

Iran's Nuclear Facilities

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November 2012

Introduction

While U.S. intelligence has not yet indicated that Iran has decided to pursue a nuclear weapon, Iran has also failed to address continuing international concerns regarding its nuclear program.

In an effort to convince Iranian leadership to come clean about its nuclear activities, the United States and a broad international coalition is employing a strategy of tough economic sanctions and diplomatic negotiations.

In addition, the United States is keeping the military option on the table. With negotiations still ongoing, a military strike right now could be seen as premature and contrary to our strategic interests.

However, an understanding of the practical aspects of the military option, from resource requirements to potential consequences, is crucial to developing an effective policy towards Iran.

This factsheet informs the debate by highlighting the Iranian nuclear facilities that would likely be the targets of a military operation: Arak, Fordow, Natanz, Parchin, and Isfahan. *(Also included is the Bushehr nuclear power plant, an important facility but an unlikely military target for reasons explained below).*



Each of these facilities plays a different role in Iran's nuclear challenge and presents different tactical considerations for military planners.

Understanding the following aspects of Iran's nuclear facilities will be a key part of any serious, fact-based discussion of U.S. policy options towards Iran.

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The Facilities

Arak –The site at Arak, approximately 150 km south of Tehran, consists of two nuclear facilities: a heavy water production plant (HWPP) and a 40 MWt heavy water research reactor.

The heavy water plant, at Khondab, near Arak, is reported to have been under construction since as early as 1996 or 1998. The Arak heavy water research reactor is still under construction and is slated to come online as early as mid-2013.¹

When reprocessed, fuel rods irradiated in reactors like Arak yield high quality, weapons-grade plutonium.² The primary concern therefore is that the heavy water reactor could be used to support the production of weapons-grade plutonium.³

Iranian officials have insisted that the facility is intended for the production of electricity only, and that the HWPP will be producing heavy water for the research reactor.

However, light-water technology is better suited towards Iran's stated objectives – scientific research and isotope production for medical, agricultural, and industrial purposes. Many experts therefore question Iran's decision to build heavy-water facilities.⁴

Fordow – The Fordow Fuel Enrichment Plant (FFEP), one of the most controversial of Iran's nuclear facilities, lies about 30 km northeast of the holy city of Qom.

Analysts believe construction of the FFEP could have started as early as 2002 or 2004.⁵ Iran officially announced the facility's existence in 2009, although Western intelligence services knew about the facility much earlier.⁶

The facility has the capacity for 16 IR-1 gas centrifuge cascades with a total of approximately 3000 centrifuges.⁷ Iran has reportedly completed installing the centrifuges, although not all are currently operational. At last count there were 696 centrifuges that were enriching.⁸

The site is still under construction, but an IAEA report earlier this year documented the doubling of centrifuges to the site at Fordow,⁹

Iran's enrichment of uranium to 20 percent at the Fordow facility is a serious concern. Iran needs a small amount of uranium enriched to this level for medical purposes, but Iran continues to enrich beyond its needs.¹⁰



The IAEA carries out two kinds of inspections: announced inspections and short-notice announced inspections,¹¹ in which advanced notice could mean as little as two hours.¹²

The IAEA inspects the Fordow site four times per month: two announced, and two short-notice.¹³

The Fordow facility is buried deep under a mountain, posing a tactical challenge to any planners of a military strike.

Parchin – The Parchin weapons complex is the center of Iran’s munitions industry.¹⁴ The complex is dedicated to research, development and production of rockets and high explosives and is rumored to produce chemical weapons, laser enrichment technology, and high explosive testing for nuclear weapons.¹⁵

In 2004, allegations surfaced that Iran was conducting secret research involving “high-explosive shaped charges with an inert core of depleted uranium” to test the features of an implosion type nuclear device.¹⁶ Iran has also been accused of cleaning up possible nuclear contaminants at Parchin by razing buildings and burying soil samples.¹⁷

Many experts argue that Iran’s cleanup of the Parchin site could actually be a positive step, an indication of Iran’s desire to close the book on some of its past nuclear activities.

However, Iran continues to deny IAEA inspectors access to the facility. Iran’s refusal to comply with IAEA requests like this, or to come clean about its past nuclear work is an ongoing concern for the international community.

Natanz –One of the most controversial components of Iran’s nuclear program, the Natanz site contains two primary facilities: the Pilot Fuel Enrichment Plant (PFEP) and the Fuel Enrichment Plant (FEP). This is also the site of a centrifuge assembly area.



Natanz works closely with Isfahan, as the latter is a major producer of UF₆, the primary target for gas centrifuges.¹⁸

About 150 km north of Isfahan, Natanz is a hardened facility buried 8 meters underground and further reinforced by earth and concrete ceilings. According to some estimates, this facility could house as many as 50,000 centrifuges when fully complete.²⁹

Iran has been struggling with trying to implement newer, more sophisticated versions of the Pakistani P-2 centrifuge, and in 2009 and 2010, enrichment was disrupted when the Stuxnet virus caused almost 10 percent of the facility’s 9000 centrifuges to breakdown irreparably.²⁰ The damage was halted, contained and mostly repaired by Iranian scientists.

As with Fordow, the IAEA conducts four inspections per month at the Pilot Enrichment Plant: two announced and two unannounced, in attempts to disrupt the ability of Iran to use the facility for weapons-related purposes.²¹

Bushehr – The Bushehr nuclear power plant sits along the Persian Gulf about 11 miles southeast of the city of Bushehr. Construction was started in 1976 under German leadership, but this was derailed by the Islamic revolution in 1979. Iran then contracted Soviet Russia to help finish the plant, and after several years of delays due to technical and financial challenges, the plant became fully operational in early 2012.²²

The Bushehr plant is a security concern because spent fuel rods could be used to produce one quarter of a ton of weapons-grade plutonium per year.²³ The US dropped its opposition to the plant after Russia provided assurances that the spent fuel rods would not be used to create weapons-grade plutonium.²⁴

A military strike on Bushehr facility, once loaded with reactor fuel, would potentially risk environmental hazards due to radiation leaks.

A strike on Bushehr would also have to factor in a Russian reaction.



Isfahan – The Isfahan (Esfahan) Nuclear Technology/Research Center (INTC) is Iran's largest nuclear research center, where as many as 3000 scientists are thought to work.²⁵ The University of Isfahan, one of the leading institutions of higher education in Iran, is part of the complex, and was supposed to be the training ground for scientists that would eventually operate the site at Bushehr.²⁶



The Chinese have provided the INTC with a Miniaturized Neutron Source Research Reactor²⁷ and the ~90 Percent enriched U235 that fuels it, raising concerns about China's commitments to nonproliferation.

The Chinese have also sold Iran a Heavy water Zero-power reactor for this site, and there is also a uranium conversion facility, a fuel production plant and zirconium production plant.²⁸

The site is controversial because of its proposed links to the supposed Iranian chemical and nuclear weapons programs. Intelligence sources linked the site to rocket propellant development as well as missile component assembly and chemical weapons production.²⁹

After 2003, these reports were scaled back as newer intelligence reporting suggested that INTC could field chemical agents, but was not likely active.³⁰

Conclusion:

Iran's nuclear facilities pose several unique challenges. Many of the facilities are under IAEA inspections, which contribute significantly to our understanding of Iran's nuclear progress.

However, Iran's refusal to take steps to increase transparency remains a serious concern.

Until Iran addresses international concerns regarding its nuclear program, the U.S. and its international partners are rightly keeping the military option on the table.

Understanding the details of Iran's nuclear program, from basic location and capabilities to tactical considerations, is key to the ongoing debate over policy options.

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Endnotes

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The American Security Project (ASP) is a nonpartisan initiative to educate the American public about the changing nature of national security in the 21st century.

Gone are the days when a nation's strength could be measured by bombers and battleships. Security in this new era requires a New American Arsenal harnessing all of America's strengths: the force of our diplomacy; the might of our military; the vigor of our economy; and the power of our ideals.

We believe that America must lead other nations in the pursuit of our common goals and shared security. We must confront international challenges with all the tools at our disposal. We must address emerging problems before they become security crises. And to do this, we must forge a new bipartisan consensus at home.

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We live in a time when the threats to our security are as complex and diverse as terrorism, the spread of weapons of mass destruction, climate change, failed and failing states, disease, and pandemics. The same-old solutions and partisan bickering won't do. America needs an honest dialogue about security that is as robust as it is realistic.

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