

The Iran Threat Geiger Counter: Reaching Extreme Danger

Institute for Science and International Security

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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.

Since May 2023, the date of the last edition of the Counter, the threat posed by Iran's nuclear program has increased dramatically. This increased threat has been in part fueled by the Hamas terrorist attacks on Israel on October 7, 2023, Israel's subsequent invasion of Gaza, and subsequent attacks carried out by Iranian-backed proxy groups, including Palestinian Islamic Jihad, Hezbollah, and Ansar Allah (Houthi). The volatile situation in the region is providing Iran with a unique opportunity and amplified internal justification for building nuclear weapons while the United States and Israel's resources to detect and deter Iran from succeeding are stretched thin. The ongoing conflicts are leading to the neglect of the Iranian nuclear threat at a time when Iran's nuclear weapons capabilities have never been greater. Coupled with decreased transparency over its nuclear program, for the first time in years, we are facing the real possibility that Iran may choose to weaponize its nuclear capabilities and build nuclear weapons.

These grave and concerning changes have led the Institute to raise the total threat score to 151 out of 180, up from 140 in May 2023, and assessed as **Extreme Danger**, the first time the Counter has reached this level.



Criteria	Hostile Actions	Hostile Rhetoric	Lack of Transparency	Nuclear Breakout	Sensitive Nuclear Capabilities	Beyond Breakout
Total Score: 151	28	29	21	30	22	21
Direction of Change	↑ 3	↑ 1	↑ 2	— Max	↑ 2	↑ 3
Danger Level Extreme Danger	Extreme Danger	Extreme Danger	High Danger	Extreme Danger	High Danger	High Danger

The current score of 151 is in Extreme Danger territory. Most of the points are the result of Iran’s hostile actions (28 points) and rhetoric (29 points) against the United States and its allies, combined with the fact that Iran’s nuclear breakout time remains at zero (30 points). The rest result from Iranian progress on developing sensitive nuclear capabilities (current score of 22 points), increasing its nuclear weaponization efforts beyond breakout (current score of 21 points), and inadequate transparency over its nuclear program (21 points). The scores have increased across the board since May 2023, moving the overall threat score to Extreme Danger.

Overview of Methodology

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: 28 points 

Iran has significantly intensified its hostile activities against the United States and its allies in the wake of the terrorist attack by Hamas against Israel on October 7, 2023, and Israel's subsequent invasion of Gaza. Proxy groups supported and directed by Iran have attacked U.S. forces in the region, causing multiple casualties and deaths. These groups have also targeted international shipping. Meanwhile, Iran continues to support Russia's invasion of Ukraine and target specific individuals on U.S. and European soil for kidnapping and assassination. However, it has also been hesitant about a direct confrontation with the United States.

These hostile activities warrant an increase in the threat assessment score of three points to 28 points (Extreme Danger). At its most basic level, this score measures Iran's level of hostile action against the United States and its allies. These activities – and U.S. and allied reactions to them – are an important backdrop as the Iranian regime contemplates building nuclear weapons.

Significant recent developments include the following:

Iranian Proxy Groups Continue to Attack U.S. Forces in the Middle East

Iranian proxy groups have conducted more than 100 attacks against U.S. forces in the Middle East in 2023 and 2024, most recently killing three U.S. soldiers in an attack in Jordan on January 27, 2024.¹

In addition to ongoing attacks by local proxies against U.S. forces in Jordan, Iraq, and Syria, the Houthi in Yemen have directly targeted U.S. and allied naval units in the Red Sea, most recently launching a major drone and missile strike on January 10. The U.S. and United Kingdom navies shot down 18 drones, two anti-ship cruise missiles, and one anti-ship ballistic missile.²

¹ Meghann Myers, "US troops in Iraq and Syria have faced over 100 attacks since October," *Yahoo News*, December 21, 2023, https://news.yahoo.com/us-troops-iraq-syria-faced-214426929.html?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAAHANb4dHA9ZNIxoCo1DMe0EJ5TvzNkRaZsJhVTNt-9rpnBkGaa7ey-0M8Vo6VJfSYjgobYsQGvlfuw3lgnDc19RRzVKBsfhXlCd91G3wP7WoBpLOXLtZYk7mULcKEK5MQUfi8JRxnW8R_uMulMM_M4qK9lPiulJnDUGbTq_6Hs5.

² "US, UK forces shoot down Houthi missiles, drones in Red Sea - US military," *Reuters*, January 10, 2024, <https://www.reuters.com/world/us-uk-forces-shoot-down-houthi-missile-drone-attack-red-sea-us-military-2024-01-10/>.

Iran Backed-Proxy Groups Attacked Israel

On October 7, 2023, the Iranian backed terrorist organization Hamas and its affiliate groups in Gaza, including Palestinian Islamic Jihad (PIJ), launched a devastating and horrific terrorist attack against Israel, killing over 1,200 Israeli civilians and soldiers and seizing over 200 hostages.³ Hamas and its affiliate groups used Iranian-supplied missiles, bombs, and other weapons as well as training and technical help to carry out the attack, although it is unclear if Iran had foreknowledge of when the actual attack would take place.⁴ Hezbollah in Lebanon has conducted almost-daily missile strikes against Israel.⁵ Houthi militants in Yemen also launched missile strikes against Israel.⁶ The war continues to rage today and it is clear that Iran's extensive assistance was critical in enabling Hamas and other organizations to maintain military operations against Israel.

Iranian Proxy Groups Attacked International Shipping with Iranian Assistance

In support of Hamas, Iranian proxy groups, in particular the Houthi in Yemen, have launched dozens of attacks against international commercial shipping transiting through the Gulf of Aden, the Red Sea, and the Strait of Bab al-Mandab.⁷ The attacks rely on missiles and long-range drones supplied by Iran.

The Houthi can carry out these attacks because they have received, and continue to receive, extensive material and logistical assistance from Iran. In mid-January 2024, U.S. Navy Seals conducted a raid on a vessel off the coast of Somalia in the Red Sea, seizing munitions and warheads produced by Iran and en route to Houthi forces in Yemen.⁸ Iranian spy ships have

³ Center for Preventive Action, "Israeli-Palestinian Conflict," December 4, 2023, *Council on Foreign Relations*, <https://www.cfr.org/global-conflict-tracker/conflict/israeli-palestinian-conflict>.

⁴ Summer Said, Benoit Faucon, and Stephen Kalin, "Iran Helped Plot Attack on Israel Over Several Weeks," *The Wall Street Journal*, October 8, 2023, https://www.wsj.com/world/middle-east/iran-israel-hamas-strike-planning-bbe07b25?fbclid=PAAabZhxAESqzDGG3foVAcblemi1UWULIGHTJrXCHrnT8H4rnD-kVeNvr-QoY_aem_AVNPJefT_PldTLsVVJh88tm38KUHEOO38cNSmNiXp32icP_qpAe-uK154VmHCZ0_MpM; Joby Warrick, Ellen Nakashima, Shane Harris and Souad Mekhennet, "Hamas received weapons and training from Iran, officials say," October 9, 2023, *The Washington Post*, <https://www.washingtonpost.com/national-security/2023/10/09/iran-support-hamas-training-weapons-israel/>.

⁵ Bassem Mroue, "Hezbollah fires rockets at north Israel after an airstrike kills 5 of the group's senior fighters," *AP News*, November 23, 2023, <https://apnews.com/article/lebanon-israel-hezbollah-gaza-mohammed-raad-c77c0e41d529d44f7d355eb6aa79d935>.

⁶ "Yemen's Houthis say they fired ballistic missiles towards Israel," *Al Jazeera*, November 14, 2023, <https://www.aljazeera.com/news/2023/11/14/yemens-houthis-say-they-fired-ballistic-missiles-towards-israel>.

⁷ Michael R. Gordon, Gordon Lubold, and Nancy A. Youssef, "U.S., Allies Give Houthis Ultimatum: Stop Ship Attacks or Face Consequences," *The Wall Street Journal*, January 3, 2024, https://www.wsj.com/world/middle-east/u-led-coalition-warns-houthis-to-stop-ship-attacks-cfd490df?mod=hp_lead_pos2.

⁸ Carla Babb, "US Seizes Iranian-Made Missile Parts in Raid Near Somali Coast," *Voice of America*, January 16, 2024, <https://www.voanews.com/a/us-military-seizes-iranian-missile-parts-bound-for-houthi-rebels-2-seals-still-missing/7442175.html>.

provided the Houthi with key intelligence on commercial shipping locations and activities that have enabled them to launch missile and drone strikes.⁹

Iran Continues to Provide Military Hardware to Russia in Support of Its Invasion of Ukraine

Iran has provided Russia's JSC Alabuga extensive assistance to establish and mass produce Shahed-136 kamikaze drones at the Alabuga Special Economic Zone (SEZ), in Yelabuga, Russia. The Institute and the Washington Post have conducted comprehensive analyses on leaked documents from the factory, outlining Russian and Iranian plans to mass produce the drone system, and ultimately make 6,000 drones by September 2025 at the SEZ.¹⁰ Commercial satellite imagery demonstrates that the factory to make drones is operational and improving its perimeter security.¹¹ Alabuga has further expressed interest in buying from Iran Shahed 129 and 181 drones and the technology to make them.

Media reports indicate that Russia received a limited quantity of reconnaissance/attack Shahed 107 drones from Iran, and possibly the kamikaze-type Shahed 101 drones.¹² The two drones can be used together to identify and attack targets.

Evidence has emerged that Iran is also supplying Russia with artillery shells and ammunition. Reportedly, hundreds of thousands of artillery shells and roughly 100 million rounds of ammunition were delivered via two cargo ships from Iran.¹³

⁹ Benoit Faucon, Dov Lieber, and Gordon Lubold, "Iranian Spy Ship Helps Houthis Direct Attacks on Red Sea Vessels," *The Wall Street Journal*, December 22, 2023, <https://www.wsj.com/world/middle-east/iranian-spy-ship-helps-houthis-direct-attacks-on-red-sea-vessels-d6f7fd40>.

¹⁰ David Albright, Sarah Burkhard, and Spencer Faragasso, "Highlights of Institute Assessment of Alabuga Drone Documents Supplied by Dalton Bennett at the *Washington Post*," *Institute for Science and International Security*, August 17, 2023, <https://isis-online.org/isis-reports/detail/highlights-of-institute-assessment-of-alabuga-drone-documents/>; David Albright and Sarah Burkhard, "Electronics in the Shahed-136 Kamikaze Drone," *Institute for Science and International Security*, November 14, 2023, <https://isis-online.org/isis-reports/detail/electronics-in-the-shahed-136-kamikaze-drone/>.

¹¹ David Albright, Sarah Burkhard, and the Good ISIS Team, "Visible Progress at Russia's Shahed Drone Production Site Satellite Imagery Update and Call for Action," *Institute for Science and International Security*, November 13, 2023, <https://isis-online.org/isis-reports/detail/visible-progress-at-russias-shahed-drone-production-site/>; David Albright, Sarah Burkhard, and Victoria Cheng, "Satellite Imagery Update on Alabuga Shahed-136 Drone Factory - No snow day for Russia's drone production!," *Institute for Science and International Security*, December 20, 2023, <https://isis-online.org/isis-reports/detail/satellite-imagery-update-on-alabuga-shahed-136-drone-factory>.

¹² Deborah Hayes, "'Explosive' new attack drone developed by Iran for Russia's war in Ukraine," *Sky News*, January 10, 2024, <https://news.sky.com/story/explosive-new-attack-drone-developed-by-iran-for-russias-war-in-ukraine-13045093>.

¹³ "Iran said to have supplied Russia with large shipment of ammunition," *The Times of Israel*, March 8, 2023, <https://www.timesofisrael.com/iran-said-to-have-supplied-russia-with-large-shipment-of-ammunition/>.

The Wall Street Journal reported that Iran is in active negotiations with Russia to supply hundreds of short-range surface-to-surface missiles for use in its war in Ukraine, although no transfer has yet been observed on the battlefield.¹⁴

Hostile Rhetoric

Point Score: 29 points 

Public statements from Iranian officials indicate an extreme level of hostility (29 points) towards the United States and its allies. Notable recent statements include the following:

Hossein Amir-Abdollahian, the Foreign Minister of Iran, in an interview with Al Jazeera on October 16, 2023, stated in reference to the war between Hamas and Israel that, “All possible options and scenarios are there for Hezbollah ... Naturally, resistance leaders will not allow the Zionist regime to take any action in Gaza, and when it feels reassured about Gaza, move on to other resistance areas in the region... Therefore, any preemptive measure is imaginable in the coming hours.”¹⁵ Hossein added “the resistance leaders...[will not allow Israel]...to do whatever it wants in Gaza.”

Hossein Amir-Abdollahian, the Foreign Minister of Iran, in a statement to the United Nations on October 26, 2023, following Hamas’ invasion of Israel and the beginning of the war, threatened that if Israel did not cease its retaliation against Hamas, that the United States would “not be spared from this fire.”¹⁶

Mohammad Reza Naqdi, a Brigadier General in the IRGC, following several attacks by Houthi forces against commercial shipping, stated in a threat made on December 23, 2023, that “They [the United States and the West] shall soon await the closure of the Mediterranean Sea, (the Strait of) Gibraltar and other waterways.”¹⁷ Naqdi added that, “Yesterday, the Persian Gulf and the Strait of Hormuz became a nightmare for them, and today they are trapped ... in the Red Sea.”

Ramezan Sharif, a spokesperson for the IRGC, stated on December 27, 2023, in reference to the October 7 attack against Israel that, “The Al-Aqsa Storm was one of the

¹⁴Michael R. Gordon, Gordon Lubold, and Benoit Faucon, “Russia Moves Forward With Plans to Buy Iranian Ballistic Missiles,” *The Wall Street Journal*, January 4, 2024, <https://www.wsj.com/world/russia-moves-forward-with-plans-to-buy-iranian-ballistic-missiles-cf3560e4>.

¹⁵ “Iran warns of ‘preemptive’ action against Israel amid Gaza war,” *Al Jazeera*, October 17, 2023, <https://www.aljazeera.com/news/2023/10/17/iran-warns-of-preemptive-action-against-israel-amid-gaza-war>.


¹⁶ “At UN, Iran Warns U.S. Will ‘Not Be Spared’ If War In Gaza Continues,” *Radio Free Europe Liberty*, October 26, 2023, <https://www.rferl.org/a/iran-gaza-warning-us-abdollahian/32655461.html>.

¹⁷ “Iran threatens Mediterranean closure over Gaza, without saying how,” *Reuters*, December 23, 2023, <https://www.reuters.com/world/middle-east/iran-threatens-mediterranean-closure-over-gaza-without-saying-how-2023-12-23/>.

retaliations of the Axis of Resistance against the Zionists for the martyrdom of Qasem Soleimani."¹⁸

These most recent statements must be seen against the backdrop of more than four decades of extreme anti-American, anti-Israel, and anti-Western rhetoric from Iranian officials.

Lack of Transparency

Score: 21 points 

Iran continues to deceive the International Atomic Energy Agency (IAEA) and violate its safeguards agreement and JCPOA monitoring agreements. With regards to Iran's cooperation with the IAEA, Director General Rafael Grossi stated at the World Economic Forum in Davos, Switzerland, on January 18, 2024: "It's a very frustrating situation. We continue our activities there, but at a minimum." He added, "They are restricting cooperation in a very unprecedented way...When there's something that France, the UK or the United States says that they don't like, it is as if they were taking the IAEA hostage to their political disputes with others. This is unacceptable for us."¹⁹

Iran's lack of transparency warrants a threat assessment score of 21 points, an overall increase of two from May 2023. This increase accounts for worsening safeguards compliance and ongoing diminished JCPOA monitoring (High Danger).

Iran Continues to Refuse to Implement the Additional Protocol

A November 2023 IAEA report states that it has been "two years and nine months since Iran stopped provisionally applying its Additional Protocol and, therefore, since it provided updated declarations and the Agency was able to conduct complementary access to any sites and locations in Iran."²⁰ The IAEA can no longer carry out daily visits to Iran's enrichment facilities or measure in-process low enriched nuclear material. It has not had access to data from on-line enrichment monitors and electronic seals, or access to measurement recordings registered by installed measurement devices.

¹⁸ "IRGC Says Hamas Attack Retaliation For Soleimani Killing," *Iran International*, December 27, 2023, <https://www.iranintl.com/en/202312278189>.

¹⁹ Sophie Estienne, "Iran holding UN atomic agency 'hostage,' refusing to cooperate, director says," *The Times of Israel*, January 18, 2024, <https://www.timesofisrael.com/iran-holding-un-atomic-agency-hostage-refusing-to-cooperate-director-says/#:~:text=%E2%80%9CIt's%20a%20very%20frustrating%20situation,inspectors%20because%20of%20their%20nationalities>.

²⁰ David Albright, Sarah Burkhard, Spencer Faragasso, and Andrea Stricker, "Analysis of IAEA Iran Verification and Monitoring Report — November 2023," *Institute for Science and International Security*, November 20, 2023, <https://isis-online.org/isis-reports/detail/analysis-of-iaea-iran-verification-and-monitoring-report-november-2023/>.

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 fully account for its past and present nuclear activities, and obstructed IAEA inspections by razing and sanitizing related nuclear sites. For four years, the IAEA has been investigating the presence of anthropogenic (of human origin) uranium particles it detected at three Iranian sites, and was seeking information about nuclear material and activities at a fourth site.²¹ The four sites are Turqz 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.

Iran maintains that the Marivan site was a mine operated by "another Member State in the 1960s and 1970s," and that the detected contamination is a product of "laboratory instruments and equipment" used at the site.²² In late May 2023, the IAEA decided it had no further questions for Iran and drew two conclusions: The IAEA was unable to prove or disprove the mining-related explanations for the presence of uranium made by Iran with the available information, but more importantly, the IAEA stood by its assessment that Iran conducted undeclared nuclear weapons-related activities at the site, specifically that Iran conducted "explosive experiments with protective shielding in preparation for the use of neutron detectors and nuclear material" at the high explosive test site at Marivan.²³ Thus, the IAEA is stating that while Iran may have prevailed on the relatively small point of the uranium particles, the elephant in the proverbial (Marivan) tent remains present.

Questions regarding two of the sites, Turqz Abad and Varamin, remain unresolved and Iran continues to stonewall the investigations and refuses to provide complete information and evidence. The IAEA states in its November 2023 NPT report that "during this reporting period, Iran has not provided the Agency with any information on the outstanding safeguards issues relevant to either of the two undeclared locations." The IAEA underscores that "despite numerous resolutions of the Board and many opportunities provided by the Director General over a number of years, Iran has neither provided the Agency with technically credible explanations for the presence of uranium particles of anthropogenic origin at two undeclared locations in Iran nor informed the Agency of the current location(s) of nuclear material and/or of contaminated equipment."²⁴ The IAEA reiterates, "The outstanding safeguards issues stem from Iran's obligations under its NPT Safeguards Agreement and need to be resolved for the

²¹ Kendall Siewert, "Acting Director General Urges Iran to Fully Cooperate with IAEA," IAEA Office of Public Information and Communication, November 21, 2019, <https://www.iaea.org/newscenter/news/acting-director-general-urges-iran-to-fully-cooperate-with-iaea>.

²² David Albright, Sarah Burkhard, and Andrea Stricker, "Analysis of the IAEA's Iran NPT Safeguards Report - May 2023," *Institute for Science and International Security*, June 1, 2023, <https://isis-online.org/isis-reports/detail/analysis-of-the-iaeas-iran-npt-safeguards-report-may-2023/>.

²³ "Analysis of the IAEA's Iran NPT Safeguards Report - May 2023," *Institute for Science and International Security*.

²⁴ "Analysis of IAEA Iran Verification and Monitoring Report — November 2023," *Institute for Science and International Security*.

Agency to be in a position to provide assurance that Iran’s nuclear programme is exclusively peaceful.”

Reduced monitoring under the JCPOA

Iran has reduced the monitoring of advanced centrifuge production and assembly under the Joint Comprehensive Plan of Action. For almost three years, the IAEA has not been able to monitor where and how many centrifuges and key centrifuge components Iran has been producing and storing. The IAEA has stated that due to gaps in relevant monitoring, it has concerns about its ability to verify Iran's declared centrifuge numbers even if Iran turned over past video footage and fully cooperated. Over the last months, Iran has not been deploying many additional centrifuges at its declared centrifuge enrichment plants, despite a late 2023 IAEA assessment that Iran continues to make centrifuges. This adds to the concern about Iran’s ability to sneak-out to a nuclear weapon, using only a small number of secretly-produced advanced centrifuges.

In the March 2023 Joint Statement, Iran agreed to re-establish JCPOA online enrichment monitors and camera surveillance removed in June 2022. Despite some initial progress on installing cameras, the IAEA reports in its November 15, 2023, NPT report that the Director General “is seriously concerned that Iran appears to have ‘frozen’ the implementation of the Joint Statement of 4 March 2023 for the past two reporting periods, and questions Iran’s continued commitment to its implementation.” During a meeting in Vienna held during the IAEA General Conference on September 25, the Director General “expressed his serious concern to Vice-President Eslami that there had been no progress in the implementation of any of the three agreed elements of the Joint Statement for several months” and that this was against the “spirit of cooperation” agreed in the joint statement.

Iran Expels IAEA Safeguards Inspectors

Iran has further degraded the ability of the IAEA to carry out verification and monitoring activities at safeguarded nuclear facilities in Iran. On September 16, 2023, Iran withdrew the designations of several senior IAEA inspectors that conduct verification and monitoring activities.²⁵ This de-designation removed a handful of inspectors from Iran considered to have the most experience with enrichment technology. Iran took this action after several dozen states, led by the U.S. and Europe, signed a joint statement at the September IAEA board meeting demanding Iran’s cooperation with the IAEA’s five-year investigation into undeclared nuclear weapons work.²⁶

²⁵ “IAEA Director General's Statement on Verification in Iran,” International Atomic Energy Agency, September 16, 2023, <https://www.iaea.org/newscenter/pressreleases/iaea-director-generals-statement-on-verification-in-iran-0>.

²⁶ “Analysis of IAEA Iran Verification and Monitoring Report — November 2023,” *Institute for Science and International Security*.

Taking Stock

With Iran's refusal to resolve outstanding NPT safeguards violations and its reductions of JCPOA monitoring, 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 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.

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 a week, using only a fraction of its 60 percent enriched uranium. This breakout could be difficult for inspectors to detect promptly, if Iran took steps to delay inspectors' access.

Using its remaining stock of 60 percent enriched uranium and its stock of near 20 percent enriched uranium, it could have in total enough weapon-grade uranium for six weapons in one month, and after five months of producing weapon-grade uranium, it could have enough for 12.²⁷ (Five nuclear weapons were the original goal of Iran's Amad Plan.)

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.

- Iran started from a level below 5 percent enriched uranium and enriched directly to near 60 percent in one cascade, rather than using two steps, a slower process entailing the intermediate production of 20 percent enriched uranium.
- It built and tested equipment to feed 20 percent enriched uranium and withdraw HEU, possibly enriched to higher than 60 percent; the exact level is unknown. Iran remixed the enriched product with the less enriched waste tails after measuring the product's enrichment level.

²⁷ 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/how-quickly-could-iran-make-nuclear-weapons-today>.

- Iran prepared advanced centrifuge cascades to switch more easily from the production of five percent enriched uranium to 20 percent enriched uranium.
- It further developed a multi-cascade set up to produce 20 percent enriched uranium from natural uranium by making 5 percent enriched uranium in advanced centrifuges and then directly feeding this product, still in gaseous hexafluoride form, into IR-1 centrifuge cascades to make near 20 percent enriched uranium. As such, Iran was practicing multi-step enrichment needed to produce weapon-grade uranium while seeking to shortcut the process.

Sensitive Nuclear Capabilities

Score: 22 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, a capability implied in April 2023 by Mohammad Eslami, head of the Atomic Energy Organization of Iran (AEOI).²⁸ Since May 2023, Iran continued to increase its enriched uranium stocks and increased the number of weapon-grade uranium (WGU) quantities it could produce in one month from enough WGU for five nuclear weapons to enough for six nuclear weapons. These activities receive a score of 22 (High Danger), up from 20 in May 2023, reflecting actions taken over the last several months, but leaving room on the scale to account for the strong possibility that Iran’s nuclear buildup could continue.

In fact, Iran has ambitious goals to increase its enrichment program, aiming for tens of thousands of advanced centrifuges, producing a range of enrichment levels, and tens of thousands of kilograms of enriched uranium. By 2030, Iran plans to have an enrichment capacity of 125,000 separative work units (SWU) per year. As Iran makes progress toward its goals, these activities will affect the score in this section even if they are allowed by a new or revived nuclear deal. Likewise, if Iran’s most threatening nuclear activities were reduced, the score would go down.

As of November 2023, Iran continued to increase the quantity and quality of its enriched uranium stock and bolster its ability to enrich uranium. Uranium enrichment remains the most sensitive activity in Iran’s nuclear program. Iran may also develop an ability to produce and separate weapon-grade plutonium, although that effort is largely dormant today.

²⁸ “Nuclear Chief: Iran Can Enrich Uranium ‘At Any Rate’,” *Asharq Al Awsat*, April 10, 2023, <https://english.aawsat.com/home/article/4263916/nuclear-chief-iran-can-enrich-uranium-%E2%80%98-any-rate%E2%80%99>.

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

Over the summer and fall 2023, Iran decreased the rate at which it produced 60 percent highly enriched uranium, producing only roughly 3 kg (Uranium mass) per month between June 2023 and November 2023. However, in late November 2023, Iran resumed increased production of 60 percent highly enriched uranium, producing about 9 kg per month, similar to what it was producing prior to its slowdown.²⁹

Iran has taken a further step to enhance its ability to produce highly enriched uranium by reversing the connection of two IR-6 cascades at Fordow Fuel Enrichment Plant so that the cascade with modified subheaders is now at the end-stage of producing 60 percent rather than being at the beginning stage, enabling Iran to quickly change the overall enrichment level of the cascade.³⁰ This mode of operation was used previously by Iran in January 2023, but had been undeclared to the IAEA, which subsequently detected the undeclared change and further detected the presence of near-84 percent HEU particles at the cascade's product sampling point.³¹

Iran's most sensitive stocks of enriched uranium, its 60 percent HEU stock and its 20 percent enriched uranium stock, increased steadily over the last months. Its 60 percent HEU stock has reached 128 kg (Uranium mass) and its 20 percent enriched uranium stock has reached 567 kg by end of October 2023.

Enrichment Capacity

As of November 2023, Iran had a total installed nominal enrichment capacity of about 30,800 SWU per year, where advanced centrifuges account for about 24,300 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.³²

Iran's advanced centrifuges make up almost 80 percent of Iran's enrichment capacity and deserve special attention because they pose a grave risk to international security, allowing Iran

²⁹ Francois Murphy, "Iran undoes slowdown in enrichment of uranium to near weapons-grade -IAEA," *Reuters*, December 26, 2023. <https://www.reuters.com/world/middle-east/iran-undoes-slowdown-enrichment-uranium-near-weapons-grade-iaea-2023-12-26/>.

³⁰ "Statement on Iranian nuclear steps reported by the IAEA," United Kingdom Foreign, Commonwealth & Development Office, December 28, 2023, https://www.gov.uk/government/news/statement-on-iranian-nuclear-steps-reported-by-the-iaea?utm_medium=email&utm_campaign=govuk-notifications-topic&utm_source=2f47a885-843f-4f0e-b89d-7c0e6285e3cc&utm_content=immediately.

³¹ "Analysis of IAEA Iran Verification and Monitoring Report — November 2023," *Institute for Science and International Security*.

³² 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. The presence of advanced centrifuges at the Fordow underground enrichment plant enhances Iran's ability to break out using a declared but highly fortified facility.

Over the summer and fall of 2023, Iran deployed over 350 additional advanced centrifuges. As of November 2023, Iran had 6277 advanced centrifuges of various types installed at its three enrichment facilities at Natanz and Fordow, up from 5919 as of May 2023, as well as 7230 installed IR-1 centrifuges. Most of Iran's advanced centrifuges are installed at the Natanz main enrichment plant and the pilot plant, with some installed at the Fordow underground plant. Iran further announced its intentions to install an additional 14 IR-6 centrifuge cascades at Fordow and an additional 6 IR-4 centrifuge cascades at Natanz. As of November 2023, Iran has not installed additional IR-6 centrifuges at Fordow; however, Iranian progress in doing so would inevitably raise the score in this section further.

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 Six 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, as of November 2023, not only can Iran produce weapon-grade uranium for its first nuclear weapon in a matter of days, it can produce enough weapon-grade uranium for six weapons in one month, and after five months of producing weapon-grade uranium, it could have enough for 12.

Iran Has Installed a Capability to Produce Highly Enriched Uranium Metal


In the last few years, Iran has developed 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.

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 and often increasing WMD-related procurement efforts.

Beyond Breakout: Building Nuclear Weapons

Score: 21 points 

So far, Iran has not turned its enriched uranium into nuclear weapons. However, over the last few years, the ability of Iran to do so has increased as well as the speed of it to accomplish this task. Thus, Iran's nuclear weapons capabilities are more dangerous than they have ever been, while its relations with the West are at a low point. Moreover, Iranian regime functionaries have suggested that perhaps it is time to produce nuclear weapons.³³ This combination of factors raises the specter that Iran will build nuclear weapons. These considerations lead to an increased score of 21 out of 30, representing an increase of three points and a shift for the first time from Considerable Danger to High Danger.

As discussed above, Iran could rapidly produce enough weapon-grade uranium for a small nuclear arsenal. In addition, Iran has multiple ways to deliver nuclear weapons, including on ballistic missiles. The missing piece is nuclear weaponization.

Iran can build a current nuclear weaponization effort based on its large-scale nuclear weapons program in the early 2000s and progress made since then. Iran appears to have a program to be prepared to make nuclear weapons and to do so in short order, one ready to produce nuclear weapons "on-demand."

Iran Has Maintained an Organizational Structure to Preserve and Possibly Hone Nuclear Weaponization Assets and Skills

Iran's nuclear weapons program started slowly, building to a crash nuclear weapons program in the early 2000s, called the Amad Plan, to create five nuclear weapons in an industrial complex capable of producing many more.³⁴ Under international pressure and fearing a military attack, the program was driven to downsize and deeper secrecy. Iran's decision to halt the Amad Plan merely served as a tactical retreat, not an abandonment of its nuclear weapons ambitions or activities, a step taken earlier by other countries, notably Taiwan and South Africa.

After the closure of the Amad Plan, other organizations continued to work on nuclear weapons. The evidence suggests that Iran not only maintained the capability to produce nuclear

³³ "Controversial Nuclear Weapons Inquiry Sparks Debate in Iran," *Iran International*, January 15, 2024, <https://www.iranintl.com/en/202401151130>.

³⁴ 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>.

weapons, but actively worked on efforts to advance that capability in case Iran's leaders made a decision to build them. There is no evidence that such work has halted.

The nuclear weaponization skills continue to be largely harbored in a military organization known by its acronym SPND, involved in many military development projects. Core Amad Plan groups remain in SPND, employing many former Amad Plan personnel, preserving and likely improving key nuclear weaponization skills and capabilities. SPND has also launched its own project to develop and build a nuclear propulsion reactor.

The post-Amad reorientation strategy shines a light on controversial Atomic Energy of Iran (AEOI) nuclear activities that followed after 2004, particularly the Fordow enrichment plant, which was originally the Amad Plan's intended facility to produce weapon-grade uranium. After the halt of the Amad Plan, the secret Fordow project was transferred to the AEOI, which was judged as providing a more credible civil cover for military activities. This turned out to be true, as Western powers revealed the secret project in 2009 and its repurposing to low enriched uranium production. Similarly, recent AEOI uranium metal production activities may include follow-on activities of the Amad Plan, posing as civil activities.

*Iran Has Multiple Paths Towards Developing A Nuclear Weapon*³⁵

Iran has multiple pathways to complete its weaponization requirements and build nuclear weapons. The two most prominent pathways are (1) launching an accelerated effort to achieve a few crude nuclear weapons or (2) reconstituting and completing its earlier Amad nuclear weapons program with the ability to serially produce annually many warheads suitable for delivery by ballistic missiles.

The second path has some notable challenges. It would require Iran maintaining secrecy for an extended period, a few years by most assessments, while rebuilding a range of production-scale facilities able to serially produce warheads for ballistic missiles. This presents a risk for Iran since early discovery could result in a harsh international reaction and plenty of time for Israel, the United States, and its allies to organize a united reaction.

The first path, an Iranian accelerated program, would not aim to produce warheads for ballistic missiles, but a warhead that could be tested or delivered by crude means (ship, or truck), and could be accomplished in about six months. It could take significantly longer than six months to build a nuclear warhead for a ballistic missile. Nonetheless, a crude nuclear weapon would signal Iran's entry into the nuclear weapons club as the tenth member, either dramatically via an underground nuclear test or stealthily via leaks about its accomplishment. A missile-deliverable warhead would probably be the next goal of Iran's nuclear weapons program. The outside world would be left to ponder how soon it could reach this capability.

³⁵ This subsection is from: 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/how-quickly-could-iran-make-nuclear-weapons-today>.

While most of the weaponization work has been accomplished for a crude nuclear weapon, such as the high explosive triggering package, an acceptable neutron initiator, and high explosives components, a few significant tasks likely remain. However, these tasks could be completed in a matter of several months. Much of the work on weaponization could be conducted in utmost secrecy and would use existing or repurposed military facilities or hidden equipment and materials, possibly located underground.

Western intelligence agencies may not detect the start of Iran's nuclear weaponization effort. Given all the complexities and conflicts in the Middle East today, these agencies are stretched to the limit. The beginning stages of a quiet, low-level effort to build nuclear weapons could slip through unobserved.

Iranian Space Launch Vehicle Development and Deployment of Solid-Fuel Propellant Missiles

Iran continues to work diligently to develop its missile capabilities, including space launch vehicles (SLV) intended to deliver payloads to geostationary orbit. In late September 2023, Iran successfully launched a Ghased SLV carrying the Noor 3 military reconnaissance satellite to geostationary orbit. The three-stage Ghased rocket uses a first-stage Ghadr liquid-propellant missile and an upper stage Salman solid-fuel propellant motor, a step towards a completely solid-fuel propellant missile.³⁶

In January 2024, Iran reportedly used the more advanced Qaem 100 three-stage solid fuel rocket to put a Soraya satellite into orbit at 750 km above the Earth's surface, breaking its previous altitude record.³⁷

Developing a solid-fuel propellant missile is a key milestone that gives a missile force an advanced capability to quickly deploy and launch ballistic missiles. Liquid-propellant missiles take hours to fuel and prepare for launch, making them vulnerable to detection and a pre-emptive strike. The development of SLV provides Iran with a plausible cover to develop some of the key technologies needed to produce long-range missile systems, a precursor for an ICBM at some point in the future. However, to date, non-theoretical developmental work on re-entry systems for ICBMs has not been detected.

³⁶ Fabian Hinz, "The IRGC's space programme and a move towards longer-range missiles," *International Institute for Strategic Studies*, December 13, 2023, <https://www.iiss.org/online-analysis/online-analysis/2023/12/the-irgcs-space-programme-and-a-move-towards-longer-range-missiles/>.

³⁷ Jon Gambrell, "Iran launches satellite that is part of Western-criticized program as regional tensions spike," *Associated Press*, January 20, 2024, <https://apnews.com/article/iran-satellite-launch-mideast-tensions-israel-palestinians-gaza-b2d8d654c24cf588acaa8228229a0415>.