducting R&D on plutonium or uranium (or their alloys) metallurgy, or casting, forming, or machining plutonium or uranium metal.

These restrictions are designed to provide greater confidence that Iran's nuclear weapons-related activities do not continue. They are an outgrowth of the PMD issue, which according to the IAEA, has involved Iran's nuclear weapons related work both in the past and possibly up until today.

It should be noted that these provisions are a major innovation in nonproliferation arms control. Some have tried to argue that several of these activities are not prohibited or subject to verification under the Nuclear Non-Proliferation Treaty. But by including them in the JCPOA, the E3+3 have sought to end any doubt or interpretation that such activities are allowed in Iran. They are supported by the JCPOA's preface which states that "Iran reaffirms that **under no circumstances** will Iran **ever** seek, develop or acquire any nuclear weapons."