Laser Enrichment - Nuclear Sites

Karaj Agricultural and Medical Center

The IAEA first learned of Karaj from NCRI, which named the site and said it was related to gas centrifuge activities. The IAEA was initially denied access in May 2003, but finally was allowed to visit in August 2003.

Iran initially said that Karaj (also sometimes called Ramandeh) was primarily involved with agricultural studies said to be unrelated to nuclear fuel cycle activities. In October 2003, when Iran revealed the existence of the laser enrichment program, it declared that it had moved laser enrichment equipment from Lashkar Ab'ad to Karaj in May 2003. This material included uranium metal and a large vacuum vessel with associated hardware. Karaj also stored mass spectrometry equipment that had been used in support of AVLIS research. There is also radioactive waste storage at Karaj. Environmental samples were taken of all the equipment at Karaj.

For more information check: Related Reports

Lashkar Ab'ad - Laser Uranium Enrichment

Lashkar Ab'ad was Iran's secret pilot plant for laser isotope separation until 2003. This site contained equipment including copper vapor lasers (CVL) that were designed to produce enrichment levels of 3.5-7 percent. The IAEA reported that the facility would have been capable of highly enriched uranium (HEU) production once all planned equipment was installed. There were several foreign suppliers to Iran's laser enrichment program, including the United States, Germany, and Russia. For Lashkar Ab'ad, the most important supplier was Russia.

In 1998, Iran signed a contract with Russian entities to obtain information related to atomic vapor laser isotope separation (AVLIS) and for the supply of the relevant equipment for an undeclared pilot enrichment facility at Lashkar Ab'ad. However, as a result of U.S. pressure, the Russian government would not grant the Russian supplier with export permits for some of the equipment, in particular the copper vapor laser (up to 150 kW) and dye lasers, some collector parts, the electron beam gun, and the power sources.

The St. Petersburg Yefremov Institute (NIIEFA), which is part of Rosatom,

delivered one large vacuum chamber (5 meters long, 1 meter in diameter) equipped with some diagnostic equipment and diffusion pumps to create the high vacuum inside the chamber. The Russian supplier also provided some training, and documentation. This contract specified the delivery of a system that could produce enrichment levels of 3.5-7 percent and to "have actual production of at least 5 kg of a product within the first year after installation."[1]

IAEA experts assessed that the system in this contract could have made highly enriched uranium, albeit in very small quantities, if the entire package of equipment had been delivered.[2] The AVLIS vacuum vessel had a number of features specific to HEU separation work, including an ion trap for the extraction of ion impurities for increased HEU yield and a collector assembly designed for the relatively low throughput of HEU.

The failure to obtain export permits for the Russian-made lasers did not stop Iran. Independently, Iran had obtained from European suppliers a range of lasers, including dye and copper vapor lasers. It had earlier acquired 50 kilograms of natural uranium metal from China to use as the feed material for an AVLIS plant.

Iran installed its already procured copper vapor lasers and dye lasers with the large vacuum vessel at Lashkar Ab'ad in 2002. Iran conducted a total of four runs with uranium feed using a total of 500 grams of uranium metal from October 2002 through January 2003, achieving enrichment levels of 0.8 percent.

Iran took steps to conceal this facility from the IAEA, even after it was revealed publicly. The IAEA first asked to visit Lashkar Ab'ad in May 2003 after the National Council of Resistance of Iran (NCRI) identified the site and said it was related to gas centrifuge activities. Iran eventually allowed an inspection in August 2003, but it still tried to hide the true purpose of the facility. Iran initially declared that Lashkar Ab'ad was devoted to laser fusion research and laser spectroscopy, and claimed that its laser program was unrelated to uranium enrichment. Iran also claimed that no nuclear material had been involved in the experiments. In May 2003, prior to the IAEA visit, Iran moved some of the equipment and the natural uranium from Lashkar Ab'ad to the Karaj site to avoid detection by the IAEA.

In late October 2003, Iran changed its declaration and acknowledged to the IAEA that a pilot plant for laser enrichment had been established at Lashkar Ab'ad in 2000, after initial development work was conducted at the Tehran Nuclear Research Center (TNRC). Iran also admitted to doing laser enrichment experiments in violation of its safeguards agreement.

IAEA safeguards officials visited Lashkar Ab'ad in late 2007 or early 2008 and reported that the laboratories were run by a private company producing and developing laser equipment for industrial purposes according to the February 2008 Iran safeguards report. This report also noted that the former laser equipment has been dismantled, with some of it stored at the site. The IAEA added: "The management of the company

provided detailed information on current and planned activities, including plans for extensive new construction work, and stated that they are not carrying out, and are not planning, any uranium enrichment activities."

On February 7, 2011, however, Iranian President Mahmoud Ahmadinejad stated that Iran "possessed" uranium laser enrichment technology.[3] IAEA reports have since then reported on the inspectors unsuccessful efforts to determine if Iran's laser enrichment efforts have restarted.

For more information check: Related Reports

---

1 Director General, Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran, September 1, 2004, GOV/2004/60, Annex p. 8.
2 Ibid., Annex p. 8.
3 Olli Heinonen, "Laser Isotope Separation – The Genie is Out of the Bottle," Presentation to Harvard Kennedy School, July 10, 2012.