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Iranian Army Commander Ataollah Salehi (February 2016)

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ARAK

The existence of a secret heavy-water nuclear facility in Arak was first unveiled to the public in August 2002 by the National Council of Resistance of Iran, an exiled opposition group, and was confirmed through satellite imagery aquired by the Institute for Science and International Security (ISIS) in December 2002. At the time, ISIS released an issue brief expressing concern that Iran was creating a plant in Arak in an effort to develop "the capability to make separated plutonium and highly enriched uranium, the two main nuclear explosive materials." In August 2006, Iran officially announced the inauguration of the Arak plant for the production of heavy water.

Heavy water is used to moderate the nuclear fission chain reaction either in a certain type of reactor or produce plutonium for use in a nuclear bomb. The reactor in Arak, the IR-40, is designed to produce 40 megawatts thermal (MWth) of power and use natural uranium oxide fuel, which will be produced at the Ifsahan facilities.

If operating optimally, the IR-40 at Arak would produce about 9 kilograms of plutonium annually or enough for about two nuclear weapons each year. Before it could use any of the plutonium in a nuclear weapon, however, it would first have to separate the plutonium from the irradiated fuel.

In August 2012, German prosecutors said police had arrested four men suspected of delivering valves for the Arak reactor, breaking an embargo on such exports to Iran. In November 2012, Iran announced that it was postponing the planned start-up of a research reactor at Arak, something Western experts say could potentially offer the Islamic Republic a second route to produce material for a nuclear bomb. Despite this delay, the IAEA has confirmed that Iran continues to install cooling and moderator circuit piping in the heavy water plant.

In February 2013, satellite imagery published by *The Telegraph* revealed that the Arak plant was fully operational and activated. The images showed signs of heavy activity, including a cloud of steam that indicates heavy-water production. The imagery also indicated that Iran has planted three surface-to-air missile sites and at least 50 batteries of anti-aircraft guns protect this research reactor. The missile batteries are found on three sides of Arak, with one crowning the highest mountain above the facility.

Under the parameters for a nuclear agreement agreed to by Iran and the P5+1 negotiators in April 2015, the Arak reactor is to be rebuilt a redesigned based on schematics approved by the P5+1. The Arak reactor will no longer produce plutonium, but will serve as a peaceful nuclear research facility and production center for radioisotopes. Iran also agreed to not accumulate heavy water in excess of what is needed by the new reactor to operate peacefully.

Past Iran President Akbar Hashemi Rafsanjani admitted in an interview published on October 28, 2015, that his government at one time sought nuclear weapons to be developed for military purposes. Rafsanjani was quoted speaking with a reporter from Iran's Nuclear Hope website, saying that, “As I have said, when we started the [nuclear] work, we were at war, and we wanted to have such an option for the day our enemies wanted to use nuclear weapons. This was [our] state of mind, but things never become serious. The principle of our doctrine was the use of nuclear [energy] for peaceful purposes, even though we never abandoned [the idea] that if we were some day to face a certain threat, and if it became necessary, then we would have the option of going to the

other side [to develop nuclear weapons].” Later in the interview, Rafsanjani revealed that during his Presidency officials sought to develop the Arak heavy water reactor facility into a plutonium processing facility, specifically for military purposes. **(*Jerusalem Post*, October 28, 2015)**

Fulfilling one of it's major obligations in the implementation of the JCPOA, on January 11, 2016, the Iranian government announced that they had removed the core and officially filled the Arak reactor with concrete. This was one of the final, and most important steps in implementing the deal.

BUSHEHR

Iran's nuclear program was officially inaugurated in 1974 with plans to build a nuclear power station at Bushehr with German assistance. The project was abandoned because of the Islamic revolution five years later, but revived in the 1990s when Tehran signed an $800 million agreement with Russia to resume construction work at Bushehr.

There are two pressurized water reactors at the Bushehr site. Satellite images from March 2010 show the first completed reactor building on a site that occupies 2.5 square kilometres, about 11 miles south of the city of Bushehr. Iranian state media said the plant was connected to the national grid in September 2010. When it was inspected by the IAEA in October 2011, the agency noted that the reactor was in operation.

In August 2010, the Russian Federal Atomic Energy Agency announced that the first reactor at Bushehr would be loaded with nuclear fuel, qualifing it as an operational nuclear power plant. The process for transferring the fuel to the pool located near the heart of reactor was estimated to take seven to eight days.

In February 2011, it was reported that the fuel rods were being removed from Bushehr. Iranian officials stressed that the activities and associated delays were entirely normal; foreign observers believed that the issues were more a matter of technical competence rather than issues stemming from release of the Stuxnet computer virus in the fall of 2010 as the virus primarily affected uranium enrichment operations, such as the operation of centrifuges at Natanz.

In early September 2011, Iran reported that Bushehr had been reloaded with fuel and successfully reconnected to the nation's power grid. The facility had come online September 2011, with the power of 60 megawatt after successfully passing a number of unspecified tests. The plant was officially launched on September 12, 2011.

On August 30, 2012, the Bushehr power unit 1 was brought to 100 percent of its power generation capacity.

At a meeting of the IAEA in early June 2013, Gulf states expressed their concern with the safety of the Bushehr plant, which is located in an earthquake-prone coastal area. The Gulf representatives are worried about the possibility of radiation escaping and blowing over Qatar’s capital, Doha, and the main oil exporting ports of the UAE. The plant was shut down without explanation IAEA Director General Yukiya Amano said, which exacerbated existing fears about the safety of the facility (Arab News, June 7, 2013).

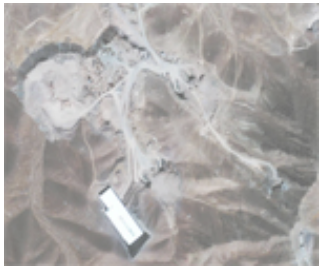
In September 2013, Ali Akbar Salehi, head of Iran's Atomic Energy Organization, announced that the government would be assuming control of the Bushehr plant. Until this point, the plant had been operated by Russian technicians in an agreement sanctioned by the IAEA.

The nuclear framework agreed to by the Iranian negotiators and the P5+1 on April 2, 2015, makes no mention of the Bushehr nuclear facility.

The Comprehensive Nuclear Agreement signed by Iran and the P5+1 in July 2015 does not specifically lay out details for inspections at the Bushehr facility. The inspectors will still have to request access to the site instead of it being automatically granted.

Seperate from the P5+1 negotiations, on November 11, 2015 Russia forged their own nuclear deal with Iran, prompting anxiety and questions from the West. Russias state nuclear power agency, Rosatom struck a deal with Iranian officials to build multiple new nuclear reactor units in Iran. The deal calls for the immediate construction of two nuclear reactors at the Russian built Bushehr power plant and the construction of two more at a later date, and four more in unspecified locations around Iran. The construction of these new facilities opens the way for Iranian domestic production of power for their own nuclear reactors.

FORDOW



The Fordow nuclear facility, located about 40 kilometers north of the holy city of Qom in central Iran, was first announced by Iran to the International Atomic Energy Agency (IAEA(in a letter on September 21, 2009, "that a new pilot fuel-enrichment plant is under construction." According to reports at the time, construction had begun on the new facility in secret as early as 2006 and it could become operational in 2010.

Fordow was publicly revealed later that month by US President Barack Obama, French President Nicolas Sarkozy and British Prime Minister Gordon Brown who used the forum at the G20 Economic Summit to accuse Iran of a covert, underground plant to produce nuclear fuels. The leaders insisted that the IAEA have access right away to ensure it was not being built to produce nuclear weapons and President Obama said that evidence suggested "the size and configuration of this facility is inconsistent with a peaceful program."

In its initial declaration, Iran stated that the purpose of the facility was the production of UF6 enriched up to 5% U-235, and that the facility was being built to contain 16 cascades, with a total of approximately 3000 centrifuges. ISIS assessed that a fully-outfitted facility this size would give Iran the capability to secretly make enough weapons-grade uranium for one bomb in less than a year. However, in September 2011, Iran said it would move its production of 20% LEU to Fordow from Natanz, and this higher-level enrichment started in December 2011.

Currently, Iran has installed four cascades of 174 IR-1 centrifuges at Fordow, where two sets of two cascades working in tandem are enriching 19.75 percent low enriched uranium (LEU). Iran has also installed at Fordow 2,088 empty IR-1 gas centrifuge outer casings along with the associated feed and withdrawal piping.

Iran and the P5+1 agreed to a framework agreement limiting Iran's nuclear program in April 2015. As a part of this agreement, Iran

agreed to convert the Fordow facility so that it is no longer possible to enrich uranium on the site. Iranian negotiators signed on to the agreement stating that they would not enrich uranium or conduct any forms of research or development related to uranium enrichment at the Fodrow facility for 15 years. Under the framework, 2/3 of Fordow's infrastructure and centrifuges will be removed and placed under IAEA care, leaving centrifuges that will not be used for uranium enrichment. The IAEA will be provided regular access to Fordow under the terms of the agreement as well. When Iran completes actions addressing nuclear related concerns, such as the conversion of the Fordow facility, all UN Security Council resolutions will supposedly be lifted simultaneously.

The Comprehensive Nuclear Agreement signed by Iran and the P5+1 in July 2015 provides for "continuous" monitoring of the Fordow facility. According to President Obama, nuclear inspectors will be granted access to Fordow "where necessary, when necessary."

ISFAHAN

The Atomic Energy Organization of Iran (AEOI) currently operates multiple nuclear facilities around the city of Isfahan (Esfahan), most likely all housed within the so-called Isfahan Nuclear Technology Center. UN Resolution 1747 of March 2007 lists the sites as the Esfahan Nuclear Fuel Research and Production Center and the Esfahan Nuclear Technology Center.

The Uranium Conversion Facility (UCF) at Isfahan, which was constructing starting in the early 1990's and began operations in June 2006, contains process lines to convert yellowcake into three forms: uranium oxide (used to fuel reactors), uranium metal (often used in the cores of nuclear bombs), and uranium hexafluoride (used in gas centrifuges).

In 1985, Iran began operating a Fuel Fabrication Laboratory (FFL) at Isfahan that it commissioned from a foreign supplier. Iran informed the IAEA of the FFL in 1993 and provided design information in 1998. It is still in operation. According to the IAEA, the FFL is suitable for producing small amounts of fuel pellets.

In the early 1980s, Iran commissioned from a foreign supplier the construction of a Uranium Chemistry Laboratory (UCL). According to the IAEA, in 1998, Iran declared that UCL had been closed down since 1987.

In 2004, Iran began construction on a Zirconium Production Plant (ZPP) which, when completed, will be able to produce 10 tonnes of zirconium tubing per year for nucler fuel cladding. The ZPP, according to Iranian officials, will be able to produce zirconium sponge, zirconium alloy strip and bar, magnesium, hafnium, 99.99 percent pure magnesium, zirconium alloys, titanium and titanium alloys, and can do ferrous and non-ferrous metal casting.

The Isfahan facility was also reportedly the site of Iran's largest missile assembly and production plant. This ballistic missile production facility, built with North Korean assistance, was said to be capable of producing liquid propellants and missile structural components. According to reports published in Russia, Isfahan was involved in the production of Scud-B and Scud-C missiles. According to the 1995 "Jane's Intelligence Review - Special Report No. 6" on Iran's weapons, North Korea helped build a "Scud Mod B" assembly plant in Iran in 1988, but the plant apparently never manufactured any missiles. North Korea aided Iran in converting a

missile maintenance facility into an assembly plant for the Scud-C's. Other activities at this facility were reported to include research and development on unguided rockets and production of missile frames.

Between 1988 and 1992, development and production at Isfahan was said to include the Shahab-1 and Nazeat missiles (as of 1988), the Chinese M-11, HY-2 anti-ship and addition Chinese M-type missiles (as of 1990-1991), Nodong/Shahab-3 missiles (after a reported deal between Iran and North Korean in 1992). Esfahan was subsequently used for research and development leading to follow on upgrades to the Shahab series and other missiles and rockets.

The nuclear framework agreed to by the Iranian negotiators and the P5+1 on April 2, 2015, makes no mention of the Isfahan nuclear facility.

The Comprehensive Nuclear Agreement signed by Iran and the P5+1 in July 2015 makes no mention specifically concerning inspections at the Isfahan facility, so the inspectors will still have to request access instead of it being automatically granted.

NATANZ

Sometimes refered to as 'Kashan,' the Iranian nuclear facilities at Natanz represent the primary base of its uranium centrifuge program, where the majority of its IR-1 centrifuges are installed. This is the facility at the heart of Iran's dispute with the United Nations Security Council.

Officially a project aimed at the eradication of deserts, construction on the facility was said to have begun in 2000/ The Natanz site now consists of two main facilities - a pilot fuel enrichment plant (PFEP) and a larger, underground fuel enrichment plant (FEP). As of November 2012, the centrifuges at Natanz were enriching 3.5 percent uranium at a rate of approximately 7.9 kg per day, a rate that would allow Iran to produce enough LEU for a nuclear bomb every four to five months.

The Natanz FEP, covering an area of roughly 100,000 square meters built 8 meters underground and surrounded by concrete walls supposedly 2.5 meters thick, is still under construction. It consists of three large underground buildings, two of which are designed to be cascade halls to hold upwards of 50,000 centrifuges. The buildings started as 70 foot deep holes, and satellite imagery showed the construction of thick concrete walls and in 2004, the roof was hardened with reinforced concrete and covered with 22 meters of earth. The complex consists of two 25,000 square meter halls and a number of administrative buildings. This once secret site was one of the two exposed by Alireza Jafarzadeh in August, 2002.

On March 30, 2005, Iranian President Mohammad Khatami toured the Natanz site accompanied by the media, in turn producing the first publicly available ground images of Natanz. Iran voluntarily suspended activity in November 2004 at the PFEP, which was originally slated to hold 1,000 centrifuges, when it was conducting both single machine tests and small cascades with uranium hexafluoride at the pilot plant. Iran resumed operation of centrifuges in early 2006 and it announced in September 2007 that it had installed 3,000 centrifuges.

In 2010, Iran told the IAEA that Natanz would be the venue for new enrichment facilities - construction of which would start around March 2011. In a letter dated January 23, 2012, the Atomic Energy Organization of Iran (AEOI) informed the United Nations that it would soon be installing a new model of centrifuge, called the IR2M, at Natanz. The IR2M can enrich two or three times faster than the present equipment being used by Tehran, according to the Associated Press.

The Natanz facility will be the only facility in Iran where uranium enrichment will take place, under the framework of the agreement signed by the P5+1 and Iranian negotiators on April 2, 2015. Iran agreed to only enrich uranium at the Natanz facility for 10 years following the agreement and to only do so with 5,060 of the less advanced, IR-1 first generation centrifuges. Iran's more advanced centrifuge models (IR-2, IR-4, IR-5, IR-6, and IR-8) will be placed under IAEA care for the duration of the agreement.

The Comprehensive Nuclear Agreement signed by Iran and the P5+1 in July 2015 provides for "continuous monitoring" of the Natanz as well as Fordow facilities. Inspectors supposedly will have unfettered access to these facilities whenever necessary.

PARCHIN

The overall Parchin complex in central Iran is one of Iran's leading munitions centres - for the research, development and production of ammunition, rockets and high explosives. One or more areas, however, near the munitions center of Parchin has been identified as a suspected, or "probable," nuclear weapons development facility.

The suspect site was physically isolated from the rest of the complex, suggesting that it was not part of the conventional ammunition, poison gas or missile programs. The construction activity was also consistent with the construction activity at other parts of Iran's nuclear program. Seyed Hossein Mousavian, Iran's chief delegate to the IAEA, angrily rejected claims that satellite photos showed Parchin to be a site for the testing and production of nuclear weapons. Supporting his claim, in November 2005, the IAEA was finally given access to Parchin and took environmental samples. Inspectors did not observe any unusual activities in the buildings visited, and the results of the analysis of environmental samples did not indicate the presence of nuclear material. Despite many requests, the IAEA has been consistently denied access to the Parchin facility since the 2005 inspection. The Iranian government claims that the 2005 inspection was good enough, and there is no need to come back and reevaluate the site.

However, according to information released in an IAEA report in November 2011, it is believed the site has now been used for testing high explosives that could be used in nuclear weapons. A huge explosion tore through the Parchin facility on October 6, 2014 leaving two workers dead. The blast was so powerful that it shattered the windows in buildings up to 9 miles from the facility. Allegedly the blast was an accident that occured when weapons materials were being transported. The Iranian government has refused the IAEA access to the Parchin nuclear facility since 2005.

The nuclear framework agreed to by the Iranian negotiators and the P5+1 on April 2, 2015, makes no mention of the Parchin nuclear facility.

The Comprehensive Nuclear Agreement signed by Iran and the P5+1 in July 2015 makes no mention specifically concerning

inspections of the Parchin facility, but negotiators stated that they were going to be drawing up a second agreement including details about inspections at Parchin.

The IAEA and Iran announced a side agreement seperate from the JCPOA in late August 2015, pertaining to inspections of the secretive Parchin nuclear complex. Iran will be allowed to use it's own nuclear inspectors to investigate the site and report nuclear development activity to the IAEA, privy to the agreement. The IAEA document states that the watchdog organization will "ensure the technical authenticity of the inspections," but does not detail how it would do so. IAEA Director General Yukiya Amano released a statement after the deal was revealed, where he asserted that the IAEA is completely satisfied with the deal it struck for inspections of the Parchin nuclear facility.

Satellite images presented to U.S. intelligence services in early August 2015 showed recent activity at the secretive Parchin nuclear facility in Iran, prompting suspicions that the Iranian regime were already trying to hide nuclear activity. The photos allegedly showed bulldozers and other heavy construction material being moved in and around the Parchin facility, possibly an Iranian effort to clean and sanitize the facility before planned IAEA inspections. When pressed about this suspicious activity during the following week, Iranian Foreign Minister Zarif asserted that the construction materials were simply present at the site because there were crews engaging in road construction in the area. Zarif accused the opponents of the deal of spreading lies in order to drum up public opposition. Although the construction material was provocatively placed, further information released during subsequent weeks revealed that the construction equipment had just been placed there for storage and parking, had been there for a long time, and was not being used. An IAEA report released in August 2015 included claims that the Iranians had allegedly built an extension to the Parchin nuclear complex. The authors of the report said that, "Since (our) previous report (in May), at a particular location at the Parchin site, the agency has continued to observe, through satellite imagery, the presence of vehicles, equipment, and probable construction materials. In addition, a small extension to an existing building." Iran's envoy to the IAEA responded, stating that, "It's funny that the IAEA claims there has been a small extension to a building... Iran doesn't need to ask for the IAEA's permission to do construction work on its sites." **(***Reuters*, **August 28, 2015)**

Members of the IAEA, including Director-General Yukiya Amano, were granted access to the Parchin facility for the first time in a decade in late September 2015. Amano met with Iranian President Hassan Rouhani during his visit, and the two spoke about implementation of the JCPOA.

TEHRAN

Established in 1967 and managed by the Atomic Energy Organization of Iran (AEOI), the Tehran Nuclear Research Center (TNRC) contains a number of nuclear research, production and testing facilities.

One of the primary facilities at the TNRC is the Jabr Ibn Hayan Multipurpose Laboratories (JHL) where Iran conducted many undeclared nuclear activities. JHL has been the site of many nuclear research and development activities, including using shielded glove boxes/hot cells; a uranium metal purification and casting laboratory; mass spectrometer and laser laboratories; and facilities for the testing of uranium purification and conversion processes. A component of the Russian Ministry of Atomic Energy (MINATOM)

contracted with Iran to provide equipment to the JHL intended for Atomic Vapor Laser Isotope Separation (AVLIS). The laser equipment was to have been delivered in late 2000 but continues to be held up as a result of US protests. AVLIS technology could provide Iran the means to produce weapons quantities of highly enriched uranium.

Another area of the TNRC is the Molybdenum, Iodine and Xenon Radioisotope Production Facility (MIX), which was completed in 2005 after a decade of construction and serves as a laboratory for the production of radioisotopes of molybdenum, iodine and xenon from natural uranium oxide irradiated in a research reactor. Because the TNRC does not have the neutron flux required to produce the isotopes that would then be separated in the MIX facility, this facility is unable to operate as planned.

The Radiochemistry Laboratories at the TNRC contained a glove box for radioisotope separation, though Iran has declared to the IAEA that neither the laboratory nor the radiochemistry section of TNRC still exist. They said that the glove box used at the facility was moved to a warehouse at Isfahan in 2000.

The final part of the TNRC is the Tehran Research Reactor (TRR), which became operational in 1967 as a 5 megawatt-thermal (MWth) pool-type light water research reactor. The United States supplied the TRR and weapons-grade uranium to fuel the reactor under its Atoms for Peace program, but it suspended supply of highly-enriched uranium following the 1979 revolution. In 1987, Iran signed a $5.5 million agreement with Argentina to convert the reactor's fuel from 93 percent enriched uranium to slightly less than 20 percent enriched uranium, and the reactor has been operating with this LEU fuel since 1993. In September 1993, the IAEA conducted a safeguards inspection at the TRR, included physical inventory verification and design information verification, as well as a number of activities to follow up on issues related to the natural uranium imported in 1991. In February 2012, Iran loaded the first domestically produced fuel element into the Tehran Research Reactor.

The nuclear framework agreed to by the Iranian negotiators and the P5+1 on April 2, 2015, makes no mention of the Tehran nuclear facility.

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