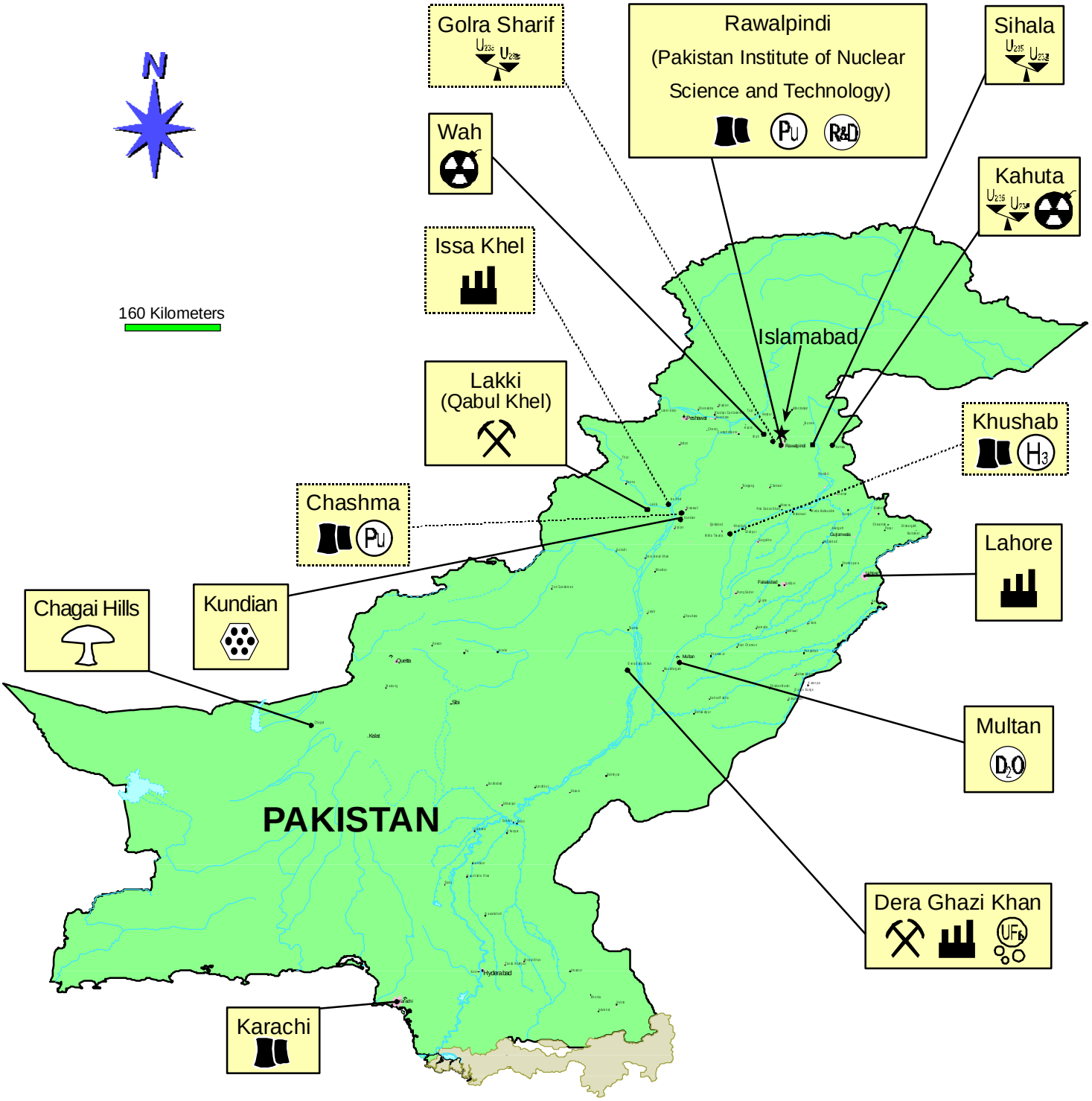
PAKISTAN'S NUCLEAR-RELATED FACILITIES



Center for Nonproliferation Studies

Fact Sheet

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Karachi

The Karachi Nuclear Power Plant (Kanupp) is a 137 MWe CANDU pressurized heavy water reactor (PHWR) that is fueled by natural uranium. Kanupp was supplied by Atomic Energy of Canada, Ltd. (AECL) and is under IAEA safeguards. The plant, owned and managed by the Pakistan Atomic Energy Commission (PAEC), became fully operational on 10/4/72. The facility is the site of a heavy water upgrading plant with a 15 MT per year capacity[1] as well as the Karachi Nuclear Power Training Center,[2] established in 1973.[3]

Chashma

Chashma-1 is a 300 MW pressurized water reactor (PWR) being built by the China National Nuclear Corporation. Work on the facility began in 1993 and is expected to be completed in late 1997;[4] the facility is expected to be commissioned in 10/98.[5] Chashma will be placed under IAEA safeguards.[6] Pakistan has proposed building a second 300 MW PWR at the site, and China has agreed in principle to build a Chashma-2 reactor if financing is secured.[7]

Pakistan has a partially built plutonium reprocessing plant at Chashma, construction of which was started by France, but abandoned in 1978. Some US intelligence officials believe the facility is being completed either indigenously or with Chinese assistance,[8] but China could be working on a fuel fabrication facility instead.[9] The contract for the Chashma-1 reactor stipulates that China will provide Pakistan with a fuel fabrication facility. The facility may be part of activities undertaken by staff at the Pakistan Institute of Nuclear Science and Technology's (PINSTECH) "New Labs" reprocessing facility.[10]

Sihala

Sihala is the site of an ultracentrifuge pilot-plant[11] for enriching uranium. It reportedly has a 54-centrifuge cascade that is not safeguarded.[12]

Khushab (Khusab)

Khushab is a 40 MWt* heavy water reactor (HWR) being built with Chinese assistance.[13] The reactor was expected to be completed by the end of 1996.[14] It is possible that the unsafeguarded reactor may be the site of a tritium production facility.[15]

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* Some estimates say Khushab is a 50-70 MWt research reactor. See Leonard Spector, Mark McDonough, and Evan Medeiros, Tracking Nuclear Proliferation: A Guide in Maps and Charts 1995 (Washington, D.C.: Carnegie Endowment for International Peace, 1995), p. 101.

Tritium production facility

In 1987, Pakistan acquired a tritium purification and production facility--which can produce up to 5-10 grams of tritium per day--from West Germany.[16] The equipment may have been tested in 1987 at a secret location 150 km south of Rawalpindi (Khushab is 150 miles SW), using lithium-6 targets irradiated in the PARR-1 research reactor.[17] Tritium can be produced by irradiating lithium-6 targets in a reactor and then processing those targets in a separate plant.

Kahuta

The Kahuta facility is the hub of Pakistan's nuclear weapons program. The site contains an unsafeguarded uranium enrichment plant using centrifuge technology based on Urenco G-1 and G-2 designs which were stolen by A.Q. Khan. Kahuta is the location of the Dr. A.Q. Khan Research Laboratory, formerly called the Engineering Research Laboratory (also know as the Project 706 Engineering Research Laboratory), which began operations in 1984.[18] The facility may also be the site where highly enriched uranium (HEU) is formed into weapon cores.[19] The enrichment facility has an estimated 3,000 centrifuges in operation, giving a capacity of 9,000-15,000 SWU, which can produce 55-95 kg of HEU per year.[20] Khan Research Laboratory has some capability to produce centrifuge components.

Golra Sharif

Located 15 km from Islamabad, this site reportedly houses an unsafeguarded centrifuge uranium enrichment plant.[21] Western intelligence sources are reported to have claimed in 1987 that satellite imagery indicated a uranium enrichment facility was being constructed at Golra. It is not clear, however, that the facility was ever completed or became operational.[22] The facility may be used to test advanced centrifuge designs before they are installed at the larger Kahuta facility.[23]

Wah

The region in and around Wah is home to the military-run Pakistan Ordnance Factory, where the Pakistani Army builds conventional weapons. In the area is a large machine tool complex at Taxila,[24] called the Heavy Mechanical Complex (HMC).[25] Taxila is also home to the Heavy Rebuild Factory (HRF), which China helped establish to overhaul Chinese-built heavy conventional weapons, and the Heavy Forge Factory (HFF).[26] A unit for developing a nuclear device was reportedly established at one of these facilities, which would likely be the location for any weaponization work due to the factory's expertise in fuzing, high explosives, and heavy machining.[27]

Pakistan Institute of Nuclear Science and Technology (PINSTECH)

In Rawalpindi, PINSTECH is the centerpiece of Pakistan's open nuclear research and development program. PINSTECH houses two small reactors, called Pakistan Atomic Research Reactor (PARR). PARR-1 is a 10 MW high flux, pool-type research reactor supplied by the US in 1965[28] and was upgraded from 5 MW. Under IAEA safeguards, PARR-1 originally used uranium enriched to 90%, but has been converted to use 20% enriched uranium.[29] Lithium-6 targets were reportedly irradiated in PARR-1 on a test basis for later use in a tritium separation facility. PARR-2 is a 27 kWt pool-type light-water research reactor that was supplied by China in 1989 and is under IAEA safeguards.[30] The reactor is fueled by 1 kg of HEU supplied by China.[31]

New Laboratories (New Labs) is an experimental-scale plutonium reprocessing plant[32] that can reprocess 10-20 kg of plutonium per year.[33] Based on a French design, construction of the unsafeguarded facility began in 1976 and reportedly has been completed.[34] "Cold" tests were conducted at New Labs as early as 1982,[35] and in 1987 West German intelligence said the facility previously conducted "hot" tests.[36]

PINSTECH also houses a small-scale reprocessing laboratory that uses a solvent extraction method,[37] as well as the Nuclear Track Detection Laboratory, which conducts uranium exploration.[38]

The Center for Nuclear Studies is Pakistan's major training school,[39] degrees from which are awarded at Quaid-i-Azam University in Islamabad.[40]

Dera Ghazi Khan

Dera Ghazi Khan is the site of a uranium hexaflouride (UF6) conversion plant that has a yearly production capacity of 200 MT and is not under IAEA safeguards.[41] A uranium milling site, which can produce up to 30 MT per year of U3O8 (yellowcake), is also located in Dera Ghazi Khan province.[42]

The Baghalchar uranium mining site is located 50 km from the mill. Although the mine has a reported capacity of 23 MT of uranium per year, the uranium deposits there may be nearing exhaustion.[43] Pakistan’s Economic Coordination Committee has approved $7.18 million to conduct uranium exploration in Nangar Ani (north and south), Khura-Murghan Zai, and Pitok-Sori Gorakh, all in Dera Ghazi Khan province.[44]

Lahore

The Atomic Energy Minerals Center, which oversees Pakistan's uranium development efforts, and houses a pilot-scale uranium mill, is located here.[45]

Kundian

Located near the Chashma reactor, Kundian is the site of fuel fabrication facility which can process 24 MT of natural uranium per year. The facility, which began operations in 1979, manufactures fuel for Kanupp and is not under safeguards.[46] The site may also house a small zirconium oxide and Zircaloy-4 production plant.[47]

Multan

Reported site of an unsafeguarded heavy water production facility supplied by Belgium in 1980, with a 13 MT per year capacity.[48]

Chagai Hills

Chagai hills is the site where Pakistan would likely conduct a nuclear test.[49] It is also the location where Pakistan conducted "cold" tests on a nuclear implosion device in 1986.[50] A nearby airbase alleged houses a facility for storing nuclear weapons-related material.[51]

Qabul Khel

The Qabul Khel uranium mine is located near Lakki in the North West Frontier Province.[52]

Issa Khel

A proposed uranium mill at Issa Khel in the Mianwali district of Punjab province is connected to the nearby Qabul Khel uranium mine by a railroad.[53]

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CNSDATA Abstracts

Document No. 773

Bibliography: **NUCLEONICS WEEK, 11/13/86, PP. 3-4: SHAHID-UR-REHMAN**

Headline: **ZIA ORDERS PAKISTAN AEC TO DESIGN INDIGENOUS NUCLEAR REACTOR**

INTERACTIVE ABSTRACT:

Pakistan and the PRC signed a comprehensive nuclear cooperation agreement in 9/86 that envisions cooperation in reactor design and construction. Top Pakistani scientists say that work in that direction has begun. Pakistan failed to purchase from western suppliers a 900 MW power reactor to be built at Chashma, although the civil work for the plant has been completed by Belgatome of Belgium. Pakistan's President Zia ul-Haq said on 11/08/86 that Pakistan would welcome cooperation from any country in its nuclear program. Any new contemplated reactor would be a heavy water reactor like the one supplied by Canada for the Kanupp project.

COUNTRY ABSTRACT:

Pakistani President Zia ul-Haq, on 11/86, formally directed the Pakistan Atomic Energy Commission (PAEC) to begin work on design and manufacture of an indigenous, inherently safe nuclear reactor to meet the country's growing energy requirements. The PAEC exhibition at Lahore in 11/86 highlighted mining of zirconium and uranium and preparation of zirconium alloys in Pakistan. At Kanupp, Pakistan has indigenously manufactured a heavy water upgrading plant. Pakistan received a heavy water reactor from Canada, but in 1974 Canada imposed an embargo on all nuclear cooperation with Pakistan.

Document No. 887

Bibliography: **WORLDWIDE REPORT, 5/23/86, PP. 78-79**

Headline: **NUCLEAR ENERGY AIMS REVIEWED, DEFENDED**

Orig. Source: **DAWN (KARACHI), 4/7/85, P. 7**

INTERACTIVE ABSTRACT:

Pakistan floated international tenders for the 900 MW Chashma nuclear power plant in 1983 and it was subsequentially stated that the Pakistan Atomic Energy Commission (PAEC) authorities were negotiating with several reactor suppliers in Europe. Canada supplied the reactor, equipment and heavy water to India which India used to make the nuclear device it exploded in 1974, but punished Pakistan for the explosion. In 12/76 Canada abrogated its agreement with Pakistan for the supply of nuclear fuel, spares and safety information to the Karachi Nuclear Power Plant (KANUPP), which had been designed, constructed and installed by the Canadian General Electric Company in 1965-72.

COUNTRY ABSTRACT:

Pakistan's 900 MW Chashma Nuclear Power Plant (CHASNUPP), which the Chairman of the Pakistan Atomic Energy Commission (PAEC), Munir Ahmad Khan, said he hoped would be built by the "early 1990s" requires enriched uranium. Pakistan's Karachi Nuclear Power Plant (KANUPP) is heavy water moderated. The US allegedly pressured all Western reactor suppliers in the informal suppliers' club not to supply Pakistan with any nuclear reactor, parts or equipment. In 12/76 the Ottawa government of Canada abrogated its agreement with Pakistan for the supply of nuclear fuel, spares and safety to the KANUPP, following actions in 1974 after India's explosion. Backed by extensive uranium exploration in northern Pakistan and mining at Lahore, Pakistan has been able to manufacture fuel bundles for the nuclear power reactor and thus has mastered the technology of the front end of the nuclear fuel cycle. KANUPP operates under full IAEA safeguards as will CHASHNUPP according to the article.

Document No. 1680

Bibliography: **THE TIMES OF INDIA (BOMBAY), 11/6/86, PP. 1,9 BY BHARAT BHUSHA**

Headline: **PAK BOMB'S BLACK MARKET ROUTE**

INTERACTIVE ABSTRACT:

In 1973, Pakistan sought plutonium reprocessing technology for a plant to be set up at Chashma from SGN of France, but the controversial deal was finally scrapped under US pressure in 1979. By 1979, Pakistan had acquired as much as 100 tons of unsafeguarded uranium oxide concentrate or "yellowcake" from Libya, which the latter had purchased from Niger. Between 11/76 and 3/77, Albrecht Migule, head of the FRG engineering firm CES Kalthoff Gmbh, purchased uranium hexafluoride plant equipment from a number of FRG firms, transported it to Pakistan and persuaded his FRG associates to help assemble the uranium hexafluoride plant at Dera Ghazi Khan for $6 million. The FRG-trained Pakistani metallurgist, Dr. Abdul Qadir Khan worked in the Netherlands between 1972-75 for FDO, a subcontractor of URENCO, a uranium consortium owned by the FRG, UK and the Netherlands, and from mid-1974 onwards he is believed to have passed on URENCO's classified enrichment know-how to Pakistan. While in Pakistan, Dr. Khan twice sought, and was refused, enrichment related know-how from his FDO colleagues. Dr. Khan was later tried on espionage charges, but acquitted by the Dutch Supreme Court. In 1977, the FDO illegally sold Pakistan a specially designed, computerized measuring machinery originally meant for URENCO's enrichment plant. Around the same time, another Dutch firm, partially owned by the Dutch government, supplied 6,500 specially hardened steel tubes to Pakistan which served as the actual centrifuges for the uranium enrichment plant, despite several warnings from the government not to do so. During the late 1970's and early 1980's, Henk Selbos, one of Dr. Khan's purchasing agents, supplied Pakistan with various aluminium-hardened steel balls which could be used for the bases of the Kahuta centrifuge. In 1983, Selbos was caught by Dutch customs agents while trying to smuggle a US made high-speed oscilloscope to Pakistan. Pakistan legally purchased high vacuum valves for their

enrichment plant from Vakuum Apparat Technik of Switzerland. From another Swiss firm, CORA Engineering, Pakistan bought a sophisticated gassification and solidification unit which feeds uranium hexaflouride gas into the centrifuges and then transforms it back into a solid at the end of the centrifuge process. Leybold Heraeus of Hanan, FRG sold Pakistan vacuum pumps and equipment for gas purification used in uranium enrichment in 1977. Aluminium Walzwerse of Singen, FRG supplied rolled aluminium rods and about 10,000 aluminium parts specially welded according to plans supplied by Pakistan. In 1977, Pakistan attempted to buy 10,000 bellows for the ultracentrifuge from France, but the French customs forbade the sale. However, it is believed that a part of the order was sent through a firm in Belgium along with dyes to enable Pakistan to make the rest indigenously. Also in 1977, Pakistan ordered and received 30 high frequency invertors for controlling the speed of the fast-spinning centrifuges from the UK's Weargate Ltd., a subsidiary of Emerson Electric of the US. A second order of 60 invertors was placed through Weargate "had" Team Industries of Leonberg, FRG, but could not be fulfilled. A separate attempt was made to buy invertor parts and sub-assemblies from the UK, but it also failed. In 1980 Canadian customs arrested Abdul Aziz Khan and his two accomplices for attempting to smuggle 19 boxes of invertor components purchased from US and Canadian companies. Nine previous illegal shipments had eluded Canadian customs however. A Pakistani, Nazi Ahmed Vaid, was arrested by US customs officials in 6/84 for trying to smuggle 50 KN-22 krytrons. However, an ABC report on 7/11/85 said that Pakistan used a US-made krytron to detonate a non-nuclear triggering package for a nuclear weapon.

COUNTRY ABSTRACT:

Pakistan has developed both complex engineering capabilities to produce weapons-grade nuclear material and the ability to assemble and test the non-nuclear components of the weapon. Pakistan apparently mastered the relatively difficult enriched uranium route to produce a nuclear bomb using the ultracentrifuge method. Pakistan initially attempted to produce pure plutonium from the spent fuel of its heavy water/natural uranium reactor

Karachi. In its pursuit of enriched uranium, Pakistan had by 1979 acquired as much as 100 tons of unsafeguarded uranium oxide concentrate or "yellowcake" from Libya which the latter had purchased from Niger. Albrecht Migule, head of the FRG engineering firm CES Kalthoff GmbH purchased the equipment for a uranium hexafluoride plant from FRG companies, transported it to Pakistan, and persuaded his FRG associates to help assemble the plant at Dera Ghazi Khan. Simultaneously Dr. Abdul Qadir Khan was beginning Pakistan's secret "project 706" to set up the ultracentrifuges to convert uranium hexafluoride from its Dera Ghazi Khan plant to enriched uranium at Sihala and Kahuta near Islamabad. Dr. Khan was tried, but later acquitted by the Netherlands for trying to obtain classified nuclear technology from the FDO where he worked from 1972 to 1975. The FDO is a subcontractor for URENCO which is a uranium consortium owned by the UK, the Netherlands and the FRG. Around the same time, another Dutch firm, Van Doorne Transmissie, partly owned by the Dutch government, sold 65,000 specially hardened steel tubes to Pakistan which served as the actual centrifuges. During the late 1970's and early 1980's Henk Selbos, one of Dr. Khan's Dutch purchasing agents, supplied Pakistan with various aluminium components and 10,000 specially hardened steel balls which could be used for the bases of the Kahuta centrifuge. Selbos was arrested in late 1983 for trying to smuggle a US made high-speed oscilloscope to Pakistan. In 1980, Canada arrested Abdul Aziz Khan and his two accomplices for attempting to smuggle 19 boxes of invertor components purchased from US and Canadian firms; however, nine previous illegal shipments had eluded Canadian customs. Nazir Ahmed Vaid and two others were arrested by US customs officials in 6/7/84 for trying to smuggle 50 KW-22 krytrons; however, ABC reported on 7/11/85 that Pakistan used a US-made krytron to detonate a non-nuclear triggering package for a nuclear weapon. Pakistan has successfully set up nearly 1,000 ultracentrifuges at Kahuta, used them to enrich uranium to 93.5%, and tested two nuclear devices.

Document No. 1960

Bibliography: **WORLDWIDE REPORT, 1/2/87, PP. 63,64, BY V.D. CHOPRA.**

Headline: **WRITER DETAILS EVIDENCE ON NUCLEAR CAPABILITY**

Orig. Source: **PATRIOT (NEW DELHI), 11/10/86, P.4.**

INTERACTIVE ABSTRACT:

Pakistan has finalized arrangements for the eventual acquisition of intermediate range missiles which will constitute a nuclear weapons delivery system from ORTAG of the FRG. Pakistan has imported invertors from the UK for a gas centrifuge system for uranium enrichment. In the 1970s Pakistan began negotiations with France over the sale of a reprocessing plant. A Pakistani defense expert said after Pakistan secured blueprints for the reprocessing plant, it purchased key components for the plant in the "international grey market" which were used to construct a reprocessing facility. KANUPP, a civilian nuclear power plant, is fully under IAEA safeguards. This article alleges that Pakistan can circumvent the statutory and administrative curbs on export by the US and other major western countries and thereby import strategic material and industrial components going into nuclear build-up.

COUNTRY ABSTRACT:

An Indian newspaper alleges that Pakistan has achieved the capability to produce nuclear bombs and may have produced one. Pakistan's construction of a uranium enrichment facility has progressed since the UK, earlier having decided to block all materials creating a nuclear capability in Pakistan, changed its policy and exported invertors for that facility. Western nations allow Pakistan to circumvent administrative curbs on components for a nuclear build up, the US in particular. Pakistan defense expert A. Fareed Ameen outlines necessary technology and equipment for building the bomb including plutonium and HEU. Pakistan has two (one since 1984) gas centrifuge enrichment facilities in operation. Pakistan plans to divert plutonium from a civilian reactor and reprocess it in a facility, the blueprints of which

were acquired by France. From the "international grey market," Pakistan purchased certain key components to construct the reprocessing facility. Pakistan's President Zia ul-Haq's relationship with the US Pentagon is discussed, including mention of US Defense Secretary Caspar Weinberger.

Document No. 2006

Bibliography: **NUCLEONICS WEEK, 2/19/87, P. 17**

Headline: **PAKISTAN: PINSTECH FABRICATES SENSITIVE TRACK DETECTING MATERIAL**

INTERACTIVE ABSTRACT:

Pakistan, in collaboration with the IAEA, has fabricated Chromium-kF39, whose uses include uranium exploration.

COUNTRY ABSTRACT:

The solid state Nuclear Track Detection Laboratory at the Pakistan Institute of Nuclear Science and Technology (Pinstech) has fabricated chromium-39 used in uranium exploration.

Document No. 2964

Bibliography: **NUCLEONICS WEEK, 1/5/89, PP. 3-5 BY MARK HIBBS**

Headline: **ILLEGAL EXPORT CHARGES MAY SPUR TIGHTER GERMAN EXPORT CONTROLS**

INTERACTIVE ABSTRACT:

The FRG firms NTB-Neue Technologien GmbH (NTB) and Physikalisch-Technische Beratung (PTB) are under domestic investigation for illegally exporting a variety of nuclear

materials and equipment to Pakistan, South Africa, and India between 1982 and 1988. Exports to Pakistan included: components for fuel fabrication; a plant for processing tritium; transport and storage containers for uranium hexafluoride; fuel cladding; plates and rods of zircaloy for fuel fabrication; a sintering oven; a vacuum smelting oven for uranium; and a pellet press. The FRG firms sent reflector material and cadmium tubing to India and "fuel measuring technology" to South Africa. The director for PTB admitted that zircaloy cladding was sent to Pakistan but claimed it was for the Kanupp heavy water-moderated reactor in Karachi, supplied by Canadian General Electric in 1972. The FRG firms supplied the zircaloy after Canada had refused. NTG expressly wished that the name of their firm would not be mentioned at domestic investigations of illegal exports for fear of terrorist reprisals like those involving exports of nuclear technology from Switzerland. FRG officials say that a third FRG firm, Gutekunst, is suspected of being involved in an illegal nuclear export ring and may have procured tritium gas and/or nuclear technology abroad for the two firms. Tritium exports are especially sensitive because tritium can be used as a neutron source in a fission bomb.

COUNTRY ABSTRACT:

Two FRG firms are under investigation for illegally exporting a variety of nuclear materials and equipment to Pakistan, South Africa and India between 1982 and 1988. Exports to Pakistan included: components for fuel fabrication, transport and storage containers for uranium hexafloride; fuel cladding; plates and rods of zircaloy for fuel fabrication; a sintering oven; a vacuum smelting oven for uranium; a pellet press and a tritium processing plant. Chancellor Helmut Kohl organized a cabinet-level group to make suggestions on effectively tightening FRG export controls. FRG prosecutor Alfred Farwick announced on 12/21/88, that nuclear exports to Pakistan may have lacked the required export permits. A particularly sensitive nuclear export--a plant for tritium processing--may have been legal and given the okay from the FRG Economics Ministry despite protests from US proliferation officials. Key suspects include Rudolph Ortmayer, former Director of NTG-Neue

Technologien GmbH (NTG) and Peter Finke, director of the nuclear consulting firm Physikalisch-Technische Beratung (PTB). FRG officials indicate that a third FRG firm may be involved in an illegal export ring and may have procured tritium gas and/or nuclear technology abroad for the two other firms. Tritium exports are especially sensitive because tritium can be used as a neutron source in a fission bomb. FRG criminal justice officials raided the FRG firms and uncovered the export of reflector material and cadmium tubing to India and "fuel measuring technology" to South Africa without proper licenses. Economics Minister Helmut Haussmann said that the investigation provided the rationale for tightening export controls in the FRG. The affair lead to a dispute between the Economics Ministry, which controls nuclear exports, and the FRG Foreign Office, which is responsible for FRG commitments to the NPT. US nonproliferation officials tried to stop the tritium plant export but the Economics Ministry okayed the transaction. A senior official at the US State Department claimed that the FRG has always been cooperative in NPT/safeguards issues, in spite of the affair. The firm NTG expressly wished that its name not be aired in domestic discussions of export fraud for fear of terrorist reprisals. In spite of this request, the activities of these firms are no secret. On 5/7/85, a Christian Democratic member of Bundestag wrote a letter to the Economics Ministry urging the approval of the tritium plant export in the interest of local jobs.

Document No. 3012

Bibliography: **NUCLEAR DEVELOPMENTS, 2/25/88, PP. 17-18**

Headline: **PAKISTAN NUCLEAR PROGRAM, INF TREATY REVIEWED**

Orig. Source: **THE HINDUSTAN TIMES (DELHI), 12/18/87, P. 11 BY R.R. SUBRAM**

INTERACTIVE ABSTRACT:

The US may transfer nuclear technology to India without a restriction that India accept international safeguards. Pakistan has been attempting to procure nuclear weapons from the PRC.

COUNTRY ABSTRACT:

Indian R.R. Subramanian talks about US Congressional willingness to allow the transfer of high technology to India from the US, without linking the transfer to India's acceptance of international safeguards, which was initially suggested by the US Senate Appropriations Committee. However, the Senate has granted $4.02 billion (US) in US aid to Pakistan, and in doing so has waived the 5 year Symington-Glenn Amendments to the US Foreign Assistance Act, which should force a cut off of economic aid to Pakistan in light of its clandestine nuclear weapons program. In 1979, President Carter wanted to cut off aid to Pakistan because Pakistan was constructing an unsafeguarded enrichment plant. Today, the Reagan Administration has taken the opposite stance, and Pakistan is now building a second enrichment plant using centrifuges at Golra. Pakistan's Planning Minister Dr. Mahbubul Hag's statement that the USSR would supply aid to Pakistan, forced the US to take action and aid the Pakistanis. President Zia's clandestine nuclear weapons program appears successful, and the new Golra facility may be able to produce highly enriched weapons grade uranium. A.Q. Khan, who heads Pakistan's weapons program with the code name Project 706, is using enrichment technology to gain permanent nuclear supremacy over India. Pakistan has also attempted to procure nuclear weapons from the PRC, and in light of the

upcoming INF treaty, the PRC will have nuclear supremacy in the subcontinent. The article recommends that the Indian nuclear program proceed "full-steam ahead!"

Document No. 3014

Bibliography: **NUCLEAR DEVELOPMENTS, 6/21/88, PP. 27-29**

Headline: **GENERAL CLAIMS U.S. MILITARY AID TO PAKISTAN ENCOURAGES NUCLEAR A**

Orig. Source: **LENINGRADSKAYA PRAVDA (MOSCOW), 2/16/88, P. 3 BY F. GONTAR**

INTERACTIVE ABSTRACT:

Belgium illegally exported "containers of nuclear material" to Pakistan from the Belgian Center for Nuclear Research where an enterprise is currently in operation for gas-centrifuge uranium enrichment. From 1976-1979, the Netherlands, the FRG and the UK exported gas centrifuge equipment and technology to Pakistan illegally, and the technology was used by Pakistan to manufacture 90% enriched uranium for nuclear bomb production. During 1982-1983 the Pakistani firm Aftab Brazers made four secret deliveries of ultra-modern computer equipment and oscilloscopes from the US through Hong Kong for use in the design of explosive components and detonators for the Pakistani atomic bomb. In 1986, the US illegally supplied a large batch of special high-speed electronic devices - krytrons - to Pakistan. The FRG firms Nukem and Transnuclear illegally exported enriched uranium to Pakistan.

COUNTRY ABSTRACT:

USSR General F. Gontar details Pakistan's successful attempts to illegally acquire sensitive nuclear technology and equipment from various sources, and criticizes US assistance as encouraging global destabilization. According to the article, Belgium illegally exported "containers of nuclear materials" from a nuclear research center where an enterprise is

currently in operation for gas-centrifuge uranium enrichment. The leakage of technology was announced by the Belgian Minister of External Relations Leo Tindemans. From 1976-1979, the Netherlands, the FRG and the UK exported gas centrifuge equipment and technology to Pakistan illegally. Pakistan used this technology at the Scientific Production Atomic Center in Kahuta to enrich uranium to both 90% and 5%. According to the WASHINGTON POST, the Kahuta facility is using the 90% enriched uranium to produce nuclear weapon's charges. According to the NEW YORK TIMES, a Pakistani company made four secret deliveries of oscilloscopes and computer equipment from the US via Hong Kong, which will also be used by Pakistan to design explosive components and detonators for bombs. In 1986, Pakistan acquired krytrons from the US and an FRG article in DER SPIEGEL indicates that two FRG firms sold enriched uranium to Pakistan early in 1988. The Soviet writer claims that all this proves that Pakistan is capable of producing nuclear weapons. Pakistan has also acquired the means to extract weapons grade plutonium from their nuclear power stations and at the Institute of Nuclear Science and Technology, the Pakistanis are developing a nuclear charge. Pakistan's nuclear program was confirmed by President, Zia-ul-Haq in a TIME article, who claims that Pakistan has a production base for manufacturing nuclear charges. UPI claimed in 11/87, that Pakistan "definitely has a real nuclear device." "A nuclear weapons program has existed in Pakistan since 1976 under the code name "Project 706." The article blasts the US and the Reagan Administration for by-passing the "Symington Amendment" and providing aid to Pakistan with full knowledge of their nuclear intention and in light of the fact that Pakistan refuses to sign the NPT. The article goes into detail that US reasoning is based on a desire to maintain control of the Persian Gulf, the Indian Ocean zone and Southeast Asia.

Document No. 3164

Bibliography: **NUCLEAR FUEL, 5/1/89, PP. 12-13 BY MARK HIBBS**

Headline: **PROSECUTORS LINK TRITIUM PLANT TO PAKISTAN WEAPONS PROGRAM**

INTERACTIVE ABSTRACT:

FRG justice officials have evidence that a tritium handling facility exported to Pakistan in 1987 was for purification and storage of large amounts of tritium from irradiated lithium-6 targets. The Pakistan Atomic Energy Commission (PAEC) in 1988, asked two FRG companies- Nukleartechnik GmbH (NTG) and Physikalisch-Technische Beratung (PTB) - to procure 100 grams of pure lithium-6. PAEC intended to irradiate the lithium-6 targets in PARR, a 5 MW (thermal) high flux research reactor supplied by the US in 1965. Justice officials said that NTG and PTB abandoned their efforts to procure lithium soon after the request was made of them. Western weapons experts have suggested that Pakistan may have wanted to test its tritium production technology in PARR before producing larger amounts in a secret reactor. IAEA safeguards are said to have been stiffened in recent years because of suspicions that Pakistan had developed a considerable clandestine nuclear program, only the reactor's uranium fuel is safeguarded. PTB and NTG reexported US-origin laser equipment to Pakistan in 1986. Other facilities were also exported to Pakistan for use in fuel fabrication in 1986 and 1987 a vacuum arc remelting facility for zircaloy, an electron beam welding machine, and a pellet press. In 7/87 PAEC ordered from NTG an automated spent fuel bundle shear, part of the lead end of a reprocessing plant. Between 1983 and 1988 $5.5 million (US) of zircaloy - 1.8 metric tons - was shipped to Pakistan in the form of plates, tubes, and rods. Some of this material was acquired in India and France and reexported to Pakistan via FRG. In 7/85 three uranium tritide containers were sent from the FRG to PAEC by air. Other equipment tied to the tritium handling system were shipped in 12/86. Recently NTG and PTB exported to Pakistan equipment useful for uranium enrichment such as UF6 containers and special aluminum for gas centrifuge housings. A scientist with the Max Planck Institute (MPI) collaborated with NTG, and prosecutors believe he provided the

Pakistanis with the know-how to build a facility capable of purifying tritium to 95%. Investigators have evidence that about 50 other FRG firms procured equipment for PAEC and its supplier companies, with help from the Pakistani Embassy in Paris. Payments to NTG and PTB amounted to $11 million; payments to the other 50 firms, which still must be examined, totalled about $55 million.

COUNTRY ABSTRACT:

FRG criminal justice officials say they have independent evidence that the export of a tritium handling facility to Pakistan in 1987 was intended for the purification and storage of large amounts of tritium from irradiated lithium-6. Evidence may be substantial enough to warrant charges of violating the FRG law banning military exports to regions of conflict. That would be more serious than the charge of violating FRG export regulations. Reinhard Huebner, a federal prosecuting attorney examining FRG nuclear exports, testified before the Bundestag investigative commission on nuclear affairs where he explained the various FRG-Pakistani transactions dating 1983-1988. The two FRG firms involved, Nukleartechnik GmbH (NTG) and Physikalisch- Technische Beratung (PTB) abandoned allegedly illegal procurement efforts when in the fall of 1988 FRG justice officials began their investigation of the firms. Testimony in the case indicates that the two firms assisted Pakistan in acquiring the know-how and materials for a clandestine reactor that would use tritium. Preliminary use of tritium production technology, Western weapons experts speculate, in PARR, a high flux research reactor, would pave the way for larger scale secret production. Despite stiffer IAEA safeguards on PARR in recent years because of suspicions about Pakistan's secret development of a nuclear program, only the reactor's fuel is safeguarded. The article notes that the export of laser equipment to Pakistan in 1986 would be in violation of FRG export regulations if there was no export permit. A single FRG scientist, Heinrich Weichselgartner at the Max Planck Institute for Plasma Physics (MPI) is said to have aided NTG in supplying tritium technology and equipment for Pakistan. Weichselgartner is thought to have set up money laundering arrangements for the transactions between PAEC, NTG, and PTB.

Evidence further reveals contact between NTG and PTB and FRG export control officials from the Bundesamt fuer Wirtschaft. Records seized from the Pakistan National Bank in Frankfurt implicate 50 other FRG firms, and involves payments of $55 million. Total payments to NTG and PTB amount to $11 million.

Document No. 3022

Bibliography: **NUCLEAR DEVELOPMENTS, 2/25/88, PP. 27-30**

Headline: **COMMENTARY DEFENDS NEED FOR NUCLEAR DEVELOPMENT**

Orig. Source: **THE PAKISTAN TIMES (LAHORE), 12/14/87, PP. 4-5 BY MUNIR AHM**

INTERACTIVE ABSTRACT:

Canada's General Electric supplied a CANDU heavy water reactor to Pakistan in 1971. In 1976, Canada decided to withdraw unilaterally from its agreement with Pakistan for the supply of fuel and spare parts for the Karachi Nuclear Power Plant (KANUPP), despite the fact that the plant and the subsequent agreement were under IAEA safeguards.

COUNTRY ABSTRACT:

Pakistan President Mohammad Zia-ul-Haq claimed in 12/87 that Pakistan's nuclear program was entirely peaceful and that the Pakistan Atomic Energy Commission's nuclear institutes are benefiting people in the fields of health and agriculture. The article insists that Pakistan's nuclear program in these two areas have an important socio-economic impact, and in themselves, justify Pakistan's program. The PAEC's Directorate of Nuclear Minerals was established in 1981, and has been the main force behind Pakistan's indigenous nuclear efforts. They are responsible for uranium mining and refinement; obtaining zirconium from the Mekran Coast; producing fuel bundles for KANUPP; and obtaining zircon for the manufacture of zircaloy fuel cladding. Since the KANUPP reactor was supplied by Canada

in 1971, and them Canada chose to unilaterally withdraw from the supply of nuclear fuel and spare parts, Pakistan had no choice but to develop their own option to keep nuclear energy a viable option and to maintain safety at the KANUPP plant. Medical and agricultural breakthroughs in Pakistan from nuclear research further justify Pakistan's nuclear program. India's nuclear program is criticized for its non-support of the NPT and its refusal to allow for mutual inspection, both of which Pakistan has supported.

Document No. 3450

Bibliography: **NUCLEAR DEVELOPMENTS, 3/28/89, 33-34**

Headline: **NUCLEAR CENTER CONTACTS WITH PAKISTAN**

Orig. Source: **DER SPIEGEL (HAMBURG), 2/27/89, P. 113**

INTERACTIVE ABSTRACT:

The FRG Foreign Ministry is concerned about the contacts between Karlsruhe Research Center and Pakistan. FRG nuclear experts have travelled to Pakistan frequently in the past twenty years. Some have been involved in setting up laboratories, giving advice on the "treatment of radioactive waste" and uranium enrichment using the nozzle process. One scientist from the FRG gave lectures at the Pakistan Institute for Science and Technology (Pinstech) on technology of the nuclear fuel cycle. In 1976, Pakistan was refused fuel elements by Canada and the FRG stepped into the breach, offering advice on "problems of fuel production." In 1974, a Pakistani businessman discussed the planning of a "hot laboratory" in Pinstech. The same man was also a partner in the Gelnhausen-based New Technologies (FRG) company, which is suspected of being involved in illegal nuclear exports.

COUNTRY ABSTRACT:

The FRG Foreign Ministry is concerned about the contacts between the Karlsruhe Nuclear Research Center and Pakistan. Cornelius Keller, director of the nuclear technology school, lectured for a week in 1983 at the Pakistan Institute for Science and Technology (Pinstech) on the "chemistry and technology of the nuclear fuel cycle." He was aware that Pakistan was able to produce plutonium. Throughout the 1970s, there was much contact between Pakistan and Karlsruhe experts. The advice and information given dealt with jet nozzle uranium enrichment, fuel reprocessing, hot cells, fuel production and waste treatment. Horst Boehm, Karlsruhe chief, told the Bundestag Research and Technology Committee on 2/22/89 he did not find the technology and know-how transfer to Pakistan at all problematic. N.A. Javed, now one of the directors of the Pakistan Atomic Commission, had discussions with Karlsruhe in 1974. As of 1987, the FRG's intelligence reported that Pakistan had run hot tests in its reprocessing plant in Pinstech, which was a major step towards setting up a plutonium production capacity for military purposes.

Document No. 3744

Bibliography: **NUCLEONICS WEEK, 6/15/89, P. 6 BY SHAHID-UR-REHMAN KHAN AND MARK HIBBS**

Headline: **MINISTER PREDICTS KANUPP RESTART BY SEPTEMBER BUT DOUBTS PERSIST**

INTERACTIVE ABSTRACT:

Pakistan has asked an IAEA Assessment of Safety Significant Events Team to visit the Kanupp nuclear reactor to suggest improvements in plant safety after the plant had a heavy water leak in 4/89.

COUNTRY ABSTRACT:

The Karachi nuclear power plant in Pakistan suffered a heavy water leak in 4/89. Tariq Rahim, minister in charge of cabinet affairs told the National Assembly that the 30-35 metric tons of leaked heavy water would be upgraded and purified at the Kanupp upgrading facility. Senior Pakistan Atomic Energy Commission (PAEC) official Saiyid Zaidi told Nuclear Fuel in 5/89 that the reactor should be back in operation within four months. PAEC announced it has asked an IAEA Assessment of Safety Significant Events Team to visit Kanupp to suggest improvements in plant safety.

Document No. 3762

Bibliography: **NUCLEONICS WEEK SPECIAL REPORT, 10/5/89, PP. 10-12**

Headline: **INDIA AND PAKISTAN: DEVELOPING PROGRAMS CAN PICK AND CHOOSE**

INTERACTIVE ABSTRACT:

General Electric (US) supplied two BWRs to India, which also has a Canada-designed pressurized heavy water reactor. Pakistan has a 137-MW Candu (Canada) PHWR. Pakistan also has a 5-MW research reactor supplied from the US under the Atoms for Peace program. Pakistan has a number of senior foreign-trained scientists. Pakistan is considering trying to purchase nuclear power plants from the PRC and France. Canada cut off all nuclear cooperation with India in 1974. Western suppliers embargoed nuclear exports to Pakistan in 1974 and Canada cut off fuel supplies and spare parts to the Kanupp plant.

COUNTRY ABSTRACT:

India and Pakistan are committed to developing indigenous nuclear programs for power and defense. India has a Canada-designed pressurized heavy water reactor (PHWR) and three indigenous PHWRs, completed after Canada cut off nuclear cooperation after 1974. India is pursuing enrichment technologies. Dr. M.R. Srinivasan, secretary of India's Department of

Atomic Energy and chairman of the Atomic Energy Commission, said India has no problem recruiting young people to work in India's nuclear program. The article describes in some detail India's nuclear education program. For India's older personnel, simulator training for operating engineers in power stations is specially emphasized. India's Atomic Energy Regulatory Board is mentioned. The Pakistan Atomic Energy Commission (PAEC) has raised a wall of secrecy around its program as a reaction to the embargoes by the western suppliers after 1974. Tanveer Ashraf is director of public relations at PAEC. The Dr. Abdul Qadeer Khan Research Laboratory is a uranium enrichment facility at Kahuta, Pakistan. Pakistan set up two major training centers after the western nuclear countries imposed their restrictions. These were the Karachi Nuclear Power Training Center, which was established after Canada stopped fuel supplies and spare parts for Kanupp (a nuclear power reactor), and a Center for Nuclear Studies, which is affiliated with the Pakistan Institute of Nuclear Science and Technology. Pakistan is seeking self-sufficiency in the production of nuclear fuel. The article describes in some detail Pakistan's nuclear education program.

Document No. 3844

Bibliography: **NUCLEONICS WEEK, 11/23/89, PP. 14-15 BY SHAHID-UR-REHMAN KHAN**

Headline: **PAKISTAN FORUM GIVES INSIGHTS INTO KAHUTA METALLURGY RESEARCH**

INTERACTIVE ABSTRACT:

An International Symposium on Advanced Materials met in Islamabad in late 9/89. It was organized by the Khan laboratories (of Pakistan) and the Pakistan Institute of Metallurgical Engineers, and it was sponsored by 24 national and international organizations, industries, and universities.Foreign sponsors included private firms from the FRG, the UK and Belgium. The two day symposium was attended by 37 delegates from 13 countries; US participation was a five-member delegation from the University of Connecticut.

COUNTRY ABSTRACT:

Papers read at an International Symposium on Advanced Materials in Islamabad gave an insight, for the first time, into the intensive work done by the Dr. Abdul Qadeer Khan Research Laboratories at Kahuta (Pakistan) on the preparation of different alloys and the metallurgy necessary for the success of any nuclear program. Symposium foreign sponsors included private firms from the FRG, the UK, and Belgium. In his inaugural address, President Ghulam Ishaque lamented the state of underdevelopment in metallurgy in Pakistan. He noted that, although Pakistan presented a gloomy picture in the field of advanced material, a modest beginning had been made in recent years to undertake R&D in this area. According to the subjects of various papers contributed by the Khan laboratory, extensive work has been carried out on the application of 18% nickel maraging steel. There are frequent references to experiments done with maraging steel; in addition to two papers dealing with cold-working and temperature variations related to mechanical properties of 18% Ni ultra-high strength maraging steel. On the heels of the seminar, there was news of a consortium of major industries in the private and public sector organized by the Pakistan Atomic Energy Commission (PAEC) to help manufacture Pakistan's first indigenous reactor.

Document No. 3896

Bibliography: **NUCLEAR DEVELOPMENTS, 7/14/89, PP. 39-40**

Headline: **MINISTER WANTS TO STIFFEN EXPORT CONTROLS**

Orig. Source: **DER SPIEGEL (HAMBURG), 6/26/89, PP. 87-89**

INTERACTIVE ABSTRACT:

In 12/74, two Pakistanis at the Karlsruhe Nuclear Research Center acquired technical details about "hot cells" while at the facility. Information was also provided on how to construct a similar reprocessing laboratory in Pakistan. Pakistan acquired, legally and illegally, valuable parts for their bomb program from firms like Neue Technologien GmbH (NTG) in

Gelnhausen, FRG. A Federal Research Minister (of the CDU) instructed the Nuclear Research Center to terminate the "Agreement on Cooperation in the Area of Peaceful Use of Nuclear Energy" signed in 1974 with the Pakistan Atomic Energy Commission. The FRG is examining current cooperation agreements with foreign institutes. NTG illegally exported to Pakistan a facility for the recovery of tritium.

COUNTRY ABSTRACT:

In 1974 Abdul Majeed and Naeem Ahmed Javed (both Pakistanis) acquired technical details about "hot cells" at the Karlsruhe Nuclear Research Center(FRG). Karlsruhe nuclear researchers also provided information and plans on how to construct a fuel reprocessing plant in Pakistan to the men mentioned above. A reprocessing facility at the Pakistan Institute of Nuclear Science and Technology (Pinstech) has been operating for some time and has been estimated by experts to be capable of producing up to 20 kilograms of plutonium annually. These two men and others have cultivated their relation with many firms in the FRG, like Neue Technologien GmbH (NTG), from which they acquired valuable parts for their bomb program-sometimes legally or illegally. In 6/89, officials at Karlsruhe put an end to the Pakistani connection on orders from Federal Research Minister Heinz Riesenhuber (CDU [Christian Democratic Union]) as he became concerned over nuclear exports that possibly violated the NPT. The Bundestag very recently discussed tightening up export controls under the foreign trade law. Changes have been initiated at the Federal Economics Ministry due to reports of lax controls on the part of the Federal Office of Trade and Industry (BAW). Economics Minister Helmut Haussmann (FDP [Free Democratic Party]) played down the issue of lax controls with the US Secretary of Commerce recently in Bonn. He said holes would be filled which allowed exports of technology and material which could be used in a bomb. He also stated that a thoroughgoing reform of export controls" would take place; that BAW President Hans Rummer and associated were "not sensitive enough" about to why export applications; and finally, that export controls and new thinking on behalf of BAW export control staff will take time. DER SPIEGEL has raised suspicions that NTG made a

deal with Pakistan which officials did not block though they had been given adequate warning of a pending illegal export of a tritium recovery facility. BAW boss Dr. Rummer has fallen from grace from the SPD (Social Democratic Party) and other coalition parties and is likely to fall from his position.

Document No. 3946

Bibliography: **NUCLEAR DEVELOPMENTS, 6/1/89, P. 21**

Headline: **DEFECTIVE VALVE RESPONSIBLE**

Orig. Source: **ISLAMABAD DOMESTIC SERVICE, 5/11/89**

INTERACTIVE ABSTRACT:

COUNTRY ABSTRACT:

The Pakistan Atomic Energy Commission (PAEC) has examined the causes of the defect in a valve at the Karachi Nuclear Power Plant (KANUPP) which had caused heavy water leakage. The leaked water was immediately collected and it will be purified in the purification unit for reuse when the plant becomes operational after inspections and repairs. Senator Khurshid Ahmad has demanded an immediate inquiry into the heavy water leakage at KANUPP.

Document No. 4001

Bibliography: **NUCLEAR DEVELOPMENTS, 10/26/89, PP. 30-31**

Headline: **PAKISTAN PROPOSAL ON MUTUAL INSPECTION SAID NOT VIABLE**

Orig. Source: **PATRIOT (NEW DELHI), 8/23/89, P. 5**

INTERACTIVE ABSTRACT:

According to a just published study conducted by Dr. Ram Rajan Subramaniam, of the Institute for Defence Studies and Analysis (IDSA) in New Delhi. Pakistan's proposal for mutual inspection of nuclear facilities with India is not viable. The IAEA learned that Pakistan was building a reprocessing facility using the solvent extraction technique. The agency took up the matter with Pakistan and expressed its desire to upgrade the safeguards but Pakistan objected to it. Pakistan's Karachi nuclear plant has a reactor of Candu design.

COUNTRY ABSTRACT:

Dr. Ram Rajan Subramaniam, of the Institute for Defence Studies and Analysis (IDSA) in New Delhi, recently published a study which concluded that Pakistan's proposal for mutual inspection of nuclear facilities with India is not viable. According to the report, Pakistan started manufacturing indigenously unsafeguarded natural uranium nuclear fuel elements in 1981. Simultaneously, the IAEA discovered Pakistan was building a reprocessing facility using the solvent extraction technique. Pakistan has also mastered gaseous centrifuge enrichment technology at Kahuta. India argues that mutual inspections will not prevent the existence of such facilities and technology and recognizes that Pakistan has the same argument over India's fast breeder and reprocessing technology.

Document No. 4205

Bibliography: **NUCLEAR DEVELOPMENTS, 1/13/89, PP. 25-26**

Headline: **CONFESSIONS OF ILLEGAL EXPORT OF NUCLEAR FACILITIES**

Orig. Source: **WELT AM SONNTAG, 12/25/88, PP. 1-2, BY HEINZ VIELAN**

INTERACTIVE ABSTRACT:

According to information received by WELT AM SONNTAG, investigations by the public prosecutor's office have revealed that Neue Technologien GmbH and Physikalische-Technische Beratung, both of the FRG, illegally supplied Pakistan in 1987 with, among other things, a complete tritium isolation and enrichment plant, miscellaneous laboratory equipment, 3,000 curies of tritium, 2 vacuum furnaces for melting natural uranium, a rod-straightening machine, a pelleting machine for the production of uranium pellets and an electronic welding plant for the production of zircaloy rods. Reports indicate that between 1983 and 1986 the FRG procured in the Netherlands about 40 transport and container tanks for uranium hexaflouride which it later sold to Pakistan. Allegations have also been made that a final supply of jacket tubes was carried out in 1988. Part of the original tritium shipment (about 300 liters) was procured by the FRG from Switzerland. Total value of the deliveries has been estimated at DM 20 million. The public prosecutor's office is also investigating the Gutekunst Co. (FRG) which is alleged to have been involved in the procurement of tritium gas for Pakistan. A long-term member of the FRG's Max-Planck Institute for Plasma Physics is believed to have been involved in helping Pakistan set up the tritium facility. An NTG nuclear physicist admitted he received DM 1.5 million from Pakistan for his services.

COUNTRY ABSTRACT:

According to public prosecutor reports received by WELT AM SONNTAG, the Pakistani ambassador to the FRG and the "Technic and Scientific Section" of the Pakistani Embassy in

Paris were involved in the FRG's export of nuclear facilities in 1987 to Pakistan. Neue Technologien GmbH and Physikalische-Technische Beratung, both of the FRG, have been implicated in this illegal export of a complete tritium isolation and enrichment plant, 3,000 curies of tritium, 2 vacuum furnaces for melting natural uranium, a rod-straightening machine and a pelleting machine for the production of uranium pellets and an electronic welding plant for the production of zircaloy rods. Reports indicate that the Netherlands supplied the FRG between 1983 and 1986 with about 40 transport and container tanks for uranium hexaflouride which it later sold to Pakistan. About 300 liters of tritium were procured by the FRG from Switzerland and then sent to Pakistan. A final supply of jacket tubes was allegedly carried out in 1988. Gutekunst Company of the FRG is also under investigation for its involvement in the procurement of tritium gas for Pakistan.

Document No. 4558

Bibliography: **NUCLEAR DEVELOPMENTS, 7/18/90, PP. 26-30**

Headline: **TRITIUM TRANSFER TO NUCLEAR WEAPONS PROGRAM DETAILED**

Orig. Source: **POLITIS-LE-CITOYEN (PARIS), 2/22-28/90, PP. 50-55 BY MYCLE SCHNEIDER**

INTERACTIVE ABSTRACT:

In 2/90, Pakistan asked France to supply a power plant and to resolve a disputed contract for a reprocessing plant, which France broke in 1979. In 10/74 Saint Gobain Nucleaire (SGN) of France signed a contract to build a reprocessing plant in Pakistan. Since 1979, Pakistan has bypassed embargoes on the materials and components, such as tritium and zircalloy, needed to build an atomic bomb. Pakistan has a research reactor from the USA, and a nuclear power plant from Canada. Pakistan's scientists have gone for training to the US, France, the FRG, Belgium, and the Netherlands. In 1975 a scientist from Pakistan fled the Netherlands, taking to Pakistan plans for a uranium enrichment plant. An engineer from the FRG sent to

Pakistan 62 truckloads of equipment, worth about Fr 50 million. The Leybold and Heraeus Company of the FRG delivered to its subsidiary in France, Leybold and Haraeus Sogev, equipment needed to load and unload uranium fuel destined for enrichment. This equipment was flown via Air France to the United Arab Emirates and on to Pakistan. On 7/4/80 the FRG clandestine agency BND (Federal Intelligence Service) reported that Pakistan took on 18 personnel from Libya for training, in exchange for $100 million in funding from Libya for Pakistan's nuclear program. In 1985 Radium Chemie AG (RCAG), of Switzerland, acquired a tritium facility from the FRG. Before being transported to RCAG, the tritium is sent to the Grenoble Nuclear Research Center (CENG) where it is purified. RCAG took delivery of 7.9 grams of tritium. RCAG sold 0.3 gram of military-grade tritium, 95% pure, to Gutekunst Leuchtfarben (GUTK) of the FRG. In 1987 GUTK ordered more tritium. RCAG sent GUTK 0.5 gram of tritium remaining from a 1980 USSR delivery. GUTK sent the 0.8 gram of tritium that it had obtained from RCAG to Pakistan in containers falsely declared to be empty. Traffickers delivered to Pakistan an entire system for the purification and enrichment of tritium, a process called TROC (Tritium Removal with Organic Compounds). On 3/13/86 the State Department of the US claimed that Linde AG (LIND) of the FRG had been identified as a possible supplier of the TROC to Pakistan. Two "phantom" firms, Chemisch-Technische-Beratung (CTB) of the FRG and Physikalische-Technisch-Beratung (PTB), were set up by an FRG businessman to secretly deliver the TROC to Pakistan. On 5/31/87 CTB and PTB shipped the TROC probably for DM 3-million to Pakistan by airplane, declaring it to be a waste handling system. A year after the plant went into operation, officials from Pakistan feigned ignorance about a tritium purification unit. A black market network set up by an FRG businessman kept supplies of zirconium flowing to Pakistan from 1983 to 1988. Initially the FRG businessman bought zirconium from the National Fuels Company (NFC) of India and shipped it to the FRG for delivery to Pakistan. Pakistan complained about the poor quality of zirconium from India. The FRG businessman turned to two subsidiaries of Pechiney (PECH) of France, Cezus (CEZS) and Zircotube (ZIRC) of France for zirconium. Neue Technologie GmbH (NTG) bought zirconium from PECH and CEZS, then resold it on paper to PTB, which in turn transferred it to Metall-

Vertriebs-Gesellschaft (MVG), a company which does not exist. The material was then sent to Frankfurt, where the labelling was altered from zirconium to "special steel," and then sent to Pakistan without export authorization. Through the summer of 1988, the FRG businessman succeeded in transferring probably more than 30 tons of zirconium and zircalloy tubes to Pakistan.

COUNTRY ABSTRACT:

Nuclear matters were discussed during Francois Mitterrand's visit to Pakistan in 2/89. Pakistan wanted a resolution of the disputed contract for a reprocessing plant, which France broke in 1979 due to pressure from the US. On 1/12/90 the police in the FRG arrested Rudolph Maximilian Ortmayer, the head of Neue Technologien GmbH (NTG) of the FRG who allegedly helped Pakistan to get around international laws restricting the acquisition of nuclear material. Dr. Hassibullah, chief of the Pakistani Embassy's technology and science section in Paris, France, was at the center of the clandestine operations. Dr. Abdul Wahid, the Pakistani ambassador in the FRG, also participated. In 1974, Zulfikar Ali Bhutto, the Prime Minister of Pakistan, launched a program to narrow the nuclear weapons gap between Pakistan and India. Bhutto established a large research center and sent scientists to train in the US, France, the FRG, Belgium, and the Netherlands. In 1975, Dr. Abdul Qadeer Khan fled the Netherlands, taking with him plans for a uranium enrichment plant. Khan is now considered to be the head of Pakistan's military program. The personnel of the Pakistan Atomic Energy Commission (PAEC) built a network of clandestine suppliers around the world. The Pakistan Embassy in Paris served as the center of the network. In 4/80 Pakistan opened a facility for conversion of uranium into UF6. In the Spring of 1987, Ortmayer of NTG had made all the arrangements to deliver to Pakistan tritium and the equipment needed to separate and enrich tritium. The Pakistan ambassador in Paris, France expressed his satisfaction. Hassibullah paid Ortmayer for his efforts, using money acquired from Libya. The National Bank of Pakistan in Frankfurt, FRG, made questionable transfers of Fr350 million to some 50 West German companies. Reinhard Hubner, the public prosecutor of

Hanan, FRG, said that the Pakistan embassy in Bonn, FRG, played the role of a mail drop, and the Pakistan embassy in Paris, France, made important personal contacts. A director of the PAEC, known by the code names Mr. Butt and later Dr. Shef, for a long time was the main buyer at the Pakistan embassy in Paris. Some time after 1985, Mr. Hassibullah took over the role of main buyer for Pakistan. The US requires special authorization for the export of tritium, due to proliferation concerns. The Nuclear Control Institute in the US argues that because tritium tends to decay rapidly, the depletion of stocks will help nonproliferation. Switzerland acquired a tritium facility from the FRG in 1985. Ortmayer smuggled 0.8 gram of tritium to Pakistan in 1987. Ortmayer paid Weichselgartner, director of the tritium laboratory at the Max Planck Institute for Plasma Physics (IPP) in the FRG, and other individuals from well-known research centers, to help send to Pakistan a system for the purification and enrichment of tritium - a process called TROC (Tritium Removal with Organic Compounds). IPP's personnel director, Dr. Duisburg, and a physicist, Peter Finke, also helped Ortmayer's efforts. The US in 4/24/86 managed to add TROC-type systems to the COCOM (Coordinating Committee for Multilateral Strategic Export Controls) list restricting the export of sensitive materials. The new COCOM accord provisions were not incorporated into FRG law until 3/25/88. The FRG Ministry of Economic Affairs was not impressed by the US fears, and did not investigate Ortmayer's activities despite complaints in 1988 by the Ministry of Foreign Affairs of the FRG. Theoretically the TROC in Pakistan can produce 5 to 10 grams of pure tritium per day. Saiyid Zaidi, director of the PAEC claimed he did not know what a tritium purification unit was. It was not until 1/10/90 that Ortmayer was arrested and his network dismantled. In 1986 A.Q. Khan announced that Pakistan had the capability to enrich uranium. Zia-ul-Haq then said that Pakistan is capable of building the bomb whenever it wants. On 11/18/87 a UK representative said he was convinced Pakistan has a few small nuclear weapons, and that India could produce them on two weeks' notice, if it had not done so already. A US magazine in 11/87 said Pakistan had 6 uranium-based nuclear bombs and was starting work on plutonium bombs. Three years ago Khan said Pakistan would use the bomb if its existence were threatened. The Ortmayer network supplied zirconium to Pakistan from 1983 to 1988. Initial supplies of zirconium came from

India in 1983. Mr Wellensieck, the Karachi representative of Riechermann (RICH) of the FRG invented companies to help hide the shipments of zirconium to Pakistan. In 1985, The Quai d'Orsay questioned why the FRG was receiving zircalloy tubes, when they had no heavy-water reactors. Ortmayer claimed that India was the destination country and was insisting on secrecy in order to protect its position on the world market. Regulators in France were content with this explanation. The Quai d'Orsay passed the information to its counterpart in the FRG, who requested that the economic ministry of the FRG monitor the exports of Ortmayer's NTG. The economic ministry only phoned Ortmayer, thus choking off the investigation. Through the summer of 1988, Ortmayer succeeded in illegally transferring to Pakistan probably more than 30 tons of zirconium and zircalloy tubes.

Document No. 4696

Bibliography: **NUCLEAR DEVELOPMENTS, 6/28/90, PP. 21-22**

Headline: **NUCLEAR PROGRAM EXAMINED BY SOVIET PAPER**

Orig. Source: **KRASNAYA ZVEZDA (MOSCOW), 5/23/90, P. 3 BY COL. S. BAKOV**

INTERACTIVE ABSTRACT:

A uranium enrichment factory created with assistance from the FRG is located in the area of Dera Gazi Khan in Pakistan.

COUNTRY ABSTRACT:

The effort by Pakistan to build an atomic bomb had been approved by the former government of Zulfikar Ali Bhutto. In 1977 the military, headed by Gen. Zia-ul-Haq, seized power and stepped up the implementation of the Pakistan nuclear military program. The current Pakistan government of Benazir Bhutto is continuing these efforts. Abdul Qadeer Khan, a Pakistani nuclear scientist, leads the nuclear weapon program that began in the beginning of the 1970's. Pakistan is developing the nuclear technology and industrial base to obtain and

stockpile weapons-grade uranium. Pakistan is declining to place the majority of its nuclear program under monitoring by the International Atomic Energy Agency. Pakistan, to this day, has not signed the nuclear nonproliferation treaty. 10,000 gas centrifuges operate around the clock at a secret facility in Kahuta, Pakistan. Western specialists claim that Pakistan can already assemble several nuclear weapons from the Kahuta produced weapons-grade uranium. Pakistan is upgrading the gas centrifuges in Kahuta and is beginning to build new facilities in the Golra area. A uranium enrichment factory located in Dera Gazi Khan, Pakistan, has an annual capacity of 200 tons of uranium concentrate, enough weapons-grade uranium to build 16-24 nuclear weapons. The US Congressman, S. Solarz, criticizes Pakistan for claiming that they are not developing atomic bombs. The 1976 Symington-Glenn amendment to the US law on military assistance to foreign states forbids the US to assist countries developing their own nuclear weapons. The US CIA presented proof that Pakistan was on the list of states developing nuclear weapons. The Carter, Reagan, and Bush administrations have closed their eyes to Pakistan's nonobservance, due to the situation in Afghanistan. US administrations limited themselves to assurances by Pakistan that it was not developing nuclear weapons. The US knows Pakistan will never allow monitoring of their nuclear facilities. On 3/29/90, the Prime Minister of Pakistan, Benazir Bhutto, expressed satisfaction with the course of Pakistan's nuclear program. Munir Ahmad Khan, chairman of Pakistan's Commission on Atomic Energy, was awarded one of Pakistan's highest orders.

Document No. 5551

Bibliography: **NUCLEAR ENGINEERING INTERNATIONAL, 12/90, PP. 46, 47**

Headline: **CHINA AND PAKISTAN COLLABORATE ON PARR-2**

ABSTRACT:

The PRC's Chinese Institute of Atomic Energy assisted in the design and construction of a 27kW research reactor (PARR-2) at the Pakistan Institute of Nuclear Science and Technology. The reactor went critical on 11/2/89.

Document No. 6002

Bibliography: **NUCLEAR ENGINEERING INTERNATIONAL, 5/91, PP. 52-54**

Headline: **DATAFILE: PAKISTAN**

ABSTRACT:

Pakistan became one of the first countries to have an operational nuclear reactor with the commissioning of the US-supplied PARR-1 5 MW research reactor in 1965. In the same year Pakistan placed a turnkey order with Canada for a 137 MWe CANDU, which was financed through soft loans from Canada and Japan. After India's 1974 nuclear test, foreign technical assistance and supplies were withdrawn, due in part to Pakistan's refusal to sign the NPT. The chairman of the Pakistan Atomic Energy Committee (PAEC), Munir Ahmad Khan, has said that despite the cost, Pakistan cannot afford to forego the nuclear weapons option unless India agrees to also. Benazhir Bhutto told President Bush in 6/89 that Pakistan was not building a bomb, but her successors have not reaffirmed this. In 10/90, the US suspended all military and financial aid to Pakistan because of Pakistan's suspected nuclear weapons program. India and Pakistan both still refuse to sign the NPT, but KANUPP and Pakistan's two research reactors are under safeguards. Due to foreign embargoes, Pakistan has been forced to develop its own nuclear-related technology, including uranium exploration, mining

and enrichment; fuel fabrication and post-irradiation examination; radioactive waste storage; zirconium mining and production; and heavy water upgrading. KANUPP was inspected by IAEA OSART teams in 1985 and 1989 and found to conform to IAEA standards on both occasions. The PRC is negotiating to sell a 300 MWe PWR to Pakistan following a 1986 cooperation agreement between the two countries, but the start of construction has been delayed due to financial problems. France also is selling a nuclear power plant to Pakistan, and this sale has also encountered financial obstacles. Pakistan has also requested a nuclear power plant from the USSR. Pakistan provides its own training for its personnel, and has now upgraded its 5MW research reactor to 10MW, and converted it to use 20 percent enriched uranium fuel instead of 90 percent enriched. The PRC has assisted Pakistan with fuel fabrication and construction of the PARR-2 research reactor. The Kahuta gas centrifuge enrichment facility, built partly through information acquired through European countries from Urenco, began operation in 1984. Research on the project began in 1972. Pakistan contracted with the French firm Societe Generale pour Techniques Nouvelles (SGN) in the early 1970 to provide a reprocessing facility. Before SGN suspended the agreement in 1979, some reprocessing information was transferred. Pakistan is believed to have built two reprocessing plants, and Pakistan scientist Abdul Qadeer Khan said work would continue in this area. Fuel fabrication at the Kundian plant began in 1979. Pakistan also produces nuclear grade zirconium oxide and Zircaloy-4 ingots, and has in operation a post-irradiation fuel examination facility and heavy water upgrading facilities. The PAEC belongs to WANO and the CANDU Owners Group, but can only receive information, and not technology, through the latter.

Document No. 6315

Bibliography: **NUCLEAR EUROPE WORLDSCAN, 7-8/91, P. 51**

Headline: **PAKISTAN**

ABSTRACT:

The article provides statistics on Pakistan's Kanupp nuclear power unit, its capacity and production. The Pakistan Atomic Energy Commission has replaced the turbine monitoring system at Kanupp, the only nuclear plant in the country. Pakistan is now fabricating its own fuel bundles and in 8/91 replaced the last one it had received from Canada. Pakistan is planning 2 new nuclear power plants. France and the PRC, who are the potential suppliers, are delaying firm agreements. The PARR-1 research reactor has been redesigned and upgraded from 5 to 10 MW.

Document No. 6324

Bibliography: **NUCLEONICS WEEK. 7/4/91, PP. 13-14 BY RAUF SIDDIQI**

Headline: **NEW PAEC HEAD SAYS PAKISTAN WILL ACHIEVE NUCLEAR SELF-RELIANCE**

ABSTRACT:

Ishfaq Ahmad, the new chairman of the Pakistan Atomic Energy Commission (PAEC) said that Pakistan ranks in the top 12 nuclear science countries in the world and is determined to gain self-reliance in nuclear industry. He spoke at a ceremony at the Karachi Nuclear Power Training Center (KNPTC), which provides nuclear science training. It is located at Kanupp, a Canadian-designed heavy water reactor and Pakistan's only nuclear power plant. Ahmad stressed the importance of the training efforts of both KNPTC and the Center for Nuclear Studies at Pinstech (Pakistan Institute of Nuclear Science and Technology). After Candada cut off aid in 1974, Pakistan was left on its own to run the plant and develop technology.

Ahmad praised Kanupp personnel for their accomplishments; Kanupp now runs on locally fabricated fuel.

Document No. 6326

Bibliography: **NUCLEONICS WEEK, 8/29/91, P. 12**

Headline: **PAKISTAN: A.Q. KHAN PROMISES CONTINUITY**

ABSTRACT:

On 8/22/91, Abdul Qadeer Khan, the director of the A.Q. Khan Laboratories at Kahuta, spoke at a reception honoring him given by the Karachi Chamber of Commerce & Industry. He spoke about the Kahuta project and said that he had trained replacements for himself so that even though there are conspiracies against Pakistan, the project can continue if something would happen to him. Pakistan's uranium enrichment capabilities were developed at Kahuta from gas centrifuge technology they are said to have stolen from Europe. Khan also spoke about the establishment of the Ghulam Ishaque Khan Institute for Science & Technology, which has been funded by the BCCI Foundation of Pakistan.

Document No. 6815

Bibliography: **NUCLEAR ENGINEERING INTERNATIONAL, 12/91, P. 3**

Headline: **PARR'S NEW LEASE OF LIFE**

ABSTRACT:

The PARR 1 research reactor at the Pakistan Institute of Scientific and Industrial Research (Pinstech) has been redesigned and upgraded, and went critical on 10/31/91. It was originally supplied by the US in 1965 as a 5MW reactor that ran on 90% enriched uranium, which was supplied by the US until the 1970s. The conversion work allows the reactor to

operate at 10MW on 20% enriched fuel and should extend the life of the reactor another 25 years beyond its original 25-year design life. Pakistan Atomic Energy Commission (PAEC) engineers may consider a similar 25-year life expansion for Kanupp. ..... Related Article: Ishfaq Ahmed, PAEC Chairman said in 11/91 that PAEC is planning to modernize Kanupp to increase its capacity and extend its life. Kanupp was supplied by Canadian General Electric Co. under an agreement with Atomic Energy of Canada, and went critical in 1971. Ahmed said redesign of PARR-1 has moved Pakistan closer to its goal of manufacturing a nuclear reactor indigenously. The 20%-enriched uranium fuel used by PARR-1 is designed by PAEC and could be made by Pakistan, but Pakistan buys it from China because it is cheaper. (Nucleonics Week, 11/7/91, p. 10 by Shahid-ur-Rehman Khan and Rauf Siddiqi, "PAEC Plans to Expand and Extend the Life of Kanupp.")

Document No. 7141

Bibliography: **NUCLEONICS WEEK, 3/26/92, PP. 9-10 BY MARK HIBBS**

Headline: **SECOND INDIAN ENRICHMENT FACILITY USING CENTRIFUGES IS OPERATIONAL**

ABSTRACT:

According to India's director of the Department of Atomic Energy (DAE) P.K. Iyengar, a second gas centrifuge enrichment plant is now operational in India. The facility is made up of "several hundred...centrifuges made of domestically produced maraging steel." The centrifuges do not contain maraging steel bellows. India and Pakistan were suspected of starting research on centrifuge enrichment in the mid-1970s. India's new enrichment facility was not listed in the inventory of nuclear-related facilities given to Pakistan by India. In addition, Pakistan did not list the centrifuge enrichment facilities which it is believed to have at Golra. India might be attempting to enrich uranium for its nuclear submarines or for a nuclear device. The US, which supplied two BWRs to India, said India may try to enrich fuel for its reactors, since France, which currently supplies India with LEU fuel, will probably

stop exports if India does not allow full-scope IAEA safeguards. India is presently developing laser enrichment technology. Former Indian DAE directors Raja Ramanna and Malur Srinivasan were also mentioned.

Document No. 7242

Bibliography: **NATIONAL SECURITY ARCHIVE NEWS RELEASE, 3/17/92**

Headline: **US KNEW IN 1983 PAKISTAN WAS PURSUING THE BOMB, ACCORDING TO ...**

Orig. Source: **STATE DEPARTMENT MEMORANDUM, 6/23/83, "THE PAKISTANI NUCLEAR PROGRAM"**

ABSTRACT:

Project Comment: The National Security Archive News Release refers to a secret State Department memorandum obtained by the Archive under the Freedom of Information Act. A copy of the released section of the memo and a list of quotes from US Goverment officials are attached to the news release. The memo highlights the US knowledge about Pakistan's nuclear program as of 6/23/83. ..... Tom Blanton of the National Security Archive said the knowledge from the State Department memorandum became "muffled by national security secrecy." US official policy on Pakistan, as reflected in a speech (attached to memo) by Deputy Assistant Secretary of State Marshall on 9/12/83, was to give conventional military aid to Pakistan in hopes that it would have less desire for nuclear weapons. Virginia Foran, an Archive analyst, appealed an initial denial for the information, sought in 1988 under the Freedom of Information Act, and received the document in 3/92. The memo shows that in 1983 the US felt that Pakistan under Zia was "actively pursuing a nuclear weapons development program." The information shows that Pakistan had the following nuclear facilities in 1983: a CANDU-type nuclear power plant from Canada at Karachi, a UF6 production plant at Dera Ghazi Khan, a fuel fabrication plant at Chashma, a small research reactor and small-scale reprocessing facility at PINSTECH, and a uranium enrichment plant

at Kahuta. The centrifuge enrichment program began in earnest in 1975, using designs stolen from Europe and an international procurement network relied on by the Engineering Research Laboratories (ERL) for supply of parts and equipment. Pakistan has also sought help from the PRC for enrichment. Pakistan claimed its enrichment program was only for research and development, but the US (in 1983) felt that Kahuta's enriched uranium, which is not safeguarded, would be used for nuclear weapons. In 1983, Pakistan was working on a reprocessing plant at Chashma, which was originally to be supplied by France, but for which it was continuing to seek assistance from "supplier countries." Bids were also being sought for construction of a light-water power reactor at Chashma. At PINSTECH, construction on the New Labs (the spent fuel reprocessing plant) began in 1976, and with the help of technology and equipment obtained in Europe (including design assistance), the facility was almost complete in 1983. However, the memo said a trilateral safeguards agreement with France and the IAEA should mean solvent extraction reprocessing in Pakistan would fall under IAEA safeguards, and using spent fuel from KANUPP would mean violating safeguards agreements with Canada and the IAEA. The fact that the IAEA (in 1983) determined that safeguard measures had not been adequate and that indigenous fuel rods were being used at KANUPP raised fears that spent fuel would be diverted to unsafeguarded facilities. Pakistan's actual nuclear weapons design program was thought to have been started under Prime Minister Bhutto. Work on electronic triggers and shaped charges for explosive devices took place and attempts were made to buy related cameras and camera equipment. In 1981 and 1982 metal components for a nuclear explosive devices were ordered from European companies by ERL. In 1983, Pakistan was seeking to obtain "metal working equipment (precision lathes and associated equipment)" for making metal explosive components. Cooperation between China and Pakistan was originally limited to aid with operation of KANUPP but was thought to later involve production of fissile material and perhaps nuclear weapons design. Statements made by President Zia (1982), Ali Arshad of the Pakistani embassy in the UK (1985), US Ambassador Richard T. Kennedy (1985, 1986), and State Department spokesman John Hughes (1984) are attached.

Document No. 7544

Bibliography: **THE BULLETIN OF THE ATOMIC SCIENTISTS, 7-8/92, PP. 38-43 BY D. ALBRIGHT...**

Headline: **PAKISTAN'S BOMB: OUT OF THE CLOSET**

ABSTRACT:

Project Comment: The article summarizes in detail Pakistan's efforts to develop a nuclear weapon production capability since 1974. Specific transactions and technical descriptions of Pakistan's believed capabilities are given. ..... The Bush administration is determined to stem nuclear proliferation in the Middle East, the Korean Peninsula and the Asian subcontinent. Nuclear disarmament efforts have made progress in South Africa, Brazil, and Argentina. Now attention is focusing on Pakistan and India in hopes that they also will abandon their nuclear weapons programs. Pakistan has expressed its willingness to sign the NPT if India does so as well. However, Pakistan signaled that it wants recognition as a de facto nuclear weapons state if it attends a US-sponsored nuclear disarmament conference. On 2/7/92, Pakistani Foreign Secretary Shahryar Khan said that his country had the components to assemble at least one nuclear bomb. In 1985, the US Congress passed legislation making US aid to Pakistan contingent upon the US President's certification that Pakistan did not possess nuclear weapons. In 1990, President Bush failed to supply such a certification. Pakistan's uranium enrichment program, begun in 1976, is developed enough to produce HEU for six bombs per year. The Pakistani enrichment program began with the secret establishment of the Engineering Research Laboratories (ERL). A 1983 US State Department Memorandum says that Pakistan stole the gas centrifuge designs from Urenco, a European gas centrifuge enrichment consortium. A. Q. Khan is identified as an important agent in the transfer. The 1983 memo further says that ERL has acquired and produced materials for both gas centrifuges and nuclear weapons. The Kahuta gas centrifuge plant began operating in the early 1980s but has experienced numerous technical difficulties and delays. Pakistan has sought PRC help, but the exact nature and extent of the assistance provided is unclear. A 1989 report speculated that the Chinese may have supplied HEU for two bombs, or that the

PRC may have provided hexafluoride for use in the centrifuges. Pakistan obtained uranium hexafluoride from a German firm in the late 1970s. The PRC may have received Urenco technology from Pakistan in return for its help. The PRC's gas centrifuge program began in 1958. In 1984, A. Q. Khan announced that Pakistan was producing low-enriched uranium and that it would not enrich uranium beyond five percent. In 1986, US intelligence said that Pakistan was producing HEU at the Kahuta plant. A 1986 memo, prepared for Henry Kissinger and the Foreign Intelligence Advisory Board, asserted that Pakistan could produce enough HEU for "several nuclear devices per year." Prior to her 6/89 trip to Washington, Pakistani Prime Minister Benazir Bhutto reportedly ended her country's HEU production. But in the Spring of 1990, following a Pakistani-Indian border clash, Pakistan resumed production, and continued this until 1991, according to Shahryar Khan. Pakistani agents may have stolen CNOR and SNOR centrifuge designs and technology from Ultra-Centrifuge Nederland in the 1970s. By 1980, an intelligence report concluded small CNOR and SNOR machines were in operation in Pakistan. Other reports say that due to technical difficulties, Pakistan sought to replace the two centrifuge designs with the more advanced G-1 and G-2 systems based on German Urenco designs. In 1974, Urenco Netherlands asked A. Q. Khan to translate secret design documents for the German centrifuge systems. Pakistan also may have acquired centrifuge components and design information in Germany. The IAEA has confirmed that Urenco designs form the basis for the Iraqi clandestine centrifuge program. Information on the G-1 and G-2 may have been passed to Iraq by the same German sources who supplied Pakistan. In 1986, Kahuta was reported to have 14,000 centrifuges but US officials speculated that perhaps only 1,000 were in operation. The Muslim, a daily newspaper in Islamabad, cited rumors of a planned capacity of 2-3,000 centrifuges for Kahuta. These reports are consistent with the 1983 memo's analysis. A US official said that Pakistan was operating roughly 3,000 machines at the Kahuta center in 1991. David Albright and Mark Hibbs figure that Kahuta could produce enough HEU for three to six devices per year. By the end of 1991, Pakistan probably had enough HEU for six to thirteen devices. Another enrichment site is now under construction at Golra. A 1987 British report claimed that Golra would eventually house "several thousand centrifuges." Construction has

been slow due to difficulty importing critical components. Pakistan has completed a small reprocessing plant at the Pinstech facility near Rawalpindi called "New Labs." It is based on French designs, including key components supplied from abroad. The 1983 State Department memo said that New Labs would not be able to produce plutonium for a nuclear device for several years. Rudolf Ortmayer, a German engineer convicted of illegally exporting nuclear goods to Pakistan, testified that he supplied piping in the late 1980s that was for use in a pool-type reactor. The aluminum fuel-cladding material would be unusable in the reactors that Pakistan was then using. Pakistan was trying to develop indigenous reactor systems. The PRC has helped Pakistan to build a small research reactor with 1 kg of Chinese-supplied HEU. The HEU is under IAEA safeguards. Shortly after the 1974 Indian nuclear test, the Pakistan Atomic Energy Commission began work on "nuclear explosive design and development." The 1983 memo said that Pakistan soon thereafter began working on an electronic triggering circuit. US officials insist that the PRC supplied Pakistan with a proven weapon design in the early 1980s. Also, in 1981 and 1982, European firms sold nuclear weapon components to Pakistani agents. The agents also tried to get lathes and other equipment for bomb production. Pakistan's safeguards agreements with the IAEA, Canada and the US restrict its ability to produce a constant supply of polonium, an important component in bomb production. However, Pakistan has probably produced tritium initiators, possibly based on a design provided by China. In 1987, Pakistan smuggled 0.8 grams of pure tritium 999 that it had received from Germany. A German convicted in 1990 for illegally selling sensitive items to Pakistan said that that country was trying to develop an H-bomb. Plans and technology for a tritium facility may have been acquired by Pakistan as early as 1987.

Document No. 8170

Bibliography: **THE WALL STREET JOUNRAL, 4/21/89, P. 12 BY JOHN J. FIALKA AND THOMAS F. O'B**

Headline: **WEST GERMAN FIRMS ADMIT SUPPLYING NUCLEAR-WEAPONS MATERIAL TO PAKISTAN**

ABSTRACT:

Neue Technolgien GmbH and Physikalisch Technische Beratung, both of the FRG, obtained $5 million worth of zirconium from India and France and re-shipped it to Pakistan, where it appears to have been used in a large reactor to produce plutonium and tritium, the latter a chemical used to boost the destructive power of nuclear weapons. A scientist from the Max Planck Institute for Plasma Physics (FRG) is said to have stolen tritium technology and set up a private firm to deliver it to Pakistan. The Pakistanis said they were going to try the tritium-making process in a safeguarded, US supplied research reactor at Rawalpindi. FRG firms are also accused of having assisted the clandestine nuclear programs of India, Pakistan and Libya.

Document No. 9942

Bibliography: **Proliferation Issues, 5/18/93, p. 12**

Headline: **Details Of Nuclear Weapons Program Revealed**

Orig. Source: **Sunday (Calcutta), 4/24/93, pp. 34-38 by Indrani Banerjee**

ABSTRACT:

The article cites details and gives commentary on information concerning Pakistan's nuclear capability. Although the article refers to various sources, the primary source cited is a 1/93 report given by Dr. Yevgeny Primakov, the chief of Russia's external intelligence agency (FIS). Primakov states that the nuclear complex at Kahuta, 35 km from the Pakistani capital of Islamabad, houses an ultra-high speed centrifuge factory, capable of producing weapons-

grade uranium for up to twelve nuclear explosive devices a year. The complex consists of four main halls which house 10,000 to 14,000 centrifuge cascades. Pakistan's centrifuge design is based on centrifuges produced by the Physical Dynamics Research Laboratory in Amsterdam (Netherlands) and Ultra Centrifuge Netherlands (UCN), based in Almelo, Holland. The high-speed aluminum centrifuges constitute a relatively cheap method of extracting bomb grade isotopes (U-238 and U-233).

According to the article, the West German firms CES Kalthof, Neue Technologies GMBH, and Transnuklear, as well as the Belgian organization Belgonucleaire, supported the Pakistani procurement of centrifuge technology by Dr. Abdul Qadeer Khan from UCN, where he worked from 1972-75. Pakistan formally began its centrifuge-type uranium enrichment program on 7/31/76, when Khan returned to Pakistan from the Netherlands. Reportedly, Khan convinced then-Prime Minister Z.A. Bhutto to pursue the uranium bomb rather than the plutonium bomb. Pakistan tested a prototype centrifuge by 6/78, and clearance was given to build a 54-centrifuge pilot plant at Sihala and a full-scale enrichment plant at Kahuta. By 1981, the program had completed a cascade of 1,000 centrifuges capable of producing one nuclear bomb each year; by 1983, 1,000 to 2,000 centrifuges had been added. Today, Pakistan's plant reportedly has 10,000 to 14,000 centrifuges, and its older centrifuges have been replaced by more efficient German-designed maraging steel centrifuges.

Pakistan has reportedly built a second enrichment complex at Golra Sharif, near Islamabad, in order to hasten the production of weapons-grade uranium. The enrichment facilities at this location are still under construction and have been hampered by US pressures as well as by funding shortfalls.

In addition to its work with uranium, Pakistan is also reportedly developing technology for a plutonium bomb. While production of a plutonium bomb is somewhat problematic for Pakistan because it has no unsafeguarded nuclear reactors from which to take spent fuel, sources claim that Pakistan "diverted" unspecified amounts of plutonium from its 137 MW

Canadian- supplied (KANUPP) nuclear power station at Karachi. The Chinese have also agreed to set up a 300 MW safeguarded reactor for Pakistan which could be used for plutonium fuel diversion. In 1980, Belgium's Belgonucleaire built a 13-ton/year heavy water production facility in Multan, Pakistan.

Sources also state that Pakistan is building a 50 or 70 MW heavy water NRX nuclear reactor on its own, to be used for plutonium production. Although the exact status of the plutonium production reactor is unknown, Pakistan has already completed an unsafeguarded experimental-scale plutonium separation facility called the New Laboratories, PINSTECH (NLP) near Rawalpindi. Completed by 1980, the NLP was designed to handle 8-10 tons of spent fuel annually, producing 10-20 kg of weapons-grade plutonium in the process. Although Pakistan had signed a contract with France for the construction of a plutonium separation plant in 1979, France backed away after it learned of Pakistan's weapons program. Nonetheless, the article asserts that Pakistan obtained drawings for the plant. In addition, according to Russian intelligence sources, Pakistan has built a chemical radiation facility at Chashma which can be used to extract plutonium; sources suspect that Belgian and German companies helped build the plant.

At the same time it was working on producing indigenous plutonium reactors, Pakistan was also able to illegally procure nuclear wastes and plutonium from the Sudan, as well as from the German firm Transnuklear. The nuclear waste smuggling involved the nuclear waste dump at Mol, Belgium, sources say.

Finally, the article asserts that while the CIA had been gathering information on the Pakistani bomb program since the 1970's, the Reagan administration ignored these activities in an attempt to win favor for its Afghan policy from Pakistan's General Zia-ul Haq. It also notes that Pakistan is a "limited democracy", where major national security issues and nuclear policy are handled by "the coterie headed by the President and assisted by the army top brass, defence ministry, and intelligence agency heads (most of whom are serving or former army officers), sections of the higher bureaucracy, and the nuclear hot shots, the most

prominent of whom is Dr. Abdul Qadeer Khan." The article also cites a report by Seymour Hersh in The New Yorker, which suggests that the Reagan administration had allowed Pakistan to procure nuclear-related goods from the US.

Document No. 10707

Bibliography: **JPRS-TND-94-003, 1/31/94, p. 16**

Headline: **Article Reviews Nuclear Weapons Program**

Orig. Source: **Hindustan Times (Delhi), 1/2/94, p. 17**

ABSTRACT:

Project Comment: The article highlights the main features of Pakistan's nuclear program, giving both historical achievements and current capabilities. ..... While Pakistan has successfully developed its domestic capability to produce the highly enriched uranium necessary to create a nuclear bomb, it is having difficulty obtaining or developing a "command and control mechanism to trigger and deliver the nuclear device." According to experts, Pakistan is currently working on the design of nuclear weapons and trying to develop delivery systems, and "little would stand in the way of its manufacturing nuclear arms" except the time necessary to achieve the trigger and delivery systems. Experts believe Pakistan may have "several hundred kgs of weapon grade uranium." Dr. Abdul Qadir Khan, who is in charge of the nuclear weapons program, allegedly obtained classified information regarding uranium enrichment while working at the Physical Dynamics Research Laboratory, built by URENCO, in the Netherlands. Pakistan subsequently used this knowledge to create a nuclear power plant with "thousands of centrifuge units" at Kahuta and an ultracentrifuge pilot plant in Sihala. Pakistan purchased the necessary yellowcake, possibly 100 metric tons, from Libya, which had purchased it from Niger. The yellowcake was not subject to IAEA monitoring. Pakistan claims to have several hundred tons of uranium reserves in Ghazi Khan Thalkot, Azad Kashmir, and Cholistan, but the information

on Pakistani deposits is often inconsistent. Experts acknowledge that given the level of foreign assistance and extensive history of weapons design that Pakistan has had, it may not have to rely on a nuclear test to ensure that its nuclear arsenal is functional.

Document No. 10718

Bibliography: **Bulletin of the Atomic Scientists, 9/93, pp. 27-32, by Simon Henderson**

Headline: **We Can Do It Ourselves**

ABSTRACT:

Simon Henderson, a journalist with the Financial Times, interviewed Pakistani nuclear scientist Abdul Qadeer Khan in Khan's office in Rawalpindi. Henderson, who has followed the development of Pakistan's nuclear program since 1977, found no significant clues in the office that indicated the existence of nuclear weapons research at Kahuta. In 1979 then-State Department official Robert Galucci attempted to present satellite evidence of Kahuta to President Zia but was refused a visit. Henderson relates a story of a British reporter who was beaten outside Khan's home in 1979. Khan was in England at the time of the beating, visiting his network of suppliers. Henderson notes that a chart in the office of one of Khan's subordinate's showed that the Dr. A.Q. Khan Research Laboratories (KRL) are divided into fifteen technical divisions as well as security, medical, and finance sections and the Civil Works Organization, which is "KRL's in-house construction group." The employees at KRL earn 80% more than Pakistani government employees of an equivalent ranking, and have an extensive package of benefits unavailable to the other government employees.

Pakistan has been forced to be self-sufficient in its nuclear capabilities, which has also led to ambiguity as to whether or not it possesses or can create nuclear weapons. Pakistan's nuclear program is inexpensive; the domestically-produced reprocessing plant cost "less than half" than the $300 million reprocessing plant that was to be supplied by France. Pakistani Foreign Ministry official Shahryar Khan almost ended the ambiguity on 7/2/92 in a

Washington Post interview. A.Q. Khan is currently in charge of enriching uranium at Kahuta, Pakistan, building weapons for the army, and expanding Kahuta's uranium production to meet the new demand to be created by the opening in 1997 of the Chinese-supplied and designed Chashma power reactor.

Khan returned to Pakistan from his graduate studies in the 1980's and proceeded to open an engineering institution in Pakistan. Khan said that he wished the nuclear program to be autonomous, without having to rely on foreign assistance. Khan stated, "We consider it as an economic project so we should not depend on foreign countries for the fuel, and not be subjected to unnecessary pressure. When we have reactors, we like to have our own fuel."

Regarding Indo-Pakistan relations, Khan said that the international approach to Pakistan is highly discriminatory because it singles out Pakistan. Khan said that Pakistan is willing to open its nuclear facilities to international inspections but that India is not willing to do so. Khan said that, "if India signs the NPT, then we will sign the NPT. If they will open their facilities today for inspection by foreign inspectors, we will open ours."

Khan described Kahuta as a small facility that has not accumulated very much fuel; it should have enough material, however, to feed the Chinese reactor once it is established. He said, "Kahuta is a self-sustained , small laboratory. We have our own facilities in the electronics field, metallurgy, production engineering. So it can do a lot of things for the country, and that's why we are doing a lot of work for the army." He said that the work he does for the army is not associated with the nuclear program. When asked if the turbulent state of Pakistani politics could negatively affect the nuclear program, Khan responded, "I don't believe that there is any doubt or suspicion, or that the world should have any doubt or suspicion that our nuclear program is in unsafe hands."

Khan had been accused of stealing uranium enrichment secrets from the Dutch government but was later acquitted of all charges in the Dutch high court. Khan explained that he was accused of soliciting information from a Dutch colleague but that the Dutch government has since announced that he was not accused of spying.

Khan said that Pakistan does not use subterfuge to circumvent international export controls; he said that the ultimate responsibility lies with the suppliers of the goods. According to Khan, if the supplier government does not restrict the sales of possible dual-use technology, then there is no legal problem.

When asked if he is pleased with the Western press referring to him as "the father of the Islamic bomb," Khan answered, "No. I think the world has not done justice to me. In Pakistan nobody calls me father of the Islamic bomb." He said that the Pakistani people will always remember his prestige and his name while stating that "the foreign press will forget me." Khan denied having any intention of entering politics.

Document No. 11895

Bibliography: **The Hindu (International Edition), 8/27/94, p. 5**

Headline: **MPs See Threat to Indian Security**

ABSTRACT:

On 8/19/94, members of India's parliament demanded that allegations that Pakistan has smuggled plutonium from Russia be brought to international attention. The allegations stem from reports that German police arrested two Poles, a German, and a Pakistani, for plutonium smuggling; a "few grams" of plutonium were recovered [1]. The Poles arrested in the 8/17/94 operation possessed Pakistani visas, maps, and documents indicating that Pakistan was the intended destination for the plutonium [2]. On 8/18/94, a Pakistani spokesman denied that any governmental agency of Pakistan had participated in the attempt to acquire plutonium [3]. On 8/21/94, in an attempt to obtain more information, the Indian Minister of State for External Affairs Salman Khursheed indicated that he had asked a visiting German official to present India's concern about the smuggling to German Chancellor Kohl [4].

Pakistan's nuclear program is now "virtually suspended" due to technical difficulties encountered by Pakistani scientists and China's refusal "a few months ago" to send Chinese scientists to Pakistan "to 'correct' the atomic bomb manufacturing program" [5]. China also "made clear that there is no point in their [Pakistan] thinking of holding tests at China's Lop Nor test range" [5]. Delays in the construction of a Chinese reactor in Pakistan have also caused a fissile material shortage there; waste from the reactor would be used to produce fissile material [5].

Supporting Sources:

[1] Navbharat Times (Delhi), 8/20/94, p. 6; in JPRS-TND-94-017, 9/8/94, p. 16, "Indian Editorial Assailing Pakistan's 'Stealing' of Nuclear Technology." [2] J.N. Dixit, Indian Express, 8/30/94, "India's Nuclear Options: Pakistani Smuggling Underlines Non-proliferation Shortcomings." [3] PTV Television Network (Islamabad), 8/18/94; in JPRS-TND-94-017, 9/8/94, p. 22, "Spokesman Denies Allegations on Plutonium Shipment." [4] All India Radio Network (Delhi), 8/22/94; in JPRS-TND-94-017, 9/8/94, p. 21, "Germany Asked To Inform on Plutonium Smuggling Case." [5] Aleksandr Sychev, Izvestiya (Moscow), 8/20/94, p. 3; in JPRS-SOV-94- 162, 8/22/94, p. 16, "Pakistan's Need of Fissile Material, Expertise Noted." [6] Roger Highfield, The Times, 8/25/94, "20-year Race for Bomb."

Document No. 12218

Bibliography: **Nuclear Engineering International, 1/95, p. 6**

Headline: **Training Centre Set Up**

ABSTRACT:

Pakistan Atomic Energy Commission (PAEC) Chairman Ishfaq Ahmad announced that the PAEC had established an institute in Islamabad for the training of engineers and scientists.

A non-destructive testing center, scheduled to begin operations in 1996, has also been founded by PAEC.

Document No. 12275

Bibliography: **Foreign Report, 11/24/94**

Headline: **British Customs Have . . .**

ABSTRACT:

UK customs halted the shipment of vacuum furnaces, which can be utilized in the development of materials needed for nuclear weapons production, to Pakistan's Institute for Industrial Automation; the transaction was arranged by a small company from France.

Document No. 12669

Bibliography: **Washington Post, 4/8/95, p. A20, by R. Jeffrey Smith and Thomas W. Lippman**

Headline: **Pakistan Building Reactor That May Yield Large Quantities Of Plutonium**

ABSTRACT:

Clinton administration officials are concerned about Pakistan's construction of a new 40 MW heavy water reactor at Khushab which would give Pakistan access to large amounts of plutonium for its stockpile. The reactor project, which will not be finished until at least 1996, has been in progress for several years. In an interview on 4/7/95, Pakistani Prime Minister Benazir Bhutto initially said she doubted the existence of such a reactor. After consulting materials her staff had prepared, however, she said that there was "a small reactor for an experimental purpose." Bhutto pointed out that Pakistan has no facilities for reprocessing the plutonium extracted from the reactor into weapons grade material. "We have no plans to

produce plutonium," Bhutto said. U.S. officials confirmed Bhutto's statement, but also noted that a partially-built reprocessing plant near the Chinese-supplied reactor at Chashma could be completed within several years and that, as an indigenously-produced facility, the heavy water reactor at Khushab would be exempt from international inspections.

Clinton administration officials have attempted to dissuade China and other countries from becoming involved in the Pakistani reactor project. Bhutto noted that the Khushab plant is "tied into our nuclear power plant from China." The officials also worry that Pakistan's work on the reactor will hinder the administration's attempts to convince the U.S. Congress to suspend or modify Pressler Amendment sanctions on Pakistan.

India's External Affairs Minister Pranab Mukherjee said the new Pakistani reactor proves the Indian claims that the NPT fails to prevent the transfer of sensitive nuclear technology [1].

Supporting Sources:

[1] Hindu, 4/15/95, p. 1, "Pakistan Reactor Causes Concern."

Document No. 13152

Bibliography: **Jane's Intelligence Review, 6/95, pp. 270-272, by Harold Hough**

Headline: **Pakistan's Nuclear Status**

ABSTRACT:

An analysis of Pakistan's nuclear weapons program argues that Pakistan is satisfied with its present nuclear deterrent capability. The article points out that, even though more effective delivery options have been available, Pakistan has chosen to acquire or develop only short-range delivery systems which do not suggest aggressive intentions. Another indicator of Pakistan's relaxed nuclear posture is the absence of "hot" nuclear testing, and the relative lack of "cold testing" of the conventional explosives package necessary to detonate a nuclear device. From this, the analyst surmises that Pakistan has done little to test or improve the

nuclear device it acquired from China. This design, tested at China's Lop Nor site in 1966, requires 15 kg of highly enriched uranium (HEU) and produces a 20 kT yield. The design is too large for delivery by Pakistani missiles, but sufficient for a gravity bomb. According to David Albright, Pakistan possessed approximately 200 kg of HEU in 1991, enough for 13 devices using the Chinese design. Although Pakistan conducted a cold test of the Chinese design in the Chagai hills in 9/86, Pakistan's nuclear laboratories rely on computer simulations to enhance and miniaturize the design. Pakistani Prime Minister Benazir Bhutto suspended production of enriched uranium, ceased weapons core production, and curbed construction of the Khushab reactor. The analysis concludes that Pakistan sees little advantage in alienating the US by further development of delivery systems or its weapon design.

However, the article asserts that, in the long term, Pakistan needs to maintain its nuclear deterrent and therefore cannot afford to abandon its nuclear program completely. Any deployment of nuclear weapons by India would trigger a commensurate acceleration of the Pakistani weapons program. During the Kashmir conflict in 1990, reports claimed that Pakistan transported nuclear weapons from a bunker in Chagai to an airfield where F- 16s, capable of delivering the bombs, were based. Satellite imagery failed to confirm these reports, indicating that "the events of May 1990 were not as 'hot' as reported in the media."

A 2/26/95 report prepared by the US Republican Congressional Research Committee said that Pakistan has come to rely heavily on its nuclear deterrent in dealing with India over the issue of Kashmir.[1] The report concludes, "Bhutto will continue to accelerate and expand the Pakistani military nuclear program."[1] Developments such as construction of the plutonium-generating reactor at Khushab and attempts to acquire additional F-16s from the US are seen in this context.

Supporting Sources:

[1] Times of India (New Delhi); in Asian Recorder, 3/19/95-3/25/95, pp. 24666-24667, "N-Arms Key To Kashmir Strategy."

Document No. 13398

Bibliography: **Nucleonics Week, 7/6/95, p. 5, by Shahid-ur-Rehman Khan**

Headline: **PAEC Head Denies Report That U.S., Money Ills Derail Chashma-2**

ABSTRACT:

On 6/24/95, at the inauguration of the 20th annual Pakistan Atomic Energy Commission (PAEC) Summer College, PAEC Chairman Ishfaq Ahmad Khan refuted allegations printed in the 6/18/95 edition of the Muslim (Islamabad) that Pakistan is halting efforts to complete the Chashma-2 nuclear power reactor due to financial problems and pressure from the U.S. Khan said, "Construction of a 300-MW, PWR-based, nuclear power plant is proceeding according to schedule at Chashma while the feasibility of the installation of additional power stations is being studied." The Muslim article quotes an anonymous official as saying, "Efforts to acquire nuclear technology have been scaled down to ensure success of the thermal power policy." The official attributed the slowdown to financial problems and political pressure from the U.S. The Muslim report also said that in 5/95, a Chashma design bureau employing 50 scientists and engineers was closed.

The Pakistani government's Public Sector Development Program for FY 1995-96 notes that the Chashma-2 project is estimated to cost $1.033 billion, $368 million of which has already been spent. The government of Pakistan budgeted $156 million for construction on the Chashma-2 site for FY 1995- 96, and just under $1 million for uranium exploration in the Dera Ghazi khan and Mianwali districts.

Document No. 13571

Bibliography: **Nuclear News, 6/95, pp. 42-43, by Simon Rippon**

Headline: **Asian Subcontinent: Nuclear Programs in Pakistan, India**

ABSTRACT:

Note: Article contains a detailed description of the Indian and Pakistani nuclear programs. ..... In late 1991, China agreed to supply a 300 MWe Qinshan-model pressurized water reactor (PWR), nuclear fuel, technology, and support services to Pakistan. In 8/93, reactor construction began at Chashma, and the reactor is due to start up in mid-1998, with commercial operation set to begin in 3/99. A second Chashma unit, based on China's 600 MWe Qinshan-2, is reported to be under consideration.

India is building the first two 235 MW reactors at Kaiga, although a construction accident at Kaiga-1 has pushed its startup date back to mid- to late-1996. Rajasthan-3 and -4, both 235 MWe units, are due to enter commercial service in 1997. India intends to build another four units at Rajasthan, but they will not be completed before 2005. Tarapur-3 and -4, both 500 MWe units, are under construction and due to go commercial in 2000. India may seek to resurrect a deal originally concluded with the USSR, whereby Russia would provide two VVER-1000 PWRs at Koodankulan. India recently supplied 100 tons of heavy water to South Korea and 350 tons to Romania. India can produce over 650 tons/year at its eight heavy water plants.

India's Atomic Energy Commission has developed MOX fuel fabrication technology and has declared that it can provide fuel for Tarapur-1 and -2. India has ample reserves of uranium (at sites including Meghalaya and Jadaguda), zirconium, and thorium. India's nuclear fuel complex at Hyderabad is reportedly able to make fuel for all Indian reactor types, including PHWRs, BWRs and the 50 MWt fast reactor at Kalpakkam. India, which has long worked to develop the thorium fuel cycle, has the expertise to process irradiated thorium in order to

produce U-233 and currently has a first core functioning at its Dhruva experimental reactor at the Bhabha research center. India's thorium reserves total 360,000 tons.

India currently operates two reprocessing facilities, the 30 ton/year Trombay plant, which processes fuel from the Bhabha research center, and a second 100 ton/year plant that processes fuel for the Tarapur, Rajasthan, and Madras plants. India is building a third reprocessing facility at Kalpakkam to serve an experimental fast breeder reactor (FBR) there and a future 50 MWe FBR. India has one vitrification plant at Tarapur for reprocessing high-level radioactive waste (HLW), and is building two others, one at Trombay and the other at Kalpakkam.

Document No. 13670

Bibliography: **Risk Report, 7/95, p. 5**

Headline: **Pakistan's A-Bomb Potential**

ABSTRACT:

Pakistan's Kahuta plant, which started up in the early 1980s, has produced about 170 kg highly-enriched uranium (HEU), an amount sufficient to produce 8-12 weapons.

The initial stage of Pakistan's nuclear weapons production cycle involves mining uranium ore at Baghalchar and Qubul Khel, and milling the uranium at Dera Ghazi Khan and the Atomic Energy Minerals Center in Lahore [1]. The nuclear plant at Dera Ghazi Khan then purifies and transforms the material into uranium hexafluoride gas (UF6) at an annual rate of 200 MT [1].

More than 1,000 high-speed centrifuges at Kahuta enrich the UF6 to 93 percent, producing about 20 kg of HEU per year. Pakistani representatives claim the Kahuta plant has already been re-designed to only produce low-enriched uranium (LEU), used to fuel the Chashma reactor. However, Pakistan also has a pilot-scale centrifuge site in operation in Sihala [1].

Furthermore, some reports indicate another enrichment facility is under construction at Golra, but Kahuta program director A.Q. Khan denies these allegations.

Finally, the Pakistani Ministry of Defense and the A.Q. Khan research center finalize the production process by molding HEU into nuclear weapon components [1].

Supporting Sources:

[1] Risk Report, 7/95, p. 3, "Nuclear Profile: Pakistan."

Document No. 13138

Bibliography: **Nucleonics Week, 6/1/95, p. 15, by Shahid-ur-Rehman Khan**

Headline: **Officials Say Pakistan Developing Nuclear Manufacturing Capability**

ABSTRACT:

In early 4/95, at the opening ceremony of Pakistan's National Center for Non-Destructive Testing (NDT) and the Pakistan Welding Institute, Pakistan Atomic Energy Commission (PAEC) Chairman Ishfaq Ahmad Khan commented that Pakistan's nuclear goals include the achievement of self-reliance in the construction of nuclear power plants. The ceremony was led by Minister for Industries and Production Mohammed Asghar. Khan said the centers would operate on a commercial basis. PAEC speaker Pervaiz Butt revealed that Pakistan plans to have a nuclear power generating capacity of 2,000 MW by the year 2003, and 8,000 MW by 2010. Butt conceded that some foreign assistance would be required before Pakistan can begin manufacturing its own nuclear reactors. Pakistan has established a zircalloy tube plant and other specialized centers and institutes to develop nuclear technology, including "an Institute for Nuclear Power Centre for Nuclear Instrumentation & Computer Control."

NDT Center Director Dr. Khalid Ibrahim said the Welding Institute, which provides training for work on various nuclear plant components, has already certified 250 welders.

Document No. 14025

Bibliography: **Risk Report, 7/95, p. 9**

Headline: **Pakistan Needs Help To Make Plutonium And Tritium**

ABSTRACT:

U.S. officials say China is providing assistance in the construction of Pakistan's 40 MW Khusab nuclear reactor. The former head of Pakistan's Atomic Energy Commission, Munir Ahmad Khan, insisted that Pakistan is building the reactor completely on its own. The Khusab reactor is not under IAEA safeguards, which means that any plutonium produced there could legally be used to build atomic weapons, although it would first have to be reprocessed. Pakistan has not "mastered" the process of plutonium extraction, although it received transfers of experimental plutonium processing technology from European companies in the 1970s. In the 1980s, Pakistan built a small plutonium extraction facility called "New Labs."

The Khusab reactor could produce tritium, which Pakistan already attempted to produce by irradiating lithium. In the 1980s, German firms sold Pakistan parts for a tritium purification facility. Later, Pakistan attempted to procure from Germany 30 tons of aluminum tubing, used to "clad lithium for irradiation in a reactor."

In its 1992 Militarily Critical Technology List, the U.S. Defense Department (DOD) described Pakistan's capability to produce a nuclear reactor indigenously as "limited." The report noted that Pakistan would probably require assistance in obtaining or producing key nuclear materials, such as beryllium, boron, carbide, hafnium, zirconium, lithium, graphite, and high-purity bismuth. The report also found Pakistan's nuclear program to be deficient in critical production and testing equipment for nuclear components, including furnaces, multi-stage light gas guns, transient recorders, oscilloscopes, flash X-ray equipment, capacitors, pulse generators, high-speed computers, and sophisticated electronics.

Document No. 14057

Bibliography: **S&T Perspectives, 6/30/95, p. 3**

Headline: **In A Project Supported By...**

ABSTRACT:

On 6/30/95, it was reported that scientists in Russia, working on a project backed by the Russian Ministry of Science and Technology Policy and the Ministry of Atomic Energy, developed a "nuclear-pumped laser," which the scientists expect to be useful in laser weapons and laser fusion.

Document No. 14309

Bibliography: **Nuclear News, 1/96, p. 38**

Headline: **Containment Topped At Chashma Nuclear Plant**

ABSTRACT:

On 11/21/95, the containment facility at the Chashma nuclear power plant in Pakistan was fitted with a 184 MT steel dome. China National Nuclear Corporation (CNNC) President Jiang Xinxiong said Chashma will be connected to the national grid in 10/98 as scheduled. Due to nonproliferation concerns, South Korea will not provide the Pakistani facility with a reactor vessel [1].

Supporting Sources:

[1] Nucleonics Week, 11/23/95, p. 13, "Pakistan: Chashma Dome Installation Nears." [2] NucNet News, 11/29/95, "Pakistan: Second N-Plant Half-Complete, On Schedule."

Document No. 14336

Bibliography: **Nucleonics Week, 11/30/95, p. 6, by Shahid-Ur-Rehman Khan**

Headline: **Chashma Vessel Manufacture Said To Be Underway In China**

ABSTRACT:

On 11/21/95, a senior official of the Pakistan Atomic Energy Commission (PAEC) stated that China has begun construction of the pressure vessel for Pakistan's 300 MW Chashma reactor. The Chashma reactor design is based on China's domestically-developed Qinshan-1 PWR. Japan's Mitsubishi built the pressure vessel for China's Qinshan reactor.

Western experts have expressed doubt that China can build the pressure vessel, but China insists that it is fully capable of doing so.

The 8/93 construction schedule for Chashma states that the pressure vessel will be installed in 9/96, fuel loading will be completed by 6/98, and the plant will be commissioned by the end of 1998. China Nuclear Energy Industry Corp. will provide Pakistan with fuel for the first three cores.

Jiang Xinxiong, president of China National Nuclear Corp. (CNNC), stated that "Chashma is progressing smoothly, according to contractual obligations."

Mohammad Yaqub Khan, Chashma's main engineer, said that Pakistani engineers are involved in the pressure vessel's construction. It is not known exactly where the construction is taking place, but reports state it is being done at a forge in Shanghai. PAEC experts have reportedly visited the site in Shanghai, and Pakistani engineers have been studying with Chinese experts. PAEC Chairman Ishfaq Ahmad stated that Pakistani engineers have benefited from working with Chinese engineers in developing the project's civil works.

In addition, China Nuclear Energy Industry Corp. will assist Pakistan in the establishment of a fuel fabrication facility. Pakistan currently has a facility at Kundian (near Mianwali and Chashma) where it manufactures fuel for the 137 MW Kanupp PHWR, located at Karachi.

Document No. 14378

Bibliography: **Nature, 11/23/95, by Zia Mian**

Headline: **Atomic Energy In Pakistan**

ABSTRACT:

In a letter to the editor, Zia Mian criticizes a report by Ehsan Masood for playing up Pakistan Atomic Energy Commission's (PAEC) contributions to the construction of a 300 MW reactor at Chashma. Mian argues that, in actuality, China is providing Pakistan with a Chinese-designed reactor at a "give-away" price of $500 million in order for Chinese products to gain access to the international nuclear market. Mian states that PAEC's irresponsible behavior and lack of financial accountability are overlooked because of its connection to the Pakistani nuclear weapons program. Mian also attacks Masood for overlooking Pakistan's Khushab 40 MW plutonium production reactor project, which was disclosed during Pakistan Prime Minister Benazir Bhutto's 4/95 trip to the U.S.

Document No. 14583

Bibliography: **JPRS-TND-94-008, 4/1/94, pp. 34-36**

Headline: **Country's Security Situation Viewed**

Orig. Source: **Syed Alamdar Raza, Muslim (Islamabad), 3/19/94, p. 7**

ABSTRACT:

Pakistan has safeguarded its nuclear arsenal by moving it from Kahuta, where it was vulnerable to an Indian attack, to a nuclear storage facility located at Chagai in Balochistan. If the new facility were under attack, Pakistani pilots to take off before India could destroy the nuclear arsenal. Pakistan is also constructing a new 70 MW reactor at a secret site on the Indus River. According to Indian experts, the facility was already half complete by 1992, and

when finished it "could yield enough bombs that would counterbalance India's vastly superior conventional force."

Document No. 14595

Bibliography: **Strategic Digest, 2/96, pp. 250-251**

Headline: **Pakistan: Uranium Mining Project Launched**

Orig. Source: **Khaleej Times, 10/20/95**

ABSTRACT:

Pakistan's Atomic Energy Commission (PAEC) Chairman Ishfq Ahmed said that embargoes and restrictions placed on Western exporters of nuclear materials to Pakistan were forcing the "indigenisation" of Pakistan's nuclear program. Pakistan's nuclear power plant at Karachi runs on uranium from a mining and processing facility in the Dera Ghazi Khan region, but deposits there are reportedly almost depleted. The construction of a Pakistani 300 MW nuclear power plant is underway at Chashma with Chinese help. China will provide Chashma with nuclear fuel for the first three years of operation; the plant is scheduled to start up in 1998. Meanwhile, Pakistan will begin mining the Qabul Khel uranium deposits in the Lakki Marwat district.

Document No. 14636

Bibliography: **Nucleonics Week, 2/22/96, p. 3, by Mark Hibbs**

Headline: **China Challenges U.S. Data Pointing To Pakistan Aid**

ABSTRACT:

During 1/96, U.S. government representatives met with China National Nuclear Corporation officials in Beijing to discuss China's transfer of ring magnets for gas centrifuges to

Pakistan. The U.S. believes its data on the transfer is correct, but China says that the U.S. must provide convincing evidence that China is helping upgrade Pakistan's Kahuta gas centrifuges.

During the week of 2/19/96, U.S. officials also stated they believe that China is offering Pakistan assistance at another site, Khusab, where Pakistan is constructing a plutonium production reactor and either a fuel fabrication or plutonium separation plant.

Document No. 14795

Bibliography: **Financial Times, 4/1/96, p. 5, by Tony Walker and Peter Montagnon**

Headline: **Sharp Frosts Still Threaten China-US Links: Taiwan Crisis May Have Passed But A Host Of Problems Remain**

ABSTRACT:

U.S. experts believe China may have not only exported ring magnets to Pakistan, but also aided Pakistan in producing plutonium. The issue of Chinese nuclear exports to countries of proliferation concern may result in economic sanctions and negatively influence the annual vote in the U.S. Congress on most favored nation trade status for China.

According to U.S. officials, a plutonium plant associated with Pakistan's New Laboratories is being built with Chinese help near the Chashma reactor [1]. This plant could produce plutonium from spent fuel from the Chashma reactor or the Khushab research reactor [1]. Pakistan may want the plutonium in order to make a smaller and lighter nuclear weapon than is possible with uranium [1].

Supporting Sources:

[1] Bill Gertz, Washington Times, 4/3/96, p. A4, "China Aids Pakistani Plutonium Plant."

Document No. 14835

Bibliography: **Washington Times, 2/20/96, pp. A1, A16, by Marcus Warren**

Headline: **Pakistan Nuclear Program At A "Screwdriver Level"**

Orig. Source: **London Sunday Telegraph**

ABSTRACT:

During the week of 2/12/96, the U.K. government delivered a deportation order to Mohammed Salim, a clerk at the Pakistani High Commission in London, after discovering three shipments of dual-use laser technology at Heathrow Airport. Discovered in 12/95, the laser equipment could be used by Pakistan for precision measurements needed in a nuclear weapons program [1]. The London Home Office said Salim's presence was "not conducive to the public good on grounds of national security" due to his involvement in the proliferation of weapons of mass destruction (WMD). Pakistan's High Commissioner to the U.K. Wajid Shamsul Hasan denied the charges and said that Pakistan's nuclear program was of a peaceful nature [2]. U.S. officials claim Salim is the European buyer for the A.Q. Khan Research Laboratory in Kahuta, Pakistan.

Pakistan claims that it has stopped producing weapons-grade nuclear material at the Kahuta uranium enrichment plant, but the CIA has tracked the shipment of 5,000 Chinese ring magnets to the Pakistani facility. The magnets could be used to boost Pakistan's uranium enrichment capabilities. Any large-scale manufacturing of nuclear weapons in Pakistan is expected to occur at the top-secret ordnance complex at Wah. Pakistan also runs a nuclear research and development center in Golra.

Supporting Sources:

[1] Marcus Warren, Washington Times, 4/13/96, p. A8, "Foiled Smuggling Efforts Heightens Nuclear Worries." [2] Farhan Bokhari, Financial Times, 2/13/96, p. 4, "Deportation Prompts Pakistan Nuclear Arms Denial."

Document No. 14922

Bibliography: **Economic Review, 10/90, pp. 63-70**

Headline: **Heavy Engineering Industry -- Its Role And Status**

ABSTRACT:

Pakistan's machine tool industry is led by two large public sector companies, Pakistan Machine Tool Factory (PMTF) and Pakistan Engineering Company (PECO), which together control about 30 percent of the machine tool market. The machine tool industry comprises about a third of total engineering investments in Pakistan and currently functions at a level ranging between 25 and 30 percent of production capacity. Pakistan's Heavy Mechanical Complex (HMC) was built in 1971 in Taxila to make non-nuclear equipment, but it could provide 74 percent of the components used in the building of local nuclear power plants, including heat-exchangers and pressure vessels. Although HMC has plans to shift some of its production away from nuclear power plants, guarantees of multiple orders from the Pakistani Atomic Energy Commission (PAEC), which plans to build 600 MW module plants, could result in HMC reconsidering such a switch.

Document No. 15066

Bibliography: **FBIS-NES-96-105, 5/28/96**

Headline: **India: Article Views Region's Nuclear Policy**

Orig. Source: **Pioneer (Delhi), 5/28/96, p. 10, by General Ashok Mehta**

ABSTRACT:

Independent estimates from the U.S. media, intelligence community, State Department, CIA, and Defense Department indicate that Pakistan possesses 12-20 nuclear weapons. Pakistani General Aslam Beg said that Pakistan has been nuclear-capable since 1987, while Dr. A.Q. Khan said that Pakistan's nuclear weapons program has never been interrupted. Khan

claimed that no Pakistani political or military leader would even consider scaling down the Pakistani nuclear program.

The Pakistani National Command Authority (NCA), which includes the President, the Army Chief of Staff, the Joint Chiefs of Staff (JCS) Chairman, and the JCS Director General, control the Pakistani nuclear program and arsenal. According to unconfirmed Western intelligence reports, in 1983 China exploded a Pakistani nuclear device in Xinjiang.

Document No. 15773

Bibliography: **NuclearFuel, 9/9/96, pp 15-16**

Headline: **Pakistan Might Increase U Exploration**

ABSTRACT:

Pakistan's Economic Coordination Committee has approved a $7.18 million project to explore uranium deposits "in the areas of north and south Nangar Nai, Khara-Murghan Zai, and Pitek Sori Gorakh in the Dera Ghazi Khan region." The project will be funded by the Pakistan Atomic Energy Commission's (PAECs) Public Sector Development Programme.[1]

Supporting Sources:

[1] Dawn (Karachi), 8/24/96, "Bureau Report;" in FBIS-NES-96-168, 8/24/96, "Pakistan: Article On Plans To Step Up Uranium Exploration."

Document No. 15980

Bibliography: **FBIS-NES-96-178, 9/8/96**

Headline: **Pakistan: KRL Achieves Breakthrough In Ultracentrifugal Technique**

Orig. Source: **Nawa-I-Waqt (Rawalpindi), 9/8/96, pp. 1, 11, by Sohail Abdul Nasir**

ABSTRACT:

On 9/7/96, Abdul Qadeer Khan, head of Pakistan's Kahuta Research Laboratories, said that his organization has achieved a breakthrough in research on controlling vibrations in its ultracentrifuge machinery.

Document No. 15994

Bibliography: **FBIS-NES-96-173, 9/2/96**

Headline: **Pakistan: IAEA Requests Cessation of 'Illegal' Nuclear Program**

Orig. Source: **Muslim (Islamabad), 9/2/96, pp. 1, 11, by Aroosa Alam, "IAEA Asks Pakistan To Curb Its 'N Pursuits'"**

ABSTRACT:

According to an IAEA report, Pakistan and 11 other nations have been identified as being involved in "illegal nuclear business" and as having nuclear weapons programs. The report says Algeria, Argentina, Brazil, China, the former Soviet Union, India, Iran, Iraq, Israel, North Korea, and South Africa have "undeclared nuclear facilities" and "hidden quantities" of nuclear material.

The report says that Pakistan is "an active nuclear importer and has been willing to use secret or illegal means to gain access to the material and technologies it desires." In 1987, Pakistan tried to procure tritium production and uranium enrichment technology from the Federal Republic of Germany (FRG), and managing [maraging] steel from the US. China reportedly provided Pakistan with design assistance for a nuclear weapon in the 1980s.

Pakistan supplied uranium enrichment equipment, which was originally received from the FRG, to Iran and North Korea.

The report cautions that Pakistan has a number of undeclared nuclear sites, including a uranium conversion plant at Dera Ghazi Khan, uranium enrichment facilities at Kahuta, Golra, and Sihala, a fuel fabrication plant at Chashma, a heavy water production facility at Multan, and a tritium purification plant south of Rawalpindi. US intelligence sources suspect that these facilities are being used to produce highly enriched uranium (HEU).[1]

The report holds the US accountable for the advancements in Pakistan's nuclear program because Washington ignored Pakistan's nuclear activities, including its 1984 attempt to smuggle nuclear triggers out of the US and its 1985 decision to enrich uranium to levels above five percent.

The US believes that Pakistan broke its promise not to construct an enrichment plant by building one near Rawalpindi-Islamabad with Chinese help.[1] According to an anonymous official source in Pakistan, the US is demanding on-site inspections of the Pakistani nuclear facilities that do not fall under IAEA safeguards.[1] Pakistan has resisted these demands.[1] According to a "competent" source in Islamabad, the US "strongly suspects" that Pakistan is converting its non weapons-oriented nuclear program into one that can produce HEU.[1] Pakistan has admitted to having a facility that can produce low-enriched uranium (LEU), but the US said Pakistan is building an enrichment facility that can produce HEU.[1]

The report said that in 1985, India began producing plutonium in unsafeguarded reactors. According to IAEA estimates, India has 40-60 warheads and a "huge capacity to export nuclear components."

Supporting Source:

[1] Aroosa Alam, Muslim (Islamabad), 7/3/96, p. 1; in FBIS-TAC-96-008, 7/3/96, "Ties With U.S.'Under Strain' From Refusal To Sign CTBT."

Document No. 16086

Bibliography: **Sapra India Monthly Bulletin, [Online] http://www.subcontinent.com/sapra/96apr/si049606.html, 4/96-5/96**

Headline: **Pakistan-China Defence Cooperation**

ABSTRACT:

Pakistan has received Chinese assistance in establishing two heavy industrial facilities at Taxila--the Heavy Rebuild Factory (HRF) and the Heavy Mechanical Complex (HMC). Another Pakistani heavy industrial facility--the Heavy Forge Factory (HFF)--is located at Taxila.

Document No. 16314

Bibliography: **FBIS-NES-96-232, 12/2/96, by Tariq Butt**

Headline: **Pakistan, China: Spokesman On Jiang Zemin Visit; Nuclear Ties To Continue**

Orig. Source: The News (Islamabad), 12/2/96, pp. 1, 10

ABSTRACT:

Chinese President Jiang Zemin, accompanied by Qian Qichen, vice-premier and foreign minister, visited India on 11/28/96 and Pakistan on 12/1/96. Jiang's meetings with Indian officials were likely meant to assuage concerns over China's nuclear cooperation with Pakistan, while the meetings with Pakistani leaders were intended to assure Pakistan that China had no intentions of discontinuing the assistance. On 12/1/96, Jiang met with Pakistani President Farooq Leghari and confirmed that the nuclear technology cooperation for peaceful purposes would continue. A Pakistani foreign ministry spokesman said the Chinese were theoretically willing to assist Pakistan with the building of a second 300-MW power plant, a "Chashma-2," but questions of financing have yet to be settled.[1]

Supporting Sources:

[1] Tahir Ikram, Reuter, 12/5/96, "China Said Ready To Provide N-Plant To Pakistan." [2] Jawed Naqvi, Reuter, 12/4/96, "Jiang's South Asia Tour Plays On Old Indian Fears."