Institute for Science and International Security

Report

The Iran Threat Geiger Counter: Extreme Danger Grows

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Since February 2024, the date of the last edition of the Geiger Counter, the threat posed by Iran's nuclear program has worsened significantly. Major negative factors include Iran's greater nuclear weapon capabilities, its shorter time frames to build nuclear weapons, and the growing normalization of internal Iranian discussions favoring building nuclear weapons. The possibility of Iran deciding to build nuclear weapons has been increased by the ongoing military conflicts in the Middle East, pitting Iran and its proxy forces against Israel and its allies, a conflict Iran is losing. The volatile security situation is now combined with the perception, if not the reality, that Iran is preparing to build nuclear weapons.

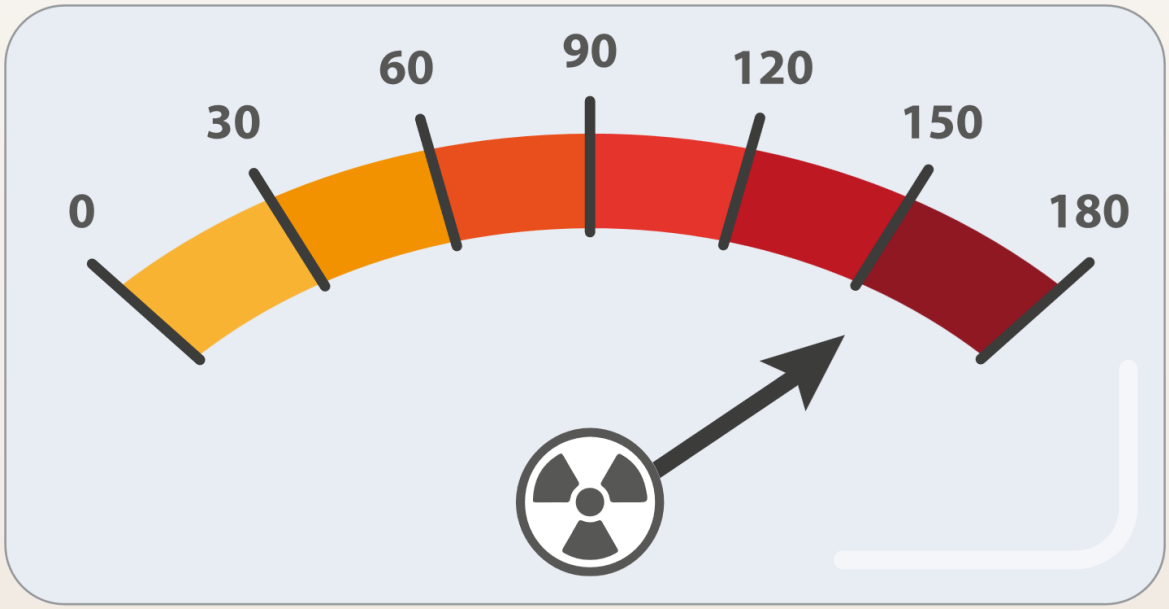
The uncertainty is worsened by Iran's refusal to cooperate with the IAEA as it tries to establish that Iran's nuclear program is peaceful. With Iran making thousands of advanced centrifuges outside the monitoring of the IAEA, as witnessed by deployments at declared enrichment sites, the chance has risen that Iran is also building, or laying in place, a secret enrichment plant. As uncertainty grows, this or a black swan event could occur. This uncertainty could also feed narratives that exaggerate the threat, further increasing tensions.

The ongoing conflicts have led to an increased urgency of eliminating the Iranian nuclear weapons threat, whether through renewed negotiation, increased pressure and threats of military force, or actual military force. But no clear path forward has emerged, and the success of any path is not guaranteed, and, at any moment, the Iranian leadership may launch a secret crash program to build nuclear weapons.

These grave and concerning changes have led the Institute to raise the total threat score to 157 out of 180, up from 151 in February 2024, indicating **Extreme Danger** for a second consecutive assessment.

The points are the result of Iran's hostile actions (current score of 20 points) against the United States and its allies, hostile rhetoric (29 points), short nuclear breakout time (30 points), progress on developing sensitive nuclear capabilities (27 points), lack of transparency over its nuclear program (24 points), and nuclear weaponization efforts beyond breakout (current score of 27 points). The overall score increased since February 2024, maintaining an overall threat score of Extreme Danger.

Iran Threat Geiger Counter



Current threat: Extreme Danger

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Criteria	Hostile Actions	Hostile Rhetoric	Lack of Transparency	Nuclear Breakout	Sensitive Nuclear Capabilities	Beyond Breakout
Total Score: 157	20	29	24	30	27	27
Direction of Change	↓ 8	— 0	↑ 3	— Max	↑ 5	↑ 6
Danger Level Extreme Danger	Considerable Danger	Extreme Danger	High Danger	Extreme Danger	Extreme Danger	Extreme Danger

Overview of Methodology

A national security threat is typically posed by a combination of hostile intentions and capabilities. The threat from Iran's nuclear program is no exception. The Iran Threat Geiger Counter from the Institute for Science and International Security measures on a regular basis Iran's hostile actions and intentions toward the United States and U.S. allies, and its capability to turn these hostile intentions into action through the potential or actual construction of nuclear weapons. As with the radiation levels measured by a Geiger counter, any level above zero represents a degree of danger.

The Institute assigns the following threat level using a zero to 180 scale on the Iran Threat Geiger Counter:

0-30:	Least Danger
31-60:	Low Danger
61-90:	Moderate Danger
91-120:	Considerable Danger
121-150:	High Danger
151-180:	Extreme Danger

The Iran Threat Geiger Counter analyzes Iran's activities in six categories and assigns up to 30 points for each category:

Hostile Actions (30 Points Max)
Hostile Rhetoric (30 Points Max)
Lack of Transparency (30 Points Max)
Nuclear Breakout (30 Points Max)
Sensitive Nuclear Capabilities (30 Points Max)
Beyond Breakout (30 Points Max)

The scoring system for each category is the following:

0-5:	Least Danger
6-10:	Low Danger
11-15:	Moderate Danger
16-20:	Considerable Danger
21-25:	High Danger
26-30:	Extreme Danger

The following sections discuss the threat posed by Iran and the allocation of points to each category in detail.

Iran Threat Geiger Counter in Detail: What Drives the Threat?

Hostile Actions

Score: 20 points ⇓

Over the past year, Iran has faced several major setbacks that have reduced its ability to engage in hostile actions against the United States, Israel, and other allies in the region. Iran's offensive and defensive capabilities are not as great as the regime claims them to be. Iranian attacks on Israel were quickly and efficiently repelled, causing only minor damage to Israel. Israeli retaliation against multiple Iranian attacks have left Iran exposed and vulnerable to future attack, eliminating much of Iran's veneer of strength. Iran finds itself increasingly isolated in the Middle East and many of its former allies and partners have had their capabilities greatly diminished or have utterly collapsed. Hezbollah and Hamas have been decimated by Israeli military actions and covert operations that have effectively decapitated their leaderships and offensive capabilities. The Assad Regime in Syria, a key Iranian ally and antagonist to Israel, completely collapsed and was replaced with a new government. The destruction of Iran's proxy forces has removed a key offensive tool that it relied on for decades to project power and check Israeli actions in the region. However, Iran still possesses military capabilities that threaten the region. It has large stockpiles of drones, ballistic missiles, and cruise missiles that it can employ against Israel and its allies. Iran also continues to be a major player in the Ukraine war, backing Russia with vast arms transfers, including drones and missiles. The setbacks of the last year may have reduced the threat in certain ways, but have not entirely eliminated it.

The aforementioned reduction in hostile capabilities warranted a reduction in the threat assessment score by eight points to 20 points (Considerable Danger), recognizing the on-going threat, including its role in supporting Russia in its war against Ukraine, but taking account of Iran's recent setbacks and remaining military capabilities. At its most basic level, this score measures Iran’s level of hostile action against the United States and its allies. These military setbacks that Iran has suffered are an important backdrop as the Iranian regime contemplates building nuclear weapons.

Significant recent developments include the following:

Iranian Proxy Groups in Gaza, Lebanon, and Syria Have Been Decimated

Since the Hamas led invasion of Israel on October 7, 2023, Israel has launched retaliatory and preemptive military operations against Hamas, Hezbollah, and other forces backed Iran. Thousands of Hamas and Hezbollah fighters have been killed by Israeli airstrikes and ground operations. Hamas’ leadership has been largely killed, including Ismail Haniyeh (who was in Tehran, Iran at the time of his death), Yahya Sinwar, Mohammed Deif, Fatah Sharif, and others.

Israel then turned its attention to Hezbollah, which had been indiscriminately firing rockets into Israel in support of Hamas' invasion. Israel has killed nearly all of Hezbollah's leadership, including Hassan Nasrallah, Fuad Shukr, Nabil Kaouk (Deputy Head of the Central Council), and many others. Covert operations were used by Israel to cause mass casualties amongst Hezbollah members using remote exploding pagers and walkie-talkies. Israel conducted ground operations and airstrikes on Lebanon that have eliminated Hezbollah stockpiles of missiles, missile launchers, and launch sites. On December 8, 2024, Syrian President Bashar al-Assad was forced to flee to Russia, while his Iranian/Russian backed regime collapsed as a result of rapid advances by rebel forces. The decimation of the Iranian backed proxy forces in Gaza and Lebanon, and the collapse of the Assad Regime in Syria greatly diminished a major threat that Iran has used for decades to attack Israel and allied forces in the region.

Iran Attacked Israel in April and October 2024 and Suffered Retaliatory Attacks

In response to an Israeli airstrike on the Iranian embassy in Damascus, Syria, which killed a high-level Iranian Quds Force commander part of the Iranian Revolutionary Guard Corps (IRGC), on April 13-14, 2024, Iran launched a massive airstrike at Israel consisting of close to 330 drones, cruise missiles, and ballistic missiles.[1] Nearly all the drones and missiles were intercepted by coordinated Israeli, United States, and allied defenses in the region. On April 19th, Israel retaliated by launching airstrikes on missile defense sites near the Iranian city of Esfahan, near a key Iranian nuclear facility. The retaliatory attack destroyed an S-300 missile defense battery, proving that even Iran's most advanced missile defense system is vulnerable to attack and Iran was unable to detect or shoot the incoming Israeli missiles down.[2] Iran's drones and missiles proved vulnerable to Israeli and allied air defenses and inflicted only minor damage on Israeli targets. Many of the projectiles not intercepted fell in unpopulated areas.

Late on the night of October 1, 2024, Iran launched a second airstrike on Israel following Israeli airstrike on Lebanon in late September 2024 that killed many senior Hezbollah members, including Hassan Nasrallah, and the commencement of Israeli ground operations into Lebanon earlier in the day on October 1st. The Iranian attack involved over 180 drones, cruise missiles, and ballistic missiles.[3] A majority of the projectiles were intercepted by Israeli, United States, and allied air and ground-based defenses. The projectiles that did manage to land in Israeli territory only caused minor damage and casualties, with several missiles hitting non-critical parts of the Israeli Nevatim Airbase. Israel retaliated on October 26, 2024, by using more than 100 aircraft, including F-35 stealth fighters, to launch airstrikes on numerous Iranian S-300 missile defense batteries as well as missile component production facilities at the Parchin military complex and an additional facility, known as Taleghan-2 at Parchin, connected to

[1] "Israel-Iran April 2024: UK and international response," United Kingdom Parliament House of Commons, July 25, 2024, https://commonslibrary.parliament.uk/research-briefings/cbp-10002/.
[2] David Albright, Sarah Burkhard, Victoria Cheng, Spencer Faragasso, Mohammadreza Giveh, and the Good ISIS Team, "Assessment of Israeli Strike on Iran near Esfahan," *Institute for Science and International Security*, April 23, 2024, https://isis-online.org/isis-reports/detail/assessment-of-israeli-strike-on-iran-near-esfahan/.
[3] Hadeel Al-Shalchi and Greg Myre, "Iran carries out a massive missile attack on Israel, expanding the Middle East conflict," Associated Press, October 1, 2024, https://www.npr.org/2024/10/01/g-s1-25707/iran-israel-hezbollah-lebanon-attack.

Iranian nuclear weaponization work during the early 2000s.[4] The attack eliminated much of Iran's air defense capabilities, hampering Iran's ability to defend itself from an aerial assault and making it vulnerable to future air strikes on key military sites, including nuclear facilities. Israel proved it can deeply penetrate Iranian airspace with advanced precision missiles and destroy select buildings at military complexes. Israel's destruction of Taleghan-2 signaled to Iran its ability to detect, target, and destroy facilities that may be related to nuclear weaponization work.

Iran Continues Military Cooperation and the Transfer of Advanced Technology with Russia

Since the war in Ukraine began several years ago, Iran has played a major role in providing Russia with drone systems and short-range ballistic missiles (SRBM). These arms transfers have bolstered Russia with key capabilities that have enabled it to mass produce innovative weapons and continue to wage war against Ukraine. Iran continues to play a role in the procurement of components used in the production of Shahed 136 drones at the Alabuga Special Economic Zone. Russia has since improved upon the drone's design and streamlined the production process. The production and design improvements made by Russia have been reexported back to Iran, giving it a more effective and combat proven drone system.[5] In early September 2024, the U.S. Department of Defense confirmed that Iran transferred hundreds of Fath 360 SRBM to Russia and provided training and assistance to combat units on how to operate the missile system.[6] Iran's transfer of short-range ballistic missiles helped to shore up Russia's missile stockpile and enable Russia to focus its stockpile of medium and intermediate range ballistic missiles on other Ukrainian targets.

Hostile Rhetoric
Point Score: 29 points

While Iran's capability to wage military operations through proxies and defend its airspace from external threats has been significantly compromised by Israel, the intention of the leadership to use military power from homeland and through proxy power remains the same. Public statements from Iranian officials indicate an extreme level of hostility (29 points) towards the United States and its allies. Much of this hostile rhetoric was made in the context of the direct attacks between Iran and Israel.

[4] David Albright, Sarah Burkhard, Spencer Faragasso, and the Good ISIS Team, "Taleghan 2: Pre- and Post Strike Assessment," *Institute for Science and International Security*, December 12, 2024, https://isis-online.org/isis-reports/detail/taleghan-2-pre-and-post-strike-assessment/.
[5] David Albright and Spencer Faragasso, "Iran/Russia Military Technology Axis: Russia Showcases to Iran New and Advanced Military Technology," *Institute for Science and International Security,* June 25, 2024, https://isis-online.org/isis-reports/detail/iran-russia-military-technology-axis-russia-showcases-to-iran-new-and-advan/.
[6] "Iran Gives Russia Short-Range Missiles, While U.S., Partners Expect to Keep Bolstering Ukrainian Air Defense ," U.S. Department of Defense, September 10, 2024, https://www.defense.gov/News/News-Stories/Article/Article/3901774/iran-gives-russia-short-range-missiles-while-us-partners-expect-to-keep-bolster/.

Most recently, the IRGC commander-in-chief's senior advisor Ebrahim Jabbari threatened that "the 'Operation True Promise 3' (the third round of attacks on Israel from Iran) will be carried out appropriately and at the right time, with the scale and extent necessary to destroy Israel and raze Tel Aviv and Haifa to the ground."[7]

Following the first missile barrage from Iran to Israel as a response to Israel's killing of IRGC commanders in Syria, the IRGC publicly warned Israel and the U.S. against aiding Israel and cautioned of direct consequences. The statement read: "The terrorist U.S. government is hereby warned that any support or involvement in harming Iran's interests will prompt a decisive and regret-inducing response from Iran's armed forces; furthermore, if the U.S. fails to rein in this child-killing regime [Israel] in the region, it must accept the consequences."[8]

Consequent to the significant erosion of Hezbollah capabilities, Hossein Salami, the IRGC commander-in-chief threatened Israel with a ground invasion from Iran. "Let Israel look at our Operation Fath al-Mobin and Beit al-Moqaddas and see if it can withstand another Fath al-Mobin. If the engine of a ground operation is set in motion, can it escape the scale of our Beit al-Moqaddas operation in 1982?" Fath al-Mobin and Beit al-Moqaddas operations happened during the Iran-Iraq war, and both resulted in Iranian forces taking back occupied territory from Iraqi forces. It is worth noting that with the fall of the Assad regime in Syria this threat is no longer within the realm of possibilities.[9]

Amidst tensions with Israel, 40 members of the Islamic Parliament wrote a letter to the Supreme National Security Council on the necessity of building a nuclear weapon. Mohammad Mannan Raisi, a Parliament member who signed the petition said in an interview that "If [Khamenei] deems it necessary to have a weapon and the matter is also approved by the Supreme National Security Council, we can make faster efforts to acquire a nuclear weapon, as we are currently not far from this issue. Fortunately, over the past year, we have made significant progress in the nuclear field, and God willing, we can achieve this capability in less than six months."[10]

Kamal Kharrazi, head of the Islamic Republic's Strategic Council on Foreign Relations was the first prominent regime official to publicly raise the issue of "changing the nuclear doctrine" in the last year. In a recent interview he affirmed his previous statement "If the Islamic Republic

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[7] "Advisor to the IRGC Commander-in-Chief: Operation "True Promise 3" will be carried out on the scale of the destruction of Israel and the razing of Tel Aviv and Haifa to the ground," AsrIrans, February 21, 2025. asriran.com/004MLX.

[8] "The IRGC's warning to America," ISNA, April 14, 2024, isna.ir/xdQTR8.

[9] "Major General Salami spoke about mobilization and a ground attack on Israel," Tabnak, October 24, 2024. https://www.tabnak.ir/fa/news/1267693/%D8%B3%D8%B1%D9%84%D8%B4%DA%A9%D8%B1-%D8%B3%D9%84%D8%A7%D9%85%DB%8C-%D8%A7%D8%B2-%D9%84%D8%B4%DA%A9%D8%B1%DA%A9%D8%B4%DB%8C-%D9%88-%D8%AD%D9%85%D9%84%D9%87-%D8%B2%D9%85%DB%8C%D9%86%DB%8C-%D8%A8%D9%87-%D8%A7%D8%B3%D8%B1%D8%A7%D8%A6%DB%8C%D9%84-%DA%AF%D9%81%D8%AA.

[10] "Mannan Raisi, Member of Parliament: We can acquire a nuclear weapon in less than six months / We must withdraw from the NPT / There is no choice but to change the nuclear doctrine of the system," Didban Iran, October 12, 2024, https://www.didbaniran.ir/fa/tiny/news-203049.

of Iran faces an existential threat, we will inevitably have to change our military doctrine. We currently have the necessary capability to produce a [nuclear] weapon, and the only obstacle is the Supreme Leader's fatwa, which prohibits the production of nuclear weapons. As for projectiles and missiles, everyone acknowledges our missile power. We fully demonstrated this capability in Operation 'True Promise.'"[11]

Mohammadreza Sabbaghian, a member of the Islamic Parliament said after killing of Ismail Haniyeh, the political leader of Hamas publicly stated that "I believe that the Islamic Republic's response to the massacre of Palestinians and Gaza, especially Ismail Haniyeh, should be the development of a weapon that Israel and the oppressive powers possess today."[12]

Lack of Transparency

Score: 24 points ⇧

Iran continues to deceive the International Atomic Energy Agency (IAEA) and violate its safeguards agreement and JCPOA monitoring agreements. Over the last year, the IAEA Board of Governors passed two censure resolutions to get Iran to change course, but to no avail. As of February 2025, the IAEA concludes that Iran's nuclear declaration is incomplete and that, due to the lack of Iranian cooperation, it has reached an "impasse." It further reports that continuity of knowledge cannot be re-established on sensitive nuclear-related activities, including the production and storage of centrifuges and critical components.

Iran's lack of transparency warrants a threat assessment score of 24 points, an overall increase of three from February 2024. This increase accounts for another year of nuclear escalations without adequate monitoring and worsening safeguards compliance (High Danger). The point increase would be higher had Iran not agreed to implement a "strengthened safeguards approach" at the Fordow Fuel Enrichment Plant and at a nuclear material storage facility at Esfahan, requested by the IAEA due to Iran's vast increase in 60 percent HEU production in December 2024.

Iran Continues to Refuse to Implement the Additional Protocol

It has been four years since Iran stopped implementing its Additional Protocol (AP). Without the AP in place, the IAEA has neither been able to conduct complementary access to any sites and other locations in Iran nor received updated declarations from Iran."[13]

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[11] "Kharrazi: We have the capability to produce nuclear weapons | Our response to Israel will be decisive," Ensaf News, November 1, 2024, https://ensafnews.com/?p=556365.

[12] "Controversial request by a Member of Parliament for the development of a nuclear weapon following the assassination of Ismail Haniyeh in Iran," Khabar Online, August 12, 2024, khabaronline.ir/xmxyk.

[13] David Albright, Sarah Burkhard, and Spencer Faragasso , "Analysis of IAEA Iran Verification and Monitoring Report — February 2025", *Institute for Science and International Security*, March 3, 2025, https://isis-online.org/isis-reports/detail/analysis-of-iaea-iran-verification-and-monitoring-report-february-2025.

Safeguards violations and Iranian non-cooperation

Iran has consistently violated its obligations under its comprehensive safeguards agreement (CSA), a key part of the verification of the Nuclear Non-Proliferation Treaty (NPT). It has refused to cooperate with the IAEA and provide a complete declaration, including fully accounting for its nuclear material inventory and past and present nuclear activities. It has obstructed IAEA efforts to bring Iran into compliance by razing and sanitizing related nuclear sites. For five years, the IAEA has been seeking cooperation from Iran in explaining undeclared nuclear material and activities at four sites: Turquz Abad, Varamin, Marivan, and Lavisan-Shian. Out of these four sites, three were discussed in Iran's Nuclear Archive, and all four are related to Iran's former and possibly ongoing work on nuclear weapons.

As of February 2025, the IAEA stands by its assessment that Iran conducted undeclared nuclear weapons-related activities at Marivan and Lavisan-Shian. For Marivan, the IAEA assesses that Iran conducted "explosive experiments with protective shielding in preparation for the use of neutron detectors and nuclear material," likely linked to preparation of a cold test of a nuclear explosive.[14] For Lavisan-Shian, the IAEA assesses that activities included "the drilling and processing of natural uranium in the form of a metal disc in order to produce metallic flakes that were subsequently subjected to chemical processing on at least two occasions," likely meaning work on a neutron initiator, another critical step in the development and production of a nuclear weapon.

Questions regarding two of the sites, Turquz Abad and Varamin, remain unresolved and Iran continues to stonewall the investigations and refuses to provide complete information and evidence. The IAEA underscores that "Iran has neither provided technically credible explanations for the presence of uranium particles of anthropogenic origin at undeclared locations in Iran nor informed the Agency of the current location(s) of the nuclear material and/or of the contaminated equipment involved."[15] The IAEA pointedly states that these issues "stem from Iran's obligations under its NPT Safeguards Agreement and **unless and until Iran resolves them** the Agency will not be in a position to provide assurance that Iran's nuclear programme is exclusively peaceful" [emphasis added]. It concludes that due to Iran's unwillingness to cooperate, it has arrived at an "impasse".

Over the last year, yet another issue emerged with respect to Iran's accounting of nuclear materials. In its 2003/2004 declaration to the IAEA, Iran reported that more uranium was transferred from the Jaber Ibn Hayan Multipurpose Laboratory to its uranium conversion facility at Esfahan than could be accounted for. After multiple attempts by the IAEA to account for all the reported uranium, and taking into account potential measurement errors, Iran rectified its records on how much uranium was received at Esfahan. Thus, a certain amount of uranium that was once at JHL remains unaccounted for today.

[14] "Analysis of the IAEA's Iran NPT Safeguards Report - May 2024", *Institute for Science and International Security*.
[15] "Analysis of the IAEA's Iran NPT Safeguards Report - May 2024", *Institute for Science and International Security*.

Refusal to Implement Modified Code 3.1

Iran has been refusing to implement Modified Code 3.1 despite it being a legally binding part of its safeguards commitments. The IAEA reports in February 2025 that it is concerned about Iran's construction of nuclear reactors without providing the IAEA the requested design information. It concludes, "this significantly obstructs the Agency's ability to conduct design information verification in respect of such new facilities and to provide assurance of the peaceful nature of Iran's nuclear programme."

Reduced monitoring under the JCPOA

Iran has reduced the monitoring and verification access established under the Joint Comprehensive Plan of Action for a multitude of sensitive activities, including centrifuge manufacturing, heavy water production and uranium mining and milling. The IAEA has not had access to data from on-line enrichment monitors and electronic seals, or access to measurement recordings registered by installed measurement devices.

The IAEA has stated that due to gaps in relevant monitoring, it has "lost continuity of knowledge in relation to the production and current inventory of centrifuges, rotors and bellows, heavy water and UOC [uranium ore concentrate], which it will not be possible to restore."[16]

Perhaps most worrisome, the IAEA has not been able to monitor where and how many centrifuges and key centrifuge components Iran has been producing and storing. Over the last months, Iran has been deploying thousands of additional advanced centrifuges at its declared centrifuge enrichment plants, showcasing a sizable production capability. The concern about Iran's ability to sneak-out to a nuclear weapon, using only a small number of secretly produced advanced centrifuges, is growing.

Refusal to Replace Experienced IAEA Safeguards Inspectors

Iran has continued to refuse to allow the designation of experienced inspectors to replace those whose designation it withdrew in 2023. This has further degraded the ability of the IAEA to carry out verification and monitoring activities at Iran's uranium enrichment plants.

Taking Stock

With Iran's refusal to resolve outstanding NPT safeguards violations and implement additional monitoring and verification, the IAEA has a significantly reduced ability to monitor Iran's complex and growing nuclear program, which in particular has unresolved nuclear weapons dimensions. The IAEA's ability to detect diversion of nuclear materials, equipment, and other

[16] "Analysis of IAEA Iran Verification and Monitoring Report — February 2025", *Institute for Science and International Security*.

capabilities to undeclared facilities remains greatly diminished. Nonetheless, the transparency situation could worsen even further, if, for example, Iran withdrew from the NPT, asked IAEA inspectors to leave the country altogether, or fabricated excuses to temporarily deny inspectors access to one or multiple uranium enrichment or enriched uranium storage facilities.

Nuclear Breakout
Score: 30 points

In 2022, for the first time, Iran's breakout time became zero, indicating an extreme threat and a score of 30 (Extreme Danger). Iran has more than enough 60 percent enriched uranium, or highly enriched uranium (HEU) to directly fashion a nuclear explosive.

If Iran wanted to further enrich its 60 percent enriched uranium up to 90 percent weapon-grade uranium (WGU), used in Iran's known nuclear weapons designs from the Amad Plan, it could do so quickly. It can break out and produce enough weapon-grade enriched uranium for a nuclear weapon in less than a week, using only four advanced centrifuge cascades, and only a fraction of its 60 percent enriched uranium. Over the last year, Iran has installed additional advanced centrifuge cascades at Fordow, and increased its 60 percent HEU production, optimizing the use of Fordow alone in a breakout. This breakout could be difficult for inspectors to detect promptly, if Iran took steps to delay inspectors' access.

Moreover, over the last few years, Iran has learned important lessons in breaking out to nuclear weapons by experimenting with and practicing shortcuts in multi-step enrichment.

Sensitive Nuclear Capabilities

Score: 27 points ⇧

Iran continues taking steps to escalate its sensitive nuclear activities. Iran has a capability to produce large amounts of enriched uranium and achieve enrichment levels up to 90 percent, or weapon-grade uranium. Over the last year, Iran has not only increased its stocks of enriched uranium and ramped up its enrichment capacity, but it has focused on dramatically increasing its capability to produce weapon-grade uranium at the underground Fordow enrichment plant. These activities receive a score of 27 (Extreme Danger), up by five points from 22 in February 2024, reflecting actions taken over the last year but leaving room on the scale to account for the strong possibility that Iran's nuclear buildup could continue and could include making small amounts of 90 percent enriched uranium under safeguards or producing larger quantities of enriched uranium metal.

Ability to Produce WGU at Fordow

Over the last months, Iran has instituted a capability to quickly produce large amounts of WGU at Fordow alone, using its existing enriched uranium feedstock. It could also produce WGU at Fordow more slowly, without using enriched uranium stocks stored elsewhere, starting from natural uranium and enriching it up to WGU in multiple, sequential steps. Both pathways are a result of Iran's installation of additional eight IR-6 cascades at Fordow, which multiply Iran's enrichment capacity at the facility, and its decision to produce 60 percent HEU from 20 percent enriched uranium feed instead of 5 percent feed. Our estimates are that Iran can convert its current stock of 60 percent enriched uranium into about 175 kg of WGU in three weeks at the Fordow Fuel Enrichment Plant (FFEP), enough for 7 nuclear weapons, taken as 25 kg of weapon-grade uranium (WGU) per weapon. Iran could produce its first quantity of 25 kg of WGU in Fordow in less than one week. This makes a breakout scenario involving only the declared, but highly fortified, Fordow enrichment plant more attainable and attractive to Iran, and thus substantially more dangerous.

Stocks of 20 and 60 Percent Enriched Uranium and Capacity to Make Highly Enriched Uranium

Over the last months, Iran has multiplied its average monthly 60 percent HEU production rate. It was producing 60 percent HEU at an average rate of 35 kg (U mass) per month as of February 2025. This rate is not sustainable as it uses more 20 percent enriched uranium as feed per month than Iran is currently producing; it is in essence the near-final step of breaking out, namely converting its 20 percent stock to HEU.

The increased production led to a doubling of Iran's 60 percent HEU stock over the last year. While Iran's stock of 60 percent HEU was 128 kg (Uranium mass) in November 2023, it was 275 kg as of mid-February 2025. Its 20 percent enriched uranium stock has decreased recently but still increased overall compared to February 2024, for a total of 607 kg as of mid-February 2025. (Numbers are given in kg uranium mass and only include the stocks that are in the form of uranium hexafluoride).

Enrichment Capacity

As of mid-February 2025, Iran had a total installed nominal enrichment capacity of about 58,800 SWU per year, where advanced centrifuges account for about 52,300 SWU per year and IR-1 centrifuges account for 6500 SWU per year. The amount of separative work achieved in practice is lower, sometimes far lower, due to inefficiencies in centrifuge construction and operation.[17]

Iran's advanced centrifuges make up almost 90 percent of Iran's enrichment capacity and deserve special attention because they pose a grave risk to international security, allowing Iran

[17] The achieved enrichment capacity varies considerably over time. For more information, see the Institute series on surveying Iran's IR-1 and advanced centrifuges at www.isis-online.org.

to produce weapon-grade uranium for a nuclear weapon more quickly, either at declared nuclear sites or at clandestine ones.

Over the last year, Iran doubled the number of advanced centrifuges it has installed. As of November 2023, Iran had 6277 advanced centrifuges of various types installed at its three enrichment facilities at Natanz and Fordow; as of mid-February 2025, it had 13,355 advanced centrifuges installed. Of these, 1660 are IR-6 centrifuges installed at Fordow.

Work continued on a new, large, heavily fortified underground site near the Natanz enrichment plant to assemble advanced centrifuges. This site may also be slated to hold another enrichment plant.

Shortened Timeline to Breakout and Produce Enough Weapon-grade Uranium for Multiple Nuclear Weapons

An indicator of sensitive nuclear activities is a change in the amount of weapon-grade uranium Iran can produce in a breakout. As discussed in the previous section, Iran can produce weapon-grade uranium for its first nuclear weapon in a matter of days, including if it only used the Fordow enrichment plant. It could produce about 175 kg of WGU in a little over three weeks, enough for seven nuclear weapons from its 60 percent HEU. Adding the use of its 20 percent enriched uranium and enrichment capacity at Natanz, Iran could produce in total about 260 kg of WGU, enough for 10 nuclear weapons, within the first month of breakout. In the second month, Natanz alone could turn the rest of 20 percent stock and a major portion of the 4.5 percent stock into WGU, producing enough WGU for another two, almost three, nuclear weapons, for a total of 12 to 13 nuclear weapons. By the end of the fourth month, Iran would have used up its stocks of enriched uranium and produced enough WGU for 17 weapons. These numbers are meant to provide a realistic breakout scenario rather than a hypothetical scenario where Iran uses all its nominal enrichment capacity independent of logistical challenges. However, this approach underutilized Fordow, since the ten IR-6 cascades are not used in the breakout after the first month. For all the assumptions, see *Analysis of IAEA Iran Verification and Monitoring Report — February 2025.*[18]

Iran Has Installed a Capability to Produce Highly Enriched Uranium Metal

Iran maintains capabilities at the Esfahan site to produce enriched uranium metal, a necessary step in building nuclear weapons. It has developed a capability to convert enriched uranium hexafluoride, the output of its centrifuge plants, into enriched uranium metal. On a small scale it has converted 20 percent enriched uranium hexafluoride into metal. This accomplishment means that Iran could do the same with weapon-grade uranium hexafluoride.

[18] David Albright, Sarah Burkhard, and Spencer Faragasso, "Analysis of IAEA Iran Verification and Monitoring Report — February 2025," *Institute for Science and International Security*, March 3, 2025, https://isis-online.org/isis-reports/detail/analysis-of-iaea-iran-verification-and-monitoring-report-february-2025.

Iran Remains a Serial Violator of National Export Controls and Sanctions

Iran continued to violate international and national sanctions and strategic trade control laws as it seeks to outfit its nuclear and missile programs. These activities are crucial for Iran, since it does not produce many of the subcomponents and raw materials needed by its nuclear, conventional arms (including drones), and missile programs. Intelligence reports, prosecutions, and sanctions listings continuously highlight Iran's ongoing WMD-related procurement efforts.

In an increasingly important development, there is a growing concern about sensitive nuclear reactor-related exports leaving Iran as it further develops its indigenous capability to make small and medium-sized nuclear reactors.[19]

Beyond Breakout: Building Nuclear Weapons

Score: 27 points 

So far, Iran has not turned its enriched uranium into nuclear weapons. However, over the last year, Iran's ability to do so has continued to increase as well as its ability to speed up the process of building a nuclear weapon. The most visible evidence of this shortening timeframe has occurred at the deeply buried Fordow enrichment plant, as discussed above. Over the last year, however, evidence has emerged that Iran is also taking steps to shorten the time frame needed to build the nuclear weapon itself, often called the process of nuclear weaponization.

While for years, the U.S. intelligence community has publicly championed a simplistic "on-off" light switch model of Iran's nuclear weapons efforts, it has shown recent signs of adjusting to the fact that Iran has been preparing itself to build nuclear weapons for years, noticeably picking up its pace in the last year. Last August, in a threat assessment, the IC stated that Iran has "undertaken activities that better position it to produce a nuclear device, if it chooses to do so."[20] The *New York Times* reported on February 3, 2025, that new intelligence has convinced U.S. officials that a secret team of Iranian nuclear scientists is exploring a faster, if cruder, approach to developing an atomic weapon, involving months not years.

This last year has seen concrete signs of Iran's work on nuclear weaponization. Two reported by the media and the Institute include computer modelling relevant to nuclear explosions and

[19] Maliheh Bitaraf, Mohammadreza Giveh, and the Good ISIS Team, "The New Nuclear Research Reactor at Esfahan," *Institute for Science and International Security*, February 24, 2025, https://isis-online.org/isis-reports/detail/the-new-nuclear-research-reactor-at-esfahan; and David Albright and Mohammadreza Giveh, "Darkhovin Nuclear Power Reactor: Another Blemish on Iran's Safeguards Compliance," *Institute for Science and International Security*, March 25, 2024, https://isis-online.org/isis-reports/detail/darkhovin-nuclear-power-reactor-another-blemish-on-irans-safeguards-complia/8.

[20] Office of the Director of National Intelligence, "Iran's Nuclear Weapons Capability and Terrorism Monitoring Act of 2022," July 23, 2024, https://www.dni.gov/files/ODNI/documents/assessments/ODNI-Unclassified-Irans-Nuclear-Weapons-Capability-and-Terrorism-Monitoring-Act-of-2022-202407.pdf .

renewed work at old Amad sites by ex-Amad people working on sensitive high explosive work.[21] The latter may be related to renewed work on the high explosive initiator, called the shock wave generator (see also Figure 2).

A new consideration is that the scales on an Iranian decision to build nuclear weapons could be tipped simply because its weaponeers can promise to relatively quickly build a nuclear weapon, over a period of months. The regime leadership could calculate that success would happen before a military response occurs or that the regime can withstand the effects of an attack and emerge afterwards as a nuclear power. Although the weapon would likely not be missile deliverable, it could still be tested underground or delivered in other ways, serving to establish Iran as a nuclear power.

These considerations lead to an increased score of 27 out of 30, representing an increase of six points and a shift for the first time into Extreme Danger.

Pathways to a Nuclear Weapon

Iran's current nuclear weaponization effort rests on the accomplishments of its large-scale nuclear weapons program in the early 2000s and progress made since then.[22] While not making nuclear weapons, Iran created a program to be prepared to make nuclear weapons, focusing on solving remaining bottlenecks and shortening time frames, and being ready to produce nuclear weapons "on-demand." The present is so dangerous in part because Iran has shortened deadlines so dramatically.

Iran has many pathways to building nuclear weapons using weapon-grade uranium, some of which require Iran to finish those tasks quickly, while others do not.[23] Figure 1 summarizes several pathways, where the production of the WGU is in orange and weaponization is in blue. For a crash program, Iran needs about six months, or less, to finish.

Estimating which of these pathways is more likely depends on developments both inside the regime and in the region. But with tensions high, capabilities growing, the crash program poses the highest risk. But the accumulation of WGU under safeguards in the short-term cannot be dismissed, a step which would escalate tensions further.

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[21] Mark Gorwitz, Mohammadreza Giveh, and David Albright, "Iran's Likely Violations of Section T: Computer Modeling Relevant to Nuclear Weapons Development," *Institute for Science and International Security*, September 10, 2024, https://isis-online.org/isis-reports/detail/irans-likely-violations-of-section-t-computer-modeling-relevant-to-nuclear/; and David Albright, Spencer Faragasso, and the Good ISIS Team, "Renewed Activity at the Sanjarian and Golab Dareh Amad Sites," *Institute for Science and International Security*, September 12, 2024, https://isis-online.org/isis-reports/detail/renewed-activity-at-the-sanjarian-and-golab-dareh-amad-sites/.

[22] David Albright with Sarah Burkhard and the Good ISIS Team, "Iran's Perilous Pursuit of Nuclear Weapons," *Institute for Science and International Security*, May 2021, https://isis-online.org/books/detail/irans-perilous-pursuit-of-nuclear-weapons.

[23] David Albright, "Going for the Bomb: Part I, Pathways and Timelines," *Institute for Science and International Security*, November 7, 2024, https://isis-online.org/isis-reports/detail/going-for-the-bomb-part-i-pathways-and-timelines/8.

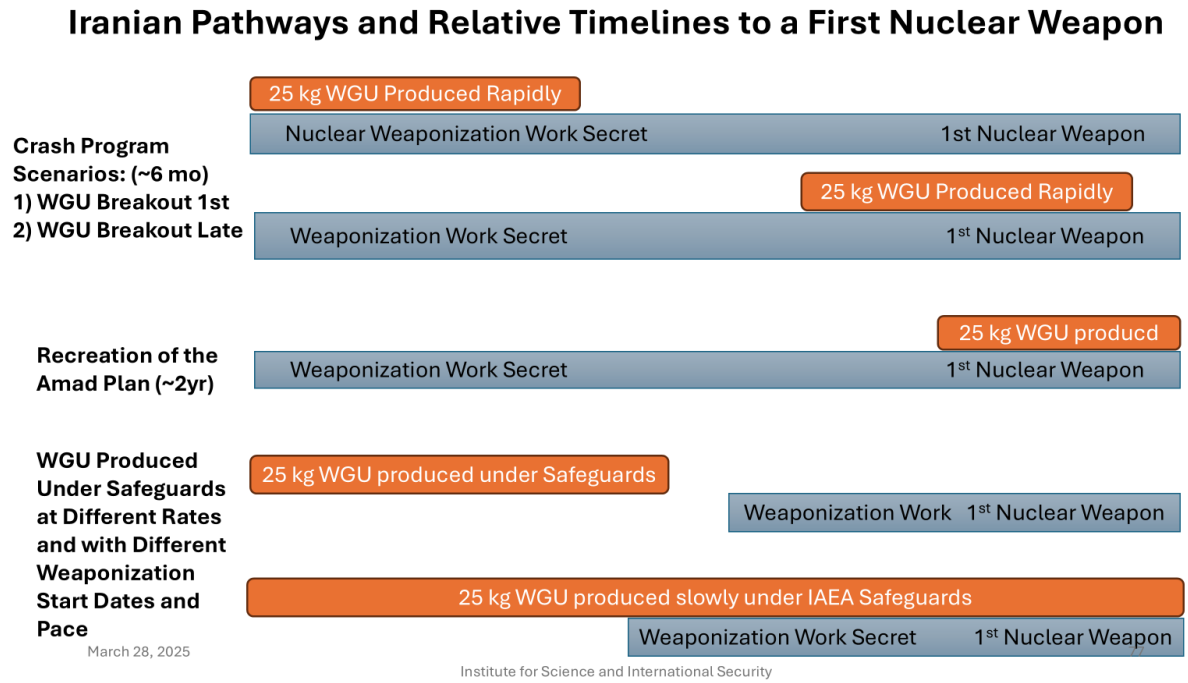

Figure 1. This chart shows several pathways and timelines that Iran could take to produce its first nuclear weapon.

Crash Program

Although the actual construction of the nuclear weapon, or "weaponization," typically poses less formidable challenges than acquiring the means to make plutonium or weapon-grade uranium, it requires overcoming many technical hurdles. With so much accomplished in the Amad Plan and afterwards, as documented by the Iran Nuclear Archive, the IAEA, and the media, Iran has only a few unfinished developmental tasks to complete before building a non-missile deliverable nuclear weapon.

In terms of the crash nuclear weapons pathway, the time to build a non-missile deliverable nuclear weapon revolves around the remaining steps that remain unfinished.[24] Iran can finish the weapons development steps rapidly, and in parallel build the necessary components, although some of those may already be in storage. Figure 2 lists the essential tasks, their status, and the remaining ones.

In earlier Institute studies this question has been evaluated carefully.[25] A good starting point is to consider Iran's basic levitated nuclear weapons design. Figure 2 shows a schematic of this

[24] David Albright and Andrea Stricker, "Going for the Bomb: Part II, Tasks to Make a Crude Nuclear Weapon, *Institute for Science and International Security,* November 7, 2024, https://isis-online.org/isis-reports/detail/going-for-the-bomb-part-ii-tasks-to-make-a-crude-nuclear-weapon/8.

[25] David Albright with Sarah Burkhard and the Good ISIS Team, Iran's Perilous Pursuit of Nuclear Weapons (Washington, D.C.: Institute for Science and International Security Press, 2021) and Institute reports on Iran's

design from the Nuclear Archive, which at the end of the Amad Plan, was 55 centimeters in diameter. Accomplishing these steps and assembling a nuclear weapon would take six months.

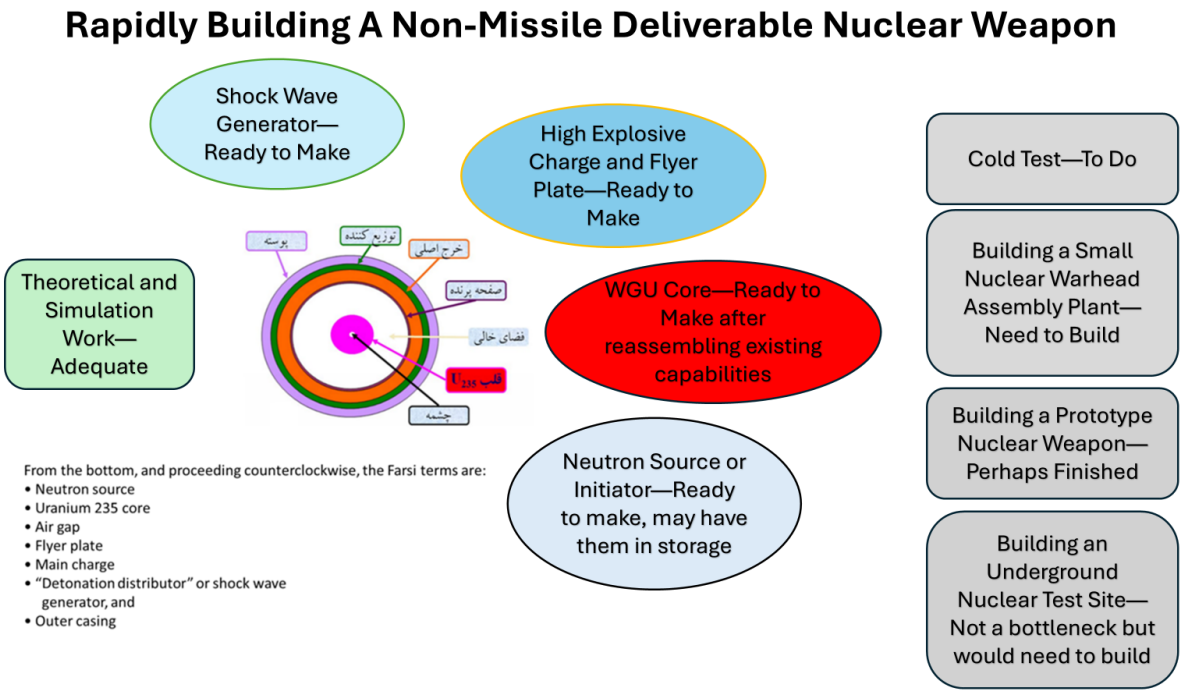

Figure 2. Summary of the tasks needed to build a crude nuclear weapon, marked finished, ready, and to do.

Missile-Deliverable Weapon

For a reliable nuclear warhead mounted on a ballistic missile, Iran faces more challenges in finishing this task. Estimating the time to finish this task is complicated because Iran faced many challenges at the end of the Amad Plan in finishing a warhead to fit inside the Shahab 3 ballistic missile. For more advanced missiles and reentry vehicles, Iran may also need to further miniaturize its warhead. If this step is accomplished in the context of recreating the Amad Plan nuclear weapons production complex, it will take about two years to accomplish.

nuclear archive (www.isis-online.org); David Albright, "How Quickly Could Iran Make Nuclear Weapons Today?" *Institute for Science and International Security*, January 8, 2024, https://isis-online.org/isis-reports/detail/howquickly-could-iran-make-nuclear-weapons-today/8; and David Albright, "Iran Building Nuclear Weapons," *Institute for Science and International Security*, December 5, 2022, https://isis-online.org/isis-reports/detail/iran-buildingnuclear-weapons/8.