MIDDLE EAST INITIATIVE
PROJECT ON MANAGING THE ATOM

Iran and Nuclear Verification

20 Years of Continuing Sturm und Drang

Trevor Findlay

HARVARD Kennedy School
BELFER CENTER

50 YEARS
OF RESEARCH, POLICY, AND LEADERSHIP

PAPER
APRIL 2024

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About the Author

Trevor Findlay is a Principal Fellow at the School of Social and Political Sciences at the University of Melbourne, Australia. He was a Joint Fellow/Senior Fellow with the International Security Program and Project on Managing the Atom (MTA) at the Belfer Center from 2011–2015. From 2005–2015, he was a professor at the Norman Paterson School of International Affairs at Carleton University in Ottawa, Canada and holder of the William and Jeanie Barton Chair in International Affairs. He was also inaugural director the Canadian Centre for Treaty Compliance and held a concurrent apointment at the Centre for International Governance Innovation (CIGI) in Waterloo, Ontario, as head of its Nuclear Futures Project.

Dr. Findlay has a B.A. Honours degree from the University of Melbourne in political science and a Masters degree and Ph.D. in International Relations from the Australian National University (ANU). He spent thirteen years in the Australian diplomatic service, with postings in Tokyo, Mexico City, and Geneva. This was followed by academic appointments at the Peace Research Centre at the ANU, including acting directorship, and four years as a project leader at the Stockholm International Peace Research Institute (SIPRI) in Sweden, where he inaugurated the project on peacekeeping and international security. From 1998–2005, he was Executive Director of the London-based non-governmental organization, the Verification Research, Training and Information Centre (VERTIC). Professor Findlay was appointed to the United Nations Secretary-General's Advisory Board on Disarmament Matters in 2013 and chaired the Board in 2017.

His current research focuses on global nuclear governance. His report on the International Atomic Energy Agency (IAEA), Unleashing the Nuclear Watchdog, was published by CIGI in 2012. Dr Findlay's most recent book, based on research conducted for the Project on Managing the Atom, is Transforming Nuclear Safeguards Culture: the IAEA, Iraq, and the Future of Non-Proliferation (Cambridge, MA: MIT Press, 2022).

About the Project on Managing the Atom

The Project on Managing the Atom (MTA) has a dual mission: (1) leading the advancement of policy-relevant knowledge about the future of nuclear weapons, nuclear energy, and the connections between the two; and (2) preparing the next generation of leaders for work on these issues. MTA researchers not only engage in policy research and analysis, but also propose and promote policy innovations, and provide authoritative information for an interested public.

About the Middle East Initiative

Established in 1998, the Middle East Initiative (MEI) is Harvard University's principal forum for policy-relevant research and teaching on the contemporary Middle East and North Africa.

Chaired by Tarek Masoud, Ford Foundation Professor of Democracy and Governance at Harvard Kennedy School, MEI convenes policymakers, scholars, and intellectuals from the region and beyond to expand our understanding of this complex part of the world and to contribute to the search for solutions to its most pressing policy challenges. Through the integration of scholarly research, policy analysis, executive and graduate education, and community engagement, MEI aims to advance public policy and build capacity in the Middle East to enhance the lives of all the region's peoples.

> *"The Middle East Initiative is one of the most important ways in which the Kennedy School and Harvard engage with the contemporary Arab world and its neighbors. Our programs and events give our students a front-row seat to the most exciting developments in the region; and they provide scholars and practitioners from the region access to the cutting-edge policy solutions being generated at this University."*
>
> -Tarek Masoud, *MEI Faculty Chair and Ford Foundation Professor of Democracy and Governance*

Acknowledgments

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Abstract

The year 2023 marked twenty years since Iran was discovered to have had a nascent nuclear weapons program in violation of the 1968 Nuclear Non-Proliferation Treaty (NPT). In response, the international community, led by a self-selected group of the most powerful states in the international system, has sought to impose restrictions and sanctions on Iran's nuclear program that would at least delay its acquisition of a nuclear arsenal. While Iran has episodically negotiated with the international community to minimize the threatened dismantling of its program and to maximize its future nuclear options, it has also prevaricated, procrastinated and resisted efforts to determine, through monitoring and verification, the truth about its past, present and future activities. The result has been almost unrelenting *sturm und drang* (storm and stress) for all the parties concerned.

The ill-fated Iran nuclear deal, the 2015 Joint Comprehensive Plan of Action (JCPOA), that was supposed to rein in Iran's program, is now in deep trouble. For the first four years Iran surprised most observers by complying almost completely with the plan. But in May 2018, President Donald Trump vengefully sought to sabotage the accord by withdrawing the United States from what he called, hyperbolically, the "worst deal ever".[1] After a year's hiatus, Iran began to engage in the systematic, progressive violation of JCPOA constraints on its nuclear activities. Today it is closer than ever to acquiring enough fissile material for several nuclear explosive devices in a 'breakout' scenario that could be accomplished in months or even weeks.

The International Atomic Energy Agency (IAEA) has for twenty years sought to apply both traditional and enhanced monitoring and verification to Iran, as well as JCPOA-specific measures since 2015, to both check the status of Iran's current program as well as fully reveal its past suspected weapons program. Iran has sometimes acquiesced in, actively undermined or opposed outright the IAEA's activities. Currently it has almost completely decimated the special verification arrangements imposed on it by the JCPOA, including removing on-site monitoring equipment, although Iran has not categorically ended all IAEA activities or renounced the agreement itself. It has recently refused to admit several experienced IAEA safeguards inspectors from certain European states.

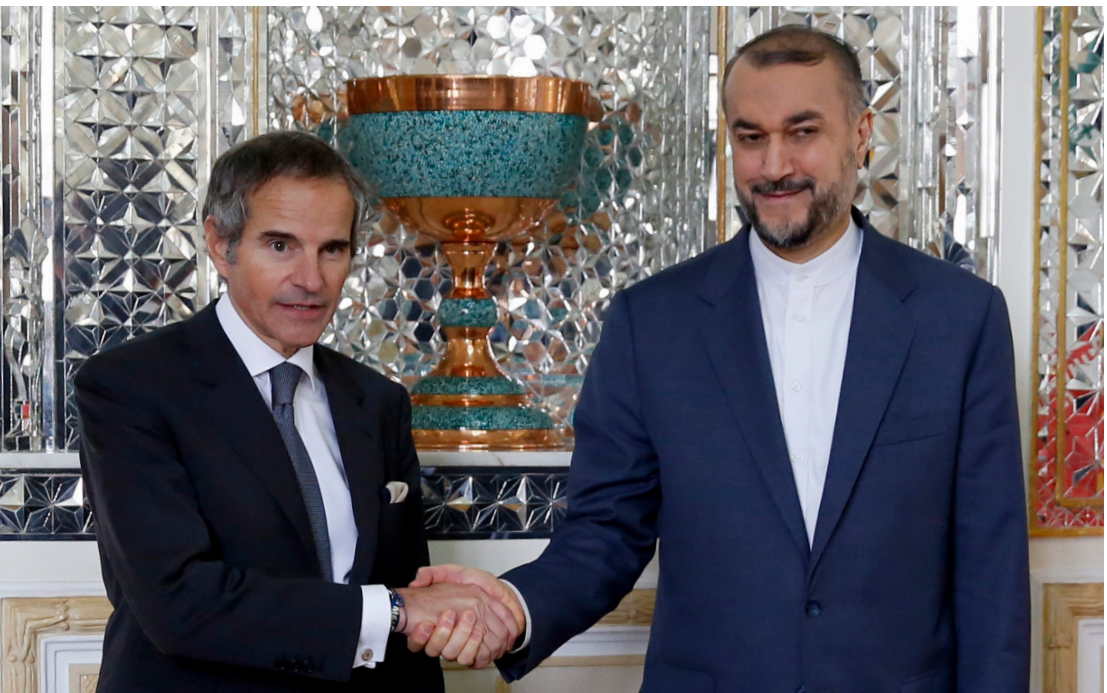
By attacking such non-JCPOA activities of the IAEA Iran is now threatening to undermine the integrity and credibility of the IAEA safeguards system as a whole. One can imagine Saudi Arabia, Iran's great rival, which is pursuing an ambitious nuclear energy program, seeing Iran's impunity as a rationale for resisting the imposition of the highest safeguards standards to itself. More broadly, the projected rapid increase in the use of nuclear energy worldwide, now widely accepted as one means of tackling global warming, will rely on a credible IAEA safeguards system to ensure that it does not result in nuclear weapons proliferation.

The IAEA Board of Governors, apparently loath to provoke Iran at a time when other seemingly more important geopolitical factors are at play, most recently the Israel-Hamas war, has yet to adopt a new resolution condemning Iran's actions. It should do so as soon as possible, demanding that Iran reinstate the excluded inspectors and return to full compliance with its safeguards agreement and the JCPOA. The Board should report Iran once again to the Security Council if it fails to comply. Under the JCPOA any of the remaining parties, including the EU3 (France, Germany and the UK) have the right to lodge a non-compliance complaint with the Council and start a 30-day process to "snap back" multilateral sanctions on Iran that were suspended by UN Security Council Resolution 2231 which endorsed the JCPOA. Russia and China cannot block the snapback. Although any additional Council action is likely to be vetoed by China and Russia, a thorough Council debate would put Iran on notice that it cannot continue to flout the IAEA without consequence.

For its part the IAEA Director General and Secretariat can only do so much to cajole Iran into 'restoring full cooperation, usually through excruciating diplomatic exchanges that often lead nowhere. The Agency's activities in Iran thus continue to be held hostage to Board and Security Council inaction, Iranian domestic and geopolitical factors, and regional and global dynamics. The IAEA can, unfortunately, only expect more *sturm und drang* pending a more lasting internationally negotiated resolution of the Iran case.

Iranian President Mohammad Khatami, right, shakes hands with Director General of the International Atomic Energy Agency (IAEA), Mohamed ElBaradei, before their meeting in Tehran, Tuesday April, 6, 2004. Iran will stop building and assembling centrifuges this week, the country's nuclear chief said Tuesday after a meeting with the chief U.N. weapons inspector. (AP Photo/Hasan Sarbakhshian)

Iran's President Hassan Rouhani, right, shakes hands with the International Atomic Energy Agency's director-general, Yukiya Amano, as they pose for photos at the start of their meeting in Tehran, Iran, Thursday, July 2, 2015. The head of the U.N. atomic agency, Amano, visited Tehran to discuss remaining outstanding issues over Iran's nuclear program. (AP Photo/ Ebrahim Noroozi)



International Atomic Energy Organization, IAEA, Director General Rafael Mariano Grossi, left, and Iranian Foreign Minister Hossein Amirabdollahian pose for the media before their round of talks, in Tehran, Saturday, March 4, 2023. (AP Photo)

Introduction

The year 2023 marked twenty years since Iran was discovered to have had a nascent nuclear weapons program in violation of the 1968 Nuclear Non-Proliferation Treaty (NPT). Since 2003, while Iran has episodically negotiated with the international community to minimize the threatened dismantling of its program and maximize its future nuclear options, it has also prevaricated, procrastinated and resisted efforts to determine, through monitoring and verification, the truth about its past, present and future activities. For its part, the international community, led by a self-selected group of the most powerful states in the international system, has sought to impose restrictions and sanctions on Iran's nuclear program that would at least delay its acquisition of a nuclear arsenal.

The International Atomic Energy Agency (IAEA), caught in the middle, has sought to apply both traditional and enhanced monitoring and verification to Iran, as well as JCPOA-specific measures which the Iranian government has sometimes acquiesced in, actively undermined or opposed outright. Iran has seen off two Directors General, Mohamed ElBaradei and Yukiya Amano, and is currently vexing a third, Rafael Mariano Grossi. The Iran issue has gone on for so long that the Agency's "IAEA and Iran: Chronology of Key Events" currently runs to almost 75 pages.[2] For all parties concerned the Iran nuclear saga is best characterized by the German expression *sturm und drang*, rendered in English as 'storm and stress'.

A groundbreaking deal, the Joint Comprehensive Plan of Action (JCPOA), was supposed to end the strife. After arduous negotiations and several precursor agreements, the JCPOA was signed in July 2015 by Iran and the European Union (EU), China, France, Germany, Russia, the United Kingdom and the United States.[3] The accord was endorsed by the United Nations Security Council in Resolution 2231 of 20 July 2015, making it legally-binding under international law.[4] Commonly known as the Iran nuclear deal, the JCPOA imposed significant verifiable constraints on Iran's nuclear program in return for sanctions relief and assistance in developing, under enhanced safeguards, its peaceful use of nuclear energy.

The IAEA, although not party to the JCPOA, was mandated to carry out verification of Iran's compliance.[5] Based in Vienna, this multilateral organization, associated with the United Nations but governed autonomously, has more than 60 years' experience implementing nuclear safeguards to prevent the misuse of peaceful nuclear material and facilities for nuclear weapons purposes.[6] By the time the JCPOA was given the task of verifying compliance with the JCPOA, the IAEA had been dealing with Iran, in the most complex, arduous and longest-running safeguards non-compliance case in its history, for 12 years. It knew Iran well. The JCPOA gave the Agency unprecedented additional verification powers and intrusive monitoring capabilities to the extent that Iran was described as the most "verified" country on the planet. Notably, the JCPOA gave the IAEA the right to station inspectors permanently at Iran's key nuclear facilities, with 24-hour access on request; conduct continuous monitoring of uranium enrichment output; monitor the status and production of centrifuges; and conduct what amounted to challenge inspections.

The wonder is that Iran ever accepted such measures, an indication that at the time it was sincere in agreeing to the JCPOA, undoubtedly in the expectation that it would receive meaningful sanctions relief and be able to bury permanently the controversy over its past nuclear weapon activities in violation of the NPT. Adopting a long-range hedging strategy, successive Iranian leaders also presumably hoped that Iran could continue under the JCPOA to accrue nuclear experience that would ultimately bring it closer to the nuclear weapon threshold, especially as JCPOA constraints fell away and the world's attention focused elsewhere. Such a strategy seems to have been confirmed by the most recent assessment by the U.S. Office of the Director of National Intelligence which concluded that Iran has "undertaken research and development activities that would bring it closer to producing the fissile material needed" to produce a nuclear weapon but that it is "currently not undertaking the key nuclear weapons-development activities that would be necessary to produce a testable nuclear device".[7]

After several hopeful years in which Iran was compliant with its basic obligations under the JCPOA (with some significant exceptions), the withdrawal of the United States from the accord in May 2018 and its reimposition of U.S. sanctions prompted Iran—after a disquieting year-long lull while it considered its options—

to initiate an escalating cascade of deliberate violations. These were calibrated to gradually ramp up pressure on the other parties which had stayed in the JCPOA, notably the Europeans, to provide their promised sanctions relief and honor the terms of the agreement. Initially confined to progressively breaching the JCPOA's key limitations on its nuclear activity, notably uranium enrichment, Iran then sought to degrade, although so far never quite eliminate, the IAEA's JCPOA-related monitoring and verification capabilities on its territory.

After breaching the limits on the level of uranium enrichment that it was permitted to undertake (at or below 3.67 percent) and the amount of such LEU (300 kg) it was permitted to keep, Iran has continued to enrich at or even above 60 percent and accumulate large stockpiles of the material. It has also exceeded the limits on centrifuge numbers, installation and manufacture. Currently, Iran has breached JCPOA limitations to such an extent that it is estimated by David Albright and his colleagues to be able to build a crude nuclear explosive in six months.[8] Furthermore, they have concluded that Iran's "breakout time" is essentially zero, as it has significantly more than enough 60 percent enriched uranium to be "assured it could directly fashion a nuclear explosive". It could further enrich all its 60 percent material to 90 percent in about 23 days and have enough for seven nuclear weapons in three months.[9] Kelsey Davenport, meanwhile, estimates that if Iran made the decision to produce enough weapons-grade uranium for one nuclear explosive device (25 kilograms of uranium enriched to 90 percent), it could do so in less than one week, although weaponizing a device would take an additional 1-2 years.[10] Officially, then U.S. Chairman of the Joint Chiefs of Staff General Mark Milley predicted that Iran could make enough fissile material for a nuclear weapon in "less than two weeks" and the weapon itself in "several more months".[11] Although the IAEA traditionally does not speak in such terms, even IAEA Director General Grossi in January 2023 declared that Iran had amassed enough material for "several nuclear weapons", although not yet enriched to weapons grade.[12]

Such transgressions make the JCPOA, in the parlance of economics, a "stranded asset", unproductive and worthless. U.S. President Joe Biden has been overheard saying that the Iran nuclear deal was "dead" (a term later used by an Iranian official) but has publicly stressed the U.S. would not formally announce its demise.[13] Other U.S. officials, as well as European officials, have been more

cautious. None of the parties involved, including Iran, the EU and the U.S. have entirely ruled out resuming negotiations to rescue the JCPOA. Meanwhile, the verification and monitoring system continues to degrade, notwithstanding some recent Iranian concessions to allow the IAEA to reinstall some monitoring devices.[14] Press reports have suggested that talks have been held about a "freeze-for-freeze" approach, in which Iran would freeze parts of its nuclear program (perhaps limiting enriched uranium to 60 percent, which can itself be used directly, although not ideally, in nuclear weapons) in return for some sanctions relief.[15] Whether this would be a prelude to resurrecting the JCPOA is unclear. [16]

Although a seemingly endless series of action plans, work plans, frameworks for cooperation, joint statements and agreements preceded the landmark JCPOA, and the sanctions regime imposed on Iran remains a critical part of the JCPOA deal, the focus of this paper is on monitoring and verification. Three now inseparable sets of Iranian nuclear commitments are subject to such monitoring and verification:

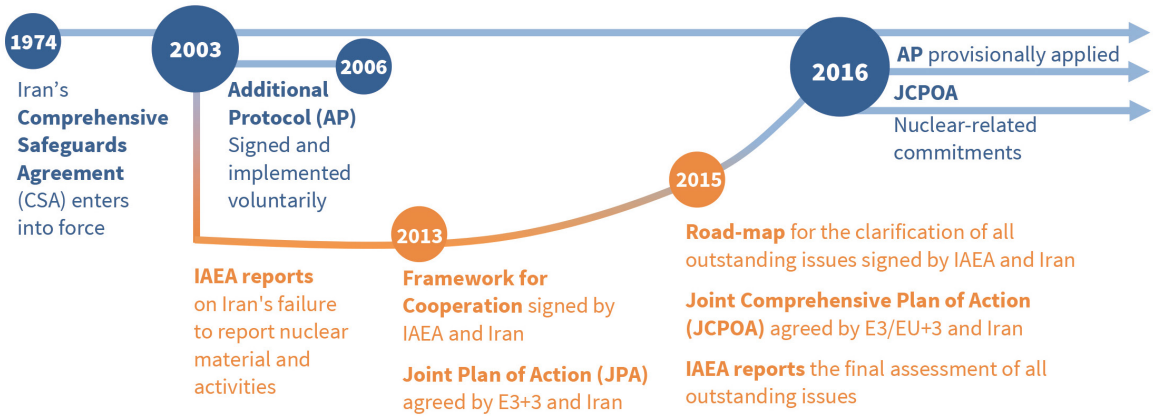
- Iran's 1974 Comprehensive Safeguards Agreement (CSA) with the IAEA, Iran's violation of which gave rise to the JCPOA
- the Additional Protocol to its CSA that Iran has only periodically implemented;
- and the JCPOA itself.[17]

Although it is not always possible to pinpoint the legal basis of each monitoring and verification measure imposed on Iran—and certainly the Agency would be unwise to compartmentalize what it learns from each in assessing Iran's nuclear program as a whole—the following discussion will seek to identify the specific agreement that certain measures are associated with in order to assess their current status and operability.

IAEA VERIFICATION & MONITORING IN IRAN

ENSURING THE PEACEFUL USE OF ALL NUCLEAR MATERIAL

KEY DATES



KEY FACTS

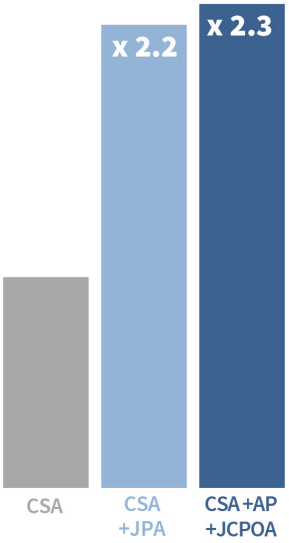
18 NUCLEAR FACILITIES & 9 LOCATIONS OUTSIDE FACILITIES UNDER IAEA SAFEGUARDS

ADDITIONAL PROTOCOL

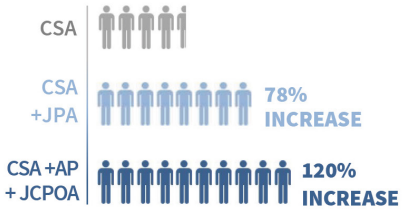
Provides IAEA with **broader access** to information and locations, increasing its ability to verify the peaceful use of all nuclear material in Iran

DAYS IN THE FIELD/YEAR

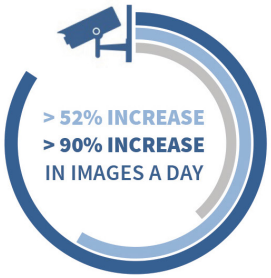
ANNUAL COSTS



HUMAN RESOURCES



SURVEILLANCE SYSTEMS



IAEA International Atomic Energy Agency

Source: IAEA & Iran https://www.iaea.org/newscenter/focus/iran

Iran's Standard Safeguards Obligations – At Least 40 Years of Non-Compliance and Counting

Iran concluded a Comprehensive Safeguards Agreement (CSA) with the IAEA (INFCIRC/214) in 1974.[18] This is a legally binding bilateral safeguards agreement that all non-nuclear weapon states parties to the NPT are obliged to negotiate with the Agency pursuant to the treaty's Article III. Safeguards are the technical means by which the IAEA verifies states' undertakings under their safeguards agreements and protocols. In the IAEA's own words, such "independent verification provides assurances to the international community that States are fulfilling their commitments concerning the peaceful use of nuclear energy and deters States, through the risk of early detection, from acquiring or using *nuclear material*, *facilities* and/or other items subject to safeguards for proscribed purposes".[19] Since 1974 the IAEA has applied to Iran all the standard verification techniques allowed by CSAs: notably, nuclear materials accountancy, design information verification, containment and surveillance (C&S), and a variety of on-site inspections.

After the Iraq non-compliance crisis of the early 1990s the Agency strengthened its safeguards system considerably. Under Part 1 of its so-called 93+2 program the Agency's Board of Governors reaffirmed several rights that the IAEA had under CSAs, including the use of open source and intelligence information, environmental sampling and special inspections. Further strengthening of safeguards involved the development and application of the State-Level Approach, in which the Agency considers all pertinent information and analysis about a state in reaching its safeguards conclusions.

All such measures have been applied to and accepted by Iran before and since the advent of the JCPOA—except one: modified Code 3.1 of the Subsidiary Arrangements for CSAs.[20] The original Code required states to notify the Agency of design information for a new nuclear facility as early as possible before nuclear fuel was introduced into it (180 days' notice was specified in Iran's CSA). The modified Code, approved by the IAEA Board of Governors in 1992, instead requires states to notify the IAEA "as soon as the decision to construct or to

authorize construction has been taken, whichever is earlier". Arguing that the Board had no authority to make the change mandatory, Iran has been alone among states in refusing to comply with the new requirement, although it did so "voluntarily" between 2003 and 2007.[21] The JCPOA sought to remedy this situation by requiring Iran to notify the IAEA by Implementation Day, January 16, 2016, that it would fully implement modified Code as long as its CSA was in force.[22] Given that Iran had failed to declare the secret construction of enrichment facilities at Natanz and underground at Fordow prior to 2003, this measure was seen as vital in restoring confidence that Iran would reveal future nuclear infrastructure plans well in advance. As required by the JCPOA, Iran provided the necessary notification of its future plans to the IAEA by Implementation Day.[23]

Iran also complied with the Code between 2016 and 2018, giving the Agency early design information for two planned light water reactors at Bushehr, the site of its existing nuclear power plant; advising of a plan to construct a research light water critical reactor at an Atomic Energy Organization of Iran (AEOI) site (construction began in Isfahan in February 2024); and even foreshadowing Iran's interest in naval nuclear propulsion "in the future".[24]

Iran has not, however, complied with the Code since 2018, despite commencing construction in December 2022 of its domestically designed 300 Mwe pressurized water reactor.[25] It is not even clear that Iran has given formal notice to the Agency of its commencement of construction in November 2019 of Unit 2 at its Bushehr civilian nuclear power plant.[26] While news of all of these developments is in the public domain, this does not lessen Iran's legal obligation to report them to the IAEA. Director General Grossi has repeatedly reminded Iran that it cannot unilaterally modify any part of its CSA obligations, but Iran continues to make no effort to comply.[27]

Otherwise, paradoxically, Iran is annually declared to be in compliance with its CSA obligations by being listed among 45 states with "comprehensive agreements in force, but without additional protocols in force" and for which the IAEA Secretariat has "found no indication of the diversion of declared nuclear material from peaceful nuclear materials".[28] In other words, the IAEA has verified, through its standard CSA verification techniques, that nuclear material currently declared by Iran as part of its peaceful nuclear program has been accounted for. Until

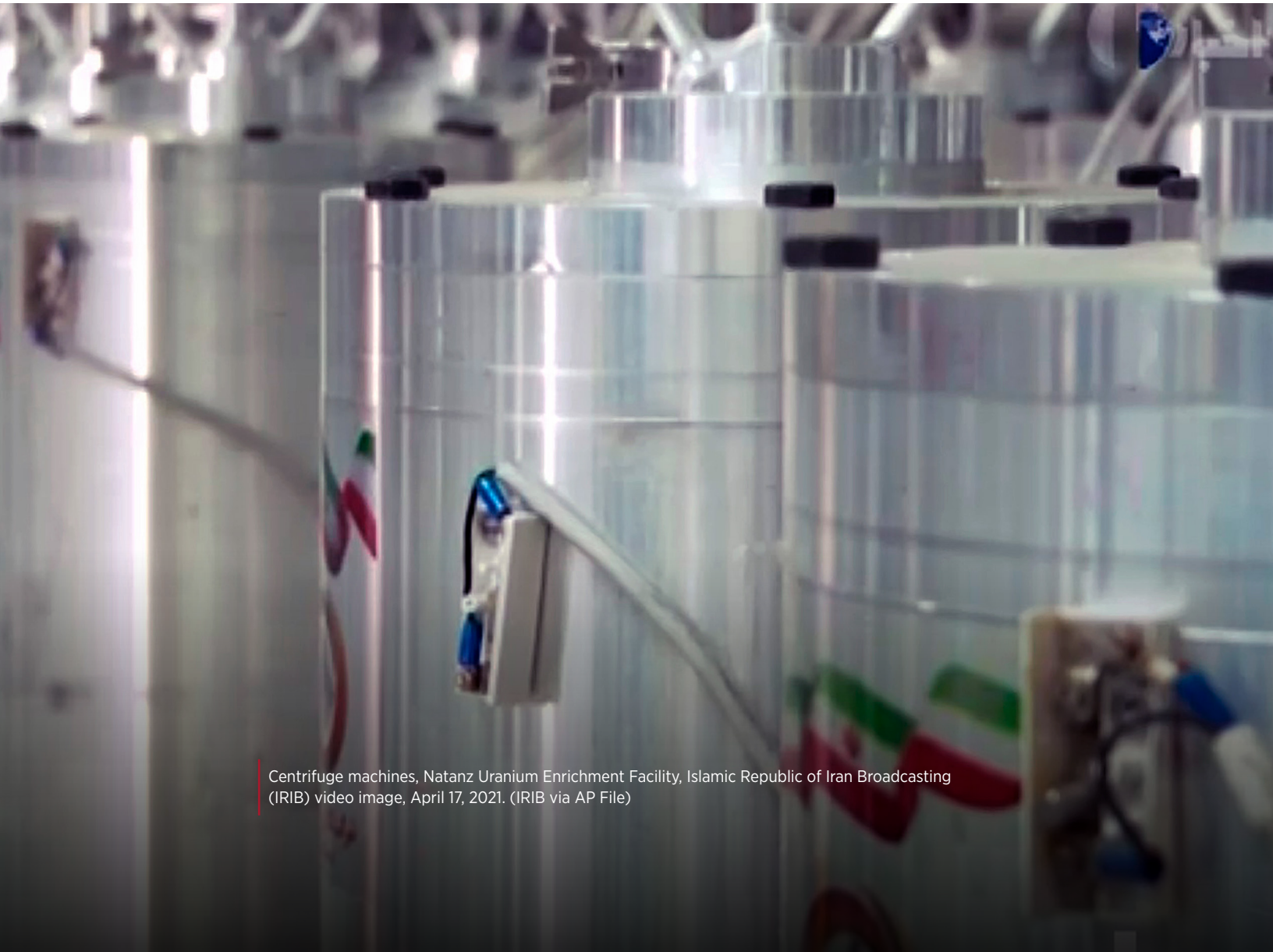
very recently (as detailed below) Iran has submitted the necessary declarations of nuclear materials under its CSA and provided IAEA inspectors access to perform their CSA-related verification tasks, including nuclear materials accountancy and C&S.

But this is far from the whole story. The IAEA's formal annual safeguards conclusion for Iran only refers to currently declared materials. As in the case of Iraq before it, Iran has for decades failed to declare all of its past nuclear material and activities to the IAEA and has therefore been in continuous non-compliance with its safeguards agreement and the NPT.[29] Although its non-compliance was only revealed in 2003 and the Board of Governors only formally declared Iran to be in non-compliance in September 2005, the scale and sophistication of Iran's hidden nuclear enterprise—more or less a complete fuel cycle, including the construction of two undeclared enrichment facilities at Natanz and a research reactor at Arak—indicates that it had been in violation since at least the late 1970s.[30] Iran itself admitted to the IAEA in 2003 to having been developing an enrichment program for 18 years, including 12 years' work on a laser enrichment program.[31] In September 2003 the IAEA released a "Detailed Technical Chronology" outlining the Iranian activities of which it was aware at that time, beginning in 1977.[32] Further details came to light in subsequent years.

As will be described below, Iran has never, even 20 year later, fully accounted for what came to be known as its "past military activities" (PMD) and has engaged in continuous efforts to evade complete transparency. And now, by failing to declare that in late 2022 it began enriching uranium close to weapons-grade and altered the connection between two of its centrifuge cascades to do so, Iran has committed a further, even more egregious violation of its CSA.[33] In September 2023 it compounded its non-compliance by withdrawing its acceptance ("designation" in safeguards parlance) of several IAEA inspectors (of French and German nationality) who were experts in Iran's enrichment activities.[34] Director General Grossi made a point of specifying that these inspectors were formally permitted under Iran's 'NPT Safeguards Agreement', pre-empting a possible claim by Iran that they were authorized under the tottering JCPOA. Iran had traditionally refused the designation of inspectors from the United States and other states it considered unfriendly (38 inspectors over four years prior to 2010). The JCPOA unfortunately did nothing to end this practice.

Iran's Additional Protocol – Fleeting Compliance

The Additional Protocol (AP), the model for which was adopted by the IAEA Board of Governors in 1997 to strengthen safeguards after the Iraq non-compliance case, is a voluntary amendment to states' CSAs. Currently in force for 140 states (and Euratom), it significantly expands the information a state is obliged to provide the IAEA, including a full declaration of all nuclear activities, updated annually. This amounts to cradle-to-grave transparency about a state's entire nuclear fuel cycle. The Protocol also gives the Agency significant new information-gathering powers, including short-notice "complementary access" inspections to clarify previous inspection outcomes at declared sites; access to nuclear research and development (R&D) not involving nuclear material; and the right to conduct wide-area environmental sampling (with Board approval).



Centrifuge machines, Natanz Uranium Enrichment Facility, Islamic Republic of Iran Broadcasting (IRIB) video image, April 17, 2021. (IRIB via AP File)

Iran had been one of the most significant holdouts from adopting an AP, but relented after it was found to be in non-compliance with its safeguards agreement in 2003. However, although it negotiated a draft with the IAEA Secretariat it has never formally signed or ratified it, only implemented it "provisionally", and then only episodically. Between 2003 and 2006 Iran reportedly did provide, in a timely manner, the required AP declarations and gave Agency inspectors access to locations as required, including complementary access.[35] This provided the Agency with significant new information on the country's nuclear activities such that Iran, presumably alarmed by the AP's effectiveness, ended its implementation of it in 2006.

In 2015 the JCPOA, through its endorsement by the UN Security Council, essentially made Iran's compliance with the AP legally binding, even though as a face-saving measure this provision was listed among the "voluntary transparency measures" that Iran "offered" to take.[36] Iran was required to apply its AP provisionally and "seek [its] ratification and entry into force, consistent with the respective roles of the President [of Iran] and the Majlis (Parliament)".[37]

Iran has still not ratified its AP, but from 2016 it again applied it provisionally. Iran was thus once more subject to the AP's transparency provisions and verification measures conducted by the IAEA. This time its implementation was mixed. It notably failed to provide transparency and inspector access to permit the IAEA to have sufficient confidence that all of Iran's past and current nuclear activities had been accounted for. Such certification was required before the IAEA could issue Iran with the so-called Broader Conclusion, as envisaged by the JCPOA, in return for sanctions relief. For a normal state, achieving the Broader Conclusion, which is re-examined annually, permits the IAEA to rationalize the various layers of verification applied over the years and reduce monitoring and verification intensity for the state. Since the IAEA was unable to grant the Broader Conclusion, Iran was unable to take advantage of this "integrated safeguards" process. Iran ended its provisional implementation of the AP entirely in February 2021 along with halting other JCPOA monitoring and verification measures.

JCPOA-Specific Monitoring and Verification

On July 20, 2015, UN Security Council resolution 2231 endorsed the JCPOA, triggering a complicated timetable of activities and associated deadlines agreed by the parties, along with new monitoring and verification arrangements.[38] The staggered implementation plan was intended to ensure that compliance was rewarded (notably though the staged lifting of sanctions) and non-compliance deterred (notably through the "snap back" of sanctions for serious non-compliance). Key dates were:[39]

- **October 15, 2015:** the IAEA would certify that the so-called Roadmap leading to the JCPOA had been implemented—Iran complied on schedule and the IAEA certified implementation
- **October 19, 2015, Adoption Day**: activities to implement the agreement would begin—these all began as scheduled
- **January 16, 2016, Implementation Day**: key steps would be taken by Iran, verified by the IAEA and rewarded with some sanctions relief—these all occurred as scheduled.
- **October 19, 2023, Transition Day**: further sanctions relief would occur eight years after Adoption Day or earlier if the IAEA reached the Broader Conclusion that all nuclear material in Iran remained in peaceful activities—this did not happen
- **October 19, 2025, Termination Day**: ten years after Adoption Day, UN Security Council resolution 2231 terminates and remaining sanctions and restrictions on nuclear and non-nuclear activities end, provided that previous resolutions have not been reinstated due to Iran's non-compliance—how this will resolve itself in the light of Iran's continuing violations of the JCPOA is unknown.

The constraints on Iran's nuclear program by the JCPOA can be divided into two types: those applied to the plutonium route to the bomb and those applied to the high enriched uranium (HEU) route.[40] Transparency, monitoring and verification measures might be considered a third category of constraint, to the extent that

they raise the costs of and deter Iran from attempting to subvert the JCPOA. However, to encourage Iran to cooperate with transparency and verification measures the accord studiously avoids characterizing them as constricting or punitive, both to save Iranian face and to comport with the IAEA's own culture of cooperative multilateralism.[41]

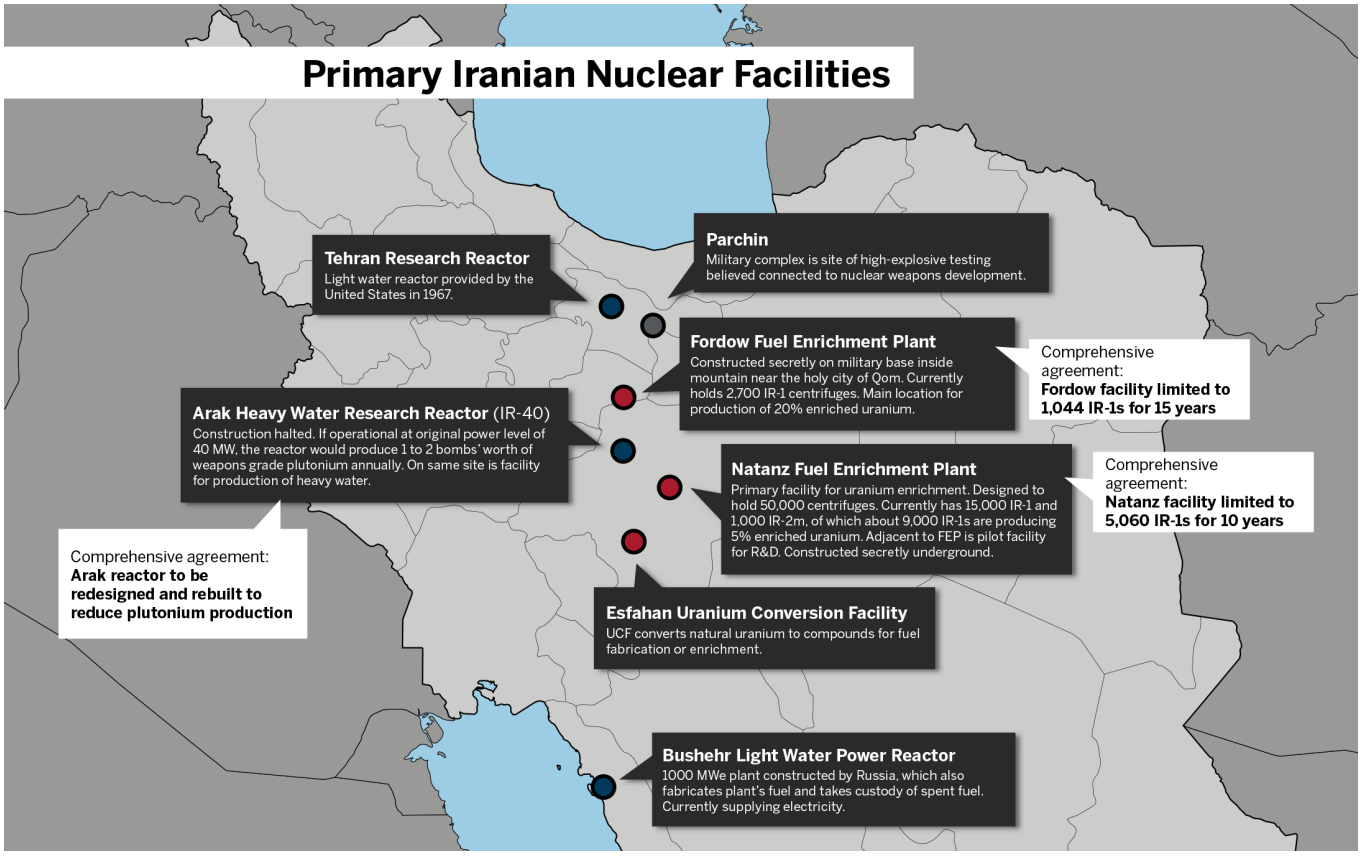
The key elements of the plutonium route to be curtailed were the construction of the Arak plutonium production reactor, the production of heavy water for the reactor, and the future reprocessing of plutonium from the spent reactor fuel. As for the enriched uranium route, Iran had three known operational uranium enrichment facilities at the time the JCPOA was concluded. At Natanz it had a Fuel Enrichment Plant (FEP) and a Pilot Fuel Enrichment Plant (PFEP), while at Fordow it had a large underground enrichment facility. It was required to accept limitations on the operations of the Natanz facilities, including the type and number of operating centrifuges, while converting the one at Fordow to a research and development (R&D) facility. In addition, there were constraints on enriched uranium levels and holdings, centrifuge and bellows manufacturing, enrichment R&D, and uranium stocks and fuels, along with reporting on uranium mining, production and processing.

While seeking to reinforce the safeguards measures applied to Iran under its CSA and AP, the JCPOA authorized the IAEA to apply extensive new JCPOA-specific verification measures. Some were "one off" activities (such as verifying the pouring of concrete into the calandria of the Arak reactor to disable it) that only needed to be conducted once. Others, such as constraints on the number of centrifuges, needed monitoring and verification throughout the lifetime of the JCPOA. The Agency was therefore faced with a rolling series of verification activities of varying duration, linked to various stages of the JCPOA. To facilitate verification, Iran was obliged to make the "necessary arrangements" for additional IAEA access and monitoring measures, described in the JCPOA as voluntary "Transparency and Confidence-Building Measures".[42] Since the entire Security Council resolution was adopted under Chapter VII of the UN Charter, making compliance with all its provisions mandatory, the reference to voluntary transparency measures was, again, purely face-saving for Iran.

One of the most consequential "voluntary transparency measures" was a commitment to facilitate a long-term IAEA presence in Iran and the use of "approved and certified modern technologies". Iran was obliged to issue long-term visas to Agency inspectors as well as providing working space at nuclear sites and "with best efforts" at locations near nuclear sites.[43] The JCPOA also required an increase in designated IAEA inspectors approved by Iran to 130-150 within nine months of Implementation Day. Iran agreed to "generally allow" the designation of inspectors from nations that have diplomatic relations with Iran, "consistent with its laws and regulations".[44]

As for new monitoring technologies, Iran agreed to permit the IAEA to use on-line enrichment measurement and electronic seals that communicate their status to Agency inspectors in real time.[45] These had never previously been used by the IAEA. Unspecified additional modern technologies, as approved and certified by the IAEA, were permitted, "in line with internationally accepted IAEA practice". Iran also undertook to facilitate the automated transmission of measurement recordings from installed Agency devices to IAEA working spaces at nuclear sites.

The following analysis of the implementation of these complex arrangements draws critically on both quarterly and special reports by the Director General of the IAEA to the IAEA Board of Governors. Since the advent of the JCPOA the Secretariat has adopted the practice of issuing two separate types of reports on Iran, one on implementation of the JCPOA and one on Iran's compliance with its CSA. Since 2020, in addition to the traditional quarterly reports for Board meetings, the Director General has issued quick updates (often just a single page) to both types of reports, although these have tailed off recently. While these run the risk of overwhelming smaller IAEA delegations with detail, it seems a wise tactic in order to keep the attention of member states and the international community focused on Iran's escalating non-compliance. It also matches Iran's virtually constant flouting of the JCPOA in new and "creative" ways. The focus on uranium enrichment developments in many of the JCPOA updates also signals the Agency's concern about a key nuclear weapons capability indicator.



Source: The Iran Nuclear Deal: A Definitive Guide

From Adoption Day to Implementation Day—Iran Mostly Compliant and Verification Smooth

The initial experience of the IAEA in verifying Iran's compliance with the JCPOA between Adoption Day and Implementation Day was almost entirely without significant problems.[46] Then Director General Yukiya Amano's report of January 16, 2016, which paved the way for the Agency to begin monitoring and verifying the next stage of the JCPOA, towards Transition Day, mentioned no difficulties in implementing any of the JCPOA requirements to that time.[47] Nor did the Agency detect, in IAEA safeguards parlance, any "anomalies" in accounting for nuclear materials or associated technologies.

Iran appeared to be in full compliance. As required, it had, *inter alia*, halted work on the Arak reactor; lowered its heavy water holdings; reduced the number of IR-1 centrifuges at the FEP at Natanz; stopped enriching uranium beyond 3.67 percent U-235 at any of its declared facilities; reduced its stockpile of UF_6 gas enriched to 3.67 percent; ended its accumulation of enriched uranium through its R&D activities; halted enrichment and R&D at its Fordow plant; provided the required information under its

Additional Protocol; stopped producing IR-1 centrifuges to replace damaged or failed machines; provided an inventory of all existing centrifuge rotor tubes and bellows and permitted continuous monitoring of such equipment; permitted the IAEA to monitor uranium ore concentrate production; and complied with Modified Code 3.1 and the AP.[48]

Verification was facilitated by Iran's adherence to the agreed transparency arrangements. In addition to providing information beyond what would normally be expected under a CSA and AP, Iran issued long-term visas to inspectors and provided them with proper working spaces.[49] An unprecedented continuous IAEA presence was established at Iran's nuclear facilities and daily access to them was granted on request.[50]

In his remarks to the Board of Governors on January 19, 2016, DG Amano noted that "Verifying that Iran had completed the necessary preparatory steps was a complex and difficult task, carried out under intense time pressure".[51] In a presentation at the Belfer Center in November 2017 he claimed that the combination of the CSA, the AP and additional transparency measures under the JCPOA represented "the most robust verification system in existence anywhere in the world… Our current verification capability is much stronger than it has ever been".[52] An often-overlooked contributing factor to better verification, he said, was that Iran's nuclear enterprise had shrunk. The first stage of the JCPOA had led "to a significant reduction in Iran's nuclear activities".[53]

In some respects, though, the initial steps required by Iran to wind back its nuclear program were the easiest part of the JCPOA to verify. As a general verification principle, any resumption of completely banned activity is much easier to verify than constraints on continuing activity. Declared items at declared facilities, such as centrifuges at enrichment plants, along with definitive changes in their numbers and location, are comparatively simple verification tasks to the extent that a single deviation from declarations is normally detectable and constitutes a breach. Moreover, having learned from past loosely worded agreements with Iran, JCPOA negotiators had gone to great lengths to try to ensure that definitions and requirements were as unambiguous as possible and to provide for transparency measures and technologies to help avoid disputes. The challenge of JCPOA verification was that the agreement also permitted multiple, complex, nuclear-related activities to continue, including uranium enrichment and R&D, requiring constant, perpetual vigilance. Iran's decision to cooperate during this first stage was key, once again proving the old verification adage that anything is verifiable if transparency and a cooperative spirit are evident.

Towards Transition Day in 2023—Initial Iranian Compliance, US Withdrawal and the Great Unravelling

For roughly the first three and a half years after Implementation Day occurred, on January 16, 2016, the IAEA's verification of Iran's nuclear-related commitments under the JCPOA again proved relatively uneventful. Eighteen months after Implementation Day, in July 2017, UN Secretary-General António Guterres reported to the Security Council, based on IAEA reports, that he was "encouraged" by Iran's implementation of its commitments under the JCPOA.[54] There were several contested issues, notably heavy water stockpile limits, the amount of recovered enriched uranium at a plant in Esfahan (resolved through a ruling by the JCPOA's Joint Commission comprising all of the parties, including Iran, and chaired by the EU) and delays in Iran accepting complementary access requests.[55] There was also some criticism of the Agency's performance.[56]

In addition, there was no information about IAEA verification of and Iranian compliance with the most mysterious and opaque part of the JCPOA, Section T, labelled "Activities Which Could Contribute to the Development of a Nuclear Explosive Device". These included a prohibition on computer modelling, multi-point explosive detonation systems, explosive diagnostic systems and explosively driven neutron sources. David Albright and Olli Heinonen argued that the IAEA should apply a routine inspection approach to these issues, with Iran providing declarations of its current activities, material, technologies and locations.[57] Jarrett Blanc argued that the access provisions of the JCPOA already permit Agency verification as required.[58] Reports by the Director General have to date still not reported on Section T compliance.

On May 8, 2018, less than two and a half years after Adoption Day on October 19, 2015, President Donald Trump announced that the United States would withdraw from the JCPOA and reimpose sanctions on Iran.[59] In addition, U.S. Secretary of State Mike Pompeo announced a policy of "maximum pressure" on Iran linked to a specific list of objectives, many of which had nothing to do with the nuclear issue.[60] All the other parties, including Iran, pledged to remain in the agreement. The IAEA, meanwhile, carried on verifying Iran's compliance, obliged to do so unless and until instructed otherwise by the parties or by the UN Security Council. Significantly, almost a year after the US withdrawal Iran continued its overall

compliance with the JCPOA, presumably biding its time to decide what to do and to seek the moral high ground to encourage others, especially the Europeans, to apply pressure on the Americans to return.

On May 8, 2019, exactly a year after the US withdrawal, all pretense evaporated when Iran's Supreme National Council issued an order to "stop some of Iran's measures under the JCPOA from today".[61] More specifically, Iranian President Hassan Rouhani said that unless world powers protected Iran's economy from sanctions within 60 days Iran would start enriching beyond permitted limits.[62]

Since that time there has been a steady deterioration in Iran's compliance with the JCPOA. Still hoping to ratchet up pressure on the US to return to the agreement and drop its unilaterally reimposed sanctions, Iran adopted a "death by a thousand cuts" approach, insisting all the while that its early steps were reversible. As far as we know, Iran, unlike Iraq, North Korea and Syria, has until recently been transparent, indeed openly defiant, about its progressive breaching of the constraints on its nuclear program. The Iranians have also reverted to their time-honored playbook of gaming the compliance procedures of the IAEA Secretariat and Board of Governors, adopting quasi-legal arguments, bureaucratic delaying tactics, engaging in voluminous correspondence, agreeing to meetings that never eventuate, and even casting aspersions on the motives of the Director General and Secretariat.

In November 2019, a major firewall was breached. Director General Grossi reported that Iran had begun enriching UF_6 above 3.67 percent U-235 and, in addition, had exceeded 300 kg of UF6 above 3.67 percent U-235, both activities in violation of JCPOA limits.[63] Iran had also begun conducting enrichment activities outside its agreed long-term enrichment and R&D enrichment plan. Production of rotor tubes and bellows for activities beyond those specified in the JCPOA had also resumed.[64]

As to monitoring and verification, initially Iran continued to allow the Agency to use all of the permitted tools, including on-line enrichment monitors and electronic seals, as well as facilitating inspectors' visas and working spaces. Complementary access continued under the AP. But in December 2018, in a foretaste of what was to come, Iran sought to humiliate the Agency by demanding that its "relevant security and judiciary officials" inspect an IAEA sample camera, albeit "in the presence of the Agency officials".[65]

On 5 January 2020, in the "fifth step in reducing its commitments", Iran announced it was discarding "the last key component of its operational limitations in the JCPOA, which is the 'limit on the number of centrifuges'". As such, Iran said, its nuclear program "no longer faces any operational restrictions, including enrichment capacity, percentage of enrichment, amount of enriched material, and research and development". Iran's nuclear program would in future be developed "solely based on its technical needs".[66] While the announcement appeared to be in response to the assassination of the head of Iran's Revolutionary Guard, Qasem Soleimani, by a U.S. drone strike in Baghdad two days earlier, Iranian Foreign Ministry spokesman Abbas Mousavi said that decisions about the "fifth step" had already been taken before the killing but that some changes (presumably for the worse) would be made in response.[67]

Iran said it would continue to cooperate with IAEA inspectors. Unlike the U.S., it also did not announce its formal withdrawal from the JCPOA. Nonetheless, Iran's "fifth step" further increased ambiguity about the status of the JCPOA under international law, leaving the IAEA monitoring and verifying compliance with an agreement that was rapidly falling apart.

IAEA inspectors during a Safeguards Comprehensive Training Exercise at Dukovany Nuclear Power Plant in the Czech Republic. Dean Calma/IAEA

Iran Attacks the Verification System

Soon enough, in addition to continuing to breach the JCPOA's limits, Iran began restricting the IAEA's monitoring and verification activities themselves, a further violation of the JCPOA. In February 2021 Iran informed the Agency that, following a law passed by the Iranian Parliament, it would stop implementing by February 23 the so-called voluntary (but actually legally binding) transparency measures envisaged by the JCPOA, encompassing:

- the Additional Protocol
- Modified Code 3.1
- the use of modern technologies and long-term presence of the IAEA
- transparency measures related to uranium ore concentrate
- transparency measures related to enrichment
- access "pursuant to provisions of the JCPOA"
- monitoring and verification of the implementation of the voluntary measures, and
- transparency related to centrifuge component manufacturing.[68]

Essentially Iran gutted monitoring and verification of the accord. Director General Grossi was able to negotiate a "temporary technical understanding" to permit the continued operation and servicing of its monitoring equipment, but the collected data were to be placed under joint IAEA/AEOI seals and not independently accessible by the Agency.[69] Meanwhile Iranian officials engaged in a farcical dispute with the Director General about re-installing replacement cameras at the TESA Karaj complex which had been attacked by saboteurs. Iran made groundless accusations that the cameras had facilitated the attack.[70]

In March 2022 Director General Grossi told the Board of Governors that the Agency's verification and monitoring activities had been "seriously affected as a result of Iran's decision to stop the implementation of its nuclear-related commitments under the JCPOA, including the Additional Protocol".[71] He plaintively asserted that "It continues to be the Agency's understanding that surveillance data from all Agency cameras installed for activities in relation to

the JCPOA, as well as its on-line enrichment monitors, electronic seals or installed measurement devices, will continue to be stored and made available to the Agency if and when Iran resumes implementation of its nuclear-related commitments under the JCPOA".[72]

Iran's maneuvers were just preludes to its eventual demand that all of the Agency's JCPOA-relevant monitoring equipment be removed, starting in June 2022 with the On-Line Enrichment Measurement (OLEM) devices at the FEP and the flow meter at the Heavy Water Production Plant (HWPP), as well as cameras at the Tehran Research Centre and two centrifuge component workshops at Esfahan and enrichment monitoring devices at Fordow and Natanz.[73] The Director General said he was gravely concerned by this action, which had removed "the possibility for the Agency to have full confidence – in the event of a full resumption by Iran of its nuclear-related commitments under the JCPOA – that the centrifuges, uranium ore concentrate and heavy water produced by Iran since February 2021 would have been declared to the Agency".[74]

The IAEA confirmed in November 2022 that it had removed all of its equipment previously installed at facilities in Iran for surveillance and monitoring of the JCPOA. The equipment, as far as is known, is now in storage at various locations in the country under Agency seal. As a result, the continuity of knowledge that is vital for accurate verification has been lost. Establishing a baseline for future verification and monitoring activities will "take a considerable time and have a degree of uncertainty" which will only increase the longer the monitoring hiatus persists.[75] This undermines Iran's blithe reassurances, not repeated lately, that its actions may be easily reversible. On the contrary, a prolonged hiatus in monitoring will inevitably require more intrusive safeguards measures to confirm the consistency of Iran's declarations.[76] This is likely to require a re-negotiation of at least parts of the JCPOA if the situation is ever to return to the *status quo post ante*, a further complication in an already fraught effort to somehow revive the accord. Bizarrely, Iran has continued to issue long-term visas to IAEA inspectors and provide appropriate workspace, presumably seeking to maintain the illusion of continuing cooperation with the Agency.

In March 2023, as it has in the past, Iran made some concessions on transparency to avoid another scolding from the Board of Governors. This follows the discovery by IAEA inspectors that Iran had reconfigured two centrifuge cascades at the Fordow enrichment facility without notifying the Agency and the inspectors' consequent

detection by sample analysis of uranium particles enriched to 83.7%—dangerously close to the 90% considered to be weapons grade. These steps were a significant provocation by Iran, signaling a willingness to openly produce enriched uranium for which there is no identifiable peaceful use. After the Iranians explained that the incident was inadvertent, Director General Grossi indicated that the information later provided by Iran was "not inconsistent" with its explanation and that the Agency had no further questions on the matter "at this stage".[77]

During an urgent visit by Grossi to Tehran from March 3-4, 2023, the Iranians agreed in a Joint Statement to "implement further appropriate verification and monitoring activities" on a "voluntary basis".[78] Grossi reported that the Iranians had agreed to a 50 percent increase in inspections at Fordow and reinstallation of surveillance equipment such as cameras and an enrichment monitor that the Iranians had disconnected in June 2022. Grossi claimed the new measures would put a "tourniquet on the bleeding" in the continuity of knowledge and could be useful in beginning the re-establishment of baselines. Yet the IAEA's current monitoring and verification capabilities are far from what the JCPOA envisaged. Grossi somewhat forlornly called for "a set of safeguards-related, confidence-building measures" to pave the way to the restoration of the safeguards-related knowledge in relation to the production and inventory of centrifuges, rotors and bellows, heavy water and uranium ore concentrate".[79]

Iran's withdrawal of its acceptance of several experienced Agency inspectors from France and Germany in September 2023, constituting one third of the cadre of inspectors dedicated to Iran, was one of Iran's most provocative steps to date, given that these are permitted under Iran's CSA, not the JCPOA, as Director General Gross pointedly noted. It followed an earlier refusal of Iran to accept one designated inspector. Although legally permitted under safeguards agreements, Iran's action came in direct response to the EU3 criticism of Iran at the Board of Governors and is a blatant attempt to politicize the inspection regime. The inspectors are among the Agency's personnel most familiar with Iran's enrichment activities, an indication that the IAEA's monitoring continues to effectively threaten exposure of Iran's non-compliant activities. Director General Grossi reported to the Board that Iran's "de-designation" of inspectors "was exercised by Iran in a manner that directly and seriously affects the Agency's ability to conduct effectively its verification activities in Iran".[80] Iran's behavior is also now a direct threat to the integrity and credibility of the entire safeguards system, which relies on the IAEA inspectorate being impartial,

apolitical and technically oriented. If the Agency falters other states may seek to follow Iran's lead.

The Agency is now "flying blind" with regard to many crucial aspects of Iran's nuclear activities. In February 2023 the Director General compiled a long list detailing the "Impact of Agency verification and monitoring resulting from Iran stopping implementation of its nuclear-related commitments as envisaged in the JCPOA".[81] Grossi was reported in May 2023 as saying that the number of inspections in Iran had fallen by 10 percent compared to 2022, although the number has likely fallen further.[82] It is difficult as an outsider to precisely measure the Agency's current myopia given the range, complexity and constant evolution of Iran's nuclear capabilities. However, as the continuity of knowledge and level of intrusiveness of the Agency's presence declines it is possible the Agency will be unable to detect the construction of new, undeclared facilities, especially for centrifuge production, or other activities at undeclared sites.

To some extent the verifiability uncertainty cuts both ways. Due to its experience with verifying the JCPOA so far and its previous extensive engagement with Iran the Agency has a better understanding of the Iranian nuclear program than of any other state under safeguards. The Iranians will continue to be unsure of what the Agency knows and is able to detect. David Albright notes that recent Iranian transgressions may have been a gambit to test the Agency's verification capabilities.[83] IAEA inspectors have successfully detected recent undeclared Iranian activities and appear to have surprised the Iranians on several occasions with their findings regarding past military-related activities. As the Director General himself has noted: "These events clearly indicate the capability of the Agency to detect and report in a timely manner changes in the operation of nuclear facilities in Iran".[84] As long as inspectors are allowed some form of access, especially if it is in addition to that normally provided by states with a CSA, opportunities for serendipitous detection will continue. Iran seems, for the moment, loathe to block entirely the IAEA's regular non-JCPOA safeguards activities at its declared facilities and even some JCPOA-specific measures, presumably to avoid alienating even its supporters on the Board of Governors. But Iran continues to gradually tighten the noose.

On 19 October 2023 a major JCPOA milestone, so-called Transition Day, was reached. The JCPOA's Annex V states that "Transition Day will occur 8 years from Adoption Day or upon a report from the Director General of the IAEA to the IAEA

Board of Governors and in parallel to the UN Security Council stating that the IAEA has reached the Broader Conclusion that all nuclear material in Iran remains in peaceful activities, whichever is earlier".[85] In return it promised Iran further sanctions relief. Transition Day was a bust, passing with little notice. The IAEA was certainly in no position to reach the Broader Conclusion. Iran would in any case not get further sanctions relief due to its accelerating disregard of the JCPOA and its continuing violation of its Comprehensive Safeguards Agreement. The EU announced in advance that it would not lift sanctions on Transition Day. One major reason why the IAEA is unable to reach the Broader Conclusion is continuing uncertainty about Iran's past activities.

Unresolved safeguards compliance concerns—from possible military dimensions to anthropogenic uranium particles

The Agency continues to press Iran to resolve longstanding questions about its past nuclear activities carried out prior to the advent of the JCPOA. In the Joint Statement with the IAEA following Grossi's March 4, 2023, visit, Iran expressed its readiness to provide the Agency with "further information and access" to help resolve the issue, although its past promises to do so have proved worthless. Grossi reported in his quarterly report on Iran's NPT safeguards agreement in November 2023 that there had been no progress on such matters since the Joint Statement in March.[86]

Since being declared in non-compliance with its CSA in September 2005 by the IAEA Board of Governors and reported to the Security Council, Iran has consistently failed to cooperate with the Secretariat in resolving outstanding questions about the nature of its past nuclear weapons program—which was supposedly shut down in 2003. Iran therefore remains in continuing non-compliance with its CSA, which requires it to "clarify information relating to the correctness and completeness of [its] declarations under its Safeguards Agreement and Additional Protocol, in particular, in relation to three undeclared locations in Iran".[87] Although Iran is no longer provisionally applying its AP, the Agency is presumably holding it to account for the information it provided and the Agency obtained by its own verification means when Iran was applying the protocol. The focus on three locations is just the latest episode in a saga that stretches back to 2003 when it was first learned that Iran had a nascent nuclear weapons program, subsequently discovered to have been called the AMAD Plan.

After more than a decade of trying to discern the extent of Iran's program, then Director General Amano released a report in November 2011 that laid out in a 12-page annex and two attachments the most significant of the Agency's concerns.[88] He enumerated multiple "nuclear explosive development indicators of activities which suggested the existence of a structured program" prior to 2003, some of which "may still have been ongoing". Both the UN Security Council and the IAEA Board of Governors have repeatedly pressed Iran to come clean about such alleged weaponization activities. But Iran has always refused, although it conceded that it had conducted some of the suspect activities, allegedly for other military or civilian purposes.

Although Iran has always denied having nuclear weapon aspirations and constantly cites a 2012 *fatwah* against such acquisition by Ayatollah Ali Khamanei, it also claims that it had "no choice" but to have a "discreet" program because the U.S. suppressed Iran's efforts to procure nuclear technology for peaceful purposes.[89] Iran's Ambassador to the IAEA Ali Salehi in 2003 conceded a less than perfect Iranian record: "If cooperation has been slow, at times … if there have been few incidence [sic] of discrepancies … if there have been hesitations [sic] to adhere to the Protocol, … or embrace confidence building initiatives it is all out of one and only one concern. The U.S. intention behind this saga is nothing but to make this deprivation final and eternal".[90]

In 2015 a "Roadmap" was agreed by the IAEA and Iran to resolve questions about what were then called the "possible military dimensions" (PMD) of Iran's nuclear program.[91] Concluding the Roadmap to the satisfaction of the IAEA was a major stumbling block to negotiating the JCPOA and its predecessor accords. One of the main issues was evidence of weaponization-related testing activities for an HEU implosion device, the existence of anthropogenic uranium particles detected by increasingly powerful IAEA sample analysis, and a subsequent cover-up of related activities at the Parchin military base.[92]

Despite the intensive verification measures applied, the Road-map was never satisfactorily concluded. Iran refused to provide the necessary transparency, including access to: relevant individuals (and their cooperation); documentation related to procurement and dual use equipment; and certain military workshops and R&D locations. As a satisfactory conclusion to the Roadmap exercise was necessary to allow the JCPOA to proceed, a diplomatic fudge was concocted to

allow that to occur despite many outstanding unresolved issues.[93] The expectation of IAEA Secretariat officials was presumably that the enhanced access, monitoring and verification measures under the JCPOA, as well as its locking in of Iranian implementation of its AP and its quest for the Broader Conclusion, would, however long it took, eventually lead to further information being uncovered about Iran's past activities. This is exactly what has transpired, albeit fitfully and with scant Iranian cooperation.

Ironically, partially as a result of Iran's fleeting implementation of its AP, the IAEA has concluded, since at least July 2019, that it is unable to account for all of Iran's nuclear material, in particular at three undeclared sites where the Agency discovered, through on-site inspection and sample analysis, uranium particles of anthropogenic origin. These were at Turquzabad (discovered in 2019), Varamin (2020) and "Marivan" (2020).[94] While Iran in 2023 provided a possible explanation for the presence of depleted uranium at Marivan, the Agency reported that its assessment of the undeclared activities there 'remains unchanged'.[95] Seemingly illogically, the Agency said it nonetheless regarded the matter as "no longer outstanding at this stage", drawing immediate Israeli criticism.

This leaves two sites under continuing investigation. As of November 2023, Iran had still not provided explanations for these that were "technically credible", despite the Agency providing Iran with "numerous opportunities, in different formats through exchanges and meetings in Vienna and Tehran, to clarify these safeguards issues".[96] Without such explanations the IAEA says it cannot confirm the "correctness and completeness" of Iran's declarations under its CSA. The Board of Governors has repeatedly admonished Iran and called on it to cooperate with the Secretariat, but to no avail.[97]

The Iranians are now making the IAEA's capitulation on the uranium particles issue the latest precondition for resuming the sputtering negotiations on the future of the JCPOA. They claim, without evidence, that the materials in question were imported from "abroad". The Agency obviously cannot close its investigation, nor afford Iran the Broader Conclusion, without undermining the credibility of its post-Iraq emphasis on "correctness and completeness", now a fundamental pillar of IAEA safeguards.

Meanwhile Iran is once again violating other aspects of its CSA, including: failing to declare under Modified Code 3.1 the modifications to its Fordow Fuel Enrichment Plant; neglecting to report that it had begun enriching uranium almost to weapons grade; declining to implement "additional safeguards measures" (presumably re-installation of cameras that would normally be expected in any state with a CSA) and by failing to facilitate the Agency's verification of its total enriched uranium stockpile produced at its various facilities and consumed as feed material.[98]

It might be argued that it is unfair to continue to accuse Iran of violating an agreement, the JCPOA, which it has declared it is no longer bound to implement and which another major party, the U.S. has withdrawn from and not returned to. However, the legal status of the JCPOA remains unclear, as all the other parties have stayed in it and the UN Security Council has not withdrawn its endorsement. Even if the JCPOA is considered defunct there is no question that Iran is increasingly in violation of its "garden variety" safeguards agreement under the NPT in various ways and that the IAEA has the right and obligation to pursue its monitoring and verification mandate under that agreement, not least because to do otherwise would undermine the integrity and credibility of the entire IAEA safeguards system.

Conclusion

Paradoxically, as the Iranians have progressively violated the terms of the JCPOA, the IAEA has been left verifying non-compliance as much as compliance. Iran is thus a unique case in nuclear compliance history. It has combined relative transparency about its violations (indeed often provocatively boasting about them) with partial cooperation with verification. Non-compliant states in the past, such as Iraq, Syria and North Korea, have attempted to conceal as much as possible while seeking to confound verification efforts. It is likely that Iran wishes to avoid being tarred with the same brush as such states as North Korea and is therefore unlikely to completely end cooperation with the IAEA, much less withdraw from the Agency and the NPT as North Korea did. Instead, Iran is likely to continue to game what remains of the verification system even if all that remains falls under its CSA. Meanwhile, it is clearly pushing the boundaries of uranium enrichment towards producing weapons-grade material, increasing its enrichment capacity and perhaps even preparing hidden enrichment facilities and a nuclear weapon test site without the IAEA's knowledge, due to the severe degradation of the Agency's verification rights and capabilities under the JCPOA.

Ali Akbar Salehi, former head of the Atomic Energy Organization of Iran, has claimed that the country has all it needs to build a nuclear weapon: 'We have all the [pieces] of nuclear science and technology. Let me give an example. What does a car need? It needs an engine, it needs a steering wheel, it needs a gearbox. Have you made a gearbox? I say yes. An engine? But each one is for its own purpose'. 'We have it in our hands', he then said.[99] This sounds like an admission that Iran has been assembling all the requirements for a nuclear weapon while claiming they are for other, peaceful or unstated, purposes. The enrichment of uranium to weapons grade, which has no peaceful use, is an example. Director General Grossi responded that 'Iran is presenting a face which is not entirely transparent when it comes to its nuclear activities…There's loose talk about nuclear weapons more and more…A very high official said… "We have everything. It's disassembled. Well, please let me know what you have'.[100] David Albright's 'Iran Threat Geiger Counter' now rates the current situation as 'extreme danger' as a result of 'the real possibility that Iran may choose to weaponize its nuclear capabilities and build nuclear weapons'.[101]

Despite the best efforts of the negotiators to insulate the JCPOA's implementation process and verification system from Iran's non-nuclear military activities, its domestic politics, its regional entanglements and global geopolitics, this has proved impossible. The latest non-nuclear issues to dampen prospects for reviving the JCPOA include: Iran's continuing development of missile technology; its provision of drones to Russia for use against Ukraine; its ruthless suppression of domestic opposition; and its support for Hezbollah, Hamas and Yemen's Houthis. President Trump's willfully ignorant and spiteful decision to withdraw from the JCPOA reportedly simply due to its association with his predecessor Barack Obama, has predictably produced the worst of both worlds. The JCPOA constraints are gone and Iran is closer to a nuclear weapon capability than ever before.

The IAEA meanwhile is required to proceed, under increasingly dire circumstances, as if it remains fully tasked with verifying an accord that Director General Grossi has described as an "empty shell".[102] He has also called implementation of the Joint Statement of 4 March 2023 by the Agency and Iran, designed to overcome the latest barriers to effective verification, as "frozen".[103] In order to avoid questions about whether the JCPOA remains legally binding on Iran the IAEA has cast its most recent findings as violations of Iran's standard safeguards agreement, which remains extant and legally binding. The Agency has learned a great deal about Iran's nuclear activities, although as in the case of North Korea, its knowledge will continue to decline over time unless new arrangements are agreed. It has also gained invaluable experience with new monitoring technologies and verification techniques that can be applied both to Iran and other cases. But it remains to be seen how long the international community will be willing to pay for faux verification costing €9.8 ($US11 million per year).[104]

Beyond the specific Iran case, its actions are undermining the integrity and credibility of IAEA safeguards, with grave implications for future of the safeguards regime. One can imagine Saudi Arabia, Iran's great rival, which is pursuing an ambitious nuclear energy program, seeing Iran's impunity as a rationale for resisting the imposition of the highest safeguards standards. Other states might follow. More broadly, the projected rapid increase in the use of nuclear energy worldwide, now widely accepted as one means of tackling global warming, will rely on a credible IAEA safeguards system to ensure that it does not result in nuclear weapons proliferation.

The IAEA Board of Governors has yet to adopt a new resolution condemning Iran's actions. At its most recent meeting, in March 2024, the Board declined to issue such a resolution, presumably to avoid inflaming the already tense situation in the Middle East. Instead, U.S. ambassador Louise Holgate called for a 'comprehensive summary' from the Secretariat that addresses Iran's nuclear status and 'the degree to which the Agency is in a position to verify that Iran's program is entirely peaceful'. Based on the content of that report, Holgate said, the Board should take 'appropriate action in support of the IAEA and the global nuclear nonproliferation regime'.[105] It should do so as soon as possible, demanding that Iran reinstate the excluded inspectors and return to full compliance with its safeguards agreement and the JCPOA. It should report Iran once again to the Security Council if it fails to return to compliance. Under the JCPOA each of the remaining parties, including the EU3 have the right to start a 30-day process to "snap back" multilateral sanctions on Iran that were suspended by the accord under UN Security Council Resolution 2231.[106] Russia and China cannot block the snapback. Although any additional Council action is likely to be vetoed by China and Russia, a thorough Council debate would put Iran on notice that it cannot continue to flout the IAEA without consequence.

For its part the IAEA Director General and Secretariat can only do so much to cajole Iran into restoring full cooperation. The Agency's activities in Iran thus continue to be held hostage to Board and Security Council inaction, Iranian domestic and geopolitical factors, and regional and global dynamics. The IAEA can, unfortunately, only expect more *sturm und drang,* pending a more lasting internationally negotiated resolution of the Iran case.

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