

Nuclear Latency (NL) Dataset
Country Coding Sheets

NETHERLANDS

COW COUNTRY CODE: 210

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

1. Almelo SP1 (Dutch)
2. Almelo SP2 (German Plant adjacent to the Dutch one in Almelo)
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4. Almelo SP4
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Detailed Facility-Specific Information and Sources

1. Almelo SP1 (Dutch)

- 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 1971,¹ the facility started limited production in 1973,² and it reached full production in 1976.³ The facility closed in the middle of 1981.

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

No, the facility was not developed covertly.

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

¹ Zentner et al. provide the construction start date. Laughter lists 1972 and a third document suggests 1970 ("Theoretical Energy Required Per SWU Using Gaseous Diffusion" <http://fti.neep.wisc.edu/neep423/FALL99/lecture8.pdf>). Zentner et al's date is used as the start date to remain consistent with coding expectations.

² The IAEA lists the facility beginning operation in 1973. The Institute for Energy and Environmental Research report also lists 1973 the beginning date while Zentner et al. list 1972.

³ The 1976 date was reaffirmed by Laughter.

Yes, the facility was under IAEA safeguards from 1977 forward. The Urenco report states, “while full safeguard arrangements have still to be implemented, the Urenco/Centec safeguard approach has been extensively examined by the IAEA Technical Advisory Group.”

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

Yes, the Netherlands signed the Euratom agreement in 1958. Safeguards apply to all civilian facilities once the agreement is signed.

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

No, the facility did not have a military purpose.

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

Yes, the facility is owned by Urenco with other partner countries including Germany and the UK.

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

Yes, The facilities were collaborative efforts by the three members of Urenco. The Almelo Treaty (signed March 4, 1970), which created URENCO, allowed for collaboration between Germany, the Netherlands, and the UK. The major shareholders are BNFL, Ultra-Centrifuge Netherlands, and Uranit (Germany). The three nations agreed to “co-operate in the development of the gas centrifuge process for uranium enrichment and on the construction and operation of uranium enrichment facilities, based upon the gas centrifuge, for nuclear energy applications” (Krass). One of the initial pilot facilities built in the Netherlands was actually constructed by Germany.

- j. *Sources:*

Hibbs, Mark and Christian Rengifo. 2013. “Would Urenco’s Sale Pose a Proliferation Risk?” *The Global Think Tank*. <http://carnegieendowment.org/2013/10/21/would-urencos-sale-pose-proliferation-risk/gqto?reloadFlag=1>. Accessed 06/29/2015.

International Atomic Energy Agency. “Integrated Nuclear Fuel Cycle Information Systems.” <https://infcis.iaea.org>. Accessed 06/08/2015.

Krass, Allan S., Peter Boskma, Boelie Elzen, and Wim A. Smit. 2008. “Chapter 8: The World Enrichment Picture.” In *Uranium Enrichment and Nuclear Weapons*

Proliferation. London, UK: Taylor & Francis Ltd.
<http://books.sipri.org/files/books/SIPRI83Krass/SIPRI83Krass08.pdf>.

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

Parry, J.V. 1982. "Status Report on URENCO's Progress and Plan." *The American Institute of Chemical Engineers*. 221(78): 18-23.

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

2. Almelo SP2 (German Plant adjacent to the Dutch one in Almelo)

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

Uranium 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 started in 1971. Production began in 1973⁴ with full production starting in 1976. The facility closed in 1981.⁵

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

No, the facility was publically announced.

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

Yes. the Netherlands and the IAEA INFCIRC/193 was signed in 1977. Additional protocols were signed in 2004. (The one-year discrepancy was covered by the Euratom Agreement, which is typically enforced through the IAEA).

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

⁴ The IAEA lists the facility beginning operation in 1973. The Institute for Energy and Environmental Research report also lists 1973 as the beginning date while Zentner et al. list 1972.

⁵ Date established through private correspondence with a Urenco representative.

Yes.

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

No, the facilities are civilian owned and operated.

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

Yes, Urenco owns the facility with other partner countries including Germany and the UK. This particular plant was German constructed. It also operated longer than the Dutch plant to gather more information.

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

Yes, the Almelo Treaty (signed March 4, 1970), which created Urenco, allowed for collaboration between Germany, the Netherlands, and the UK.

j. *Sources:*

Krass, Allan S., Peter Boskma, Boelie Elzen, and Wim A. Smit. 2008. "Chapter 8: The World Enrichment Picture." In *Uranium Enrichment and Nuclear Weapons Proliferation*. London, UK: Taylor & Francis Ltd.
<http://books.sipri.org/files/books/SIPRI83Krass/SIPRI83Krass08.pdf>

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

3. Almelo SP3 Demonstration

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? List the start and end year for construction and operation.*

Construction of the facility began in 1974 and was completed in 1980. The facility operated from 1980 to 2005.⁶ The facility is no longer operating.

⁶ The 2005 decommissioning date is from a Urenco report which states 2005 was the year of completion of the inactive decommissioning of the facility. The facility was actively decommissioned in 2006.

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, the facility was under IAEA safeguards from 1980 forward. The Urenco document states, “while full safeguard arrangements have still to be implemented, the Urenco/Centec safeguard approach has been extensively examined by the IAEA Technical Advisory Group.” Additional protocols were signed in 2004.

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

Yes, the Netherlands signed Euratom in 1958. Safeguards apply to all civilian facilities once the agreement is signed. The Netherlands has allowed HSP safeguards since 1983.

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

No, the facilities civilian own and operated.

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

Yes, Urenco owns the facility with other partner countries including Germany and the UK.

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

Yes.

j. *Sources:*

Aaldijk et al., 1987. “Gamma Techniques for IAEA Safeguards at Centrifuge Enrichment Cascades.” *Transactions of the American Nuclear Society*. Third International Conference on Facility Operations-Safeguards Interface, San Diego, CA. 55(1): 13.

Hibbs, Mark. 1993. “Urenco Expects November Decision on Licensing of Almelo Expansion.” *Nuclear Fuel*. 18(12): 15.

International Atomic Energy Agency. “Integrated Nuclear Fuel Cycle Information Systems.” <https://infcis.iaea.org>. Accessed 06/08/2015.

Krass, Allan S., Peter Boskma, Boelie Elzen, and Wim A. Smit. 2008. "Chapter 8: The World Enrichment Picture." In *Uranium Enrichment and Nuclear Weapons Proliferation*. London, UK: Taylor & Francis Ltd.
<http://books.sipri.org/files/books/SIPRI83Krass/SIPRI83Krass08.pdf>.

Makhijani, Arjun, Lois Chalmers, and Brice Smith. 2004. "Uranium Enrichment: Just Plain Facts to Fuel an Informed Debate on Nuclear Proliferation and Nuclear Power." Institute for Energy and Environmental Research. Nuclear Policy Research Institute.

Parry, J.V. 1982. "Status Report on Urenco's Progress and Plan." *The American Institute of Chemical Engineers*. 221(78): 18-23.

Urenco. 2007. "Sustainability Report 2006/07." Urenco Sustainability Report 2006/07.

4. Almelo SP4

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? List the start and end year for construction and operation.*

Construction of the facility began in 1979 and it began operation in 1981. The facility continues to operate.

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, the facility was under IAEA safeguards from the beginning of operation.

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

Yes.

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

No, the facilities are civilian owned and operated.

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

Yes, the facility is owned by Urenco with other partner countries including Germany and the UK.

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

Yes.

j. *Sources:*

Aaldijk et al. 1987. "Gamma Techniques for IAEA Safeguards at Centrifuge Enrichment Cascades." *Transactions of the American Nuclear Society*. Third International Conference on Facility Operations-Safeguards Interface, San Diego, CA. 55(1): 13.

Heriot, I.D. 1988. "Uranium Enrichment by Gas Centrifuge." *Nuclear Science and Technology*. Commission of the European Community.

International Atomic Energy Agency. "Integrated Nuclear Fuel Cycle Information Systems." <https://infcis.iaea.org>. Accessed 06/08/2015.

Krass, Allan S., Peter Boskma, Boelie Elzen, and Wim A. Smit. 2008. "Chapter 8: The World Enrichment Picture." In *Uranium Enrichment and Nuclear Weapons Proliferation*. London, UK: Taylor & Francis Ltd.
<http://books.sipri.org/files/books/SIPRI83Krass/SIPRI83Krass08.pdf>.

Makhijani, Arjun, Lois Chalmers, and Brice Smith. 2004. "Uranium Enrichment: Just Plain Facts to Fuel an Informed Debate on Nuclear Proliferation and Nuclear Power." Institute for Energy and Environmental Research. Nuclear Policy Research Institute.

Parry, J.V. 1982. "Status Report on Urenco's Progress and Plan." *The American Institute of Chemical Engineers*. 221(78): 18-23.

—. 1990. "More DOE SWU Competitor Profiles from Recent Smith Barney Report." *Nuclear Fuel*. 15(14): 4.

5. Almelo SP5

- 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? List the start and end year for construction and operation.*

Construction of the facility began 1999 when the license was issued. The facility became operational in 2000.⁷

- 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, the facility was under IAEA safeguards.

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

Yes.

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

No, the facilities are civilian owned and operated.

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

Yes, Urenco owns the facility with other partner countries including Germany and the UK.

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

Yes.

⁷ There is considerable disagreement about when the facility became operational. The IAEA profile overview of the Netherlands, ORNL, Urenco, and Knapik give 2000 as the operational start date. The NRC lists the facility as still under construction in 2002. Ceremonial openings of Hall 5 did not occur until 2008.

j. Sources:

Aaldijk et al., 1987. "Gamma Techniques for IAEA Safeguards at Centrifuge Enrichment Cascades." *Transactions of the American Nuclear Society*. Third International Conference on Facility Operations-Safeguards Interface, San Diego, CA. 55(1): 13.

International Atomic Energy Agency. "Country Profiles: The Netherlands." http://www-pub.iaea.org/mtcd/publications/pdf/cnpp2003/cnpp_webpage/PDF/2002/Documents/Documents/Netherlands%202002.pdf. Accessed 06/29/2015.

International Atomic Energy Agency. "Integrated Nuclear Fuel Cycle Information Systems." <https://infcis.iaea.org>. Accessed 06/08/2015.

Knapik, Michael. 2000. "HEU Shipments Resume; Urenco Revenue Grows; First U Deal Done On-line." *Nuclear Fuel*. 25(14): 2.

Krass, Allan S., Peter Boskma, Boelie Elzen, and Wim A. Smit. 2008. "Chapter 8: The World Enrichment Picture." In *Uranium Enrichment and Nuclear Weapons Proliferation*. London, UK: Taylor & Francis Ltd.
<http://books.sipri.org/files/books/SIPRI83Krass/SIPRI83Krass08.pdf>.

Makhijani, Arjun, Lois Chalmers, and Brice Smith. 2004. "Uranium Enrichment: Just Plain Facts to Fuel an Informed Debate on Nuclear Proliferation and Nuclear Power." Institute for Energy and Environmental Research. Nuclear Policy Research Institute.

Parry, J.V. 1982. "Status Report on Urenco's Progress and Plan." *The American Institute of Chemical Engineers*. 221(78): 18-23.

Additional Note:

It appears as though the Urenco facility will soon be entirely privately owned. While previously held jointly by the three countries, all three have announced intentions to sell their stakes in the facility. This could have implications for the multinational nature of the facility (WNN).

—. 2013. "Netherlands to Sell Urenco stake." *World Nuclear News*.
http://www.world-nuclear-news.org/c-netherlands_to_sell_urenco_stake-2405134.html.