In Perspective: Iran and the Steps to Building Nuclear Weapons

The U.S. intelligence community has assessed that Iran has the scientific, technical, and industrial capacity to eventually produce nuclear weapons and the International Atomic Energy Agency continues to investigate outstanding issues related to Iran's nuclear weapons-related research before 2004.

Because Iran probably has the knowledge necessary to manufacture a nuclear weapon, the verifiable limits established by the Joint Comprehensive Plan of Action, which blocks Iran from amassing enough bomb-grade material for one weapon in less than 12 months, are all the more vital.

There are two routes for Iran (or any state) to obtain sufficient fissile material to make nuclear weapons—using highly enriched uranium or plutonium. The following major scientific, technical, and industrial steps are required to build a uranium or plutonium weapon.

Mining or Importation of Uranium Ore
Iran is believed to have large reserves of uranium and two working mines.

Milling of Uranium
Concentrating uranium from ore, i.e., increasing uranium oxide content to 65–85 percent to produce "yellow cake."

Processing (Conversion)
Converting yellow cake, a solid, into uranium hexafluoride, a gas.

URANIUM ENRICHMENT ROUTE
Increasing the relative abundance of the uranium-235 isotope in the uranium hexafluoride

- to light-water power-reactor grade (3.5–5.0 percent)
- to research-reactor grade (20 percent)
- to weapons grade (90+ percent)

The IAEA estimates that 25 kg of weapons grade uranium is sufficient to produce one nuclear device.

PLUTONIUM PRODUCTION ROUTE
A nuclear "heavy water" reactor fueled by natural uranium will produce plutonium as a byproduct of reactor operations. The plutonium must be separated from the spent fuel and the highly radioactive fission product contained in the fuel.

Spent Fuel Reprocessing
A separate reprocessing facility is needed to separate out the plutonium before it can be used in nuclear weapons.

The IAEA estimates that 8 kg of weapons-grade plutonium is sufficient to produce one nuclear device.

Fabrication
Converting weapons-grade uranium hexafluoride to uranium dioxide powder and into metallic forms for use in the fissile core of a nuclear device, or fabricating plutonium weapons components from reprocessed fuel.

Weapons Design and Assembly
Designing and assembling the other non-nuclear components in and around the fissile material core to make a device capable of forming the "physics package" of a warhead, suitable for use as part of a combat-ready weapons system.

Nuclear Explosive Testing
Detonating the nuclear device as proof of concept. Typically, multiple nuclear test explosions are necessary to perfect warhead designs, particularly smaller, lighter, more efficient designs.

Weapons Integration With a Delivery System
Adapting the warhead for placement into a bomb or the nose cone of a delivery vehicle.

Missile Testing With Inert Warhead
Performing flight tests with an inert warhead to confirm the performance of the non-nuclear functions of the warhead, such as safing, arming, and fusing, which are necessary in order to achieve higher levels of confidence and reliability.