Nuclear Latency (NL) Dataset
Country Coding Sheets

ISRAEL
COW COUNTRY CODE: 666

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

1. Negev Nuclear Research Center, Dimona Machon 8
2. Negev Nuclear Research Center, Dimona Machon 9
3. Negev Nuclear Research Center, Dimona Machon 2
4. Nahal Soreq

Detailed Facility-Specific Information and Sources

1. Negev Nuclear Research Center, Dimona Machon 8

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 of the Dimona facility began in 1958 and it was officially identified as a nuclear site in 1960.[1] The Machon 8 construction date is unknown so the laboratory construction dates are used. The facility is considered operating from 1979[2] and is coded as continuing to operate.

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

Yes, the facility remains relatively secretive. However, a 1974 CIA memorandum refers to potential uranium enrichment facilities.

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

No.

[1] The construction dates are provided by the Federation of Nuclear Scientists.
[2] The operational dates are from Global Security, which states the facility maybe able to produce commercial quantities of HEU.

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 purported location houses an enrichment facility for Israel's nuclear weapons program. Israel's weapons are primarily plutonium-based.

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

No, the facility was Israeli owned and operated.

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

No, this facility is highly secretive. Hersh writes that Israeli scientists developed a method of gas centrifuge enrichment here. Spector also says the enrichment facilities at Dimona are Israeli in origin.

j. Sources:

Albright, David, Frans Berkhout and William Walker. 1997. *Plutonium and Highly Enriched Uranium 1996.* Oxford, UK: Oxford University Press. 254. http://books.sipri.org/files/books/SIPRI97AlBeWa/SIPRI97AlBeWa.pdf. Accessed 06/24/2015.

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

Department of Political and Security Council Affairs. 1982. *Study on Israeli Nuclear Armament.* New York City, NY: United Nations Centre for Disarmament.

Federation of American Scientists. "Israel: Nuclear Weapons." http://www.fas.org/nuke/guide/israel/nuke/. Accessed 06/24/2015.

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Hersh, Seymour M. 1991. *The Samson Option: Israel's Nuclear Arsenal and American Foreign Policy.* New York City, NY: Random House Publishing Group.

Nuclear Threat Initiative. "Negev Nuclear Research Center (NNRC)."

http://www.nti.org/facilities/418/. Accessed 06/24/2015.

Nuclear Weapons Archive. 1997. "Israel's Nuclear Weapons Program." http://nuclearweaponarchive.org/Israel/index.html. Accessed 06/24/2015.

Shipler, David K. 1986. "A-Arms Capacity of Israelis: A Topic Rich in Speculation." *The New York Times*. October 29.

Spector, Leonard S. and Jacqueline R. Smith. 1990. *Nuclear Ambitions*. Boulder, CO: Westview Press. 173.

Zentner, M.D., G.L. Coles, and R.J. Talbert. 2005. "Nuclear Proliferation Technology Trends Analysis." Pacific Northwest National Laboratory. Report 14480: 39.

—. "The Secrets of Israel's Nuclear Arsenal Revealed." *The Sunday Times.* October 5, 1986. http://www.thesundaytimes.co.uk/sto/news/world_news/article237419.ece. Accessed 06/24/2015.[3]

2. Negev Nuclear Research Center, Dimona Machon 9

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

Enrichment, laser.

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 this section of the facility began in 1972 and it became operational by 1974. The facility is believed to continue to operate based on the lack of evidence that the facility closed. Research in the 1980s indicates the facility was still operating in that decade.

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

Yes, the facility remains relatively secretive. However, a 1974 CIA memorandum refers to potential uranium enrichment facilities.

[3] This article appears to have also had the title of "Inside Dimona, Israel's nuclear bomb factory," and "How the experts were convinced," but the article titles all have the same date.

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 purported location houses an enrichment facility for their nuclear weapons program. Israel's weapons are primarily focused on plutonium.

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

No, the facility was Israeli owned and operated.

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

No the facility is indigenous. It is believed Machon 9 is a laser isotope facility for uranium enrichment. Farr writes, "In 1972, two Israeli scientists, Isaiah Nebenzahl and Menacehm Levin, developed a cheaper, faster uranium enrichment process. It used laser beam for isotope separation. It could reportedly enrich seven grams of Uranium 235 sixty percent in one day. Sources later reported that Israel was using both centrifuges and lasers to enrich uranium." Spector adds that the uranium enrichment facilities were indigenous.

j. *Sources*:

Albright, David, Frans Berkhout and William Walker. 1997. *Plutonium and Highly Enriched Uranium 1996.* Oxford, UK: Oxford University Press. 254. http://books.sipri.org/files/books/SIPRI97AlBeWa/SIPRI97AlBeWa.pdf. Accessed 06/24/2015.

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

Department of Political and Security Council Affairs. 1982. *Study on Israeli Nuclear Armament.* New York City, NY: United Nations Centre for Disarmament.

Farr, Warner D. 1999. "The Third Temple's Holy of Holies: Israel's Nuclear Weapons." The Counterproliferation Papers, USAF Counterproliferation

Center. http://www.fas.org/nuke/guide/israel/nuke/farr.htm. Accessed 06/25/2015.

Federation of American Scientists. "Israel: Nuclear Weapons." http://www.fas.org/nuke/guide/israel/nuke/. Accessed 06/24/2015.

Global Security. "Dimona: Negev Nuclear Research Center." http://www.globalsecurity.org/wmd/world/israel/dimona.htm. Accessed 06/24/2015.

Nuclear Threat Initiative. "Negev Nuclear Research Center (NNRC)." http://www.nti.org/facilities/418/. Accessed 06/24/2015.

Nuclear Weapons Archive. 1997. "Israel's Nuclear Weapons Program." http://nuclearweaponarchive.org/Israel/index.html. Accessed 06/24/2015.

Shipler, David K. 1986. "A-Arms Capacity of Israelis: A Topic Rich in Speculation." *The New York Times*. October 29.

Spector, Leonard S. and Jacqueline R. Smith. 1990. *Nuclear Ambitions*. Boulder, CO: Westview Press. 173.

Zentner, M.D., G.L. Coles, and R.J. Talbert. 2005. "Nuclear Proliferation Technology Trends Analysis." Pacific Northwest National Laboratory. Report 14480: 39.

—. "The Secrets of Israel's Nuclear Arsenal Revealed." *The Sunday Times.* October 5, 1986. http://www.thesundaytimes.co.uk/sto/news/world_news/article237419.ece. Accessed 06/24/2015.[4]

3. Negev Nuclear Research Center, Dimona Machon 2

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

Reprocessing.

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 of the facility began in 1957 and was completed in 1963. The facility began operation in 1963[5] and is potentially still operating.

[4] This article appears to have also had the title of "Inside Dimona, Israel's nuclear bomb factory," and "How the experts were convinced," but the article titles all have the same date.

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

Yes, the facility was covert as it was part of the nuclear weapons program.

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 reprocessing facility is used to reprocess material from the production reactor at Dimona. It is believed that the reactor at the facility largely produces tritium but is also efficient plutonium producer. The facility was primarily responsible for plutonium production for the weapons program. According to Mordechai Vanunu, an Israeli nuclear technician that provided details of the nuclear program, the reprocessing facility potentially produced 800 kilograms prior to 1992—enough for 150 weapons. The production reactor continues to operate in Israel at Dimona.

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, In 1957 Israel signed an agreement with a French firm for the construction of facilities at Dimona including an installation for plutonium extraction. As part of this agreement, France also provided information on the design and manufacturing process for nuclear weapons. It is thought that the French "knowingly assisted Israel" in the construction of Machon 2, and that this support was both technical and industrial in nature (Cochran). Fitzpatrick notes, "The Dimona project included all the technological components required for enabling Israel to achieve a plutonium-based nuclear weapons infrastructure within about a decade" (Fitzpatrick). The French-assisted project reportedly included a secret underground reprocessing plant for producing weapons-grade plutonium.

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[5] The 1963 date is from the Ciricione et al. while Barnby states that the reprocessing facility began operating in 1966. Cohen (2002) is the original citation for Zentner et al.'s start year of operations. NTI says French contractors left the site in 1965 and the plant became operational in 1965 or 1966.

j. Sources:

Barnaby, Frank. 1993. "How Nuclear Weapons Spread: Nuclear-Weapon Proliferation in 1990's." New York City, NY: Routledge. 70.

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

Cochran, Thomas B. 1996. "Democracy, Disarmament and Human Rights: The Case of Mordechai Vannu." Natural Resources Defense Council, Presented at the International Conference. http://docs.nrdc.org/nuclear/files/nuc_10149601a_174.pdf. Accessed 06/25/2015. 2.

Cohen, Avner. 1998. *Israel and the Bomb*. New York City, NY: Colombia University Press.

Federation of American Scientists. "Israel: Nuclear Weapons." http://www.fas.org/nuke/guide/israel/nuke/. Accessed 06/24/2015.

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. 2.

Global Security. "Dimona: Negev Nuclear Research Center." http://www.globalsecurity.org/wmd/world/israel/dimona.htm. Accessed 06/24/2015.

International Panel on Fissile Materials. 2011. "Global Fissile Material Report 2011." http://fissilematerials.org/library/gfmr11.pdf. Accessed 06/25/2015.

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Nuclear Weapons Archive. 1997. "Israel's Nuclear Weapons Program." http://nuclearweaponarchive.org/Israel/index.html. Accessed 06/24/2015.

Oak Ridge National Laboratory. 2007. "Profile of World Uranium Enrichment Programs."

Zentner, M.D., G.L. Coles, and R.J. Talbert. 2005. "Nuclear Proliferation Technology Trends Analysis." Pacific Northwest National Laboratory. Report 14480: 107.

4. Nahal Soreq

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

Reprocessing.

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 could not be identified. The facility started operating in 1983 and is believed to continue to operate.

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

Yes, the facility activities remain secret. The facility has been compared to the Los Alamos in the US as part of the nuclear weapon infrastructure.

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

No, only limited aspects of Israel's nuclear infrastructure are under safeguards. For example, the Soreq reactor was placed under IAEA safeguards in 1955.

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, but the exact nature of activities at this facility is not well documented.

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

The facility was largely developed indigenously.

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

No, the facility was not built with foreign assistance. The assistance that Israel received from the US and France probably supported this facility but direct evidence of support was not found. There is very little information available about the reprocessing plant.

j. Sources:

Attiq-ur-Rehman and Syed Shahid Hussain Bukhari. 2011. "Israel's Nuclear Program: An Analysis of International Assistance." *Berkeley Journal of Social Sciences.* 1(3).

Carengie Endowment For International Peace. "Israel." http://www.carnegieendowment.org/static/npp/chapters/13-Israel.pdf

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

Cohen, Avner. 1998. *Israel Builds the Bomb.* Ithaca, NY*:* Columbia University Press.

Global Security. "Nahal Soreq Nuclear Research Center." http://www.globalsecurity.org/wmd/world/israel/soreq.htm. Accessed 06/25/2015.

Kroenig, Matthew. "Importing the Bomb: Sensitive Nuclear Assistance and Nuclear Proliferation." The Belfer Center. http://belfercenter.ksg.harvard.edu/files/uploads/Kroenig_Importing_the_Bomb.pdf. Accessed 06/25/2015. 11.

Spector, Leonard S. and Jacqueline R. Smith. 1990. *Nuclear Ambitions*. Boulder, CO: Westview Press. 173.

Additional notes:

Insight into Dimona is based largely on information provided by Mordechai Vanunu in 1986. Declassified CIA memorandums from the 1970s demonstrate the US knew considerably more than what was publicly reported.

The Rotem Fertilizer Plant does not meet our coding requirements. The recovery of uranium with phosphates may or may not be tied to enrichment and reprocessing. Strict coding procedures for enrichment and reprocessing exclude production of fertilizer. There are potentially upwards of 400 fertilizer facilities. The uranium is actually a bi-product of the separation process and is not the objective of extraction. It is possible that the recovered natural uranium could then be enriched but without efforts of enrichment, the fertilizer separation is not considered ENR activity.