Institute for Science and International Security

Report

# Going for the Bomb: Part I, Pathways and Timelines

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At the Institute, we have often been asked to describe timelines and unfinished tasks for Iran to build a nuclear weapon. Many of our publications have discussed these issues in detail.[1] This report is one of two new reports that summarize those findings and add some new thinking from the Institute and knowledgeable officials on Iran's pathways to nuclear weapons and the tasks needed to build nuclear weapons. This report, Part I, evaluates pathways and timelines to nuclear weapons. Part II summarizes the tasks needed to construct a nuclear weapon, both to produce sufficient weapon-grade uranium (WGU) and to build the nuclear weapon itself.

Which pathway Iran might choose to undertake those tasks remains unclear. Will it rush to the bomb in a crash program? Will it take its time and build a production-scale nuclear weapons production complex? Will it delay a decision but start accumulating weapon-grade uranium under International Atomic Energy Agency (IAEA) safeguards, as it has been doing with 60 percent enriched uranium, and work on the nuclear weapon itself in secret, or delay further work?

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. The process of building nuclear weapons can be divided into (1) acquiring the requisite amount of weapon-grade uranium for a nuclear weapon, conservatively taken here as 25 kilograms of WGU, and (2) building the nuclear weapon itself, commonly called nuclear weaponization, which in essence weaponizes the WGU. These two fundamental tasks can occur in parallel or sequentially, although the assembly of a nuclear weapon must, of course, occur after the production of the WGU. Figure 1 summarizes the main pathways considered here, where the production of the WGU is in orange and weaponization is in blue.

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[1] 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 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/how-quickly-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-building-nuclear-weapons/8.

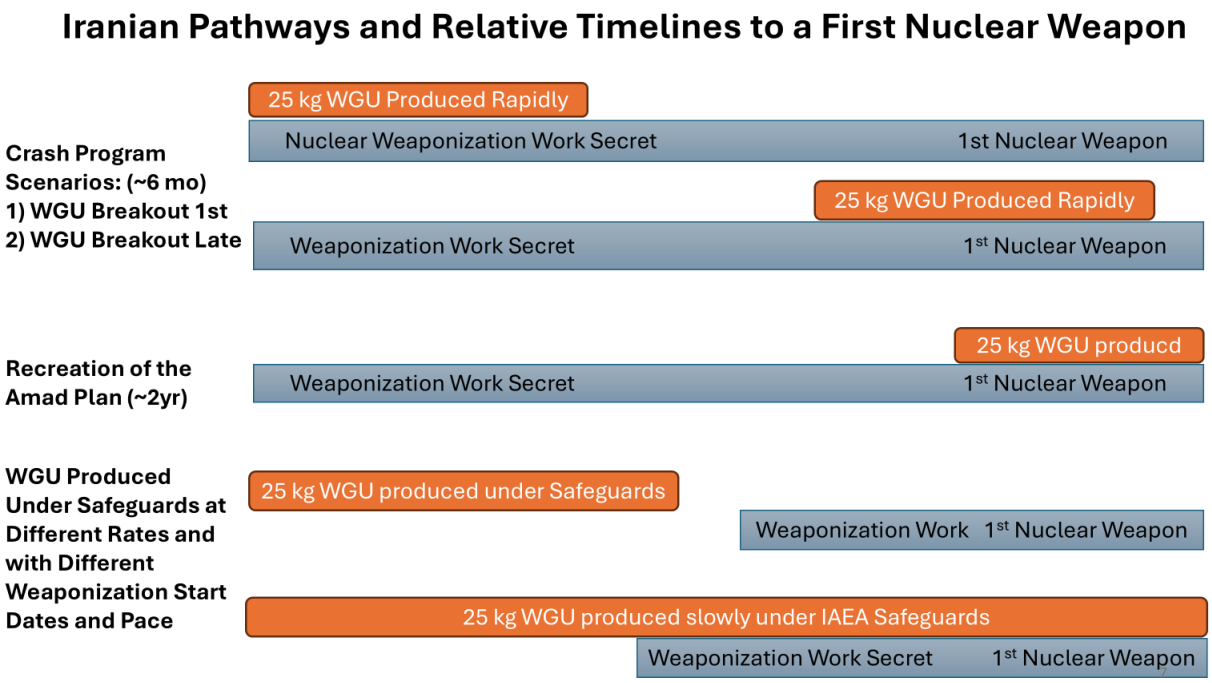


**Figure 1.** Iranian pathways to building nuclear weapons, where the orange bars represent the relative effort to make 25 kilograms of weapon-grade uranium (WGU), and the blue bars are the relative timelines to weaponize that weapon-grade uranium. Only the production of Iran's first nuclear weapon is considered here, but given Iran's capability to produce far larger amounts of weapon-grade uranium quickly, subsequent nuclear weapons could follow soon afterwards. It should be noted that the length of the bars is not proportional to the time to complete that task, either in an absolute or relative sense.

## Crash Program Pathway

A crash or accelerated program would involve Iran moving secretly and as quickly as possible to build its first nuclear weapon. It likely would not be deliverable by one of its ballistic missiles, but it could be detonated in an underground test or delivered by truck or ship or possibly by a larger airplane.

A downside of this pathway is that the risk of failure could be higher. However, in a crisis, the Iranian leadership may perceive the risk as necessary and worthwhile, ordering the nuclear weapons' team to undertake this approach. In this case, the perception of having a nuclear weapon at all is more valuable than not having one. Because Iran can produce a large amount of weapon-grade uranium in a breakout (see Part II of this series), it could produce several more weapons soon afterwards.

Two scenarios are considered in this pathway:

- Breakout to 25 kilograms of WGU as soon as a decision occurs to build nuclear weapons, using safeguarded stocks of enriched uranium.

- Delay breakout of 25 kilograms of WGU using safeguarded stocks of enriched uranium until late in the timeline for weaponization. This could have the benefit of delaying tipping off the IAEA inspectors, who monitor the enriched uranium. For example, Iran could wait until two months before the end of the timeline before diverting its enriched uranium from IAEA safeguards to produce weapon-grade uranium, steps likely to be detected by inspectors. However, Iran may further delay the diversion's detection by a few weeks by denying inspectors access to key sites, such as Fordow, perhaps by falsely declaring a fire, an accident, or a security incident. If the weaponization program was not detected, the result could be a shortened warning; Western intelligence agencies may have less than two months to respond.

In both scenarios, with such large stocks of enriched uranium to be used in a breakout to weapon-grade uranium, Iran could produce multiple nuclear weapons soon after the first one.

**Timeline.** An accelerated program, benefiting from earlier Amad work, could produce its first crude nuclear weapon in six months, or less, based on earlier Institute assessments.

## Recreating a Nuclear Weapons Program Like the Amad Plan

This pathway represents Iran secretly and comprehensively building a production-scale nuclear weapons production complex like the one it was creating under the Amad Plan. The diversion of the safeguarded enriched uranium would be delayed until late in this timeline. Upon completion, Iran would be able to produce reliable nuclear warheads for its ballistic missiles at a rate of several per year, perhaps even more initially, having built up large stocks of enriched uranium usable to generate a large supply of weapon-grade uranium.

Iran would emerge with a full-blown nuclear weapons production complex to match India's, Pakistan's, or North Korea's early nuclear weapons programs and an ability to greatly expand its numbers of nuclear weapons in subsequent years. A downside to this approach is that, at any point in this timeline, Western intelligence of the IAEA could discover these secret efforts, triggering a harsh international response, long before it possesses any nuclear weapons.

**Timeline.** The time needed to revive and recreate a production-scale nuclear weapons production complex is estimated as two years, at which point Iran would have produced its first missile-delivered nuclear warhead and created the infrastructure for the serial warhead production of many more.

## Gradual or Slow Pathway

Iran may escalate its nuclear program and start producing weapon-grade uranium under safeguards. Dealing with this situation will be extremely challenging as Iran builds up its inventory of WGU, as it did with its 60 percent enriched uranium stock, and as uncertainties about the status of its nuclear weaponization program possibly grow.

Two scenarios are considered:

- 25 kilograms of WGU accumulated under safeguards, with a decision to build its first weapon coming later.
- 25 kilograms of WGU accumulated slowly under safeguards, but a decision to build its first weapon occurs during safeguarded production of WGU and runs secretly in parallel to WGU production.

**Timeline.** Weaponization start dates and pace are indeterminate.

## Other Pathways

These pathways capture the main possibilities Iran has before it today, when its enriched uranium and centrifuge plants are under safeguards. In the longer term, the risk is growing that Iran may construct a covert uranium enrichment plant, filled with 500-1000 advanced centrifuges, creating another pathway to the bomb, whereby safeguarded enriched uranium is diverted to this facility. However, in practical terms, Iran can rapidly make WGU in its safeguarded centrifuge plants and have plausible excuses to deny access to inspectors. In essence, enrichment up to 90 percent can happen in secret, and the resulting WGU can be removed before inspectors reenter the safeguarded enrichment plant.

## Which pathway is more likely?

Estimating which of these pathways is more likely depends on developments both inside the regime and in the region. The crash program or a slow accumulation of WGU under safeguards appears more likely today. But recreating and finishing the Amad Plan has long term advantages, if those activities can be kept secret or explained away as non-nuclear military work. Thus, at this point in time, the international community needs to prepare for any of these possibilities, devising policies and actions that prevent Iran from succeeding at any of them.