[redacted]

Revised 26 April 1978

Introduction and Summary

1. Pakistan is strongly motivated to develop at least a potential nuclear capability, in part for prestige purposes but more strongly because it genuinely believes its national security could ultimately be threatened by India. A decision made by any subsequent Pakistani leader to gain a nuclear capability will be strongly supported by the military sector, the most important power center in Pakistan, and by the populace in general. But at present there is no visible sense of urgency about the matter and a decision to proceed may be postponed for many years.

2. Pakistan has already undertaken certain actions which could give it a nuclear option.

--it negotiated the purchase from France of a facility for reprocessing irradiated reactor fuel into plutonium suitable for weapons. Were this facility, as originally planned, to be completed (and this becoming increasing doubtful), and were Pakistan willing to violate safeguards, this would enable it to obtain the plutonium needed for a number of nuclear devices.

[redacted]

--It has established a nuclear device design organization within the Atomic Energy Commission specifically charged with ensuring that Pakistan will be in a position to produce a device if a final decision is made to do so.

3. Delivery of the reprocessing plants components has been delayed and may well be altered or even cancelled. If it is built, the plant can begin to produce plutonium from irradiated fuel of the KANUPP reactor, Pakistan's only operating nuclear power unit, at some time in the early 1980s, possibly as early as 1982. As of April 1978, negotiations with France over this plant were continuing and may do so for some time. If the plant is not built, Paksitan may be able to use manual methods to produce sufficient plutonium for a single device in roughly the same time scale, but is unlikely to do so. It might also try to build a small, crude reprocessing facility on its own which, when completed, could quickly produce enough plutonium for several devices. But the technical skills of the Pakistanis on probably still too rudimentary to permit any early success in such a venture over at least the next five years and possibly much longer.

4. A Pakistani nuclear design group now appears to be operating at a relatively low priority. Even so, it can probably provide a design for a simple low-yield fission device by the time plutonium becomes available. Thus, if the option is pursued, Pakistan could have a nuclear device in hand conceivably as early as the first part of the 1980s. Barring an unexpected windfall of fissionable material, a device earlier than that is unlikely.

5. There are various forms of penalties Pakistan might suffer were it to go nuclear. One would be the reduction in nuclear assistance from Western supplier countries, which would further cripple Islamabad's lagging power program.

6. Probably more important, were Pakistan to explode a device without being able to embark on a weapons program, such could well lead India--which does have that capability--to develop nuclear weapons on its own--thereby tilting the military balance even more strongly against Pakistan. Acquisition of an effective reprocessing capability is thus critical in Islamabad's decision making and is likely to determine whether it goes nuclear or not.

7. Pakistan has announced an ambitious but inflated nuclear power program with an ultimate goal of self-sufficiency in electric power. For the foreseeable future, however, it will be dependent on foreign suppliers even for the operation of its present, minimal program, let alone its expansion. Thus for many years to come Pakistan will face a choice between foregoing its nuclear device option or foregoing much of its projected nuclear power plans.

8. Present supplies of fuel for the KANUPP reactor near Karachi, will be exhausted by the summer of 1978. Pakistan was dependent on Canada for re-supply of fuel for this reactor and also for the spare parts and heavy water which it will require. These have now all been cutoff by the Canadian government. The Pakistanis have discovered uranium in the Western Punjab and apparently can have a fuel fabrication plant in operation by late 1979. In 1977, 150 tons of uranium were reported mined and refined there. Islamabad also approached Niger in an attempt to obtain uranium. It has asked the People's Republic of China to assist in the fabrication of the fuel rods and to supplant Canada as a supplier of heavy water and spare parts. Whether China will be both able and

willing to comply with this request is not known. Even if it does provide support for the KANUPP reactor the PRC cannot fulfill Pakistan's long-range nuclear power plans.

9. If Pakistan does get a reprocessing plant, it could then proceed to develop a nuclear device or even a stockpile of weapons. There is of course a great difference between the development and testing of a simple nuclear device and the development of a nuclear weapons system, which would include both relatively sophisticated nuclear designs and an appropriate delivery system. The price of the former in terms of financial costs and drain on technical resources would be minimal; the price of the latter would be great by Pakistani standards--but probably manageable, particularly with outside help. The simplest case, a large aircraft bomb design, would probably require at least 2 years from the date of the demonstration device. In terms of delivery systems presently available to Pakistan such a weapons could be delivered only by the obsolescent, highly vulnerable B-57. Pakistan has no capability for indigenous production or either aircraft or missiles. Aircraft it might acquire from abroad or missiles it might ultimately develop on its own would entail

development of more sophisticated bombs or warheads which, while not necessarily beyond Pakistan's capabilities, would entail great investments in time, technical resources, and money.

10. If Pakistan acquires significant reprocessing facilities, and if it can keep the KANUPP reactor operating, it would eventually be able to produce an ample number of nuclear devices for its limited purposes. [redacted] The backlog of reactor-grade plutonium already produced by KANUPP-[redacted]-will also be available once a reprocessing facility were acquired. (Reactor-grade plutonium is undesirable for weapons but could be used.)

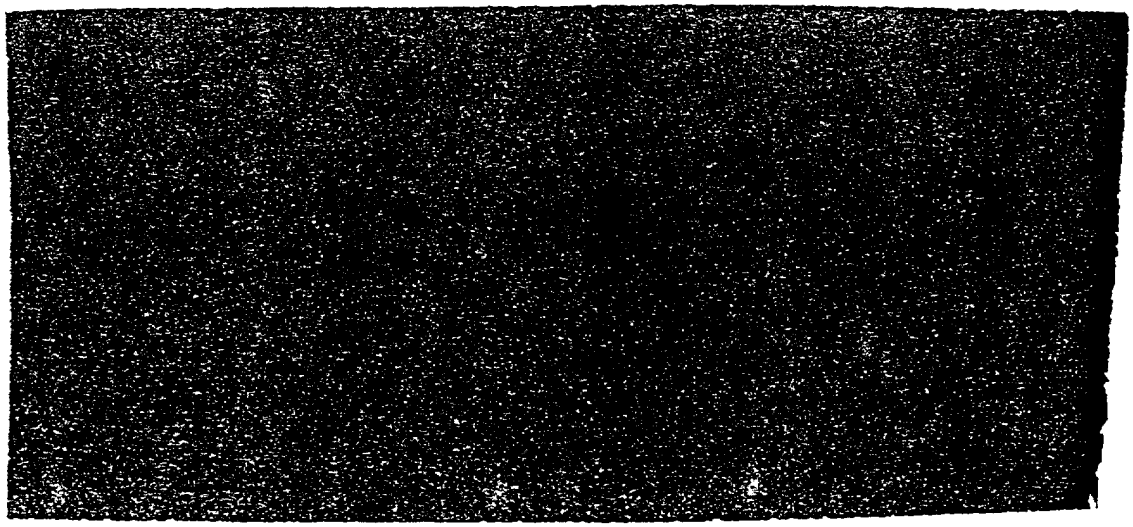
11. [redacted] the available data points to a judgment that even a very crude Pakistani nuclear device is probably many years away. A mix of shortcomings in scientific know how, likely difficulty in acquiring or developing critical reprocessing facilities capable of producing usable plutonium, domestic financial problems, fear of an active Indian response, concern over adverse reactions of major foreign powers, and a continued uncertain political

atmosphere all increase the odds against Pakistan going nuclear--perhaps for the next decade or even longer. But acquisition of a significant reprocessing capability would change this assessment sharply.

Introduction

12. That the Pakistanis are almost unanimous in their desire to develop at least a nuclear weapons capability is a truism. India has exploded a nuclear device and has a latent capability to develop an arsenal of weapons. Indian Prime Minister Desai's renunciations of further testing and of any weapons program whatsoever have, along with continued domestic uncertainty and financial strictures, taken much of a sense of urgency out of Pakistani's nuclear efforts. But that country remains essentially both fearful and emulative of India and, sooner or later, will probably work to equalize their nuclear programs.

13. [redacted]



Alternatives to a Nuclear Capability

14. A nuclear explosives program is not the only possibility for countering an India that has exploded a nuclear device. The Pakistanis have considered alternatives ranging from major changes in their conventional forces to international guarantees. None of these alternatives appear very promising, however.

15. On various occasions Pakistanis have stated that an Indian nuclear advantage could be offset by stronger conventional forces. In 1967 Bhutto wrote that an effective militia including all Pakistanis would be an even better deterrent than Pakistani nuclear weapons. Although some

attempts have been made to build up the milita organizations and military reserves since Bhutto came to power, nothing has been tried on the scale he earlier advocated. The Pakistanis do not seem interested in pursuing this alternative now.

16. Another alternative would be an increase in the size and quality of Pakistan's regular military establishment. Islamabad is actively seeking military equipment from a variety of sources to modernize and improve its arms inventories. Principal arms suppliers in recent years have been China, France, the US and the UK. Domestic arms production still accounts for a small proportion of total military procurement, and the Pakistanis are dependent on external sources for the bulk of their armaments. Pakistan has drawn up an extensive shopping list, but even if it were able to obtain most of these items, they would be insufficient to alter the military balance in Pakistan's favor. Financial constraints and sales policies restrictions, in any case, are likely to hamper large-scale Pakistani acquisitions. Moreover, whatever gains Pakistan is able to make are likely to be offset by the ongoing improvement of India's military forces.

17. Nonmilitary alternatives to a nuclear weapons capability have also been considered. In 1974, Pakistan introduced a plan in the US General Assembly for a South Asian Nuclear Weapons Free Zone. The various Pakistani drafts of this plan called for verification procedures to prevent the manufacture of nuclear weapons, but allowed for peaceful nuclear explosions. The Pakistani proposal was passed by the General Assembly but with all the nuclear power abstaining, and the resolution, which was reintroduced with minor changes in 1975 and 1976 and again passed, has not been implemented. In any case, India would not likely agree to any strict verification procedures.

18. The major purpose of the plan was to embarrass India. Nevertheless, it probably represents about what the Pakistanis think they need to counter India. A Pakistani "peaceful" explosion--even the right to have such an explosion--even the right to have such an explosion--would put Pakistan on a more nearly equal footing with India internationally. Strict verification would prevent India from going any further toward nuclear weapons.

19. Pakistan has also sought nuclear guarantees from the great powers collectively, and individually from the US and China. Given Pakistan's disappointment with such support in past critical situations, however, any great power guarantees offered now would have to be ironclad in order to be an acceptable alternative to a nuclear capability. The Pakistanis have already made it clear that current international guarantees such as UN Security Council Resolution 255 of 1968, which called for immediate action by the nuclear-weapon members of the Security Council if a nuclear state attacks a nonnuclear state, are inadequate. Islamabad has attempted, without success thus far, to strengthen this guarantee by a UN resolution which would call on nuclear weapons states to give assurances that they would not use their weapons against nonnuclear states.

The Technical Base: Pakistan's Nuclear Program

20. Pakistan's nuclear program had its beginning with the establishment of the Pakistan Atomic Energy Commission (PAEC) in 1963. Under the Pakistan Ministry of Science and Technoligy, the commission was geared to basic nuclear research, the use of radioisotopes, and the eventual development of nuclear power. In late 1972, the PAEC was placed

directly under the then President Bhutto. When Bhutto subsequently became Prime Minister, the commission was transferred to his new office. It is now under General Zia, the Chief Martial Law Administrator (CMLA). The PAEC is made up of four full-time members under the chairmanship of Munir Khan.

21. The principal research center of PAEC activities is the Pakistan Institute of Nuclear Science and Technology (PINSTECH) at Islamabad, constructed in the late 1960s. The central element of this research center is a 5 megawatt (thermal) pool type reactor of American design, similar to ones in Iran, Israel and the US. It is fueled with highly enriched uranium supplied by the US under safeguards. The reactor is used for isotope production, neutron physics experiments and for training reactor technicians. It has the capability to produce a maximum of 100 grams of plutonium per year.

22. The only operating power reactor--and the only source of sizable quantities of plutonium--is at the Karachi Nuclear Power Plant (KANUPP). This plant has a CANDU-type, heavy water moderated, natural uranium fueled reactor built by Canadian General Electric. All of the fuel and the initial 110 tons of heavy water for this reactor were supplied by Canada. It went into full commercial operation in December 1972 and now provides 137 megawatts of electric power, about 25 percent of the power needs of the city of Karachi. There have been problems involving corrosion of heat exchangers reaulting in considerable loss of heavy water, and the replenishment of the heavy water inventory has been a matter of some concern.

23. Operated at normal ratings, the KANUPP reactor should produce about 60 kilograms of reactor-grade plutonium per year. If it were operated in a mode optimized for production of weapons grade plutonium--to the detriment of power production and at the cost of greatly increased fuel requirement--it could produce between 60 and 120 kilograms of reactor-grade plutonium are now in the spent fuel rods that are awaiting disposition in KANUPP's cooling pond. None

of this plutonium will be available for use in a device until fuel reprocessing facilities are available.*

24. New fuel for the KANUPP reactor will be required by the summer of 1978. The fuel was to have been supplied by Canada but in late December 1976 Canada terminated its nuclear cooperation program with Pakistan. At about the same time, Pakistan announced that negotiations had begun with Niger for the purchase of uranium which is to be fabricated into fuel possibly by a third country. Niger has told other prospective uranium buyers that initial shipments could not begin before 1980, [redacted] If early delivery is possible, and if fabrication into fuel assemblies can be arranged, Pakistan will have an immediate alternative to Canadian-supplied uranium for fuel.

25. When Canada cutoff its aid, the major nuclear facilities in Pakistan had all been turnkey projects--constructed and commissioned by foreign personnel with little domestic participation. Pakistan had depended on Canada for heavy water, fuel, spare parts and emergency repairs for the KANUPP reactor.

* Reactor-grade plutonium is "dirty" plutonium (i.e., with high Pu-240 content) produced in a power reactor in normal operation. It can be used in weapons, but is not ideally suited to that purpose.

on the US for enriched uranium for the PINSTECH research reactor, and mainly on the US and Western Europe for the advanced training of nuclear personnel. [redacted]

26. [redacted] but we cannot rule out the possibility that it will help Pakistan to keep the KANUPP reactor operating. China has limited experience in the operation of heavy water reactors and would not be in a position to provide sophisticated CANDU-type equipment (e.g., a refueling machine) if the need arose. The Pakistani need for heavy water and fuel rods probably could be met by the Chinese, but the fuel rods would call for some research and development work beforehand. [redacted]

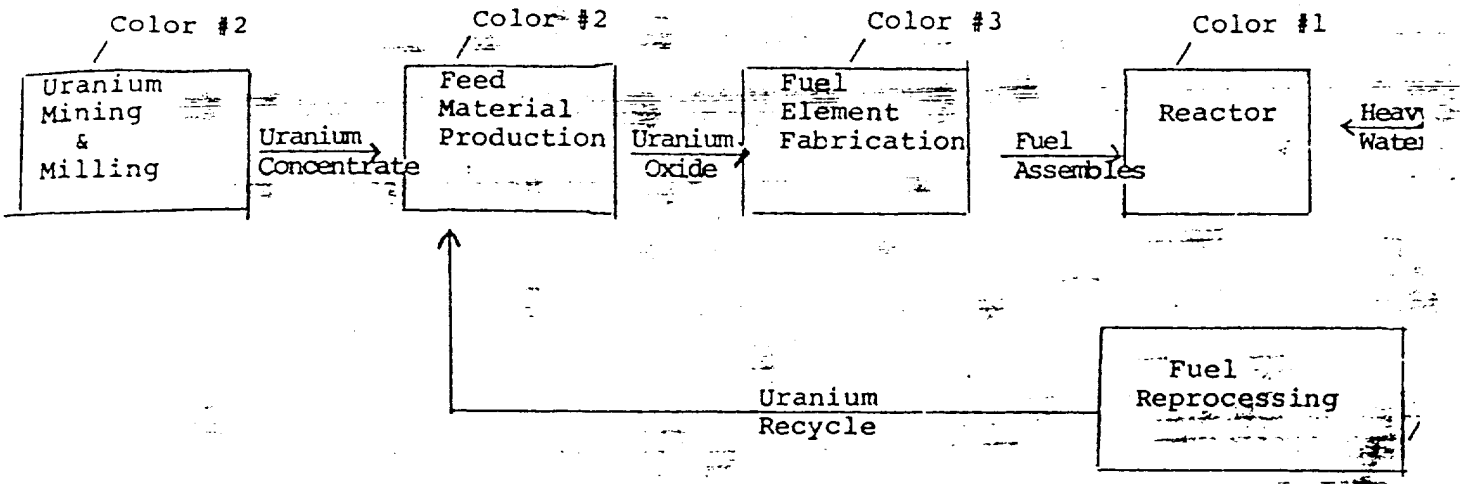
27. The Pakistanis have long sought an indiginous supply of uranium. [redacted] In 1977, mining activities in the Dera

Ghazi Klan District in western Punjab were reported to have produced 150 tons of uranium ore. Though this may be of little international commercial value, it could be sufficient to fuel the KANUPP reactor.

28.

29. The ability of developing countries to purchase full fuel cycles without arousing concern among supplier countries, however, has greatly diminished since the Indian nuclear test. Time and effort expended on negotiation will be greatly increased

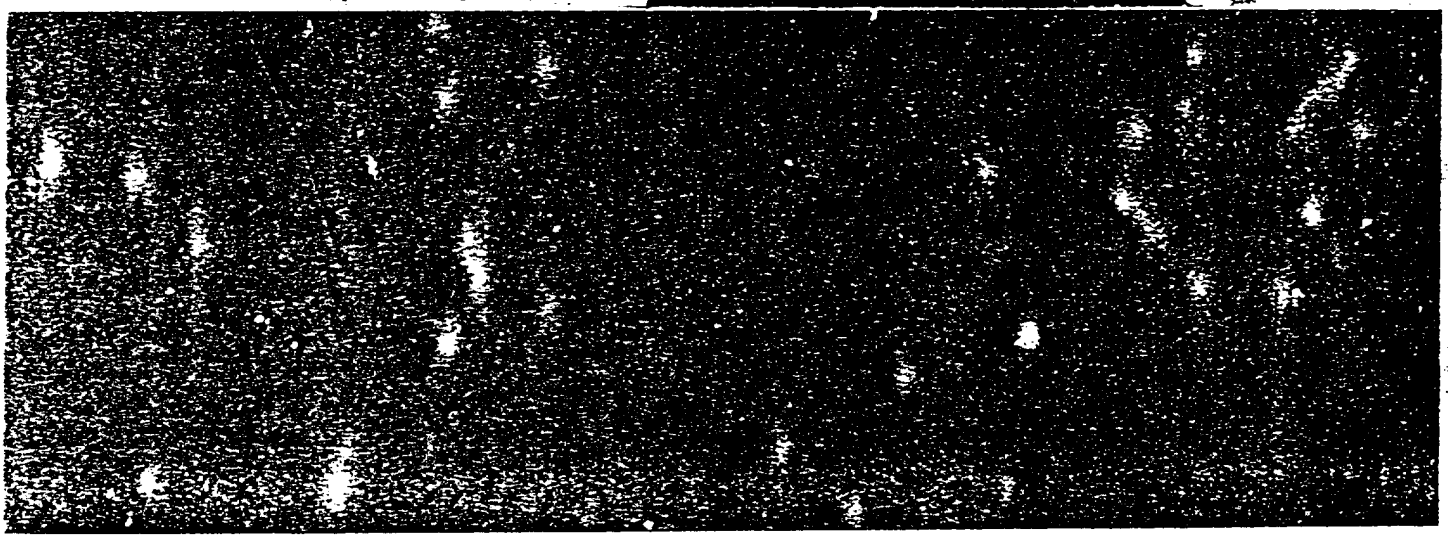
PAKISTAN AND THE CANDU REACTOR FUEL CYCLE



(Color # 1) Facilities Operational

(Color #2) Facilities Planned

(Color #3) Facilities Planned, Purchase Negotiations Begun



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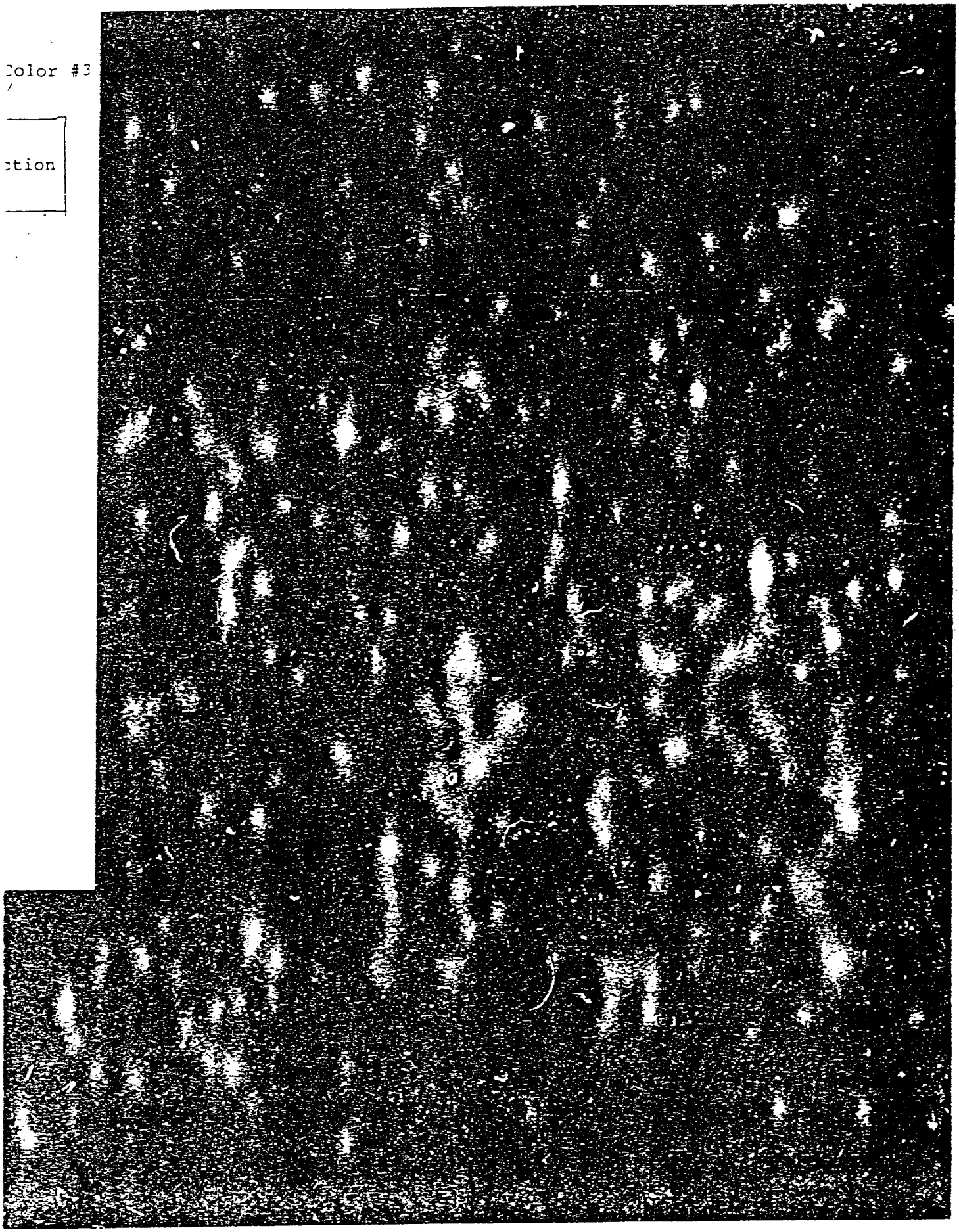

and safeguards will be much stricter than in the past. All major facilities acquired henceforth by Pakistan will almost certainly entail safeguard agreements forbidding use of their products in any nuclear explosive device.

The French Fuel Reprocessing Plant and Alternative Sources of Plutonium

30. [redacted] An agreement was finally reached with France in February 1976 to supply a safeguarded plant with a design capacity to reprocess 100 tons of fuel per year using the solvent extraction process. If built, it would be capable of reprocessing natural uranium (CANDU-type fuel and also the slightly enriched uranium fuel used in the types of power reactors planned for future construction. The plant was originally scheduled to go into operation in the early 1980s, [redacted] Both countries originally approved the sale of the reprocessing plant and obtained the sanction of the IAEA.

31. However, the odds appear to be sharply increasing that the plant will not be completed, at least according to original specifications, in the foreseeable future. The government of France has shown an increasing reluctance to build the plant as it was originally designed. Paris has since suggested either a ""coprocessing" or "apparent co-processing" technique which would produce [redacted] mixture of plutonium and uranium which is not suitable for weapons use. But the Pakistanis might, in time, be able to develop an additional (and unsafeguarded) facility which could separate the plutonium and make it available for nuclear explosions.

32. The present Pakistani martial law administration has strongly resisted these French suggestions for change. And it does have some limited leverage over the French. The reprocessing plant is part of a larger package of French sales to Pakistan including, besides the reprocessing plant, civilian and military aircraft, the Chasma nuclear power project, a truck plant and a color TV system. On the one hand, the French originally insisted that Islamabad take the entire package; on the other, the Pakistanis threaten to cutoff purchase of everything if the deal for the reprocessing plant does not go through.

33. The Pakistani military rulers would almost certainly refuse to give up the prospect of getting French military aircraft, but could well sacrifice such as a color TV system as a luxury the country cannot now afford. Other French items would probably be bought or not bought on their individual merits. And if the French do renege on their reprocessing plant agreement, they are not likely to be in much of a position to object to selective elimination of other items in the package.

34. The economic justification for acquiring a reprocessing plant has always been questionable even were the reactors for the Chasma nuclear power project to be built. The reason given for acquiring the plant is that it will be needed in the late 1980s and that it is cheaper to build it now. The certainty that Pakistan will be unable to meet its ambitious goals for nuclear power reactors in the 1980s adds to the argument against embarking on a reprocessing venture at this time.

35. Although the capacity of the proposed plant is much larger than would be required to process KANUPP fuel from normal power operation, it is of an appropriate size to handle the KANUPP output if the reactor should be operted in a manner to maximize the production of weapons grade plutonium. This does not necessarily lead to the conclusion that the reprocessing plant is intended for weapons use but it is certainly suggestive fo such use.

36. If built, the reprocessing plant is to be under a trilateral (IAEA-France-Pakistan) safeguard agreement forbidding the use of the product in making nuclear explosives or the transfer of French technology to unsafeguarded facilities. When negotiations began in 1973, France had indicated that little or no safeguarding would be required on the sale but, influenced by the Indian nuclear explosion and the increased concern on the part of all suppliers about the spread of nuclear weapons, Paris re-evaluated its stand and decided more stringent safeguards were necessary. Pakistan originally resisted but France held firm on its decision.

37. Both of Pakistan's currently operating reactors are safeguarded by the IAEA, as is the enriched uranium used for fabrication into booster rods for the Pakistani KANUPP (power) reactor and the enriched uranium used in the PINSTECH (research) reactor. There are, however, loopholes in the language defining the end use of supplied materials for these reactors. Specifically, the agreements only prohibit military uses and do not prohibit all nuclear explosive devices. Conceivably Pakistan could seize on this, as India did, to justify a "peaceful" nuclear explosion using safeguarded material. The agreement the French and Pakistanis have concluded for the reprocessing plant, on the other hand, includes language prohibiting the use of reprocessed material in <u>any</u> nuclear explosive device. It also includes a prohibition on the

replication of the of the reprocessing facility or any of its equipment or technology for 20 years.

38. There are major difficulties, however, in safeguarding any reprocessing facility. Unlike power or research reactors, the design of each reprocessing plant is unique, which necessitates the determination of safeguards specific to that facility--a time-consuming process that requires extensive personal inspection. In addition, the IAEA has never before been called upon to safeguard a reprocessing plant. Compounding the problem of the plant's design, therefore, is the IAEA's general lack of experience in the area of reprocessing safeguards. Short of round-the-clock physical inspection of a reprocessing plant it is questionable whether safeguarding such a facility is really effective. Because the time between diversion of plutonium and its conversion into nuclear weapons could be sharply reduced if a country were determined to pursue a policy of diversion, nuclear weapons could already be assembled before an effective international reaction could be mustered.

39. If Pakistan opts to pursue a series nuclear weapon program, it will need the French reprocessing plant or some equivalent. The French believe that the Pakistanis have

the know-how and enough of the plans and drawings to complete and operate the plant on their own. Other experts, including American area, do not think that this is the case, and that dependence on the French will continue for many years.

40. Such a plant is not the only conceivable source of plutonium for a single nuclear device test, however. The Pakistan Institute of Nuclear Science and Technology probably has a laboratory-scale fuel reprocessing facility. Pakistan might thus attempt--though this is unlikely (see below)--to produce sufficient plutonium using manual methods in this or some similar installation. The facility in question was designed to produce only grams per day, but with modifications might serve to produce sufficient plutonium for a single nuclear device in roughly the same time scale considered for the reprocessing plant; i.e., at sometime in the first half of the 1980s. Should this occur, however, Pakistan would still be many years from developing the reprocessing ability enabling it to stockpile weapons.

41. Indeed, the authorities in Islamabad are almost certainly aware that exploding a single device without having a further stockpile of fissionable material would be an extremely dangerous step. However much it would enhance

Pakistan's prestige in the eyes of Pakistanis, it would also alarm the Indians and--in their eyes--invite some kind of response. By the early 1980s India will have large quantities of unsafeguarded plutonium and a proven ability to set off a nuclear explosion. This is not to say that India would automatically embark on a weapons program, largeor small, but the odds in favor of its doing so would be greatly enhanced by a Pakistani test. And were India to do so, Islamabad could not counter with a program of its own--thereby enhancing India's strategic superiority even further.

43. Thus the acquisition of facilities which would enable Islamabad quickly to respond to an Indian weapons program with one of its own becomes an inescapable corollary of any nuclear explosive plan. As of April 1 '8, French-Pakistani negotiations as the matter were continuing, and could well do so far some time. Were Pakistan to be unable to get the reprocessing plant from France, the odds favoring any sort of explosive program on its part would sharply diminish.

43. For this reason, Islamabad could conceivably opt to build a small crude reprocessing facility on its own. There have been descriptions in the open literature of such "quick and dirty" installations. Most if not all the needed materials

are available on the open market. Under optimum conditions the facility could be built in a few months and could then produce several kilograms of plutonium a day--enough for several weapons--in an extremely brief period. But the technical skills of the Pakistanis are probably still too rudimentary to permit any such early success. For at least the next five years, and possibly much longer, such a facility will likely remain beyond their reach.

Pakistan's Nuclear Weapon Potential

44. If Pakistan does acquire an ample reprocessing facility and develops an explosive device, it will probably undertake eventually to develop and deploy nuclear weapons. How soon a demonstration nuclear device could be translated into militarily useful weapons would depend on a host of variables, including the nature of constraints imposed by available delivery systems. The simplest case, a low-yield bomb designed for internal carriage in an aircraft, would probably require at least two years from the date of a demonstration device. If it were designed with both simplicity and reasonably high nuclear efficiency in mind, such a bomb would be quite large, probably weighing thousands of kilograms. In terms of existing delivery systems it could be delivered only by Pakistan's relatively slow and vulnerable B-57s.

45. Pakistan will be extremely limited in delivery capabilities for many years to come. It presently has no capability for indigenous production of either aircraft or missiles. Aircraft it might acquire from abroad or missiles it might ultimately develop on its own would entail development of more sophisticated bombs or warheads which, while not necessarily beyond Pakistan's capabilities, would entail great investments in time and money and place great strains on technical resources. [redacted] but it may be reasonably assumed that Pakistan could not develop a nuclear warhead suitable for delivery by a ballistic missile in less than five years from the date of a demonstration device.

46. If fuel reprocessing facilities are acquired and if the KANUPP reactor can be kept in operation, Pakistan should be able eventually to produce enough weapons for its limited purposes--if it proves it has the technological capability to do so. If the KANUPP reactor were operated in a mode to optimize production of weapons-grade plutonium it could produce between 60 and 120 kilograms per year. [redacted]

likely to materialize in the near future. If the reactor continues to be operated primarily for power production, the maximum yearly production would be about 60 kilograms of reactor-grade plutonium. This material, as well as the 200 or so kilograms of reactor-grade plutonium already accumulated--enough for 30 to 40 weapons--could also be used but at the cost of increased design complexity and unpredictability of yield in the resultant weapons.

[redacted] If the reactor continues to be operated primarily for power production, the maximum yearly production would be about 60 kilograms of reactor-grade plutonium. This material, as well as the 200 or so kilograms of reactor-grade plutonium already accumulated-[redacted]-could also be used but at the cost of increased design complexity and unpredictability of yield in the resultant weapons.

Pages: 28-33

Exemptions: (b)(1), (b)(3)

For the foreseeable future Pakistan will be dependent on foreign suppliers even for the operation of its present minimal program, let alone for its expansion. As noted above, China may or may not be able and will to supply sufficient aid to keep the KANUPP reactor in Operation. China cannot, in any case, fulfill Pakistan's long-range nuclear power plans. Thus, for many years to come Pakistan may face a choice between foregoing its nuclear device option and foregoing much, if not all, of its projected nuclear power plans.

[redacted]

Pages: 35 - 38

Exemptions: (b)(1)(b)(3)