

Nuclear Latency (NL) Dataset
Country Coding Sheets

IRAN

COW COUNTRY CODE: 630

List of Country's Enrichment and Reprocessing (ENR) Facilities

1. Natanz Pilot Fuel Enrichment Plant (PFEP)
2. Natanz Fuel Enrichment Plant (FEP)
3. Fordow Uranium Enrichment Facility (Qom-FEEP)
4. Karaj Agricultural and Medical Center (sometimes called Ramandeh)
5. Kalaye Electric Company
6. Lashkar Ab'ad
7. Molybdunum, Iodine and Xenon Radioisotope Production (MIX) Facility
8. Tehran Nuclear Research Center (Reprocessing)
9. Tehran Nuclear Research Center (Enrichment)
10. Plasma Physics Laboratories in Tehran (TNRC)

Detailed Facility-Specific Information and Sources

1. Natanz Pilot Fuel Enrichment Plant (PFEP)

- a. ENR type (diffusion, centrifuge, EMIS, chemical and ion exchange, aerodynamic isotope separation, reprocessing).*

Enrichment, centrifuge.

- b. Facility size (laboratory, pilot, commercial).*

Pilot.

- c. Is the facility under construction or in operation? If under construction, list the construction years. If in operation, list the years of operation.*

Construction start year is coded as 2002, when equipment was moved from Kalaye. The facility started operating in 2003 after the transfer of centrifuges to the facility.¹ Iran voluntarily suspended enrichment between November 2004 and early 2006. The facility continues to operate.

- d. Was the facility developed covertly? If so, identify years that facility was covert.*

Yes, the facility was covertly developed but was publicly revealed in 2002.

¹ *Deadly Arsenals* and NTI list the start date for this facility as 2003. The ISIS report on Natanz gives 2002.

- e. *Was the facility placed under IAEA safeguards? If so, identify the years that the facility was safeguarded.*

Yes, the IAEA is implementing safeguards and conducting unannounced inspections at the facility in 2007.

- f. *Was the facility placed under regional safeguards? If so, identify the years that the facility was under regional safeguards.*

No.

- g. *Did the facility have a military purpose?*

Natanz was the centerpiece of Iran's enrichment program, which had a weapons component prior to 2003.

- h. *Was the facility multinational? If so, identify the other countries that were involved.*

No.

- i. *Was the facility built with foreign assistance? If so, list the supplier(s) and what they provided.*

Yes. The AQ Khan network supplied centrifuge designs, component parts, and complete centrifuges. Assistance from the network in the 1990s allowed for construction of the pilot and industrial facilities at Natanz to start in 2001. In 2004 Iranian officials acknowledged that Iran received advanced P-2 centrifuges from a foreign source in 1995. P-2 centrifuges are Pakistani in origin. After several failed attempts to use carbon composite material, the P-2 centrifuges were abandoned.

- j. *Sources:*

Albright, David and Corey Hinderstein. 2004. "The Centrifuge Connection." *Bulletin of the Atomic Scientists*. 60(2): 61-66.

Ciricione, Joseph, Jon B. Wolfsthal, and Miriam Rajkumar. 2005. *Deadly Arsenals: Nuclear, Biological, and Chemical Threats*. Washington D.C.: Carnegie Endowment for International Peace.

Fitzpatrick, Mark. 2011. "Nuclear Capabilities in the Middle East." Presented at the EU Non-Proliferation Consortium.
<http://www.nonproliferation.eu/web/documents/backgroundpapers/fitzpatrick.pdf>. Accessed 06/21/2015. 4.

International Atomic Energy Agency. 2007. "Implementation of the NPT Safeguards Agreements in the Islamic

Republic of Iran.” Report by IAEA Director General. http://isis-online.org/uploads/isis-reports/documents/IAEA_Iran_Report_24February2012.pdf. Accessed 06/21/2015.

Institute for Science and International Security. “Natanz Fuel Enrichment Plant.” Nuclear Iran. <http://www.isisnucleariran.org/sites/facilities/fuel-enrichment-plant/>. Accessed 06/21/2015.

Laughter, M.D. 2009. “Profile of World Uranium Enrichment Programs.” Oak Ridge National Laboratory. <http://www.fas.org/nuke/guide/enrich.pdf>. Accessed 06/21/2015.

Nuclear Threat Initiative. 2013. “Pilot Fuel Enrichment Plant.” <http://www.nti.org/facilities/172/>. Accessed 06/21/2015.

Oak Ridge National Laboratory. 2007. “Profile of World Uranium Enrichment Programs.” 23.

Public Intelligence. 2010. “Iran Nuclear Site: Natanz Uranium Enrichment Site.” <http://publicintelligence.net/iran-nuclear-site-natanz-uranium-enrichment-site/>. Accessed 06/21/2015.

2. Natanz Fuel Enrichment Plant (FEP)

- a. *ENR type (diffusion, centrifuge, EMIS, chemical and ion exchange, aerodynamic isotope separation, reprocessing).*

Enrichment, centrifuge.

- b. *Facility size (laboratory, pilot, commercial).*

Commercial.

- c. *Is the facility under construction or in operation? If under construction, list the construction years. If in operation, list the years of operation.*

Construction began in 2001. The earliest date for operations at the facility is 2006.² The facility continues to operate.

- d. *Was the facility developed covertly? If so, identify years that facility was covert.*

Yes, the facility was developed covertly and construction of the facility was particularly secretive. The National Council of Resistance in Iran revealed the

² NTI lists 2007 as the partial operational date for the facility. Fitzpatrick and FAS list 2006. The ISIS database lists the operational date as 2008 (<http://www.isisnucleariran.org/sites/by-type/category/uranium-enrichment/>).

movement of centrifuge technology from Kalaye Electric Company to the facility in August 2002. The initial assessment of the facility was of a fuel fabrication facility, however, ISIS released the first publically available satellite pictures and properly identified the site as an enrichment facility in December of 2002.

- e. *Was the facility placed under IAEA safeguards? If so, identify the years that the facility was safeguarded.*

Yes, this facility was placed under safeguards in 2003 and is currently under safeguards. Environmental sampling as occurred since 2007.

- f. *Was the facility placed under regional safeguards? If so, identify the years that the facility was under regional safeguards.*

No.

- g. *Did the facility have a military purpose?*

Natanz is the center of Iran's enrichment program, which had a weapons component prior to 2003.

- h. *Was the facility multinational? If so, identify the other countries that were involved.*

No.

- i. *Was the facility built with foreign assistance? If so, list the supplier(s) and what they provided.*

Yes. The AQ Khan network supplied centrifuge designs, component parts, and complete centrifuges. Assistance from the network in the 1990's allowed for construction of the pilot and industrial facilities at Natanz to start in 2001. In 2004 Iranian officials acknowledged that Iran received advanced P-2 centrifuges from a foreign source in 1995. P-2 centrifuges are Pakistani in origin. When touring the Natanz site, IAEA inspectors were "shocked" to see that the design of the centrifuges was Pakistani in origin, with one official questioning whether the supplying factory was in Pakistan or in North Korea.

- j. *Sources:*

Albright, David and Corey Hinderstein. 2004. "The Centrifuge Connection." *Bulletin of the Atomic Scientists*. 60(2): 61-66.

Albright, David and Andrea Stricker. "Iran's Nuclear Program." US Institute of Peace: Iran Primer: <http://iranprimer.usip.org/resource/irans-nuclear-program>. Accessed 11/16/2015.

- Ciricione, Joseph, Jon B. Wolfsthal, and Miriam Rajkumar. 2005. *Deadly Arsenals: Nuclear, Biological, and Chemical Threats*. Washington D.C.: Carnegie Endowment for International Peace.
- Fitzpatrick, Mark. 2011. "Nuclear Capabilities in the Middle East." Presented at the EU Non-Proliferation Consortium.
<http://www.nonproliferation.eu/web/documents/backgroundpapers/fitzpatrick.pdf>. Accessed 06/21/2015. 4.
- International Atomic Energy Agency. 2007. "Implementation of the NPT Safeguards Agreements in the Islamic Republic of Iran." Report by IAEA Director General.
http://isis-online.org/uploads/isis-reports/documents/IAEA_Iran_Report_24February2012.pdf. Accessed 06/21/2015.
- Institute for Science and International Security. "Natanz Fuel Enrichment Plant." Nuclear Iran. <http://www.isisnucleariran.org/sites/facilities/fuel-enrichment-plant/>. Accessed 06/21/2015.
- Laughter, M.D. 2009. "Profile of World Uranium Enrichment Programs." Oak Ridge National Laboratory. <http://www.fas.org/nuke/guide/enrich.pdf>. Accessed 06/21/2015.
- Nuclear Threat Initiative. 2013. "Pilot Fuel Enrichment Plant." <http://www.nti.org/facilities/172/>. Accessed 06/21/2015.
- Oak Ridge National Laboratory. 2007. "Profile of World Uranium Enrichment Programs." 23.
- Sinha, Shreeya and Susan C. Beachy. 2015. "Timeline on Iran's Nuclear Program." *New York Times*. Updated April 2, 2015.
http://www.nytimes.com/interactive/2013/03/20/world/middleeast/Iran-nuclear-timeline.html#/#time243_8391. Accessed 06/21/2015.
- World Nuclear Association. 2015. "Nuclear Power in Iran." <http://www.world-nuclear.org/info/Country-Profiles/Countries-G-N/Iran/>. Accessed 06/21/2015.

3. Fordow Uranium Enrichment Facility (Qom-FEEP)

- a. *ENR type (diffusion, centrifuge, EMIS, chemical and ion exchange, aerodynamic isotope separation, reprocessing).*

Enrichment, centrifuge.

- b. *Facility size (laboratory, pilot, commercial).*

Pilot.

- c. *Is the facility under construction or in operation? If under construction, list the construction years. If in operation, list the years of operation.*

Construction of the facility began around 2006 or 2007.³ The facility began operating in 2011 and it continues to operate.⁴ Iran notified the IAEA in 2011 that the facility would enrich uranium to 20%.

- d. *Was the facility developed covertly? If so, identify years that facility was covert.*

Yes, the facility remained secret from initial construction in 2006 to September 2009 when Presidents Obama, President Sarkozy, and Prime Minister Brown jointly revealed the facility. Tehran announced the facility in a letter to the IAEA on September 21 2009.

- e. *Was the facility placed under IAEA safeguards? If so, identify the years that the facility was safeguarded.*

There is disagreement between the IAEA and Iran about whether safeguards are applicable and under what conditions they can be applied. The IAEA received four Design Information Questionnaire's (DIQ's) in 2012 from Iran on the facility.

- f. *Was the facility placed under regional safeguards? If so, identify the years that the facility was under regional safeguards.*

No.

- g. *Did the facility have a military purpose?*

Yes. The Institute for Science and International Security notes that this facility enhances Iran's enrichment capacity to make enough weapons grade material for a weapon within a year if the facility used 3.5% feed stock. Additionally, Fordow is a military site.

- h. *Was the facility multinational? If so, identify the other countries that were involved.*

No.

- i. *Was the facility built with foreign assistance? If so, list the supplier(s) and what they provided.*

³ The 2006 and 2007 dates are from ISIS (2009). Some sources stated 2012 (wise-uranium.org).

⁴ The operational start date is from the IAEA GOV 2012/55.

No. The advanced centrifuges being designed for the facility were reportedly based off Pakistani designs. However, this does not constitute a new instance of foreign assistance because Pakistan indirectly, and perhaps unwillingly, provided assistance.

j. Sources:

Albright, David and Christina Walrond. 2011. "Iran's Advanced Centrifuges." The Institute for Science and International Security. <http://isis-online.org/isis-reports/detail/irans-advanced-centrifuges>. Accessed 06/21/2015.

International Atomic Energy Agency. 2012. "Implementation of the NPT Safeguards Agreement and Relevant Provisions of the Security Council Resolutions in the Islamic Republic of Iran." http://www.isis-online.org/uploads/isis-reports/documents/Iran_safeguards_report_November_2012.pdf. Accessed 06/21/2015.

Institute for Science and International Security. "Fordow Fuel Enrichment Plant (FFEP)." Nuclear Iran. <http://www.isisnucleariran.org/sites/detail/fordow/>. Accessed 06/21/2015.

Institute for Science and International Security. "Natanz Fuel Enrichment Plant." Nuclear Iran. <http://www.isisnucleariran.org/sites/facilities/fuel-enrichment-plant/>. Accessed 06/21/2015.

Institute for Science and International Security. 2009 "Imagery Brief: September 27, 2009." http://isis-online.org/uploads/isis-reports/documents/Qom_Imagery_Brief_27Sept2009.pdf. Accessed 06/21/2015.

International Panel on Fissile Materials. 2011. "Global Fissile Material Report 2011." <http://fissilematerials.org/library/gfmr11.pdf>. Accessed 06/21/2015.

4. Karaj Agricultural and Medical Center (sometimes called Ramandeh)

a. ENR type (diffusion, centrifuge, EMIS, chemical and ion exchange, aerodynamic isotope separation, reprocessing).

Enrichment, laser (AVLIS).

b. Facility size (laboratory, pilot, commercial).

Laboratory.

c. Is the facility under construction or in operation? If under construction, list the construction years. If in operation, list the years of operation.

The facility was built in 1991 but the components for the laser research equipment from Lashkar Ab'ad did not arrive until 2003. However, the facility probably began operation in 2003.⁵

- d. *Was the facility developed covertly? If so, identify years that facility was covert.*

Yes, the facility was developed covertly. Iran initially stated the facility was for agriculture and that it had no nuclear cycle facilities. The National Council of Resistance in Iran named the facility as a centrifuge enrichment facility. The IAEA was able to correctly identify the facility in August 2003.

- e. *Was the facility placed under IAEA safeguards? If so, identify the years that the facility was safeguarded.*

The IAEA was able to visit the location in August 2003 after being initially denied access in May 2003.

- f. *Was the facility placed under regional safeguards? If so, identify the years that the facility was under regional safeguards.*

No.

- g. *Did the facility have a military purpose?*

This is considered a military facility due to Iran's initial inconsistency in revealing facility operations. Iran had weapons ambitions during construction.

- h. *Was the facility multinational? If so, identify the other countries that were involved.*

No, the facility is not multinational.

- i. *Was the facility built with foreign assistance? If so, list the supplier(s) and what they provided.*

Yes. China reportedly supplied the facility with an electromagnetic isotope separator that is capable of enriching uranium in 1992. In addition to this Chinese supplied and installed Caultron, Belgium's Ion Beam Applications supplied a cyclotron accelerator. GBC Scientific, an Australian company, also constructed a cyclotron capable of laser enrichment at this site. Australian officials have stated that the spectrometer was supplied "under the condition that it be used only for agricultural and medical research."⁶ Australia claimed Iran had violated end-user stipulations by using the cyclotron for laser enrichment research.

- j. *Sources:*

⁵ The 2002 date is based on when the NCRI revealed the location.

⁶ <http://www.iranwatch.org/iranian-entities/karaj-nuclear-research-centre-medicine-and-agriculture>.

- Blanc, Alexis and Brad Roberts. 2008. "Nuclear Proliferation: A Historical Overview." Institute for Defense Analyses. <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA482642>. Accessed 06/21/2015.
- Center for Nonproliferation Studies (CNS). "Foreign Suppliers to Iran's Nuclear Development." <http://cns.miis.edu/wmdme/flow/iran/enrich.htm>. Accessed 06/21/2015.
- Ciricione, Joseph, Jon B. Wolfsthal, and Miriam Rajkumar. 2005. *Deadly Arsenals: Nuclear, Biological, and Chemical Threats*. Washington D.C.: Carnegie Endowment for International Peace.
- Congressional Research Service Report for Congress. 2000. "Weapons of Mass Destruction in the Middle East." <http://www.au.af.mil/au/awc/awcgate/crs/rl30408.pdf>. Accessed 06/21/2015. 12.
- Iran Watch. "Karaj Nuclear Research Centre for Medicine and Agriculture." <http://www.iranwatch.org/iranian-entities/karaj-nuclear-research-centre-medicine-and-agriculture>. Accessed 06/21/2015.
- Koch, Andrew and Jeanette Wolf. 1998. "Iran's Nuclear Facilities: A Profile." Center for Nonproliferation Studies. <http://cns.miis.edu/reports/pdfs/iranrpt.pdf>. Accessed 06/21/2015. 8.
- Nuclear Threat Initiative. "Karaj Agricultural and Medical Center." <http://www.nti.org/facilities/239/>. Accessed 06/21/2015.
- Parillo, Jill Marie. 2006. "Iran's Nuclear Program." Carnegie Fact Sheet. 3.
- Serrato, Ruben M. 2010. "Laser Isotope Separation and the Future of Nuclear Proliferation." 52.
- Sinha, Shreeya and Susan C. Beachy. 2015. "Timeline on Iran's Nuclear Program." *New York Times*. Updated April 2, 2015. http://www.nytimes.com/interactive/2013/03/20/world/middleeast/Iran-nuclear-timeline.html#/#time243_8391. Accessed 06/21/2015.

5. Kalaye Electric Company

- a. *ENR type (diffusion, centrifuge, EMIS, chemical and ion exchange, aerodynamic isotope separation, reprocessing).*

Enrichment, centrifuge.

- b. *Facility size (laboratory, pilot, commercial).*

Laboratory.

- c. *Is the facility under construction or in operation? If under construction, list the construction years. If in operation, list the years of operation.*

Construction of the facility began in 1995.⁷ The facility conducted centrifuge tests using UF between 1998 and 2002.⁸

- d. *Was the facility developed covertly? If so, identify years that facility was covert.*

Yes, Iran initially denied the facility was developing centrifuge technology. Iran also failed to report experiments from 1998 to 2002 at the facility to the IAEA. The international community became aware of the facility by 2003 as the IAEA's investigation indicated experiments had been conducted at the location.

- e. *Was the facility placed under IAEA safeguards? If so, identify the years that the facility was safeguarded.*

Yes, safeguards were first implemented in May 2003. Specific inspections occurred from August 9-12 and in October 2003, January 2004, and March 2004. 1.9 kg of uranium was used for testing and not reported to the IAEA. Iran had developed 19 centrifuges for testing purposes.

- f. *Was the facility placed under regional safeguards? If so, identify the years that the facility was under regional safeguards.*

No.

- g. *Did the facility have a military purpose?*

Probably, given the time in which the facility was built.

- h. *Was the facility multinational? If so, identify the other countries that were involved.*

No.

- i. *Was the facility built with foreign assistance? If so, list the supplier(s) and what they provided.*

Yes, Iran received assistance from the AQ Khan network throughout the 1990's. In 2004 Iranian officials acknowledged that Iran received advanced P-2 centrifuges from

⁷ The construction date is from the NTI facility website. The NTI states that the Kalaye Electric Company served as the major R&D location from 1995 to 2003.

⁸ Iran Watch state enrichment testing occurred in 1995. The experiment dates are from Parillo (2006). Parillo provides the operational start date. Albright & Stricker give an operation date of 1999.

a foreign source in 1995. P-2 centrifuges are Pakistani in origin. Iran has claimed that the HEU detected at this site by IAEA inspectors was due to contaminated centrifuge component parts supplied by the AQ Khan network. One source even claims that Kalaye Electric may have functioned as a front company for obtaining centrifuges from foreign sources.

j. Sources:

Ciricione, Joseph, Jon B. Wolfsthal, and Miriam Rajkumar. 2005. *Deadly Arsenals: Nuclear, Biological, and Chemical Threats*. Washington D.C.: Carnegie Endowment for International Peace.

Global Security. "Kalaye Electric Company." <http://www.globalsecurity.org/wmd/world/iran/tehran-kalaye.htm>. Accessed 06/21/2015.

International Atomic Energy Agency. 2007. "Implementation of the NPT Safeguards Agreements in the Islamic Republic of Iran." Report by IAEA Director General. http://isis-online.org/uploads/isis-reports/documents/IAEA_Iran_Report_24February2012.pdf. Accessed 06/21/2015.

Institute for Science and International Security. 2005. "Imagery Brief: Kalaye Electric." <http://isis-online.org/publications/iran/kalayeelectric.html>. Accessed 06/21/2015.

Institute for Science and International Security. "Kalaye Electric Company." <http://www.isisnucleariran.org/sites/detail/kalaye/>.

Iran Watch. "Kalaye Electric Company." <http://www.iranwatch.org/iranian-entities/kalaye-electric-company>. Accessed 06/21/2015.

Kerr, Paul. 2004. "IAEA Report Questions Iran's Nuclear Programs." Arms Control Association. https://www.armscontrol.org/act/2004_07-08/IAEAReport. Accessed 06/21/2015.

Nuclear Threat Initiative. "Kalaye Electric Company." <http://www.nti.org/facilities/167/>. Accessed 06/21/2015.

Parillo, Jill Marie. 2006. "Iran's Nuclear Program." http://www.carnegieendowment.org/static/npp/Jill_Iran_fact_1_Oct_sheet_1.pdf.

Sinha, Shreeya and Susan C. Beachy. 2015. "Timeline on Iran's Nuclear Program." *New York Times*. Updated April 2, 2015. http://www.nytimes.com/interactive/2013/03/20/world/middleeast/Iran-nuclear-timeline.html#time243_8391. Accessed 06/21/2015.

6. Lashkar Ab'ad

- a. *ENR type (diffusion, centrifuge, EMIS, chemical and ion exchange, aerodynamic isotope separation, reprocessing).*

Enrichment, laser.

- b. *Facility size (laboratory, pilot, commercial).*

Pilot.

- c. *Is the facility under construction or in operation? If under construction, list the construction years. If in operation, list the years of operation.*

Construction of the facility probably began in 2000 and became operational between 2002⁹ and 2003.¹⁰ Equipment from this facility was moved to Karaj in order to avoid inspection by the IAEA. When the IAEA inspected the location in 2008, they found that a private company operated the facility and was developing laser technology. Some of the equipment has been dismantled and stored at the location.

- d. *Was the facility developed covertly? If so, identify years that facility was covert.*

Yes, Iran initially attempted to hide the facility from the IAEA. The IAEA visited the location in August 2003.

- e. *Was the facility placed under IAEA safeguards? If so, identify the years that the facility was safeguarded.*

The facility has been inspected by the IAEA. The IAEA 2008 inspections revealed the facility is operated by a private company developing laser technology for industrial purposes.

- f. *Was the facility placed under regional safeguards? If so, identify the years that the facility was under regional safeguards.*

No.

- g. *Did the facility have a military purpose?*

Although we lack clear evidence either way, anecdotal evidence strongly suggests that this plant began operations at least partially for military purposes.

- h. *Was the facility multinational? If so, identify the other countries that were involved.*

⁹ The 2000 date is the date Iran provided the IAEA for the start of operation at the facility.

¹⁰ The NTI lists 2002 as the operational date for the facility. It appears the experiments were concluded in 2003.

No.

- i. *Was the facility built with foreign assistance? If so, list the supplier(s) and what they provided.*

Yes. The Iranian laser program benefitted from assistance from suppliers in the US, Germany, and Russia. In 1988 Iran signed a contract with Russian suppliers to gain technical information about AVLIS and obtain related equipment. Though Russia refused export permits for much of the equipment due to American pressure, a subsidiary of Rosatom supplied a vacuum chamber, diagnostic equipment, diffusion pumps, documentation, and training. The chamber was installed in 2002 along with other materials illicitly acquired from abroad. While most of the equipment for this plant was obtained abroad, only the vacuum chamber and associated equipment can be traced directly to a single firm. While it is unclear if the transfer by the St. Petersburg Yefremov Institute (NIIEFA) firm was state sanctioned, it was part of Rosatom at the time.

- j. *Sources:*

Albright, David and Serena Kelleher-Vergantini. 2013. "Iran's Unexplained Laser Enrichment Capabilities." ISIS Imagery Brief. http://isis-online.org/uploads/isis-reports/documents/Lashkar_Abad_29July2013.pdf. Accessed 06/21/2015. 9.

Prasad, Revati and Jill Marie Parillo. 2006. "Iran's Programs to Produce Plutonium and Enriched Uranium." Carnegie Endowment for International Peace. http://www.carnegieendowment.org/static/npp/Iran_fact_sheet.pdf.

The Institute for Science and International Security. "Laser Enrichment." Nuclear Iran. <http://www.isisnucleariran.org/sites/by-type/category/laser-enrichment/>. Accessed 06/21/2015.

Nuclear Threat Initiative. 2013. "Lashkar Ab'ad." <http://www.nti.org/facilities/169/>. Accessed 06/21/2015.

Sinha, Shreeya and Susan C. Beachy. 2015. "Timeline on Iran's Nuclear Program." *New York Times*. Updated April 2, 2015. http://www.nytimes.com/interactive/2013/03/20/world/middleeast/Iran-nuclear-timeline.html#time243_8391. Accessed 06/21/2015.

7. Molybdenum, Iodine and Xenon Radiosotope Production (MIX) Facility

- a. *ENR type (diffusion, centrifuge, EMIS, chemical and ion exchange, aerodynamic isotope separation, reprocessing).*

Reprocessing.

- b. *Facility size (laboratory, pilot, commercial).*

Laboratory.

- c. *Is the facility under construction or in operation? If under construction, list the construction years. If in operation, list the years of operation.*

Construction began 1987.¹¹ Construction was completed in 2005. The facility did not become operational due to technical difficulties. Between 1987-1999, Iran used the uncompleted laboratory to separate Iodine-131 from small quantities of irradiated uranium targets.

- d. *Was the facility developed covertly? If so, identify years that facility was covert.*

Yes, from 1987 to around 2005.

- e. *Was the facility placed under IAEA safeguards? If so, identify the years that the facility was safeguarded.*

Safeguards were implemented at the facility in 2012.

- f. *Was the facility placed under regional safeguards? If so, identify the years that the facility was safeguarded.*

No.

- g. *Did the facility have a military purpose?*

Although we lack clear evidence either way, anecdotal evidence strongly suggests that this plant began operations at least partially for military purposes.

- h. *Was the facility multinational? If so, identify the other countries that were involved.*

No.

- i. *Was the facility built with foreign assistance? If so, list the supplier(s) and what they provided.*

No evidence of foreign assistance found, though it is a part of the TNRC. The TNRC received foreign nuclear assistance.

- j. *Sources:*

Alexander, Yonah, and Milton M. Hoenig. 2008. *The New Iranian Leadership*. London: Praeger Security International. 142.

¹¹ The construction start date and testing information is from Alexander and Milton (2008).

International Atomic Energy Agency. 2007. "Implementation of the NPT Safeguards Agreements in the Islamic Republic of Iran." Report by IAEA Director General. http://isis-online.org/uploads/isis-reports/documents/IAEA_Iran_Report_24February2012.pdf. Accessed 06/21/2015.

Institute for Science and International Security. "Tehran Nuclear Research Center." Nuclear Iran. <http://www.isisnucleariran.org/sites/by-type/category/tehran-nuclear-research-center/>. Accessed 06/21/2015.

Sinha, Shreeya and Susan C. Beachy. 2015. "Timeline on Iran's Nuclear Program." *New York Times*. Updated April 2, 2015. http://www.nytimes.com/interactive/2013/03/20/world/middleeast/Iran-nuclear-timeline.html#time243_8391. Accessed 06/21/2015.

8. Tehran Nuclear Research Center

- a. *ENR type (diffusion, centrifuge, EMIS, chemical and ion exchange, aerodynamic isotope separation, reprocessing).*

Reprocessing (hot cells).

- b. *Facility size (laboratory, pilot, commercial).*

Laboratory.

- c. *Is the facility under construction or in operation? If under construction, list the construction years. If in operation, list the years of operation.*

The TNRC was founded in 1967 with assistance from the US. Construction of the hot cell facility began in 1967. There may have been plutonium experiments at the facility from 1974-1979. The hot cell assemblies were dismantled in 1992 or 1993.

- d. *Was the facility developed covertly? If so, identify years that facility was covert.*

No.

- e. *Was the facility placed under IAEA safeguards? If so, identify the years that the facility was safeguarded.*

Yes, part of the complex would have been under safeguards following the 1974 safeguard agreement. It remains under safeguards.

- f. *Was the facility placed under regional safeguards? If so, identify the years that the facility was under regional safeguards.*

No.

g. *Did the facility have a military purpose?*

Iran claims to have only produced 200 micrograms of plutonium during the experiments. However, the IAEA asserts that more plutonium should have been produced during the experimental process than what is claimed. Although we lack clear evidence either way, anecdotal evidence strongly suggests that this plant began operations at least partially for military purposes.

h. *Was the facility multinational? If so, identify the other countries that were involved.*

No.

i. *Was the facility built with foreign assistance? If so, list the supplier(s) and what they provided.*

Yes, the United States provided technical assistance on the hot cell construction. The TNRC benefited from American assistance in the 1960s. In addition to a thermal reactor, the US also supplied hot cells to the facility in 1967.

j. *Sources:*

Ciricione, Joseph, Jon B. Wolfsthal, and Miriam Rajkumar. 2005. *Deadly Arsenals: Nuclear, Biological, and Chemical Threats*. Washington D.C.: Carnegie Endowment for International Peace.

Fitzpatrick, Mark. 2011. "Nuclear Capabilities in the Middle East." Presented at the EU Non-Proliferation Consortium.
<http://www.nonproliferation.eu/web/documents/backgroundpapers/fitzpatrick.pdf>. Accessed 06/21/2015. 4.

Flamini, Roland. 2007. "Iran's Nuclear Program Has a Long History." *World Politics Review*. <http://www.worldpoliticsreview.com/articles/524/irans-nuclear-program-has-a-long-history>. Accessed 06/21/2015.

Hassan, Hussein D. 2007. "Iranian Nuclear Sites." Congressional Research Service.
<http://www.fas.org/sgp/crs/nuke/RS22531.pdf>. Accessed 06/21/2015.

Iran Watch. "Iranian Entity: Teheran Nuclear Research Center."
<http://www.iranwatch.org/iranian-entities/teheran-nuclear-research-center-tnrc>. Accessed 06/21/2015.

Koch, Andrew and Jeanette Wolf. 1998. "Iran's Nuclear Facilities: A Profile." Center for Nonproliferation Studies. <http://cns.miis.edu/reports/pdfs/iranrpt.pdf>. Accessed 06/21/2015. 10-11.

Nikou, Semira N. "Timeline of Iran's Nuclear Activities." United States Institute of Peace: The Iran Primer. <http://iranprimer.usip.org/resource/timeline-irans-nuclear-activities>. Accessed 06/21/2015.

Nuclear Threat Initiative. 2013. "Tehran Research Reactor (TRR)." <http://www.nti.org/facilities/182/>. Accessed 06/21/2015.

9. Tehran Nuclear Research Center

- a. *ENR type (diffusion, centrifuge, EMIS, chemical and ion exchange, aerodynamic isotope separation, reprocessing).*

Enrichment, laser AVLIS.

- b. *Facility size (laboratory, pilot, commercial).*

Laboratory.

- c. *Is the facility under construction or in operation? If under construction, list the construction years. If in operation, list the years of operation.*

Construction of the lab began in 1991.¹² The facility conducted enrichment experiments from 1993 to 2000.¹³

- d. *Was the facility developed covertly? If so, identify years that facility was covert.*

No.

- e. *Was the facility placed under IAEA safeguards? If so, identify the years that the facility was safeguarded.*

Yes, part of the complex would have been under safeguards following the 1974 safeguard agreement. It remains under safeguards.

- f. *Was the facility placed under regional safeguards? If so, identify the years that the facility was under regional safeguards.*

No.

- g. *Did the facility have a military purpose?*

¹² Construction date is from NTI.

¹³ Iran Watch provides the years while NTI only states the early 1990s as the start year. NTI says no successful experiments after 1994.

Although we lack clear evidence either way, anecdotal evidence strongly suggests that this plant began operations at least partially for military purposes.

h. Was the facility multinational? If so, identify the other countries that were involved.

No.

i. Was the facility built with foreign assistance? If so, list the supplier(s) and what they provided.

Yes, China provided the separation equipment and expertise in operation. China provided a laser spectroscopy laboratory and comprehensive separation laboratory.

j. Sources:

Ciricione, Joseph, Jon B. Wolfsthal, and Miriam Rajkumar. 2005. *Deadly Arsenals: Nuclear, Biological, and Chemical Threats*. Washington D.C.: Carnegie Endowment for International Peace.

Fergusson, Charles D. and Jack Boureston. 2004. "Focusing on Iran's Laser Enrichment Program." FirstWatch International.

<http://www.iranwatch.org/privateviews/First%20Watch/perspex-fwi-Laser.pdf>.

Accessed 06/21/2015.

Flamini, Roland. 2007. "Iran's Nuclear Program Has a Long History." *World Politics Review*. <http://www.worldpoliticsreview.com/articles/524/irans-nuclear-program-has-a-long-history>. Accessed 06/21/2015.

Hassan, Hussein D. 2007. "Iranian Nuclear Sites." Congressional Research Service. <http://www.fas.org/sgp/crs/nuke/RS22531.pdf>. Accessed 06/21/2015.

Iran Watch. "Iranian Entity: Teheran Nuclear Research Center."

<http://www.iranwatch.org/iranian-entities/teheran-nuclear-research-center-tnrc>.

Accessed 06/21/2015.

Nikou, Semira N. "Timeline of Iran's Nuclear Activities." United States Institute of Peace: The Iran Primer. <http://iranprimer.usip.org/resource/timeline-irans-nuclear-activities>. Accessed 06/21/2015.

Nuclear Threat Initiative. 2013. "Tehran Nuclear Research Center."

<http://www.nti.org/facilities/265/>. Accessed 06/21/2015.

10. Plasma Physics Laboratories in Tehran (TNRC)

a. ENR type (diffusion, centrifuge, EMIS, chemical and ion exchange, aerodynamic isotope separation, reprocessing).

Enrichment, centrifuge.

- b. *Facility size (laboratory, pilot, commercial).*

Laboratory.

- c. *Is the facility under construction or in operation? If under construction, list the construction years. If in operation, list the years of operation.*

The construction start year could not be identified. The facility conducted centrifuge research from 1985 to 1997. The facility operated during the first phase of centrifuge research. Albright and Hinderstein state that the 1997 move of centrifuge research to Kalaye Electric in Tehran was due to the need for more security.¹⁴ We have doubts as to whether any enrichment occurred at this site.

- d. *Was the facility developed covertly? If so, identify years that facility was covert.*

The activities at this facility were potentially covert. ISIS states the gas centrifuge program at the Plasma Physics Department at the TNRC was started in secret in 1985.

- e. *Was the facility placed under IAEA safeguards? If so, identify the years that the facility was safeguarded.*

Probably. The facility is part of the TNCR complex, which is under safeguards.

- f. *Was the facility placed under regional safeguards? If so, identify the years that the facility was under regional safeguards.*

No.

- g. *Did the facility have a military purpose?*

Probably. The facility was designed to facility centrifuge enrichment that Iran claimed was to ensure fuel for the German built research reactor. However, most of the technology and machines from the site were shipped to Natanz in 1997.

- h. *Was the facility multinational? If so, identify the other countries that were involved.*

No.

- i. *Was the facility built with foreign assistance? If so, list the supplier(s) and what they provided.*

¹⁴ Iran Watch says operational from 1988-1995.

No evidence of foreign assistance found, though Iran received a large amount of assistance on centrifuges from the AQ Khan network. In 1987 Iran obtained centrifuge components, technical drawings, and a “starter kit” for a gas centrifuge plant from the network. From 1994 until 1996 Iran purchased more designs and component parts from the network.

j. Sources:

Albright, David and Corey Hinderstein. 2004. “The Centrifuge Connection.” *Bulletin of the Atomic Scientists*. 60(2): 61-66.

Albright, David, and Andrea Stricker. “Iran's Nuclear Program.” United States Institute of Peace. <http://iranprimer.usip.org/resource/irans-nuclear-program>. Accessed 06/21/2015.

Boureston, Jack. 2004. “Tracking the Technology.” *Nuclear Engineering International Magazine*. <http://www.neimagazine.com/features/featuretracking-the-technology/>. Accessed 06/21/2015.

Center for Nonproliferation Studies. “Foreign Suppliers to Iran’s Nuclear Development.” <http://cns.miis.edu/wmdme/flow/iran/enrich.htm>. Accessed 06/21/2015.

Institute for Science and International Security. “Tehran Nuclear Research Center.” Nuclear Iran. <http://www.isisnucleariran.org/sites/by-type/category/tehran-nuclear-research-center/>. Accessed 12/01/2015.

Koch, Andrew and Jeanette Wolf. 1998. “Iran’s Nuclear Facilities: A Profile.” Center for Nonproliferation Studies. <http://cns.miis.edu/reports/pdfs/iranrpt.pdf>. Accessed 06/21/2015. 12.

Sinha, Shreeya and Susan C. Beachy. 2015. “Timeline on Iran’s Nuclear Program.” *New York Times*. Updated April 2, 2015. http://www.nytimes.com/interactive/2013/03/20/world/middleeast/Iran-nuclear-timeline.html#/#time243_8391. Accessed 06/21/2015.

Additional Facility (Not included in dataset):

Un-named Enrichment Facility

- a. *ENR type (diffusion, centrifuge, EMIS, chemical and ion exchange, aerodynamic isotope separation, reprocessing).*

Enrichment, ion exchange.

- b. *Facility size (laboratory, pilot, commercial).*

Laboratory.

c. *Is the facility under construction or in operation? If under construction, list the construction years. If in operation, list the years of operation.*

d. *Was the facility developed covertly? If so, identify years that facility was covert.*

Yes, the facility developed covertly.

e. *Was the facility placed under IAEA safeguards? If so, identify the years that the facility was safeguarded.*

No.

f. *Was the facility placed under regional safeguards? If so, identify the years that the facility was under regional safeguards.*

No.

g. *Did the facility have a military purpose?*

Yes, the facility is probably part of the pursuit of nuclear weapons material.

h. *Was the facility multinational? If so, identify the other countries that were involved.*

No.

i. *Was the facility build with foreign assistance? If so, list the supplier(s) and what they provided.*

Yes, China provided the technology and significant training in nuclear technologies starting in the 1990's. Besides the calutrons, China's involvement with this particular facility is unclear. China was dissuaded from providing Iran with the final elements for a plutonium production reactor in 1992. The U.S. also convinced Argentina not to export fuel cycle and heavy-water production facilities to Iran.

j. *Sources:*

Albright, David, Frans Berkhout, and William Walker. 1997. *Plutonium and Highly Enriched Uranium 1996: World Inventories, Capabilities, and Policies*. Oxford, UK: Oxford University Press.

Cirincione, Joseph, Jon B. Wolfsthal, Miriam Rajkumar. 2005. *Deadly Arsenals: Nuclear, Biological, and Chemical Threats*. Washington, D.C.: Carnegie Endowment for International Peace.

Kroenig, Matthew. 2009. "Exporting the Bomb: Why States Provide Sensitive Nuclear Assistance." *American Political Science Review*. 103(1): 113-130.

Zentner, M.D., G.L. Coles, and R.J. Talbert. 2005. "Nuclear Proliferation Technology Trends Analysis" Pacific Northwest National Laboratory. Report 14480.
(cites Iran as interested electromagnetic isotope separation)

Additional Notes:

Zentner et al. (2005) inclusion of Iran as pursuing diffusion enrichment is due to Iran's 10% share of Eurodif ownership. Because of the facility-focused coding procedure, Eurodif is not included in this coding sheet for Iran. Iran's participation is listed under France where the multinational facility was built.