

Signals, Noise and Article IV (1979)

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Military Signals and Civilian Noise

The problem presented by the spread to many countries of civilian stocks of highly enriched uranium or plutonium, or facilities that could quickly produce these materials, is that such stocks would carry these countries so far along the path that leads also to nuclear explosives that from the moment that their military purpose became unambiguous, the additional time to get nuclear explosives would be too short for any feasible inspection system to provide timely warning. And timely warning, it has long been recognized, is the most that a feasible international inspection system can provide. The International Atomic Energy Agency (IAEA) has no police force. Moreover, one of the major factors affecting a government's decision to make a nuclear explosive will be not only the extra time from the point at which its military purpose becomes clear, but also the additional political risks and indeed the increment in resource costs above the costs expended for at least a plausibly pure civilian commercial activity.

The timely warning concept is not an innovation recently thought up by President Ford near the end of his term in office. It is an essential part of what is meant by "effective safeguards." It was universally recognized as such in the 1940s when civilian nuclear power first came to be talked about seriously. It was intermittently forgotten in the 1950s but restored to a central place in the 1960s, and in particular when the IAEA began to elaborate its Nuclear Nonproliferation Treaty (NPT) safeguard system in detail. Safeguards do not mandate any penalties but *only* timely warning. That is what affords at least the possibility of counteraction. Without even timely warning, we would have little besides reminiscence.

What is new so far as the public (and even many public officials) is concerned is the official acknowledgement¹ in explicit quantitative terms that power reactor plutonium is *not* safe but can be used to make nuclear explosives reliably yielding 1 to 20 kilotons in even a very simple implosion device. The implication immediately follows that the timely warning requirement precludes the accumulation of stocks of separated plutonium or simple compounds of it in non-weapon states. This should also remind us that the same preclusion applies even more obviously to highly enriched uranium.

Since the central aim of "effective safeguards" as explicitly defined in the IAEA information circulars on NPT safeguards² is timely warning, signals of a military program must be detected and identified early enough; but they must also be unambiguous enough, that is, stand out clearly enough from the noisy background of civilian activity, to permit response either by international agencies, by regional allies, or by regional adversaries who have been relying on promises that the country observed will not acquire nuclear weapons. Programs and facilities overtly "dedicated" (to use the current jargon) to the purpose of getting bomb material present of course the least ambiguous signals. Some nuclear activities, facilities and equipment that are regarded as having legitimately "civilian" applications may nonetheless advance a country significantly toward a military weapons capability. That is to say, they diminish the additional costs entailed by a decision to get the bomb. They reduce the remaining time it would take to get nuclear explosives, and they reduce also the additional political risks of exposure and counteraction. For usable warning time must be measured at best from the moment that identification or differentiation from the noise is *reliably* made. For some sorts of response, the signals have to be not merely unambiguous enough, but they must also be public, *i.e.*, usable without excessive risk of destroying sources.

Confusions of "Peaceful Use" with "Exclusively Peaceful Use"

The rhetoric of Atoms for Peace has tended, for countries aspiring to or undecided about whether to get nuclear weapons, to enhance the political utility of the ambiguity inherent in nominally civilian activities which in fact have a dual military and civilian character. With the one explicit exception of Plowshare (nuclear explosives for civil engineering), Article IV of the NPT is frequently

interpreted as conferring legitimacy on all civilian activities, simply because they have some civilian function.³ This is so even if they are not exclusively civilian in their import. As a result, Article IV is often interpreted as obliging all advanced countries to transfer any civilian technology except Plowshare, no matter how far such transfer might carry the recipient country toward a military nuclear capability. Even some *Agreements on Nuclear Cooperation* between countries have been rather careless in failing to include or to stress the adverb “exclusively.” And the trouble goes back to the beginning of the nuclear era, when we formed the habit of talking as if a civilian use automatically substituted for military utility, rather than sometimes complementing or enhancing it.

However, the legislative history of the IAEA Statute shows that “peaceful” was intended to mean “exclusively peaceful,” as well it might in the commonsense interpretation. In the United States, for example, the legislative history makes clear that U.S. Senators have always been concerned that a civilian use should not also assist a country to get nuclear bombs. One illustration is the exchange between Senator Sparkman and Secretary of State Dulles in the 1957 *Hearings* on the IAEA. The Senator asked, “Just what certainty is there that a particular peacetime project might not have a future military use as well as a peaceful one?” Secretary Dulles deferred to Atomic Energy Commission Chairman Strauss but gave his

untutored impression that since the material furnished will not itself be of weapon quality, and since the making, converting of it into weapon quality or the extraction of weapons quality material out of it as a byproduct would be an elaborate and difficult and expensive operation, that could not occur without the knowledge of the agency and that the violation would be detected.

According to the Secretary’s impression, in short, the material furnished, or derived from what was furnished, would be “denatured.”

Senator Sparkman’s concern addressed the plain common sense meaning of “Atoms for Peace” and of various *Agreements on Nuclear Cooperation*. He assumed, but wanted to be assured, that the material would have only a peaceful use. In the same way, in reading the Nonproliferation Treaty, we ought to keep in mind

that the peaceful uses it wants to encourage are intended to be exclusively peaceful, not also military.

Now Article IV of the NPT refers to the undertaking by all parties to the Treaty "to facilitate" and the right of all parties "to participate in the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy." Indeed, it refers to such rights to the peaceful pursuit of nuclear energy, in the language of 18th-century natural law, as "inalienable." The contention was made by many of the delegates to the Iran Conference on Transfer of Nuclear Technology at Persepolis in the spring of 1977 that this "inalienable right" includes the stocking of plutonium or other highly concentrated fissile material and was therefore violated by President Carter's proposal to delay commitment to unrestricted commerce in plutonium. This particular Third World rebellion might have been a little more convincing if the President of the American Nuclear Society had not played a leading role in the writing of their declaration, and if some of the countries complaining most bitterly about a supposed violation of a most sacred part of the NPT had not themselves neglected ever to sign or ratify the NPT.

However, Article IV explicitly states that the inalienable right of all parties to the Treaty to the peaceful use of nuclear energy has to be in conformity with Articles I and II, and it is these Articles that are what make the Treaty a treaty against proliferation. In Article I the nuclear weapons states promise not to transfer or "in any way to assist, [or] encourage ... any non-nuclear weapons state to manufacture" nuclear explosives. If the "fullest possible exchange" were taken to include the provision of stocks of highly concentrated fissile material within days or hours of being ready for incorporation into an explosive, this would certainly "assist" an aspiring nonnuclear weapons state in making such an explosive. No reasonable interpretation of the Nonproliferation Treaty would say that the Treaty intends, in exchange for an explicitly revocable promise by countries without nuclear explosives not to make or acquire them, to transfer to them material that is within days or hours of being ready for incorporation in a bomb. Some help and certainly the avoidance of *arbitrary* interference in peaceful uses of nuclear energy are involved. However, the main return for promising not to manufacture or receive nuclear weapons is clearly a corresponding promise by some potential adversaries, backed by a system to provide early warning if the

promises should be broken. The NPT is, after all, a treaty against proliferation, not for nuclear development.

At the *Windscale Inquiry* in 1977, British Nuclear Fuels Limited (BNFL) and the U.K. Department of Energy took the position that England was obligated under Article IV to perform plutonium separation services for non-weapon states.⁴ And Mr. Justice Parker, in his Report on the Inquiry, agreed with BNFL. He said in fact that the NPT is “on its face a straightforward bargain”⁵: an exchange of every assistance by the nuclear weapons states in the development of nuclear energy for a promise by the nonnuclear weapon states not to make or get nuclear weapons. This assumes, among other things, that the non-weapon states have no interest of their own in seeing that other nonnuclear weapon states do not acquire nuclear weapons, that South Korea does not care if North Korea has the bomb, that Syria is unconcerned about a nuclear Iraq, that Iraq is not concerned about Iran, that Pakistan is not worried about India, and that Belgium is not concerned about the Federal Republic of Germany. This, of course, is an absurdity, since it is not hard to find recent statements to the contrary in almost all of these countries. Moreover, it flies in the face of the actual history of the genesis of the NPT, which started as a rather straightforward bargain, proposed by the Irish Republic, *among non-weapon states* to increase their safety by mutual agreement to abstain from getting nuclear weapons.⁶ Article IV was one of the embellishments added in the course of negotiation.

There are, of course, powerful commercial incentives for suppliers who are engaged in selling nuclear services and various nuclear materials and facilities to interpret Article IV as imposing as little constraint as possible. In the short term at least, the “fullest possible exchange of equipment, materials and services” is the greatest encouragement to nuclear sales. The purchasers might have mixed motives. Some, as President Carter himself suggested on April 7, 1977, clearly have used or intend to use civilian facilities to develop a nuclear explosive capability. Some, undoubtedly, believe that civilian nuclear transfers will be of enormous economic benefit or, perhaps, that they can stave off economic disaster. They may be interested in the fullest possible exchange, especially if Article IV can be interpreted as requiring nuclear suppliers to subsidize these transfers. During the negotiation of the treaty, in fact, Italy proposed inserting language to that effect, but the motion was defeated.

The report of the *Windscale Inquiry* insisted that the nuclear weapon states have the obligation, even if it might involve some expense or loss.⁷ By great good fortune it happens that Britain's fulfillment of its obligation, as interpreted by Mr. Justice Parker, is alleviated somewhat by the fact that the billion dollar contract it has arranged with the Japanese involves a cost plus commitment by the Japanese. The loss sustained then can only be negative.

Time, Warning Time and Article IV

The interpretation of Article IV is by no means a trivial matter. If, in fact, technological transfers can bring a "non-nuclear weapon state" within weeks, days or even hours of the ability to use a nuclear explosive, in the operational sense that "non-nuclear weapon state" will have nuclear weapons. The point is even more fundamental than the fact that effective safeguards mean timely warning. A necessary condition for having timely warning is that there be a substantial elapsed time. But if there is no substantial elapsed time before a government may use nuclear weapons, in effect it *has* them.

Consider, for example, the situation of a government engaged in a very short war with an adversary that has no nuclear weapons. If its adversary appears to be winning, and [if] the government has plutonium in explosive concentrations and the capability of assembling an implosion system developed by years of experiments with nonnuclear explosives in the rapid compression of heavy metal, then from the standpoint of the adversary who had been winning, it would be facing a government which to all practical effect had nuclear weapons.

Or, consider the case of a government which is not at war, but is capable of quickly assembling a nuclear device to use or threaten to use against another government without such a capability. Once again, there is no practical difference between the coercion it could use or the threat it could execute from what a nuclear power might manage.

Or, one might even consider a case where both of two adversaries were that close to potential assembly and use. The instability might be at least that which we associate with some possible confrontations between two vulnerable nuclear powers.

The point may be driven home if we recall that in 1947, for example, the United States stored its plutonium weapons in disassembled form. Moreover, since the design was quite

primitive and used much more inconvenient components than are commercially available today, the process of putting the weapon together took many hours. In fact, it took a longer time than would be needed today by a well prepared government laboratory to make highly concentrated fissile material ready for insertion in a nonnuclear assembly for compressing it rapidly.⁸ The United States did have nuclear weapons in 1947. And if the rules are relaxed enough, so can nonnuclear weapon states today.⁹

There have been a number of recent statements suggesting as implausible “an overnight scenario” by which is meant apparently a contingency in which a non-weapon state assembled a weapon in less than a day or so.¹⁰ There is, of course, nothing magical or even anything of critical importance in the interval of 24 hours. For purposes of policy against the spread of nuclear weapons, it would be bad enough if a prospective nuclear power were able to get ready in a few days or a few weeks. In suggesting that it would be a great failure in proliferation policy if the rules made it legitimate for a non-weapon state to come within a day or so of readiness to use nuclear weapons, we surely do not imply that having months or years of warning would not be valuable. Nonetheless, it is worth noting on the plausibility of the overnight scenario that the United States assembled the very first nuclear bomb for the Trinity test in 26 hours and this included time out to get some sleep.¹¹

At the *Windscale Inquiry*, representatives of BNFL suggested, as an alternative to dependence on slightly enriched uranium, that those governments (which BNFL said were moved by a concern for “energy independence” and a desire to obtain the conservation benefits of plutonium) be allowed to purchase plutonium separation services, but that the plutonium be sent out in the form of plutonium fuel rods, perhaps pre-irradiated or made radioactive in some other way; and in any case, that such fuel be placed under strict international storage and control and released only according to international criteria. The report of the *Windscale Inquiry* in paragraph 17.6 seems to accept this suggestion as a partial alleviation of the fact, which it there recognizes, that plutonium fuel would bring non-weapon states closer to nuclear weapons.

But this proposal has several difficulties, including some that involve an intolerable legal tangle in the interpretation of Article IV and some that would involve difficulties intolerable to the purchaser.

To illustrate the latter point, this proposal would make these countries more rather than less dependent on outside sources for an uninterrupted fuel supply, and their reactor operations would be much more liable to shutdowns than with the slightly enriched uranium fuel which it would be feasible and safe to supply.¹² Presumably, BNFL's proposal would mean keeping *strategic* quantities of plutonium out of the hands of governments that do not have nuclear weapons. If such arrangements were practicable at all, keeping the amount of plutonium under national control to less than a bomb's worth or a few bombs' worth would allow these countries almost no working stocks of MOX or separated plutonium under their own control. With only one MOX reload as a working stock for each reactor, and assuming they do not fabricate their own MOX fuel, in the 1990s Japan and the Federal Republic of Germany would each have more than 1,000 bombs' worth of plutonium quickly accessible and even Spain would have 650 bombs' worth.¹³ (That is, on their plans up to recently. If they fabricated their own MOX fuel they would have even more plutonium, in forms still more directly usable in nuclear weapons.) But less than one thousandth or one 650th of a country's annual reload requirement could hardly be called a working stock.

The American experience with India offers strong evidence that even supplies of slightly enriched uranium fuel that would have been enough to guarantee operation of the Tarapur reactor for over two years have been deemed by the Indian government to be below emergency levels, dictating resupply by air and other speedy action.¹⁴ Moreover, the debate in the 1950s on the draft of the IAEA Statute focused on similar though less drastic proposals for deposit of fissionable materials with the IAEA. Even then it was made clear that to give such powers to the IAEA was unacceptable to governments like India, as threatening their economic life and their independence.¹⁵ It seems extremely unlikely that governments trying to secure a little more energy independence by the use of plutonium fuel than if they only used natural or slightly enriched uranium would accept a new international institution depriving them of any significant national control of such plutonium, thus making them more rather than less dependent on outside powers for continuity of supply.

Fresh low enriched uranium stocks under national control are more likely to be susceptible to limitations satisfying both the user's desire for adequate working stocks and the international community's desire to keep stocks of highly concentrated

fissionable material out of the hands of non-weapon states. It is also true that international control and close, even continuous, inspection of spent uranium fuel would intrude much less into the essential operation of power or research reactors, yet serve an important function in providing early warning of diversion.

The proposal also makes a chaos out of the interpretation of Article IV proposed by BNFL and Justice Parker (and most of the vocal attendees at the Persepolis Conference). That interpretation of Article IV, it will be recalled, had it that “every assistance” — that is, any transfer whatsoever except for an actual weapon — was required by Article IV. Even though the first paragraph of Article IV states that the use of nuclear energy it contemplates must be “in conformity with Articles I and II of this Treaty,” which prohibits transfers that would “in any way ... assist ... non-nuclear weapon states to manufacture or otherwise acquire nuclear weapons,” Justice Parker’s report says that this does not exclude the transfer of the service of separating plutonium. Mr. Parker says quite correctly that at the time of the signing of the Treaty, many of the parties to the Treaty believed that the development of nuclear energy contemplated under Article IV included the production of plutonium. In fact, it is not hard to find documentation for that statement, including statements specifically mentioning the transfer of *metallic* plutonium. The fact that the parties to the Treaty did not understand that power reactor plutonium was not and could not be “denatured,” explains how they could have accepted both Article IV and Articles I and II, to which Article IV is subject. However, it is also obvious that many parties to the Treaty believed that they would not be subject to any of the constraints involved in the technical “fixes” BNFL and the report propose. Surely no government expected to receive fuel in pre-irradiated form and many, if not most, expected to fabricate plutonium fuel themselves, and to be handling metallic plutonium. The government of Canada, for example, a non-weapon state which is a party to the Treaty, fabricated plutonium fuel in the early 1960s for use in its NRX research reactor. To insist that governments be deprived of plutonium except in the form of already fabricated fuel rods, would be to deny them “every assistance.”

The only way out of this dilemma is to recognize that “a non-proliferation treaty should not contain any provisions which would defeat its major purpose.”¹⁶ That statement was made during the hearings on the NPT before the Senate Foreign Relations Committee by the U.S. spokesman who apparently

himself did not understand that power reactor plutonium metal was directly usable in the bomb, and had mentioned it as one of the things he thought was consistent with Article IV.

The operational meaning of Article IV is not an academic matter. If suppliers could legitimately make any nuclear transfer other than that of a fully assembled weapon, then this would radically transform the situation both of warning signals and of the sanctions they might evoke. For there to be a signal of a violation, the activity signaled has to be illegitimate. But if Article IV is not subject to the constraints of Articles I and II, in effect there may be no violations.

As for sanctions, the implications here are worth stressing.

*Sanctions and Article IV*¹⁷

Ambiguities as to whether an activity is "safe" and civilian, or "dangerous" in its military implications, not only confuse and reduce warning. They weaken and can totally frustrate sanctions.¹⁸

For a dozen years now, U.S. spokesmen have indicated that our agreements on the peaceful use of nuclear energy have always implicitly excluded the manufacture of nuclear explosives.¹⁹ The Canadian government has said the same. When the Indians conducted a nuclear explosion, they described it as "peaceful," and not a violation of any agreement either with Canada or with the United States. The Canadian government, adhering to the commonsense meaning of its agreements on nuclear cooperation with India, took immediate steps to administer sanctions. They stopped essentially all nuclear cooperation not only under the agreement covering the CIRUS research reactor, but also on those covering the CANDU power reactors at Rajasthan. The United States, on the other hand, did not follow suit. It continued its nuclear cooperation with India, and indeed in 1976 Hearings before the Nuclear Regulatory Commission, the Department of State held that if the United States did not continue its shipments of slightly enriched uranium to India under its *Agreement on Cooperation* covering the Tarapur reactors, the *United States* would be in violation; and that this would free the government of India to do whatever it wanted to, not only with the future plutonium it might accumulate from that reactor, but also with the plutonium it had accumulated in the past.²⁰ The present as well as the past Indian administration has indicated it takes a similar position.

In fact, a casual survey of the debates in Parliament and the Indian press revealed the prevalence of the view in India that the United States is or would be in violation, but failed to turn up any suggestion that the Indian government had violated the agreement on CIRUS in making and testing its nuclear explosive.

Of course, most of our agreements now explicitly exclude the manufacture and testing of a completed nuclear explosive. The point of this example, however, is more general. If an activity that brings a country very close to a nuclear weapon, and that stops just short of its assembly, is legitimate, then by assumption, there is nothing wrong with it. The government of that country has not violated the agreement. Moreover, *it is the application of sanctions by the supplier that would be a violation of the agreement.*

Increase of Civilian Nuclear Noise through Laxity in Project Economics

The practice of promoting and undertaking civilian nuclear activities which may confer prestige but have no strict economic justification has increased the noise background which serves as a potential cover for military activities. The IAEA has as part of its charter the mission of accelerating and enlarging the benefits of civilian uses of nuclear energy, with special regard for the developing countries. It is worth observing, however, that the principal international agency charged with financing international economic development, namely, the International Bank for Reconstruction and Development, has refused to finance nuclear projects in the less developed world (and not only the most dubious projects like small reprocessing plants or the cumulation of fissile stocks likely to be idle for decades) because it wants to support economic development rather than status or prestige. Nuclear electric power is in general highly capital intensive, efficient only in very large sizes and requires continuing highly sophisticated maintenance, characteristics which do not in general fit the needs of less-developed countries. Expenditures for using plutonium fuel in breeders are in general even more inappropriate. However dubious the civilian value of some nuclear projects, their military applicability may be quite definite. The most familiar example is Plowshare, which has yet to demonstrate a realistic economic application, but which – because of the laxity of economic analysis applied to such projects – has served as a nominally civilian cover for an activity with obvious

military implications. In this case, the lack of rigor in the economic analysis, indeed the nearly total absence of any economic analysis at all, has reinforced the error involved in ignoring the point that "Atoms for Peace" means "exclusively for peace." These particular atoms for "peace" are in fact likely to be useful exclusively for war. Article IV of the NPT therefore excludes "peaceful" nuclear explosives.

Plowshare, however, is merely the most familiar case. The careless way in which nuclear establishments in the mid-1950s and at the beginning of the 1960s decided to separate plutonium and to accumulate it for the distant and uncertain date at which it might be used for the initial load of a breeder reactor, ignored any rigorous economic criterion for investments over time. A rigorous criterion would maximize the productive use of current resources and so increase the resources available for future generations. When India decided in the mid-1950s to invest in a separation facility and in stocks of plutonium which in essence would be economically idle for many decades—until the hoped-for appearance of a thorium breeder, or near-breeder—this was a waste of capital in a developing country where capital is particularly scarce. Yet the activity served to increase the noise level and the opportunities and ease for a decision to make military nuclear explosives when circumstances changed.

Take the example of India: It has frequently been said that there is very little connection between programs for nuclear electricity and the spread of nuclear weapons to more countries. And the prime example of this lack of connection is sometimes said to be the Indian bomb program, which used plutonium from their CIRUS research reactor. On the contrary, the Indian program illustrates the connection. The CIRUS reactor was intended from the beginning to produce plutonium as well as to offer facilities for research and training. Both the plutonium and the research and training were connected with nuclear electric power plans. The research and training were, as one might expect, connected indirectly. For a large-scale power program, men needed to be trained in operating reactors, in handling radioactive materials, in fabrication of fuel, in safety measures, and in understanding the physics and engineering of related nuclear processes. CIRUS was an important part of that. Moreover, the Indians intended to develop their own natural uranium burner reactors on the Canadian model, moderated by heavy water, and studies and experiments with CIRUS were part of the program of designing

such power reactors. Finally, the plutonium was intended from the start to be separated and stocked for use in near-breeder and breeder power reactors.²¹ In short, the CIRUS reactor and the Phoenix separation plant were, from the beginning, part and parcel of an ambitious nuclear electric power program.

These long range plans paralleled in a general way (with some modifications for exploitation of specifically Indian resources of thorium) the model of nuclear power development current in the industrial countries: to begin with burner reactors, and to make a transition to breeders, using the plutonium from the burner reactors for the initial fuel loading of the breeders. The fact that such production and separation of plutonium followed the general model of Canada and the U.S. itself in this respect gave the Indian plans an apparent legitimacy. It made less likely that anyone would question whether the plutonium would be used in an explosive. Later, after the Sino-Indian war and the Chinese bomb test (and after nuclear explosives for civil engineering had been presented by the U.S. as a plausible agenda item at the Second International Conference on Peaceful Uses of Atomic Energy), the Indians contemplated the use of the plutonium from CIRUS under the alternative, apparently legitimate rubric of "Plowshare." (By as early as 1966 Canada and the U.S., in response to rumors of Indian interest in "peaceful" nuclear explosives, said in public that any nuclear explosive had a clear military use.)

In the case of Plowshare, the cover of legitimacy was too transparent to escape international notice and eventually a sizeable international response. The Indian explosion provoked a more immediate response, particularly by Canada. However, the apparent legitimacy of the initial plans for the use of plutonium from the CIRUS reactor for a future breeder served very well in bringing the Indians to a position where they required very little additional effort to shift to "peaceful" nuclear explosives from plutonium stocked for breeder power reactors. The fact that such plutonium stocks were justified by a quite unrealistic economic and technical program for an early breeder did not distinguish it sufficiently from India's other nuclear programs with a civilian purpose; and the universality of similar long-range programs in other countries helped explain why it was never noted that such programs were not exclusively civilian in the technologies they made accessible.

Finally, such neglect of the military potential implicit in these civilian programs is made easier by the fact that the transfers

involved are small ones, shipments of heavy water and the like, and training in reprocessing for small numbers of nuclear engineers. These can be handled at middle or even lower levels of the bureaucracy, where high policy is rarely in mind. When the transfers come up for approval at higher levels, their small scale is reassuring to the policymaker. Surely they do not constitute a mortal danger. In fact, they seem like a reasonable item or trinket for barter for the good will of a friendly country, and the good will of one's counterpart in the bureaucracy or political hierarchy of that country.

But it is precisely in this way that the policy on spreading civilian nuclear energy as a substitute for military nuclear energy dissolved into incoherence and the furtherance of military nuclear activity during the late 1950s. And it is always in danger of dissolving.

Plowshare has for a long time been a rather transparent cover for a military purpose. However, it seems that decisions to stock separated plutonium for the breeder began as sincerely but badly conceived economic measures. Many other countries besides India, including Japan, decided very early to accumulate plutonium, not for recycle in light water reactors, but for the breeder. These early decisions were made with little economic analysis, on the basis of quite unrealistic anticipations of the dates at which breeders might be of commercial importance. In India, however, these early decisions made on other than military grounds served to prepare for a program of nuclear explosives. More recent decisions to acquire either stocks of plutonium separated elsewhere, or a national separation plant, are likely to be from the outset more self-consciously related to military plans. For example, Pakistan, which has no reactors requiring fuel enriched by either uranium or plutonium, sometimes insists that the separation plant it is purchasing from France is purely civilian in intent, and on the other hand sometimes says that she will be glad to give up plutonium separation, provided that the superpowers abandon their own nuclear weapons.²² Which rather directly, if inconsistently, acknowledges that Pakistan's purpose in separating plutonium is only to make nuclear weapons to balance those of "Nuclear Powers" and that this purpose would be served equally by the destruction of everybody else's nuclear weapons.

ENDNOTES - Wohlstetter *et al.* - Signals, Noise and Article IV

1. "Reactor Plutonium and Nuclear Explosives," briefing paper by Robert W. Selden reported by Robert Gillette as presented to representatives of nuclear industry and foreign governments, November 1976, Meeting of the American Nuclear Society and Atomic Industrial Forum, Washington, DC. See Gillette, "Military Potential Seen in Civilian Nuclear Plants," *Los Angeles Times*, June 26, 1977.

2. International Atomic Energy Agency, Information Circular/153, p. 28; and *Safeguards Technical Manual*, IAEA-174, 1976.

3. See Arthur Steiner, "Article IV and the 'Straightforward Bargain'," PAN Paper 78-832-08, in Wohlstetter *et al.*, *Towards a New Consensus on Nuclear Technology*, Vol. 2: *Supporting Papers*, ACDA Report No. PH-78-04-832-33, Marina del Rey, CA: Pan Heuristics, July 6, 1979.

4. The BNFL view of Article IV reflects this interpretation widely preferred by the nuclear industry and nuclear agencies of other countries as well. See, for example, "U.S. Nuclear Export Policy," statement by the Atomic Industrial Forum's Committee on Nuclear Export Policy, July 21, 1976. It also appears to be the view of the Director General of the IAEA.

5. *Report by the Hon. Justice Parker*, presented to the British Secretary of State for the Environment, in *The Windscale Inquiry*, Vol. 1, Report and Annexes 3-5, London: Her Majesty's Stationery Office (HMSO), January 26, 1978.

6. See Steiner, "Article IV and the 'Straightforward Bargain'."

7. *Windscale Inquiry*, p. 18.

8. Albert Wohlstetter, "Spreading the Bomb without Quite Breaking the Rules," and History of the Strategic Air Force, typescript, Vol. 1, unclassified portion in Air Force history archives.

9. On this point, see Albert Wohlstetter *et al.*, *Swords from Plowshares*, *op. cit.*

10. See, for example, Carl Walske, "Nuclear Power and Proliferation," speech delivered to the International Conference on Nuclear Power and the Public: A European-American Dialogue, Geneva, Switzerland, September 27, 1977.

11. Arthur Steiner, "Trinity, the First Overnight Bomb," Pan Heuristics Paper 78-832-09, February 1978.

12. Our comments here do not address the question as to what extra costs would be imposed on the purchaser by the various methods of making the fuel radioactive, nor the question as to how effective such technical "fixes" might be.

13. Chap. 1, "The Military Potential of Civilian Nuclear Energy," in *Swords from Plowshares*.

14. March 25 Order By the Nuclear Regulatory Commission in the Matter of India, to Export Special Nuclear Material, Docket XSNM 805, KSNM 845, Transcript, pp. 4ff.

15. Dr. Bhabha rejected the draft proposal which gave the IAEA the power "to approve the means to be used for chemical processing of irradiated materials recovered or produced as a by-product, and to require that such special fissionable materials be deposited with the Agency except for quantities authorized by the Agency to be retained for specified nonmilitary use under continuing Agency safeguards." (AEA/CS/OR/28, p. 6.) "In our opinion," Dr. Bhabha continued, "the present draft gives the Agency the power to interfere in the economic life of States which come to it for aid. . . . It therefore constitutes a threat to their independence, which will be greater in proportion to the extent that this atomic power generation is developed through Agency aid" (IAEA/ CS/OR/7, pp. 49-50).

16. Hearings on the NPT before the Senate Foreign Relations Committee, July 1968, p. 39.

17. See Arthur Steiner, "Safeguards, Sanctions and Signals," PAN Heuristics Paper 78-832-08, April 1978; and "Article IV and the 'Straightforward Bargain'," *op. cit.*

18. On this, see Wohlstetter *et al.*, *Swords from Plowshares*, *op. cit.*

19. See testimony of Robert J. McCloskey, U.S. Senate, Committee on Government Operations on S.1439, June 16, 1976, p. 811.

20. Acting Assistant Secretary, Bureau of Oceans and International Environment and Scientific Affairs.

21. See Roberta Wohlstetter, Seminar on U.S. Peaceful Aid and the Indian Bomb, Santa Monica, CA: Seminar on Arms Control and Foreign Policy, December 1976, revised August 1977; "The Buddha Smiles: Absent Minded Peaceful Aid and the Indian Bomb," Monograph 3 in *Can We Make Nuclear Power Compatible with Limiting the Spread of Nuclear Weapons*, *op. cit.*; and *Swords from Plowshares*, *op. cit.*

22. See, for example, *Dawn Overseas*, Islamabad, June 19, 1977: "Mr. Bhutto said Pakistan was ready to cancel its deal with France if the Nuclear Powers gave a solemn pledge to destroy each and every nuclear weapon."