

Policy Implications

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Policy Implications

INTRODUCTION

It is the task of this chapter to examine possible policy responses to the proliferation phenomenon. To date, disagreement over policy has stemmed, in large part, from fundamentally different perceptions of the problem.

Most agree that global interest in, and demand for, nuclear energy will probably increase. Many governments see the atom as vital to meeting their future energy needs and economic growth objectives. Thirty-three countries have or are building nuclear power stations. At the same time, expressions of public opposition or reservations regarding nuclear power have become more widespread and articulate. In the absence of ameliorative policy measures, the spread of civilian nuclear energy will increase the potential for weapons proliferation. Technological, economic, and time barriers to acquiring nuclear weapons are declining, and prospective innovations in enrichment technology promise to accelerate the process. A number of nonnuclear countries already have the industrial capability to produce their own nuclear arms.

General agreement on these observations ceases when certain basic issues arise. Is civilian nuclear power an unavoidable and necessary means of meeting national and global energy needs or can viable alternative sources of energy be developed? Must the spread of nuclear power inevitably result in the proliferation of nuclear weapons, or can that linkage be disrupted? Does proliferation really constitute a serious problem from the perspective of U.S. interests?

One can delineate three major overviews of the proliferation problem from different evaluations of these issues. The first case assigns clear priority to energy supply, the second to nonproliferation, and the third assumes a shared priority. In each case, U.S. objectives can be defined, available policy options outlined, and probable costs and gains assessed.

It should be noted that these perspectives are not monolithic. They are umbrella categories encompassing diverse groups and viewpoints which, nevertheless, share a dominant orientation with regard to proliferation. The discussion of each perspective begins with an explication of the rationale, objectives, and policy prescriptions set forth by proponents of the perspective, and ends with a critique of that material.

ENERGY PRIORITY PERSPECTIVE

Rationale

To the extent that proliferation control and increased nuclear energy output prove incompatible, priority must be assigned to the latter. If nuclear power and proliferation are unavoidably linked, as many adherents of this viewpoint believe, the world will have to live with proliferation.

This perspective rests on three basic assumptions. The first is that substantial proliferation is probably unavoidable for a variety of reasons:

- (a) If the world is to make a successful transition from oil and gas to other energy sources, increasing reliance upon nuclear power is unavoidable. The facilities and knowledge required to develop this energy source have an inescapable potential for application to weaponry.
- (b) A large and growing number of countries have the technical and economic resources to construct reactor and reprocessing facilities for the purpose of fabricating nuclear weapons.
- (c) Powerful political incentives, including considerations of national security, prestige, and self-sufficiency, operate in support of a decision to acquire a weapons capability.
- (d) Any nation that decides to establish a nuclear weapons program can probably purchase the necessary fuel, facilities, and expertise from a choice of foreign suppliers. Efforts by the United States to impede the sale of such items will probably result in the American share of the nuclear export market being captured by other suppliers who may impose less stringent safeguard requirements upon importers. Some also export reactor types more vulnerable to diversion.

The second assumption is that further proliferation can have stabilizing, and therefore constructive, consequences for international politics. Possession of nuclear

weapons should have the same sobering effect on new nuclear powers as it has had upon the superpowers. It is argued that the principal result of proliferation will be to largely eliminate military aggression as a national foreign policy option. If countries such as Israel, Yugoslavia, Pakistan, South Korea, Taiwan, and Kuwait, which may have credible reasons to fear military attack by a neighbor, were to possess even a rudimentary nuclear capability, their security would be measurably enhanced. The result would be to at least partially defuse some of the globe's most volatile flashpoints.

According to the third assumption, even if proliferation resulted in the actual use of nuclear weapons by one or more of the new nuclear powers, the conflict need not escalate to include involvement by the great powers. The erosion of cold war alliance systems and post-Vietnam doubts in the United States over the desirability of expanding, or even maintaining, security guarantees overseas, tend to both stimulate proliferation and to reduce the likelihood of American involvement in a local nuclear conflict. Proliferation itself tends to reduce the need for security guarantees and accompanying overseas military installations, and with them the danger of escalation. Finally, the virtually invulnerable deterrent capability maintained by the superpowers renders a deliberate attack against them by a nascent nuclear power unambiguously suicidal, thereby obviating the necessity of a panicky or hair-trigger U.S. response to a localized nuclear flareup.

There is a variant of this perspective which is of at least equal importance. Though based on somewhat different assumptions, it shares the priority accorded nuclear energy production as compared to proliferation concerns. Proponents argue that disincentives to proliferation have proven strong in the past and appear to be getting stronger. The first decade of the nuclear era (1945-1955) witnessed the advent of three nuclear weapons states, the second decade two, and the third decade one. Consequently, supporters of this

viewpoint contend that any further proliferation will probably occur at a rate sufficiently moderate to be assimilated by equilibrating processes of the international political system—just as past proliferation has been. Arguments that proliferation can be a source of international stability and that it need not lead to escalation of local conflicts further buttress this viewpoint.

Objectives

The basic policy objective from this perspective is to prevent exaggerated fears over proliferation from jeopardizing *real* U.S. interests, which include developing nuclear power as an energy source and preserving American access to the global market for nuclear facilities, fuel services, and technology. Moreover, if the United States seeks to exert effective leverage in support of nonproliferation objectives it must do so from a position of predominance in international nuclear commerce.

Policy

On the basis of these assumptions and objectives, strenuous superpower efforts to stuff the proliferation genie back into the bottle are deemed costly, futile, and even unnecessary. Proponents of this perspective do not advocate an immediate and wholesale abandonment of efforts to impede proliferation. They do urge that the United States recover its former position as a reliable supplier of nuclear reactors, fuels, and services. From a position of preeminence in the expanding global nuclear market Washington can bargain for political and economic benefits, including the imposition of safeguards.

The President of the American Nuclear Energy Council, Craig Hosmer, has contended that the proliferation threat is confined to a few countries and should not be exaggerated. With a view to strengthening the U.S. position in international nuclear markets, the Council

and the Atomic Industrial Forum have argued, *inter alia*:

- (1) The United States should initiate commercial reprocessing, expand its enrichment capacity, and develop waste and storage facilities so as to be able to offer overseas customers full fuel-cycle services.
- (2) “Self-imposed unilateral constraints” on nuclear exports are “counterproductive and ineffective” and should be avoided.
- (3) Government-sponsored nuclear export financing should be provided.
- (4) A further tightening of export licensing criteria and procedures is inadvisable. Multinational fuel-cycle facilities are less desirable than U.S. national facilities. The basic contention is that all steps required for the full commercial development and exploitation of the peaceful atom should be taken. Government regulations that would inhibit this enterprise should be kept to a minimum.

While a strengthened American position as a global nuclear supplier offers an opportunity to attempt to exert influence on behalf of nonproliferation, such an effort is realistically regarded as a holding action which might delay, but not prevent, the spread of nuclear weapons.

Critique

The problems associated with this approach are not difficult to identify. Most analysis find it hard to view the prospect of “life in a nuclear-armed crowd” with equanimity. The most obvious danger is that these weapons will come under the control of a national leader who is irresponsible, fanatic, or psychopathic. A government led by such an individual may not feel the same constraints upon the use of these devices as have the present nuclear powers.

Many prospective Nth countries would probably be unable to provide adequate physical security for nuclear materials even with responsible leadership, thereby increasing the danger of theft or sabotage by terrorists. Similarly, they would be unable to apply elaborate permissive action links or fail-safe devices if a sophisticated delivery capability were available—thereby increasing the danger of an unauthorized or accidental nuclear strike. The prospect of *coups d'état* and civil wars provides further grounds for concern. In addition, several potential Nth countries (e.g., Israel, South Korea, South Africa, and Taiwan) are, or perceive themselves to be, facing a clear and present threat to their very existence. It is difficult to be confident that any nuclear-armed state, pushed to the brink of extinction, would not choose to use those weapons. Even if the resulting conflict remains localized, the damage both to the immediate arena of conflict and to the global environment may be severe indeed. If, contrary to prior expectations, the conflict does draw in the superpowers, the possible consequences need no elaboration. In addition, if the impression becomes widespread that the United States has resigned itself to further proliferation, the result may be a self-fulfilling prophecy. Such a posture might tip the political balance in favor of “going nuclear” in a number of countries where that decision might otherwise be postponed indefinitely.

If extensive proliferation does occur, adjustments across the whole range of U.S. foreign policy will be required. Professor Robert Tucker of Johns Hopkins University has suggested that the emergence of localized balances of terror will permit U.S. foreign policy to revert to a modified form of isolationism. At a minimum, continued proliferation would seem to necessitate a careful review of U.S. overseas defense commitments and a very cautious approach to

military intervention if the United States is to avoid being drawn into regional nuclear conflicts.

Moreover, as one analyst suggests, costs to U.S. foreign policy may be considerably more severe than implied in the benign term isolationism: “The spread of nuclear weapons will reduce our ability to control events. It will have a dissolvent effect on alliances, expose our own overseas forces to huge risks, and ultimately impose large costs in shaping our own offense and defense to protect the continental United States against small terror attacks by national, as well as subnational, groups.”

He also points out an evident discrepancy in the argument that U.S. nuclear exports are required to give this country leverage on behalf of nonproliferation objectives: “There is an obvious muddle in the . . . view that we can’t influence events on the one hand, but on the other hand that we do have an important influence that we can retain only by continuing to export. . . In short, we can retain our leverage only if we never use it.” Finally, material presented elsewhere in this study suggests that in the foreseeable future international nuclear exports will not be as large as has been generally predicted. Consequently, it becomes more difficult to argue that the economic benefits from nuclear exports will outweigh the proliferation liabilities.

A final criticism concerns the assumption of some adherents of this perspective that there is a necessary link between the spread of nuclear energy and proliferation. This connection is unproven; to state that the opportunities for proliferation will increase is not to demonstrate that those opportunities will actually be used. None of the present nuclear weapons states used a civilian nuclear energy program to provide material for weapons. The same general comment applies to the next major perspective analyzed below.

NONPROLIFERATION PRIORITY PERSPECTIVE

Rationale

This viewpoint begins by accepting the proposition underlying the first perspective: that there is an indissoluble linkage between the spread of civilian nuclear energy and proliferation. However, where the Energy Priority Perspective adjudges the need for nuclear energy as overriding and imperative, the Nonproliferation Perspective disagrees and assigns primary importance to containing proliferation—which is seen as posing a lethal threat to U.S. and global security.

Proliferation cannot be stopped unless the growth of the nuclear energy industry is curtailed. Such a development is deemed desirable, both for its effects on proliferation and in its own right. The possible consequences of heavy reliance upon civilian nuclear energy are judged to include environmental damage, severe waste disposal problems, inefficiency (e.g., low capacity factors), potentially catastrophic accidents, a massively expensive energy infrastructure, increasingly centralized electrification with a concomitant centralization of political and economic power, the emergence of a garrison state necessary to secure nuclear facilities from theft and sabotage, proliferation, and eventually—a nuclear war. In view of this grim menu of external costs, nuclear energy is held to be unacceptable, now or in the future, as a successor to oil and gas. This is particularly true because nuclear energy opponents deem it possible to develop adequate non-nuclear alternatives to petroleum at an acceptable economic and environmental cost.

In addition, nuclear power as a high-technology, capital-intensive, centralized energy source is seen as particularly ill-adapted to the needs of the majority of the world's population in the predominantly poor and agrarian Third World. Extensive reliance on nuclear energy would be inconsistent with efforts by these countries to reduce their economic and technological dependence upon the industrialized nations.

If the United States turns away from nuclear energy, it is assumed that other nations will follow. The assumption is made because of traditional U.S. leadership in this field, and because of the continued dependence of other countries' nuclear programs upon American material and political support. The international market is dominated by U.S. reactor designs, and the United States is still the principal global supplier of nuclear fuel. An American rejection of nuclear energy could be expected to strengthen anti-nuclear political forces within other nuclear supplier states.

It is contended that it is not only possible to discontinue the spread of civilian nuclear energy but essential that it be done, for reasons related to the security, safety, environmental, and political effects of this mode of power generation.

Objectives

The objective is to reduce the prospect for further proliferation by deemphasizing the use of nuclear power as an energy source and by developing alternatives.

Policy

From the above assumptions, it logically follows that the problem of proliferation can best be attacked indirectly by: 1) curtailing the further growth of civilian nuclear energy programs or, if this fails, 2) phasing out those programs entirely. Appropriate policies in support of the first, less dramatic, alternative might involve a decision to cease Government support of domestic nuclear industry expansion and redirect public resources toward the following:

- . A program to develop coal as an environmentally acceptable fuel.
- . A national energy conservation effort.
- . The development of "soft" energy sources. These would involve such

renewable and environmentally benign sources as solar-thermal, wind, and organic conversion supplemented by conservation and recycling. Other characteristics of such a "soft path" might include reduced use of electricity; energy technologies appropriate to the end use; small decentralized systems; pricing of energy to reflect true replacement and distribution costs in order to encourage conservation; and a target of eventual zero or negative growth in aggregate energy consumption.

- An offer to assist other countries to pursue the same soft path.
- The maintenance of a nuclear energy research program with particular emphasis upon fusion, nonproliferating reactors, and waste disposal.
- A decision to forgo any new contracts for nuclear exports except under the strictest limitations and safeguards. Existing contracts would be honored, but energetic rewrite efforts would be made to incorporate stricter safeguards (e.g., a requirement that the importing country accept full fuel cycle safeguards).
- Efforts to directly impede proliferation, including steps to weaken the incentives and strengthen the disincentives of potential Nth countries vis-a-vis the nuclear option; actions designed to strengthen the NPT "regime;" agreements among nuclear exporters concerning joint controls; and steps to curb the non-state adversary threat (see below for a detailed presentation of these measures).

Policies appropriate to an actual phase-out of nuclear energy would include all those actions just mentioned with two modifications: 1) the civilian nuclear energy infrastructure would be dismantled; and 2) no future export commitments would be undertaken.

Critique

Any effort to implement this perspective will confront several formidable obstacles:

1. The initial effect of even a partial U.S. withdrawal from the nuclear energy

market might be counterproductive with regard to proliferation. American export markets would presumably be taken over by other suppliers, possibly with a more relaxed attitude toward safeguards and other export controls. Only if all suppliers could eventually be persuaded to join in renouncing nuclear power, or at least exports, would U.S. actions prove useful as a curb on proliferation.

2. There is no guarantee that a combination of coal, conservation, and soft energy sources can provide an adequate energy source at acceptable economic and environmental cost. Crucial technical and economic points are in dispute among relevant specialists and among governments-especially those of the industrialized world. If a major commitment to the soft path is made and supply proves inadequate, a severe electric power shortage could result. Coal is abundant, but environmental considerations may severely curtail its use.
3. The sheer magnitude of the investment in nuclear energy made to date has created a formidable array of economic and political interests having a stake in nuclear power. These will constitute a powerful obstacle to any attempt to phase out the nuclear industry.
4. Any shift away from nuclear power carries the risk of antagonizing the Third World countries, many of which view nuclear power as their best long-term hope for economic development. Moreover, those countries which had signed the Non-Proliferation Treaty could credibly claim that the Treaty's promises of assistance in developing peaceful nuclear energy had been violated. At a minimum, it would be necessary to accompany a domestic switch to non-nuclear sources with a major increase in foreign aid to assist Third World countries in making their own adjustment.
5. The link between centralized energy production and centralized political authority is speculative. In fact, features of the soft path (e.g., a ceiling on energy consumption) may require an authoritarian economy and polity.

6. A strategy of greatly increased reliance on coal and conservation may prove inadequate in carrying the industrialized countries through a transition from oil and gas to essentially limitless sources (e.g., fusion) without major sacrifices or dislocations. If coal and conservation prove inadequate or unsatisfactory the burden will fall upon soft energy sources. Successful implementation of the soft path will probably require concomitant and profound, though not necessarily undesirable, changes touching nearly all aspects of national life. These might include a transition to a planned "organic growth" or even "steady state" economy, zero population growth, decentralization, income redistribution, changes in the industrial infrastructure with major social implications, and a substantial modification of such prevailing values as individualism, materialism, and growth. Clearly, some

such changes may occur under alternative "hard path" (i.e., high energy, heavy reliance on central station electricity production) energy scenarios. However, the hard path is designed to preserve, insofar as possible, existing lifestyles.

A decision to dismantle the domestic nuclear industry and reject all further export commitments would incur all the difficulties listed above in an intensified form. A thoroughgoing commitment to a soft path would also probably require a substantial reduction in projected rates of growth in global energy production and use in the foreseeable future. This in turn may imply steps toward world income redistribution, a global ceiling on population growth, and other comparable measures. Finally, even the complete abandonment of civilian nuclear energy would not entirely foreclose other routes (dedicated facilities, purchase, and theft) to obtaining a weapons capability.

SHARED PRIORITY PERSPECTIVE

Rationale

This perspective rests on three assumptions:

- . The potential link between civilian nuclear energy programs and proliferation can be disrupted, i.e., it is possible to obtain the benefits of the peaceful atom without entering into a Faustian bargain involving the spread of nuclear arms.
- . Proliferation beyond the current roster of weapon states is undesirable in terms of U.S. interests and international peace and stability.
- . United States policy can contribute significantly to international efforts to curb proliferation.

It is the first assumption that particularly distinguishes the Shared Priority Perspective. The question facing policy makers is how to minimize the risk that the spread of nuclear weapons will accompany the growth of civilian nuclear facilities and technology.

Objectives

The basic goal of this perspective is to decouple civilian nuclear energy and proliferation, i.e., to inhibit proliferation while proceeding to exploit the commercial atom. This will require policies designed to:

- Promote an international political climate in which the incentive to "go nuclear" is minimized and the disincentives maximized.
- Improve national and international institutions and procedures through which nuclear facilities and materials can be effectively safeguarded against national and nonstate diversion.
- Strengthen national and international controls over the availability of weapons-grade nuclear fuel and the technology and facilities required to produce it.

- . Develop sanctions designed to deter and even reverse steps toward acquiring nuclear weapons.

Policy

Pursuant to the above objectives, a wide range of policies have been proposed or actually implemented. These will be examined in detail in the next section. A critique of the Shared Priority Perspective will be subsumed under a critique of these individual policies.

There is broad agreement over the general advantages and drawbacks of most of these options. However, on the question of plutonium reprocessing and recycling there is a fundamental divergence. The first, or moratorium, school of thought contends there is a basic incompatibility between reprocess-

ing and nonproliferation: civilian nuclear energy and proliferation can only be effectively decoupled if there is an international agreement to forgo reprocessing, at least until commercial uranium supplies are nearly exhausted,

The alternative, containment, school argues that a complete moratorium on reprocessing is unnecessary and impractical, given the presumed attractions of the breeder. The development of reprocessing facilities can be controlled and managed so as to prevent a proliferation spinoff. This would be achieved primarily by locating reprocessing plants only in the present supplier countries and in multinational fuel-cycle centers in supplier and, perhaps, user states.

Specific policies designed to implement these two approaches will be outlined and analyzed below.

A NONPROLIFERATION POLICY INVENTORY

Introduction

The following is a taxonomy and analysis of specific policies which hold promise as part of a comprehensive effort to curtail further proliferation. Some of these policies will be congenial to proponents of all three of the major perspectives previously outlined. However, this inventory is associated primarily with proponents of the third Shared Priority Perspective. The logic of the first perspective suggests that the sort of detailed menu of policies that follow is probably ineffective and/or unnecessary. The second perspective would tend to view them as perhaps desirable, but as insufficient and thus ultimately ineffective. The premise that nuclear energy and weapons can be decoupled, which underlies the third perspective, opens the way for a detailed consideration of policies to achieve that result.

To be successful, policies intended to weaken the link between commercial nuclear power and proliferation must affect either the motivation of a potential Nth country to ac-

quire nuclear arms or the availability of materials and technology required. The former class of policies will be called demand policies and the latter supply policies.

The discussion of these policies will be organized according to the following topic outline:

Demand Policies

Weaken Incentives

- Strengthen the security of Nth countries

- Reduce the prestige attached to nuclear weapons

- Resolve international disputes

- Critique

Strengthen Disincentives

- Maintain technical and economic costs of the nuclear option

- Increase the political costs

- Strengthen domestic antiproliferation forces in Nth countries

- Sanctions

- Critique

Supply Policies

- Reprocessing

- Containment

Critique
 Rejection of plutonium recycle
Critique
 Enrichment
Critique
 Export (Supplier) Controls
 Multilateral Approaches
 Special Precautions
Critique
 Assistance re Non-Nuclear Energy Sources
Critique
 Technological Measures
 Strengthen the Nonproliferation Regime
 Nuclear weapon states arms control
 Improve the benefits available to an NPT signatory
 Evaluate PNE's
 Enhance the role of the non-nuclear states
 Link nuclear exports to NPT
 Link economic aid to NPT
 Strengthen IAEA safeguards
 Expand IAEA functions
 Intelligence capability
 Nuclear free zones
Critique
 Global and Regional Arrangements
 International management
 Multinational (regional) fuel cycle facilities
Critique
 Measures Concerning Non-State Adversaries
Critique
 Policy Implementation

Demand Policies

Weaken Incentives

The following initiatives are designed to weaken the incentives toward proliferation on the part of nonweapon states.

Strengthen the Security of Potential Nth Countries.— Actual or perceived vulnerability to external threat has been identified as an important possible incentive to proliferation. Each of the present nuclear weapon states was at least partially motivated by security concerns in deciding to exercise the nuclear option.

For purposes of nonproliferation, the task is to find non-nuclear mechanisms to strengthen

the security of potential Nth countries. These might include the following:

- A declaration by each of the nuclear weapon states forswearing the use of such weapons against any non-nuclear state. A contributing step would be a unilateral or joint “no-first-use” pledge by the nuclear weapon states.
- The deployment overseas of U.S. troops and military facilities. Besides strengthening the host country’s military capability, such deployments serve as a “tripwire” to increase the likelihood of American involvement should any attack occur.
- The provision of conventional weapons under military aid and sales arrangements.
- The overseas deployment of nuclear weapons and their delivery systems. America’s NATO partners pilot nuclear-armed fighter bombers and man tactical nuclear weapons, while the warheads for these systems remain under U.S. control.
- Alliances, which provide explicit, comprehensive, binding, and credible guarantees to the partners. Examples include the extension of the American nuclear umbrella to Western Europe through NATO, and the mutual assistance treaty with Japan.
- Security guarantees extending the nuclear umbrella of one or more nuclear weapon states to protect a potential Nth country against an attack or threat of attack by another nuclear power. From the perspective of a non-nuclear state, the general guarantee presently offered by the United States is unsatisfactorily vague. Former Secretary of State Dean Rusk stated the American position that a non-nuclear country “specifically threatened with the use of nuclear weapons would have the entire international community, including the United States, register its support in whatever appropriate way would be necessary in the circumstances.”

The joint obligations incurred by the United States as a signatory of the Non-Proliferation Treaty are equally unimpressive. The treaty is silent concerning security guarantees. United Nations Security Council Resolution 225 provides that assistance to any non-nuclear nation threatened with nuclear aggression will be given "in accordance with the Charter," i.e., through the Council, where each of the guarantors (as well as France and China) has a veto. A non-nuclear state (e.g., West Germany) that feels threatened by one of the guarantors (i.e., the Soviet Union) will take little comfort from this arrangement.

Reduce the Prestige Attached to Nuclear Weapons.—Prestige considerations have been identified as an important possible motivation for proliferation on the part of non-nuclear states. Consequently, the incentive to proliferation can be lessened by reducing the prestige and symbolic importance attached to nuclear weapons in international politics. Possible means of doing so include the following:

- . Eschew statements which suggest that nuclear weapons accord the United States, or other weapon states, a special claim to influence or respect. Try to dampen the rhetoric of the strategic balance and the accompanying impression that the United States views nuclear weapons as the sine qua non of its own security.
- . Attempt to increase the salience of conventional as opposed to nuclear weaponry by such steps as revisions in NATO force structures and military planning.
- . Attempt to increase the salience of non-military instruments of power—most notably economic power. A step in this direction might be a proposal to give explicit recognition to the importance of Japan by creating a sixth permanent seat on the U.N. Security Council for that country, with analogous gestures in the direction of another economic great power—West Germany. The emergence of new economic powers like Saudi Arabia might be acknowledged by expanding the Group of Ten to include them, and by providing them an impor-

tant voice in the governance of the International Monetary Fund and World Bank.

- . Initiate new efforts to achieve super-power arms control agreements. The relevance of strategic arms limitation and a comprehensive test ban to non-proliferation will be discussed subsequently.

Resolve International Disputes.—A third set of incentives for proliferation relates to the existence of international disputes in which one of the protagonists might conclude that a favorable resolution could be achieved if it acquired nuclear weapons. The response from a nonproliferation standpoint is easy to conceptualize but very difficult to implement. What is required is the identification and resolution of such disputes through mediation and other forms of diplomatic interposition. This would seem to require, at a minimum, a policy of placing special emphasis on settling disputes with a proliferation potential, and of seeking (when appropriate) to impartially dampen conflicts rather than strengthening one party against another.

Critique.—The difficulties which would confront any attempt to implement these proposals are well known. Security guarantees, alliances, and the overseas deployment of troops require, at a minimum, the willingness of the United States to undertake the requisite responsibilities. But the noninterventionist mood of post-Vietnam American foreign policy (e.g., the Nixon Doctrine) makes any significant expansion of Washington's global security role very problematical. The dilemma is intensified by the fact that the United States is particularly reluctant to enter into closer ties with several of these prominent Nth countries. Alternatively, the nationalism of some other potential weapon states make it difficult for them to accept the sort of entanglement with the great powers implied in alliances, guarantees, and the presence of foreign troops.

Similar concerns bear on military weapons assistance. Congress has exhibited increased uneasiness regarding the emergence of the United States as the world's leading exporter and donor of arms. It is difficult for a nation to avoid embroilment in the quarrels of others if

it is a principal arms supplier to one or more of the parties involved. Even a policy of assisting in the peaceful resolution of international disputes can lead to a new or increased commitment of American money, men, and prestige in diverse theaters. This is not an outcome that many modern critics of American globalism would welcome.

This suggests that a U.S. effort to control proliferation may conflict with other national goals and priorities. It may, in fact, conflict with other concerns of American foreign policy in a very direct way. The new Administration has suggested that it will try to reemphasize U.S. identification with some of those governments particularly insensitive to civil liberties, but several of the nations which might fall into this category are also the most likely Nth countries, e.g., South Korea, Chile, and South Africa. This creates a difficult dilemma. Should the United States provide military and security assistance to such regimes in the interests of nonproliferation, or should it act upon the principles of a democratic foreign policy even if the result is to stimulate proliferation? The potential for Nth country extortion of the United States in this situation is obvious. The solution is not.

The higher the priority accorded nonproliferation, the higher the potential costs in terms of other foreign policy objectives. Moreover, the proliferation issue promises to further complicate the already difficult relationship between the United States and the developing Third World. The situation is somewhat analogous to that which arose as a consequence of increased U.S. concern over assured oil imports. Some Third World nations have benefited immensely, but they are few in number and tend to be countries that were relatively well-off (e.g., Saudi Arabia). Similarly, the beneficiaries of rising American concern over proliferation will also be few and, almost by definition, among the most successful and advanced of the Third World states (e.g., Taiwan). They will often be states with an acute security problem, and therefore with the potential for drawing the United States into a possibly dangerous conflict situation.

Other proposed initiatives for the reduction of the symbolic importance of nuclear weapons and pledges of no-first-use present a different set of difficulties. If conscientiously implemented, they would require far-reaching changes in American foreign policy, including higher priority to arms control, greater attention to the developing Third World, and a probable diminution of American influence, power, and perhaps even wealth relative to the non-nuclear states. Moreover, it will not be easy to diminish the political and symbolic importance attached to nuclear weapons. Power remains the principal arbiter of international relations, and the contribution of nuclear weapons to national power in real terms is undeniable. Even if the entire catalogue of initiatives (above) designed to reduce the prestige associated with a nuclear weapons capability were implemented, the impact might be minimal.

These considerations help explain why no-first-use pledges have generated little enthusiasm on the part of non-nuclear weapon states, that rely on an alliance relationship with the United States for their security. The net effect of such a pledge would seem to be to diminish the deterrent effect of the American nuclear umbrella. By the same token, an offsetting Soviet pledge would lack credibility in the eyes of these states. Steps to give allies access to nuclear weapons, even under ultimate U.S. control, must be undertaken with extreme care. They may otherwise serve to validate the utility of such weapons, and thus confirm an incentive for proliferation.

Strengthen Disincentives

Other types of demand policies seek to strengthen the *disincentives* that confront potential Nth countries contemplating the nuclear option. Possible initiatives for this purpose include the following.

Maintain the High Technical and Economic Costs of the Nuclear Option.—A major disincentive for any nation contemplating a weapons program has been the expense and technological sophistication required to

obtain weapons-grade material and fabricate a bomb. The spread of commercial nuclear power and the evolution of reactor fuel-cycle technology threaten to erode such restraints. The policy response to this situation can take three forms:

- . Prevent, insofar as possible, the international dissemination of enrichment and reprocessing facilities and technology. This would probably require development in the near future of multi-national enrichment facilities (see below) and/or an expansion in production capacity of American, Soviet, and European enrichment plants. Increased enrichment capacity would make it possible to ensure those states contemplating or augmenting light water reactor programs a long-term secure supply of reactor fuel at reasonable prices, thus obviating the need to construct national facilities. Curtailing the spread of sensitive nuclear capabilities would also require conscientious implementation of the suppliers agreement banning the export of enrichment and reprocessing plants. An agreement to institute a moratorium on the construction of commercial reprocessing and breeder reactor facilities, if feasible, would also help preserve existing technological barriers to proliferation.
- . Subject all transfers of nuclear technology, materials, and facilities to strict safeguards. Such safeguards, if effective, may compel a nation covertly seeking a weapons capability to construct dedicated fuel-cycle facilities (including a reactor, enrichment, and/or reprocessing plants) using its own resources and technology, and at its own expense. If full fuel-cycle safeguards are in effect, as with NPT signatories, any dedicated facilities will have to be clandestine, with a consequent increase in the difficulties and costs.
- . Institute strict controls on the replication or retransfer of exported facilities or technology.

Increase Political Costs.—A second approach to strengthen disincentives is to increase the political costs of selecting the

nuclear option. This means, in the first instance, initiatives designed to reinforce the existing international norm against proliferation. Specific examples would include a United Nations General Assembly resolution, an appropriate public declaration by a group of (preferably nonweapon) states, efforts to obtain additional signatures and ratifications to the NPT, and any other steps which would tend to strengthen the NPT “regime”—a subject that will be examined subsequently. Other political costs can be more stringent, involving outright hostility and retaliatory or compensatory actions by other states. Ways of confronting would-be proliferators with the more severe costs will be examined in the section on “sanctions” below.

Strengthen Domestic Antiproliferation Forces.—In addition to the climate of international opinion, it is argued that a non-proliferation strategy must be cognizant of the domestic political situation within key Nth countries and how that situation might be affected by external (i.e., foreign) influences. For example, if it seems clear that a decision to “go nuclear” will be followed by various negative economic consequences (e.g., a cessation of foreign aid), the result may be to stimulate domestic interests concerned with economic development to oppose any nuclear weapons program. Similarly, if the same nation is offered ready access to international sources of safeguarded nuclear fuel, technology, and facilities for electrical power generation, the effect may be to reinforce an incipient division between a nuclear energy lobby and a bomb lobby or to inhibit the latter by imposing a web of political and institutional constraints. The task of American policy would be to provide the external conditions to strengthen the hand of those domestic political forces opposed to the nuclear weapons option.

Sanctions.—A fourth means of strengthening disincentives involves the use of sanctions. Sanctions and disincentives, while closely related, are not synonymous. Disincentive is a broader term referring to the whole range of constraints that confront a government considering the nuclear option. These include such general factors as technological and economic considerations, characteristics of the

international system, domestic political influences, and the like. Sanctions, on the other hand, refer to those disincentives which are the product of an active policy to inhibit proliferation. Sanctions are deliberately designed measures to augment and strengthen other disincentives. Sanctions can have three functions: as a deterrent prior to a proliferation decision, as a punishment in response to a proliferation decision, and as an example to deter other would-be proliferators in the future.

Sanctions can take a multitude of forms; what they have in common is the imposition of a penalty designed to raise the costs (economic, political, or security) of any decision to "go nuclear". Possible sanctions include the following:

- Economic penalties, including the discontinuation of economic assistance, restrictions on investment, reduced access to overseas (e.g., American) markets, and financial pressures exerted through international banks.
- Political pressures, including a possible joint U.S.-U.S.S.R. declaration stating that the acquisition of a nuclear weapons capability by a non-nuclear state would constitute a serious threat to world peace and security, requiring consultation concerning possible joint action by the two superpowers.
- A clear message to the allies and clients of each superpower that the continued extension of security guarantees would be jeopardized if they acquired or attempted to acquire nuclear weapons.
- A cutoff of nuclear materials and a withdrawal of U.S. technical personnel from nuclear-related projects.
- A curtailment of U.S. military and technical assistance.
- International sanctions ranging from a termination of IAEA nuclear assistance to a U. N.-imposed trade embargo.
- The unilateral or multilateral application of military power, including the forcible removal or destruction of Nth country nuclear weapons facilities.

- A threat (or pledge) by one or more nuclear states to provide offsetting nuclear weapons to the adversary of any non-nuclear nation that selects the nuclear option.

Critique.—The policy options available to strengthen disincentives are easier to enumerate than to implement. Almost any attempt to raise barriers to proliferation will tend to provoke a nationalistic reaction, particularly when such actions are initiated by one or both of the superpowers. Under such circumstances, accusations of imperialism, neocolonialism, and great power hegemony will be unavoidable. Any efforts to influence or manipulate the domestic political process within Nth countries will be particularly difficult without arousing a counterproductive nationalist backlash. Some options, at best, offer only limited possibilities. Efforts exerted through alliance systems will have little impact on major Nth countries outside such systems (e.g., South Africa). There is little foreseeable prospect for significant additions to the NPT now that Japan has ratified. In addition, efforts to manipulate the domestic political situation in an Nth country, besides being a high-risk tactic, may prove ineffective simply because significant organized anti-nuclear sentiment is lacking. Moreover, the postulated distinction between a nuclear energy lobby and a bomb lobby may prove more theoretical than real. This is not to suggest that antinuclear sentiment is an unimportant factor in some countries, e.g., Japan and Sweden, but simply that foreign manipulation of that sentiment, even where it is substantial, is very difficult.

The most serious difficulties involve the application of sanctions. Some, particularly those requiring the use of military force and/or other joint action by the U.S. and U. S. S. R., lack credibility. This is important because the primary value of sanctions is their deterrent effect. Once an Nth country has defied a threatened sanction and constructed a weapon, sanctions serve only as punishment and to set an example for future offenders. The damage, i.e., the spread of nuclear capability to another state, has been done—unless the sanctions include actual military action to remove the weapons facilities. If a

threatened sanction is defied with impunity, all sanctions will tend to lose their credibility. Ironically, the very prospect of coercive sanctions may cause an Nth country to proliferate so as to reduce its vulnerability to such external pressures. In that case, the more credible the sanction, the more likelihood that it will stimulate precisely the response it was designed to forestall.

Another serious problem will arise if implementation of sanctions proves incompatible with other important policy objectives and principles. The hazards of trying to manipulate security guarantees, in this regard, has already been suggested. These difficulties reach their most acute form with regard to counterproliferation strategies and military sanctions. Many would view proposals or promises to supply nuclear weapons to adversaries of a proliferator as tantamount to more proliferation. From this viewpoint, the superpowers would, and should, eschew any such pledge. Military sanctions for the purpose of enforcing international safeguards appear contrary to the major principles of American foreign policy and diplomatic conduct. Other limitations on the imposition of sanctions may involve ambiguities or extenuating circumstances surrounding the offending act, the danger of a damaging counterreaction by the target country, a lack of public (and congressional) support for sanctions. These and other related considerations are reviewed elsewhere in this report.

These considerations suggest the limitations of unilaterally imposed disincentives and sanctions. In circumstances where the United States can exert overwhelming leverage, unilateral pressures will be effective, as the recent successful effort to induce South Korea to rescind its order for a French reprocessing plant suggests. But where such leverage is not present (e.g., with regard to Argentina), attempts to impose unilateral sanctions may be ineffective or worse. The conclusion is obvious; sanctions will generally make their most effective contribution to a proliferation strategy if they are applied in the context of a collaborative effort. Attempts by the United States to exert economic pressure would be of limited utility without the approval and

cooperation of the OECD countries. Credible American threats to resort to military action in extreme cases are almost inconceivable without at least the tacit acquiescence or support of the U.S.S.R. In the early 1960's, the U.S.S.R. was reliably reported to be contemplating a military strike against Chinese nuclear facilities. After Soviet inquiries revealed that the United States would view such an action with disfavor, the project was abandoned.

Efforts to raise the political costs of building nuclear weapons will be successful in direct proportion to whether an Nth country can expect the condemnation of the United States alone, the United States and U.S.S.R. together, or the preponderance of the international community. A clear international consensus will, by itself, constitute an important disincentive, but it will also serve as the necessary context or framework for specific sanctions. The task of policy is therefore to generate such a consensus and then to formulate specific policies, which utilize and build upon that agreement.

It should be noted that the effectiveness of even multilateral disincentives and sanctions is not assured. For the majority of nations possessing limited economic and technological capabilities or lacking an indigenous uranium supply, strong multilateral measures would probably suffice to foreclose the nuclear option for the foreseeable future. On the other hand are nations, like Argentina, which possess or will soon possess the requisite capabilities and indigenous fuel sources. If Argentina decides to produce nuclear weapons, the international community can raise the cost but cannot prevent it, short of military coercion.

Supply Policies

Reprocessing

Because they provide access to bomb-grade nuclear material, reprocessing technologies and facilities have been the focus of much recent attention. It is generally agreed that the

diffusion of reprocessing plants will significantly increase the opportunity for proliferation. Therefore, from a nonproliferation perspective it is unfortunate that a state might decide to acquire such a capability for a variety of reasons. These include: an assured nuclear fuel supply; anticipation of commercialization of the breeder and the depletion of uranium reserves; a “hard sell” competition among suppliers involving reprocessing as a “sweetener” and a desire for nuclear weapons. These motivating factors must be countered with policies adopted by suppliers if the spread of reprocessing plants to an increasing number of countries is to be prevented. Such policies might aim to manage the fuel at both ends of the fuel cycle either within the supplier states or within some multinational body, or else to forego plutonium recycle altogether and eliminate the need for reprocessing. Both options need further elaboration.

Containment.—This approach is based on the assumption that the growth of a global reprocessing industry is virtually inevitable for reasons cited above. If the spread of reprocessing cannot be halted, it can be contained and managed. Specifically, reprocessing plants can be located in the present supplier countries and in multinational fuel-cycle centers in supplier and user states. The objective would be to prevent the emergence of national facilities within the user states—particularly those of the Third World. A policy strategy designed to achieve this outcome might include some or all of the following elements:

First the United States would reestablish itself as a reliable supplier of enrichment services, and other supplier states would be encouraged to do the same. An adequate guaranteed fuel supply would be offered as a quid pro quo for restraint (i.e., a moratorium on the construction of national reprocessing and enrichment facilities) on the part of user countries. Steps to upgrade U.S. supply capabilities might include:

- Increase domestic uranium exploration and production, and augment stockpiles with added imports.

- Expand enrichment capacity, beginning immediately with the Portsmouth addition or its equivalent (e.g., a centrifuge plant).
- Maintain R & D and demonstration programs concerning the technological, economic, and safeguards aspects of reprocessing, with a view to future commercialization.
- Facilitate exports of reactors and reactor fuel by establishing a consistent and easily understood set of procedures and criteria for export licensing.
- Provide user states with guaranteed fuel supplies under binding letters of commitment.
- Provide fuel to user states at non-discriminatory or even concessionary prices.

If these efforts are insufficient to restore U.S. credibility as a reliable supplier in the eyes of the importing states, an international fuel bank or “extraterritorial SWU” reserve might be established under international control.

Second, all supplier states would agree to refrain from the export of plutonium, highly enriched uranium, and enrichment or reprocessing facilities and technology.

Third, suppliers would offer spent fuel services. These might include:

- Fuel leasing, buy-back, or exchange provisions. The basic concept in each case is to obtain the return of spent fuel containing unseparated plutonium. The user state would receive a new supply of low-enriched uranium fuel in return.
- Assistance to user countries in arranging for spent fuel storage and waste disposal in the United States or overseas. This would require expansion of U.S. spent fuel repositories, and the development of the technology and facilities required for permanent waste disposal,
- Access to reprocessing in order to dispose

of spent fuel. This assumes the initiation of commercial plutonium reprocessing and recycle.

- Demonstration projects for spent fuel and reprocessing technologies.

An international spent fuel regime could be established under existing IAEA statutory authority. Spent fuel or excess national stocks of separated plutonium would be placed in IAEA custody pending use. The United States has already approached other suppliers and the IAEA Secretariat in support of this concept, and a working group of nuclear suppliers has been studying it. This will require, in turn, the construction of international fuel storage facilities (the United States could provide the first site).

To induce other suppliers to cooperate in these measures the United States could offer them tie-in agreements, guaranteeing enrichment services at nondiscriminatory prices to their reactor customers, opportunities to invest in new U.S. private-sector plant capacity, and joint-venture reprocessing facilities. Competition in the provision of fuel-cycle services and facilities could be moderated through market sharing agreements, the provision of such facilities and services to all users on equal terms, establishment of multinational reprocessing facilities, and possible mechanisms for international supervision.

The spent fuel issue is rapidly emerging as one that requires urgent attention. Most nations with nuclear power reactors in operation or on order lack adequate spent fuel repositories. That fact, plus any fuel return requirements imposed by suppliers, makes it necessary to transfer the fuel to locations where it can be stored and perhaps reprocessed. England has shown some interest in receiving spent fuel from other countries (e.g., Spain), but only if allowed to reprocess it. The United States currently faces the problem of whether to permit the transfer for reprocessing of spent fuel derived from U.S. supplied material. The bilateral agreements under which fuel was originally exported give the United States a veto over its ultimate disposal (see below).

Critique.—An analysis of the containment approach suggests a number of potential difficulties. First, its applicability may be constrained in the short term by limitations on U.S. enrichment capacity and in the long term by possible limitations on U.S. domestic supplies of uranium. The Administration's decision to construct a centrifuge facility in lieu of the previously planned Portsmouth add-on using the proven diffusion technique, introduces another element of uncertainty. Centrifuge facilities of this size exist only on paper. Consequently, their reliability and other performance characteristics have yet to be verified in practice. Second, the costs of an integrated program encompassing expanded enrichment capacity, fuel buy-back, and provision for adequate storage and waste disposal facilities would be impressive. Domestic political resistance to the price tag and to provisions for making the United States a global repository of spent nuclear fuel and wastes may be very strong. Third, it may be difficult to persuade nuclear importing states to accept arrangements which will keep the present international nuclear oligopoly intact. Present suppliers would retain both their market preeminence and technological leadership. Steps to strengthen the United States as a "reliable supplier" by concessionary exports of fuel will have the effect of subsidizing the global spread of nuclear energy—a somewhat ironic outcome from a nonproliferation perspective. The final and perhaps most important criticism from a nonproliferation standpoint is that a containment approach tolerates the growth of a global reprocessing industry, and thereby tends to legitimize the use of plutonium as a commercial fuel. Against this background, nascent weapons states may find it easy to argue that their own reprocessing facilities are essential for energy independence. The containment approach also tends to diminish the incentive to develop technological alternatives to reprocessing.

Rejection of Plutonium Recycle.—If the containment approach is judged inadequate, the logical alternative is to eliminate reprocessing entirely. The Carter Administration has apparently opted for this course by deciding to cease Federal Government support of civilian production and use of plutonium.

Proponents of this approach tend to assume that the spread of reprocessing/recycle is not inevitable; that the proliferation-related costs outweigh the energy benefits; that the economic rationale for reprocessing is questionable in any case; that reprocessing and plutonium storage cannot be safeguarded; that U.S. policy can serve as an example to other states; and that other countries are unlikely to forgo reprocessing unless the United States does so.

A policy to implement this approach would comprise the same elements as for containment, with two exceptions. (a) Plans for domestic civilian reprocessing would be suspended until commercially useable uranium reserves are exhausted or the breeder is successfully commercialized. Alternatively, both reprocessing and the breeder could be abandoned permanently. (b) An effort would be made to develop technologies for extracting the energy in spent fuel without separating plutonium, e.g., tandem cycle and coprecipitation. Such research might be undertaken as part of an international study. If the results were successful, the benefits of the new technology could be made available to other countries. If the technology proves unworkable, the nuclear industry would resort to a throwaway cycle.

Critique.—A policy to forgo plutonium recycle will encounter difficulties analogous, but more intense, than those involved with a containment approach. Demands on enrichment capacity will be increased. Thus uncertainties concerning uranium supply projections cast some doubt on the viability of a reprocessing ban beyond the immediate future. The political task of persuading other nuclear suppliers to abandon their reprocessing plans will be very difficult indeed.

The waste disposal and spent fuel storage problems will clearly be exacerbated. The problem is illustrated by the Administration's current dilemma over spent fuel transfer. To the extent that efforts to dissuade other supplier states from reprocessing succeed, a means for elimination of plutonium in spent fuel is lost, or at least indefinitely postponed. The United States would also be forgoing a known technology (reprocessing) in favor of

untried ones (e.g., tandem cycle) which, at the very least, would mean the deferral of our ability to recover the energy value from spent fuel should reprocessing prove economical. It would also mean relinquishing leadership in technology development of direct relevance to IAEA safeguards, multinational fuel-cycle facilities, and the breeder. Furthermore, a decision to forgo reprocessing would probably be the death knell for the LMFBR, the most technologically advanced of all the inexhaustible energy sources.

The most serious obstacle to a reprocessing ban or moratorium is a political one. Pressure by the United States to put a halt to reprocessing will encounter strong resistance from Japan and those European suppliers that have already committed themselves to reprocessing and have small facilities in operation or under construction. These nations view reprocessing and the breeder as a vital element in their effort to assure adequate energy supplies in the future. Unlike the United States, they do not have substantial domestic reserves of uranium. Controlling the export of such facilities and technology is the one area in which agreement has proven possible. Beyond this, the present Administration's approach is apparently to seek agreement from other suppliers to at least impose a moratorium on commercial reprocessing and on the construction of new facilities. Agreement in even this limited area will be difficult. Moreover, mutual interest and dependence among the United States, Europe, and Japan are so extensive that most efforts to apply coercive pressures become counterproductive.

Enrichment

Like reprocessing, enrichment technology and facilities provide a means of acquiring bomb-grade material. The spread of national enrichment facilities would therefore have ominous implications for proliferation, similar to those associated with reprocessing. Both have been the focus of supplier export control negotiations. As with reprocessing, motives for acquiring an enrichment plant can include an assured fuel supply (energy independence) and a desire for nuclear weapons.

There are important differences. First, enrichment is a considerably more difficult and demanding technology. Consequently, the inherent technological and economic barriers to its spread are somewhat higher than with reprocessing. This situation may erode, depending upon the outcome of technological innovations still in the development stage. More important, commercial reprocessing could be deferred for perhaps two or three decades without greatly damaging the nuclear energy industry. There is enough uranium to meet industry's needs for that period, but an increase in enrichment capacity cannot be delayed if the civilian nuclear energy industry is to keep pace with the rising demand for electrical power.

The proliferation potential inherent in an expanded enrichment capacity can be dealt with in two ways: by supplier controls over exports of technology and facilities, and by confining enrichment plants to the existing supplier states or multinational centers,

Critique.—There are a number of possible difficulties associated with the establishment of multinational facilities; these will be dealt with subsequently. Efforts to control the spread of enrichment facilities and technology will encounter difficulties similar to those for reprocessing.

Export (Supplier) Controls

Bilateral Agreements.¹—The fundamental mechanisms for international nuclear cooperation between the United States and other nations or international organizations since the mid-1950's have been Agreements for Cooperation, commonly known as "bilateral agreements." A variation, which involves commitments by the United States and another specified nation to the IAEA, is known as a trilateral or tripartite agreement. These agreements provide the framework for technical cooperation and export of U.S.

¹See "United States Agreements for Cooperation in Atomic Energy: An Analysis," prepared for the Committee on Government Operations, U.S. Senate, by the Congressional Research Service, Library of Congress, January 1976, pp. 36-53.

nuclear materials and facilities to other countries, and for safeguarding of exported items against theft, diversion, or illicit use. Provisions have varied from one country to another and over time. More recent agreements tend to include stricter constraints.

The principal provisions of recent agreements for cooperation relevant to proliferation are the following:

(1) *Exchange of information:* The agreements provide for the exchange of information dealing with peaceful applications of atomic energy relating to reactors, radioactive isotopes and source material, special nuclear material, and health and safety considerations. Restricted data (i.e., classified information) and associated materials and equipment cannot be exchanged.

(2) *Access to special facilities:* The agreements for research and development commit the Parties to make specialized research facilities and reactor testing facilities available for mutual use if it can be conveniently arranged.

(3) *Cooperation between persons:* Provisions of the agreements permit companies in the U.S. nuclear industry to deal directly with the governments, nuclear industries, and utilities of the agreement nations on matters concerning nuclear exports.

(4) *Transfer of materials and equipment:* Research agreements provide for the transfer of specified amounts of source material, heavy water, byproduct material, radioisotopes, and special nuclear material for purposes other than reactor fueling.

(5) *Supply of special nuclear materials (SNM):* Research and power agreements provide for contracts under which the United States will either supply enriched uranium from U.S. ores or will enrich natural uranium supplied by the agreement nation. The agreements set general limits on the amount of SNM (e.g., plutonium-235) to be transferred. There is usually a further restriction that the quantity of enriched uranium transferred shall be limited to the amount needed for the full loading and efficient operation of the reactors covered under the agreement. Some agreements also provide for the transfer of

plutonium under terms and conditions to be agreed upon.

(6) *Reprocessing of spent fuel:* Agreements require that reprocessing of fuel supplied or enriched by the United States shall be performed only in facilities acceptable to both parties, and only upon a joint determination that the safeguard requirements of the agreement can be effectively applied. Further, any alteration of spent fuel elements removed from a reactor must take place in mutually acceptable facilities. Pending the required joint determination, the agreement nations can only remove and store spent fuel.

(7) *Guarantees:* Agreements include two guarantees. The first is an assurance of peaceful use, which typically provides that:

No material, including equipment and devices, transferred to the government of . . . or authorized persons under its jurisdiction by purchase or otherwise pursuant to this Agreement or the superseded Agreements, and no special nuclear material produced through the use of such material, equipment and devices, will be used for atomic weapons, or for research on or development of atomic weapons, or for any other military purpose.

The second guarantee refers to retransfer of exported materials and facilities. Typically, the agreements provide that:

No material, including equipment and devices, transferred to the Government of . . . or to authorized persons under its jurisdiction pursuant to this agreement or the superseded agreements will be transferred to unauthorized persons or beyond the jurisdiction of the Government of . . . except as [ERDA] may agree to such a transfer to the jurisdiction of another nation or group of nations, and then only if, in the opinion of [ERDA], the transfer is within the scope of an agreement for cooperation between the Government of the United States and the other nation or group of nations.

(8) *U.S. safeguard Tights;* Under the agreements the United States is entitled to review the design and operation of facilities and to apply safeguards—including the right to send U.S. inspectors into the territory of the agree-

ment nation. The agreements typically specify the rights of the United States as follows:

To designate, after consultation with the Government of . . . , personnel who, accompanied, if either Party so requests, by personnel designated by the Government of . . . , shall have access in . . . to all places and data necessary to account for the source material and special nuclear material which are subject to . . . this Article to determine whether there is compliance with this Agreement and to make such independent measurements as may be deemed necessary.

In the case of noncompliance with these provisions, the United States is empowered to suspend or terminate the agreement and to require the return of any materials, equipment, and facilities provided under the agreement.

(9) *IAEA Safeguards:* An early purpose of U.S. agreements for cooperation was to provide the IAEA with experience in the application of safeguards. Consequently, the agreements included a commitment by the Parties to apply IAEA safeguards to materials, equipment, and facilities transferred from the United States. These international safeguards are carried out either under a trilateral agreement among the Parties and the Agency, or as provided in an agreement between the agreement state and the Agency pursuant to the NPT. The United States will suspend its own safeguard rights only if it determines that the international safeguards are adequate.

As noted above, recent bilateral agreements tend to contain stricter provisions regarding proliferation than do earlier ones. Further steps in this direction might include the following. First, earlier agreements could be renegotiated in at least some cases, to make them consistent with the guidelines agreed to at the London Suppliers Conference (see below). Second, the agreements might be further upgraded to include provisions similar to the list of suggested measures for strengthening the Suppliers Agreement (below). The most important of these would be requirements for full fuel cycle safeguards and provisions for spent fuel return, in conjunction with guaranteed supplies of reactor fuel,

Multilateral Approaches.—Export controls have been frequently identified as a potentially fruitful area for a multilateral approach. The recent agreement under which West Germany will export an entire fuel cycle to Brazil (with safeguards) has generated widespread concern that competition among nuclear suppliers will lead to the uncontrolled spread of sensitive nuclear materials, technology, and facilities. To prevent a competitive dilution of safeguards, the nuclear supplier states began negotiations in London to define uniform standards and controls to be applied to exports. Reportedly, the Suppliers' Conference resulted in an agreement on eight such criteria or conditions to be applied on a "best effort" basis. These include:

- a requirement that IAEA safeguards be applied to all exports;
- a requirement that recipients give assurances that exports will not be used to make explosives;
- a requirement that recipients provide adequate physical security for exported nuclear facilities and materials;
- a requirement that recipients apply the above conditions to any retransfer of exports to a third country;
- the exercise of "restraint" regarding the possible export of "sensitive" items (relating to fuel enrichment, spent fuel reprocessing, and heavy water production);
- encouragement of multilateral facilities for reprocessing and enrichment;
- assurances that facilities constructed from sensitive technology exports be safeguarded; and
- a requirement that the supplier's consent be obtained prior to any retransfer of sensitive facilities, materials, or technology.

Subsequently, Ottawa announced that it would require recipients of Canadian nuclear exports to accept full fuel-cycle safeguards—the first supplier state to do so. In a dramatic change of policy, France decided to ban future exports of enrichment and reprocessing facilities and technology. A large question mark hangs over the existing French agreement to supply a reprocessing plant to

Pakistan. The United States has threatened to cut off further economic assistance to Pakistan if the deal is not canceled. Pakistan has publicly defied this demand and France has said it will proceed with delivery if Rawalpindi insists. However, the French Government has not objected to U.S. efforts to change Pakistan's position.

The principal American representative to the Suppliers' Conference has characterized the negotiations as "an evolutionary process," and it is not hard to identify a number of ways in which the existing agreements might be supplemented and strengthened.

- Replace the present "best effort" formula with a formal binding agreement or a more compelling informal understanding.
- Follow the Canadian lead and insist on full fuel-cycle safeguards or NPT ratification as a condition for all nuclear exports.
- Expand the recipients' pledge not to use imports for making weapons to a general unqualified pledge to forgo nuclear weapons.
- Draw up a joint plan of action incorporating graded sanctions to be imposed in the event a recipient state violates or abrogates the terms of either an export agreement or the NPT (if it is a signatory).
- Require that safeguards apply for the useful life of facilities built as a result of exported technology, and to any application of exported technology to other nuclear facilities.
- Apply uniform safeguards to the provision of fuel-cycle services.
- Require participation in an international (IAEA) storage regime for spent fuel if, and when, it can be established.
- Establish multinational enrichment sites.
- Forestall the construction of national reprocessing plants. Steps towards this end might include a ban on all exports of reprocessing facilities and technology, a ban on nuclear exports to any country planning or implementing reprocessing, and a requirement that any reprocessing take place in the supplier state. Spent fuel would have to be returned to the supplier

under fuel-leasing or buy-back arrangements. In exchange, the user state would receive low-enriched uranium already fabricated into new fuel elements. Recent U.S. agreements to buy back irradiated fuel constitute an important step in this direction.

U.S. Government influence over nuclear exports is also exerted through decisions by the Export-Import Bank with regard to export financing, insurance, and guarantees. Since nuclear exports are publicly subsidized or financed in each of the supplier states, it might be useful if the directors of the national export credit associations of the supplier nations met to coordinate policies.

A final approach to export control would involve an effort to diminish competition among supplier states by creating an international exporters' cartel, with a guaranteed market share for each exporter. As an inducement to other suppliers, the United States could settle for less than the 50 percent share it would receive if shares were apportioned according to manufacturing capacity.

Special Precautions.—There are certain nations or regions which, because of regional conflict, national instability, or irresponsible leadership, appear to warrant special concern with regard to nuclear exports. In such instances it may be desirable for the nuclear exporting states to either require special precautions besides conventional international safeguards and physical security measures, or avoid all nuclear exports to the territory. The area of greatest immediate concern with regard to regional conflict is the Middle East (Egypt and Israel), where Washington has already imposed special export conditions including a fuel buy-back option, the right to veto reprocessing of spent fuel from U.S. supplied facilities, and a requirement that any reprocessing that is permitted must take place outside the recipient country.

Critique.—Policy proposals involving supplier cooperation and coordination confront formidable political obstacles. Exporting states will have to perceive sufficient common in-

terest and danger to overcome initial rivalry and suspicion. Each will have to curb its desire to capture as large a part of the export market as possible, and restrain the inclination to view nuclear exports as a source of political influence and prestige. The problem was illustrated in the negotiations that led to the recent suppliers' agreement. From the perspective of other suppliers (notably Germany and France), U.S. efforts to control exports appeared suspiciously like an attempt to protect its dominant share of the international nuclear market against rising foreign competition. Nevertheless, the modest success of the London negotiations, in conjunction with recent Canadian and French policy changes, offer grounds for some optimism in this regard. Moreover, both Great Britain and the U.S.S.R. have exhibited consistent support for supplier safeguards.

Export controls, if pushed too hard, could prove counterproductive, and U.S. negotiators insist that the Suppliers' Conference has progressed as rapidly as political realities will permit. A premature attempt, for example, to substitute a formal public and binding agreement for the present informal understanding would probably result in no agreement of any kind being reached.

The reaction of nuclear importing nations is of an even greater concern. If the conditions attached to the purchase of nuclear facilities, materials, and technology are thought to be too onerous, an importing nation may opt for a national nuclear industry (including enrichment and/or reprocessing facilities) which will permit increased independence from overseas suppliers. Brazil has already chosen this path. If the country in question has not ratified the NPT, these indigenous facilities would be entirely exempt from safeguards—with obvious implications for proliferation. Furthermore, steps to hedge the availability of civilian nuclear exports with growing restrictions and conditions could be construed as a violation of NPT Article IV. More important than the legalities is the possibility that such restrictions would be widely viewed as analogous to the resented unequal allocation of benefits and costs between nuclear and non-nuclear weapons states under the NPT

regime (see below). Cartels are seldom popular with their customers: witness the tensions between OPEC and industrialized oil consumers. While OPEC can attempt to justify its price exactions by stating that they ameliorate or at least modify global power and income inequalities, a nuclear cartel could not make the same claim.

As a consequence, the political viability of export controls for more than the short term is very much in doubt. The minimum requirements for success would seem to be: (1) a perception by suppliers that the opportunity costs of controls are equitably distributed among them, and (2) a perception by importers that controls do not unreasonably hinder diffusion of the benefits of civilian nuclear energy—either in terms of energy supply or cost.

A second problem area concerns sanctions and enforcement. At present, the basic U.S. position on sanctions remains the same as articulated by then Secretary of State Kissinger, i.e., that violations of bilateral agreements or IAEA safeguards should lead to a cutoff of nuclear assistance to the offending country and the return of supplied material and equipment. This conforms to the standard provisions in U.S. Bilateral Agreements for Cooperation. The credibility of this threat was not enhanced by either the mild U.S. reaction to India's nuclear explosion, or the subsequent proposal by the Ford Administration to resume limited exports of nuclear fuel to India. What seems required at the outset is a joint suppliers' statement that any violation of a safeguards agreement would be viewed as an extremely grave matter, resulting in consultations among suppliers and leading to the coordinated application of prearranged sanctions. Sanctions might include, in addition to a cutoff of nuclear assistance by the suppliers and a withdrawal of IAEA assistance, a severance of all economic ties with the offender, a suppliers' initiative to obtain a formal condemnation of the violation by the United Nations General Assembly, and Security Council consideration of possible further punitive actions. These sanctions should be enumerated in at least general terms in each export agreement. More drastic sanctions are reviewed elsewhere in this study.

Agreement on, and enforcement of, even the relatively mild sanctions listed above will be very difficult. To be viable, sanctions must fulfill four criteria: they must be credible; they must be strong enough to serve as an effective deterrent; they must enjoy the support of the suppliers who will enforce them; and they must be sufficiently acceptable to the recipient states to be incorporated in export agreements in the first instance. Such conditions are not easily met.

In theory, sanctions could also be applied against a supplier that fails to implement an agreed course of action following a safeguards violation. In this instance, all the difficulties of implementing sanctions are compounded. If the offending supplier is an ally, the United States will be extremely reluctant to jeopardize a vital political and security relationship; if the U.S.S.R. is the culprit, any attempt to impose sanctions will be dangerous and probably futile.

Another difficulty arises from the fact that export controls ideally should be retroactively applied to the 30 existing nuclear export agreements of which the United States is a party. All nuclear exports require a NRC or Commerce Department license, and this in turn provides a lever to institute the new criteria. Even so, unilateral, retroactive revision of a bilateral agreement is hazardous. The danger is that such action would antagonize importing states and further undermine the already damaged reputation of the United States as a reliable supplier. The problem would be ameliorated to the extent that the United States moved in concert with other suppliers, and the licensing lever is used to initiate negotiations with importing states concerning the proposed revisions rather than to simply impose those provisions on a unilateral, take it or leave it, basis. Moreover, bilateral agreements are increasingly being supplanted or supplemented by multilateral institutions and processes, e.g., the Suppliers' Agreement and IAEA safeguards.

The proposal that extraordinary precautions be taken with exports to particular countries or regions poses its own set of difficulties. In an area prone to international conflicts,

civil wars, and coups, safeguards may be irrelevant. Safeguards applied to the reactor provided South Vietnam would probably not have constrained the present Government had the facility been captured with its fuel supply intact. Where terrorism has reached military dimensions, as in the Middle East, it is hard to imagine how any set of physical security safeguards can be entirely credible. Governments and even nations are most likely to face threats to their very survival in unstable areas. As previously noted, a regime in extremis is unlikely to be inhibited by safeguards or other nominal disincentives to proliferation. In such an area, there may also be more than the usual quota of extremely ambitious or fanatic leaders—with indeterminant but unreassuring implications for proliferation. Such areas have the added liability of possibly being the focus of U.S.-Soviet rivalry, with the consequent danger that the superpowers will be tempted into a competitive dilution of safeguards requirements in the quest for regional influence. Finally, the notion of special safeguards is inherently discriminatory, i.e., it contravenes the concept of uniform safeguard standards uniformly applied which underlies all blueprints for multilateral export controls. If the principle of uniformity is eroded by special exceptions, it will be difficult to avoid a competitive erosion of safeguards by suppliers.

Assistance Regarding Non-Nuclear Energy Sources

Nonproliferation will be abetted to the extent that potential Nth countries can be induced to rely upon non-nuclear energy sources. There are both general and specific policy initiatives available to the United States for this purpose. Items in the former category include:

- R & D programs regarding energy systems appropriate to the decentralized, low capital, low maintenance requirements of the less developed countries.
- International collaborative efforts to explore the potential of conservation and renewable energy sources. Recent proposals for an international energy conference would be appropriate in this regard.

- Establishment of an International Energy Institute (possibly as an IAEA adjunct) to serve as an ongoing institutional focus of such efforts.

More country-specific steps might include:

- Assistance to individual governments in assessing their present energy needs and in devising energy development and delivery strategies.
- Technical assistance in developing whatever non-nuclear energy sources are most appropriate to a particular country's situation.
- Steps to ensure that foreign assistance and export credit arrangements are equally favorable for non-nuclear and nuclear energy sources. In each of these instances, preference could be accorded those states prepared to accept export restraints.
- Guaranteed supplies of U.S. coal.

The impact of these measures could be enhanced if some means were devised to assist nations choosing among nuclear and non-nuclear energy sources. This might involve creating a new international organization, possibly as an adjunct to the World Bank, which would systematically assess the comparative technological, economic, and administrative characteristics of alternative energy systems and provide technical assistance to requesting countries. That assistance could take three forms: a data bank, help in evaluating the relative utility of alternative systems in terms of specific national requirements and characteristics, and assistance in constructing the system or systems selected. If such a process helps stimulate increased interest in, and reliance on, non-nuclear energy sources, the pressures for proliferation may be eased.

Critique.—While development of non-nuclear energy sources has clear utility with regard to a diversion route to proliferation, its relevance to dedicated facilities and purchase/theft routes is less direct. Similarly, to the extent that proliferation is motivated by such factors as national security and prestige, provision of alternative energy supplies will be an ineffective response.

Technological Measures

It is clear from chapters VII and VIII that there is no "technological fix" that can eliminate the proliferation problem. Nevertheless, technological barriers can be raised both by enhanced safeguards and by an emphasis on nuclear systems that are inherently less vulnerable to diversion.

Safeguards technology could be quickly upgraded by both the IAEA and NRC. Possible improvements include a more extensive use of multiredundant cameras, seals, and portal monitors, with full-time remote alarm systems monitoring by inspectors. Controls to prevent procedural lapses can be made more stringent; no safeguards system can be fully effective if the equipment is inadvertently left off or doors left unlocked.

A new generation of safeguards technology now under development also shows promise. This includes advanced versions of seals, cameras, isotopic analyzers, and portal monitors. Real time accounting systems would also enhance the timeliness of detection at reprocessing plants.

Development and implementation of new reactor and fuel cycle systems that are inherently less vulnerable to proliferation will be more difficult and take longer than developing new safeguard systems. The first step might be to redesign the LWR core of existing reactors for a throwaway cycle. Changes in enrichment or core design could optimize performance for a cycle without reprocessing. The HTGR might also be considerably improved from a nonproliferation standpoint if designed for low enriched (6 percent) fuel. A cycle using denatured UPSS in LWRS coupled with multinational reprocessing and breeding centers appears to substantially reduce opportunities for diversion. Reprocessing could be made less vulnerable if techniques such as coprecipitation are used. The gas-core nonproliferation reactor mentioned in chapter VII seems to have the greatest promise of all technological developments, but is also one of the most problematical. Thorium thermal breeders are clearly superior to the plutonium fast breeders in resistance to diversion.

Most of these R & D programs could be performed quite effectively by ERDA or NRC if they are given the mandate. International implementation may be considerably more difficult. The IAEA is bound by present agreements as to the level of safeguarding. Improvements in existing equipment can be made fairly easily, but such modifications are subject to negotiation with the host country. New reactor systems would have to be clearly superior to existing or planned systems on many counts besides nonproliferation before other suppliers would turn to them.

The most difficult question concerns the LMFBR. It is a nearly ideal instrument for the production of large quantities of high-grade SNM, It may also be the best hope for virtually unlimited quantities of moderate-priced energy. A fundamental reassessment of the entire LMFBR program on an international scale may be warranted, but given the enormous effort already invested in this enterprise, any reexamination will encounter major political, bureaucratic, and budgetary obstacles-side from the technical questions of reactor design.

Strengthen the Nonproliferation Regime

The NPT constitutes the centerpiece of what may be labeled the international nonproliferation or safeguards regime. The treaty is not without its critics—including those governments, like India and Brazil, which have refused to become signatories. The most persistent objection by the non-nuclear states is that the treaty is inherently discriminatory, allocating the bulk of obligations to the non-nuclear weapons states and the privileges to the nuclear weapons countries. Other critics, generally within the nuclear nations, have complained that the safeguards system provided for in the treaty is too weak to provide an effective barrier to proliferation. They note that a number of Nth countries have not ratified the NPT, nor are they likely to do so. Even with regard to NPT parties, constraints

upon the IAEA with regard to inspector access, the lack of power to search for clandestine facilities and stockpiles, and the inability to pursue and recover stolen material leave the present safeguards system with limited authority.

Policy proposals for strengthening the non-proliferation regime are diverse and reflect each of these viewpoints. The first four subheadings that follow address ways of making the Treaty more attractive to non-nuclear states. The next three constitute means of strengthening the Treaty's control aspects, and the last three fall in a gray area between these two categories.

Nuclear States Arms Control

The nuclear weapons states have a commitment under the NPT to "pursue negotiations in good faith on effective measures relating to the cessation of the nuclear arms race at an early date and to nuclear disarmament", including a Comprehensive Test Ban. At a minimum, this would seem to require both an agreement in the next round of SALT negotiations providing for some actual reduction in armaments, and a ban on underground nuclear explosions. The apparent relaxation of Russian opposition to onsite inspection offers grounds for some optimism concerning a test ban.

Improve the Benefits Available to an NPT Signatory

The United States has taken a few steps in the direction of preferential treatment for NPT parties since late 1974, in the areas of IAEA medical research and technical assistance programs. Article IV of the NPT recognizes the "inalienable right" of all parties to full participation in all peaceful nuclear activities. The same article obligates those parties "in a position to do so" to contribute to civilian nuclear applications in the non-nuclear states, with particular attention to the needs of the developing countries. In practice, however, the nuclear nations have provided more nuclear technology and materials to states which are not full parties to the NPT (e.g.,

Israel, Egypt, Saudi Arabia, India, Pakistan, Brazil, and Argentina) than to the signatories. If adherence to the treaty is to be made more attractive, this situation must change. Equipment, materials, services, information, and technical assistance would be provided on a preferential basis—including concessions or other appropriate financial arrangements—to NPT parties.

Evaluate Peaceful Nuclear Explosions (PNEs)

The NPT contains a provision that "benefits from any peaceful application of nuclear explosions will be made available to non-nuclear weapon states party to the Treaty . . . through an appropriate international body." This paragraph has been inoperative, primarily because of differing perceptions of the value and practicality of PNEs. To resolve the issue, it has been suggested that an international moratorium on PNEs be instituted pending the completion of a study on their desirability by the U.N. Secretary General or some other neutral and prestigious entity. An international institutional framework could be created, depending upon the outcome, to provide and regulate PNE services or to ban them altogether.

Enhance the Role of the Non-Nuclear States

Participation by non-nuclear weapon states in decisions concerning peaceful nuclear activities—within an international or multinational framework—may be enhanced in order to reduce the sense of discrimination many of them feel under the NPT. Means to achieve this end are described below.

Link Nuclear Exports to NPT

Another previously mentioned means of strengthening the NPT regime involves a link between nuclear nation exports and the Treaty, i.e., a condition for the export of nuclear materials and technology would be adherence to the NPT by the importing state. Alternatively, the nuclear weapons states could decide to permit exports of nuclear

materials and technology to non-NPT signatories only if they accept the application of IAEA safeguards, both to the imported material and to all nuclear facilities and activities within their borders,

Link Economic Aid to NPT

On a broader level, it has been suggested that the United States and other industrialized countries condition all their economic assistance on the recipient nation's adherence to the NPT, and agree to curtail all exports of nuclear fuel, technology, and facilities to any NPT party found in violation of the Treaty. This would complement a general tightening of safeguard requirements on exports by nuclear supplier nations, (See above for a discussion of export controls.)

Strengthen IAEA Safeguards

IAEA safeguards constitute another important dimension of the nonproliferation regime. The ideal safeguards system would provide a universal and uniform set of requirements, standards, and procedures both for international exchanges of nuclear materials and technology and for national nuclear energy activities. Although the ideal probably remains beyond reach, a significant upgrading of the existing system can be envisioned.

- . Assure that IAEA funding, staffing, and technical competence are augmented at a rate commensurate with the global expansion of civilian nuclear energy production. This will require, inter alia, a high-quality recruitment and training program for inspectors and salaries sufficient to attract the best people available. It may also require a substantial and sustained increase in U.S. financial support for the Agency.
- . Develop new funding mechanisms to augment existing annual assessments and voluntary contributions, e.g., an IAEA tax levied on the output of all nuclear powerplants.

- . Provide the IAEA with authority to search for "undeclared" nuclear facilities, i.e., to conduct unannounced field investigations with full access to the territory of non-nuclear states. The Treaty of Tlatelolco² provides a possible model in this regard. With regard to "declared" facilities the objective would be to secure maximum inspection frequencies and access rights for inspectors. In the case of reprocessing facilities, resident round-the-clock inspection will be necessary.
- . Obtain the agreement of the U. S. S. R., France and China to allow IAEA inspection of their civilian nuclear facilities—inspection of U.S. and U.K. facilities has already been authorized in principle.
- . Extend the application of existing safeguards to prevent the acquisition, through imports or diversion, of plutonium for military non-weapons purposes (e.g., a nuclear submarine propulsion program).
- . Consider a U.N. General Assembly resolution calling for political sanctions against NPT violators, e.g., a suspension of the offending country's membership in the United Nations and its specialized agencies.
- . Seek prior international agreement on a common plan of action and graded sanctions to be applied in the case of a safeguards violation or the abrogation of an agreement. The present limited repertoire of sanctions available to the IAEA would be strengthened.
- . Institute a standard text for multilateral and bilateral safeguards agreements, as

²The Treaty of Tlateloleo (The Treaty of the Prohibition of Nuclear Weapons in Latin America) was opened for signature in 1967. It establishes the first nuclear-weapon-free zone in a densely populated area. The treaty has been ratified by 21 Latin American states. In addition the United States, Great Britain, France, and China (but not the U. S. S. R.) have signed Protocol II whereby they pledge themselves to respect the zone and not to threaten to use nuclear weapons against countries within it.

was done in the case of NPT safeguards agreements. Such standardization would be an essential concomitant of any effort by the supplier states to require recipients to submit all their peaceful nuclear activities to safeguards.

- Improve the interface between IAEA safeguards and national materials accounting systems, e.g., by developing and applying standardized measuring and accounting systems.
- Develop improved standardized seals and monitors, and lift current restrictions on operation of cameras and recording devices.
- Reserve U.S. safeguard rights with regard to American nuclear exports as a fallback to international safeguards.

Expand IAEA Functions

In addition to strengthening the IAEA's capability to perform existing safeguard tasks, the Agency might be upgraded through the assignment of new or expanded functions. These might include the following:

- Develop techniques and facilities for the international transport of nuclear fuel, waste storage and disposal, and storage of excess plutonium in conjunction with national governments.
- Draw up standards for the design, construction, and operation of reactors and other fuel-cycle facilities.
- Establish and manage an international storage regime for fresh and spent fuel.
- Develop safety, environmental, and health standards for multinational fuel-cycle facilities (parks),
- Establish standards and designs for physical security systems and devices. The agency might provide physical security for its own facilities, and evaluate and approve the plans of individual countries for national facilities.
- Provide technical assistance, including applied research services, to civilian

nuclear programs in the less developed countries.

- Provide an international clearing house both for nuclear energy and safeguards data and technology.
- Assess the environmental effects of nuclear facilities near international boundaries.

Intelligence Capability

A necessary, though not sufficient, condition for an effective nonproliferation regime is possession of timely and accurate information about actual or prospective proliferation. Safeguards are designed to provide this information with regard to diversion of SNM. Efforts to foreclose dedicated facility and purchase-theft routes to proliferation will necessitate some reliance upon covert intelligence—a capability that rests almost entirely with national governments. The principal sources of information in this area include political reporting from embassies, other human intelligence, monitoring of communications, overflights, and satellites. For example, one method of trying to detect a clandestine reprocessing facility consists of atmospheric sampling for Krypton-85. The adequacy of the existing U.S. (and foreign) capability in this field cannot be judged without extensive access to classified material. Clearly, however, an effective nonproliferation policy will require an intelligence capability sufficient to cope with the magnitude of the threat at any particular time. Moreover, if effective international (as opposed to merely national) responses to clandestine proliferation are to be developed, some sort of pooling or coordination of nuclear intelligence may be necessary.

Nuclear Free Zones

Nuclear Free Zones constitute another approach to strengthening the NPT regime. They totally ban the presence of nuclear weapons within the prescribed geographical area. Although a large number of such zones have been proposed, the only one presently in

existence applies to Latin America under the Treaty of Tlatelolco. Whereas the NPT is seen as a product of the great powers, most nuclear free zone proposals, including that for Latin America, have been initiated by the non-nuclear states of the region concerned—a political fact of some importance. A nuclear-free zone proposal has some chance of success if it enjoys general acceptance in the area concerned, does not significantly alter the regional balance of power, and is based on a genuine search for common interest. At present, only portions of Latin America, Africa (excluding Egypt and South Africa), and possibly Southeast Asia fulfill such criteria.

Critique

Formidable political obstacles will confront efforts to implement many of the above proposals. Nationalism will pose a formidable barrier to the intrusion of an international agency in search of undeclared facilities, and political resistance on the part of the Soviet Union, France, and China to proposals for IAEA inspections may be insuperable. The political difficulties involved in coordinating policies among nuclear exporters and in imposing conditions upon importing countries have already been noted. Similarly, agreements to coordinate nuclear intelligence on the part of two or more governments will require political and diplomatic acumen of a high order. Any attempt to penalize an NPT violator by suspending it from membership in the United Nations and its related agencies carries with it the danger of weakening what global institutions we have. It must be noted, however, that the international community has demonstrated an increased willingness to take that risk with regard to some of the present Nth countries, e.g., South Africa and Taiwan. As the recent Senate confirmation hearings on the new Director of the Arms Control and Disarmament Agency suggest, arms control agreements that successfully bridge the gap between international adversaries and domestic constituencies are extraordinarily difficult to negotiate. The fact that only one partial nuclear free zone agreement has been achieved despite a profusion of proposals is indicative of the difficulties of over-

coming divergent political interests and outlooks. Finally, the success of efforts to bolster IAEA safeguards with new and stronger sanctions will depend on whether governments have the political will to take action when a violation is detected. As of yet, that will remain untested.

These problems reflect a basic political reality—the weakness of international organizations within a nation-state system. Safeguards can presently be applied only with the cooperation of the subject state; they cannot be imposed. Truly compulsory safeguards would require a substantial diminution of sovereign prerogatives in the nuclear field—a formidable task. In fact, the IAEA may be hardpressed to simply maintain its existing technical standards and integrity in an international environment conditioned by political pressures and constraints.

The difficulties with proposals to bolster the nonproliferation regime are not all political. The assumption concerning a link between horizontal and vertical proliferation, which underlies the arms control proposal outlined above, cannot be verified. All that can be said with certainty is that a number of non-weapons countries have cited continued vertical proliferation as grounds for possibly reevaluating their commitment to the NPT. At a minimum, successful SALT and CTB agreements would remove one possible justification for an Nth country selecting the nuclear option. Proposals to study PNEs also raise grave doubts in the minds of many who see this as injecting new life in a concept which is slowly dying a well-deserved death. It can be persuasively argued that the best approach to PNEs is to continue efforts to convince non-weapons states that such devices hold no benefits for them.

Global and Regional Arrangements

Until very recently, the bulk of the policy proposals designed to curb proliferation have fallen in the category of negative or denial strategies. There is a growing recognition, however, that any durable solution to the

problem will have to be built on an affirmative, voluntary consensus. Suggestions regarding how such a consensus may be achieved have centered on proposals for multinational or international control over various phases of the nuclear fuel cycle.

International Management

A recent blueprint for internationalization proposed the following steps to be accomplished sequentially:

- . International management and control of reprocessing, plus international regulation and protection of plutonium transport.
- . Creation of an international PNE facility, to explore the utility of this technology and to provide PNE services to non-nuclear nations if and when they prove feasible and useful.
- . Definition of enriched uranium and plutonium as international "public goods" to be produced only under international licensing and regulatory authority. Such a step would become possible only with the prior ending of production of all fissionable material for military purposes.
- . Management of enrichment facilities as an international public utility with national facilities operating under international license and regulation.

Multinational (Regional) Fuel-Cycle Facilities

Proposals for multinational arrangements tend to emphasize the creation of regional nuclear fuel-cycle facilities or "parks" in which critical elements of the fuel cycle would be colocated. Precedents already exist in Europe for multinational enrichment and reprocessing facilities. With their regional emphasis, proposals for multinational arrangements can be regarded as a half-way house between bilateralism and internationalism. Multilateralism and internationalism are not mutually exclusive, and the concept of collocation plays an important part in both.

The advantages and limitations of multinational centers are analyzed in chapter VIII. Two features deserve further emphasis, however.

First, by calling for joint participation and shared responsibility by nuclear and non-nuclear states in the international or multinational management of nuclear activities, these approaches offer to correct the discrimination and paternalism which burden the existing NPT regime. In exchange for an agreement to forgo the nuclear weapons option the non-nuclear nation is offered a seat at the top table of nuclear institutional diplomacy. Durable nonproliferation becomes possible if the nuclear nations are willing to pay for it in the coin of shared power and prestige. The underlying assumption is that the nationalistic desire for equality and status will be a principal motivation for future proliferation, nuclear weapons being valued primarily for their political impact as symbols of power and modernity.

Second, multinational and international arrangements are also synonymous with strategies of interdependence, as opposed to "independence" (autarchy), in the effort to meet global energy needs. This has crucial implications for nonproliferation. The effectiveness of IAEA safeguards will be greatly augmented if the electric power of the nation being safeguarded is dependent on outside services or supplies. With a nation's power supply hostage to good behavior, few, if any, other nonproliferation sanctions would be required.

Critique.—The difficulties which will be encountered in any effort to internationalize management and control of civilian nuclear activities are self-evident. Internationalization will require a substantial derogation of national authority over a matter generally considered to be among the most vital of national interests—energy supply. A decision by the U.S. Government to move decisively in this direction would require considerable courage and imagination.

Regional fuel-cycle facilities would encounter many of the same difficulties, although they might not be as severe,

Regional arrangements would generally not run as clearly contrary to nationalistic tendencies and might not arouse the same degree of opposition from industrial and commercial interests that internationalization probably will in some advanced nuclear nations. Nevertheless, even where the objective is accepted in principle by all the major participants in a multinational enterprise, major disagreements can arise. These may concern, *inter alia*, allocation of production benefits and management/operations responsibilities, wide variations in industrial and industry-government relations within countries, technology transfer, and waste disposal. A fundamental problem of multinational facilities involves siting. Participating nations may feel they are less than full partners if the facility is located in another's territory. Moreover, the concept has encountered skepticism from some Third World states uncomfortable with the complexity of such centers and suspicious that these facilities will be dominated by the advanced nuclear supplier countries. With all this in mind, it may be advisable to confine the first multinational centers to one stage in the fuel cycle, possibly spent-fuel storage. This would provide a relatively modest and non-controversial means of testing the viability of the concept. An interim measure might involve designating existing storage sites in the supplier states as IAEA repositories under the Agency's management.

Measures Concerning Non-State Adversaries (NSAS)

The emergence of international terrorism by non-state entities in recent years has spawned nightmare images of nuclear high-jackings and blackmail. The danger is increased by the fact that IAEA safeguards are not designed to deal with such a threat. Existing physical security measures are inadequate in many countries, and there are no agreed standards or methods to which such measures must conform. To deal with this situation, initiatives in at least four areas bear consideration:

- Creation of a U.S. technical assistance program for other nations, designed to

upgrade their physical security measures;

- Negotiation of a convention establishing uniform international standards and methods with regard to physical security devices;
- Negotiation of an international convention to control terrorism and hijacking;
- Consideration of steps which might be taken to alleviate the grievances of dissident groups with terrorism potential; and
- Contingency planning with regard to actions which might be taken in response to an actual NSA event.

Critique. -Of these four proposals, the last three pose special difficulties. The United Nations has been the scene of strenuous efforts for several years to negotiate an international convention against terrorism—without success. If a more explicit link develops between terrorism and nuclear proliferation, perhaps the situation will change. Attempts to satisfy the grievances of radical groups are fraught with the danger of blackmail, but the matter may still be worth exploring. Possible responses by governmental authority after a nuclear incident pose another potential peril—to civil liberties.

Policy Implementation

Thus far we have presented a taxonomy and analysis of available policies under three basic perspectives. The next logical step is to order those policies in terms of their priority, or the logical time sequence in which they might be addressed. What follows is a sample categorization of available policies arranged in terms of a three-stage time sequence. The criteria for distinguishing between the categories are urgency, time required for implementation, and feasibility (in terms of technical difficulty, economic and political cost, time required, and whether the desired initiative can be taken unilaterally by the United States or requires collateral actions by other governments). Stage I, for example, includes items judged to be urgent and feasible at a relatively low cost in the near term. They tend to require initiatives that the United States can take

Figure III-1 Previous Policy and Future policy **Priorities**

Previous Policy ("The basic premise of U.S. nuclear cooperation for over 20 years has been worldwide cooperation in the peaceful uses of nuclear energy under effective controls.")

Weaken incentives of Nth countries

- mediation of disputes
- security guarantees (limited)
- maintain high technical and economic costs of nuclear option

Sanctions: political pressures (selective)

Strengthen national intelligence capabilities

Export controls (seek agreement with other vendors):

- ban on export of facilities or technology for enrichment or reprocessing
- exports subject to IAEA safeguards
- ban on reexport of exported fuel and facilities
- require importers maintain adequate physical security measures

Prohibitions against use of assistance for any nuclear explosions

Encouragement of multinational regional facilities concept

Support for NPT and IAEA

Stage I

Export Controls

Enrichment

- reliable supplier
- fuel services (e.g., spent-fuel storage)

Strengthen national intelligence capabilities

Forego plutonium recycle

Stage II

Contain plutonium recycle (If rejecting Pu recycle proves infeasible)

Weaken incentives

- non-use pledge regarding non-nuclear weapons states
- security guarantees
- reduce the prestige and symbolic importance of nuclear weapons

Strengthen disincentives

- strengthen the international political norm against proliferation
- strengthen anti-proliferation domestic political forces

Neutralize non-state adversaries

Assistance regarding non-nuclear energy sources

Strengthen the nonproliferation regime

- more adequate implementation of SALT and CTB agreement
- study of PNE practicability
- increased participation in decisions concerning peaceful nuclear activities by non-nuclear states within an international framework
- link U.S. nuclear exports to NPT adherence
- nuclear free zones
- increase benefits of NPT adherence
- strengthen IAEA safeguards capabilities

Sanctions

International spent-fuel storage regime

Stage III

Global and regional arrangements

- enriched U and Pu as international "public goods"
- enrichment plants as international public utilities
- MNFCFS
- international reprocessing facilities

SOURCE: OTA

Figure III-2.

Scope for Congressional Action (legislative and budgetary powers)

Export Controls

Criteria (require, resolve/recommend)

Unilateral and multilateral

Immediate and delayed

New and old bilateral agreements (i.e., renegotiation requirements)

Licensing procedures

Sanctions

Unilateral

Multilateral

Organizational authority and responsibility

Establish presidential authority to change or delay application of criteria

Executive branch authorization/veto

Executive branch reorganization and allocation of authority

Congressional review export decisions (licensing)

International Negotiations

Resolutions re bilateral and multilateral agreements

Content

Timetable

Allocate negotiating authority among executive departments

Require reports to Congress re negotiating progress

Statements of U.S. Policy ("sense of Congress")

Arms Control and CTB

Resolutions

Senate Treaty Approval/Disapproval

U.S. as a Reliable Supplier

Enrichment capacity appropriations

Commercial reprocessing appropriations

Privatization

Improve International Safeguards

Appropriations to strengthen IAEA

Appropriations for ERDA safeguards and physical security training and R & D

Investigations of Executive branch performance

Plutonium Reprocessing

Authorize or reject budget support

Licensing

SOURCE: OTA

unilaterally. Stage I focuses on export controls and services intended to forestall developments that might make proliferation unmanageable in the short term; Stage II on establishing an international political climate

conducive to nonproliferation and to strengthening the NPT framework; and Stage III on multinational and international arrangements.

Figure HI-3. Selection Criteria for Policy Priorities

Policy	Urgency	Time Required	Feasibility	Stage
Export Controls	1	1	2	1
Enrichment	1	2	2	1
— reliable supplier				
— fuel services				
Strengthen National Intelligence Capabilities	1 (?)	1 (?)	1(9)	1(?)
Forego Pu Recycle	1	1	1	1
Contain Pu Recycle	2	2-3	2	2
Weaken Incentives	1	1-2	3	2
— non-use pledge				
— security guarantees				
— reduce prestige of nuclear weapons				
— strengthen security of nth countries through alliances etc.				
Strengthen Disincentives	1	2	2-3	2
—strengthen international political norm				
—strengthen anti-proliferation domestic political forces				
Non-State Adversaries	2	2-3	1-2	2
Assistance re Non-Nuclear Energy Sources	2	2	1	2
Strengthen NPT Regime	2	2	1-3	2
— increase benefits of NPT adherence				
—strengthen IAEA safeguards capabilities				
—implement SALT and CTB				
— increase participation in international decisions re peaceful nuclear activities				
—link U.S. exports to NPT				
— nuclear free zones				
— PNE's				
Sanctions	2	2	3	2
International Spent Fuel Storage Regime	2	2	3	2
Global and Regional Arrangements	3	3	2-3	3
— international reprocessing facilities				
— enrichment plants as international public utilities				
— MNFCF'S				
— enriched U and Pu as international public goods				

SOURCE: OTA

CONCLUSIONS

The preceding discussion indicated that a broad range of general and specific policy options are presently available to help control proliferation. Major options may soon be foreclosed by projected growth rates in the global nuclear industry, trends in international politics, and imminent technological innovations. It will constitute a major failure of our public institutions if the choice is made by default—a mindless product of the course of events. Where the stakes are so high, policy must be conscious, informed, and deliberate.

There is, as yet, no consensus regarding such basic issues as the role of nuclear power in meeting future global energy needs, the relationship between civilian nuclear power and proliferation, and the implications of proliferation for U.S. national interests. Different judgments on these issues will lead to different perspectives concerning the overall problem and different policy prescriptions.

Despite this lack of consensus, some general propositions concerning policy can be identified:

- . There is scope for policy; proliferation is still amenable to an intelligent, determined response. A permanent cutoff at the present number of nuclear weapon states is probably unachievable, but a curtailment after two or three additional states is not.
 - . There is no single solution, no short cut. An effective policy response to proliferation must be devised along political, economic, institutional, and technological dimensions. Such a policy will require unilateral, bilateral, multilateral, and international approaches.
 - . Because there is no generic Nth country, a nonproliferation policy must be country-specific to a significant degree. In this regard, the State Department might develop (and keep current) a nonproliferation strategy paper for each Nth country.
- Solutions will have to be found primarily, though not exclusively, through multilateral actions. The scope for effective unilateral action by the United States is declining as part of a relative diminution of U.S. global influence and its fading preeminence in the international market for nuclear reactors, fuel, and fuel services. Nevertheless, the United States is, and will remain, in a position to exert considerable influence—particularly in coordination with other suppliers. It is worth noting, in this regard, that the joint-suppliers approach has already recorded some significant achievements.
 - Policy regarding proliferation will probably conflict with other foreign policy objectives, particularly concerning efforts to limit U.S. commitments overseas. A major task will be to reduce the extortion potential seemingly inherent in the possibility an Nth country might decide to acquire nuclear weapons. How this conflict is resolved will depend in large part on the relative priority assigned to nonproliferation as compared to other foreign policy concerns.
 - Sanctions can serve to deter proliferation in advance and, to a much lesser extent, remedy it after the fact. But they have limited utility if applied unilaterally. Attempts by one state to coerce another almost inevitably generate resistance and a nationalistic backlash. Sanctions are more likely to be effective when applied jointly or multilaterally and when combined with incentives and inducements. When employed in such a sophisticated manner with regard to both suppliers and/or users, sanctions can contribute importantly to a nonproliferation policy.
 - There is no nuclear system or technological device available now or under development which can, in itself, prevent proliferation. There has been little effort in this direction, however, and potential

technological innovations can contribute importantly to a solution. Promising areas for research and development include nonproliferating reactors (e.g., gas core), uranium-thorium cycles, and safeguard systems integrated into the design of the plant.

- A decision with regard to closing the nuclear fuel cycle (i.e., reprocessing and recycle) has profound implications for nonproliferation policy. Three basic policy options confront the United States with regard to reprocessing: (1) whether to initiate domestic reprocessing; (2) whether to export reprocessing facilities and technology (under safeguards), and; (3) whether to discourage reprocessing exports by other suppliers. Dissemination of reprocessing facilities to non-weapon states will not only give their operators the means to produce weapons material, but also will reduce their vulnerability to international sanctions. If reprocessing spreads to a large number of countries and plutonium becomes a common article in international commerce, opportunities for proliferation will be unavoidable. Whether an international agreement to control reprocessing will require suppliers to forgo their own domestic reprocessing is a matter still in dispute. A viable compromise between national reprocessing and no reprocessing might involve multinational fuel-cycle facilities.
- An effective policy designed to prevent proliferation through diversion or takeover of civilian nuclear power facilities will include arrangements for the return of plutonium-bearing spent fuel. Methods include fuel leasing, buy-back, and exchange. Serious consideration will have to be given to the possibility of making the return of spent fuel a requirement of all bilateral and international nuclear assistance agreements. This in turn will necessitate the development of codified "rules of return." Spent fuel collected by the United States could be stored in IAEA-maintained repositories, as envisaged in Article XII (a) (5) of the Agency's statute.
- If the incentive for other nations to acquire national reprocessing plants is to be reduced, the United States will have to establish itself as a "reliable supplier" of low-enriched uranium. Other suppliers could be encouraged to take similar steps. Reliable supplier status presupposes a willingness to enter into binding agreements both to provide uranium enrichment services and to construct any additional enrichment capacity required. The more attractive the terms under which enrichment services are offered, the more likely their success in forestalling national facilities.
- The decision to accord the breeder reactor high priority in government-sponsored R & D will have to be carefully reconsidered in light of its proliferation implications. The unfavorable characteristics of the breeder from a proliferation standpoint will have to be weighed against its potential as an energy source in determining the future of the program.
- It may be necessary to establish new institutional structures on the international level to:
 - manage selected stages in the nuclear fuel cycle;
 - govern future user-supplier arrangements;
 - implement sanctions and possibly facilitate cooperation in the detection of violations;
 - provide nonweapon countries with an opportunity for participation and influence in the international development of civilian nuclear energy.
- Although the exact relationship between vertical and horizontal proliferation is uncertain, progress on arms control by the weapons states could remove an incentive, or at least an excuse, for proliferation.
- Policy regarding proliferation must be formulated in conjunction with national security, foreign, and energy policies. It will also cut across the division between domestic and foreign policy. Consequently, it is important to determine the

priority to be accorded proliferation concerns as compared to major issues within these other policy areas.

- . No system of safeguards against diversion is perfect. A good safeguards system can raise the costs and risks of diversion to the point where it becomes unattractive to a potential proliferator compared to other routes.
- . The NPT remains an important component of an effective nonproliferation policy. The fact that there have been no known violations of the Treaty suggests that it acts as an important political constraint upon Nth countries. It also provides an agreed framework of mutual rights, obligations, and expectations constituting a basic bargain between supplier and user states.
- . An effective nonproliferation policy will be expensive. Some items:
 - lost revenues from providing uranium enrichment services at nonprofit or concessionary terms;
 - costs of fuel buy-back;
 - costs associated with re~reprocessing moratoriums or abandonment (including waste management);
 - compensation to Brazil and Pakistan in return for voiding reprocessing contracts;
 - lost revenue from foregone exports.
- . A viable nonproliferation policy will have to determine how these costs are to be allocated. It should be noted, however, that because the economics of reprocessing are unclear a reprocessing moratorium might save more money than it would cost.
- . The United States should make contingency plans to deal with nuclear thefts, extortion attempts, and other nuclear emergencies due to the activities of terrorists and other non-state adversaries.

This chapter began by outlining three perspectives toward proliferation and energy. From a policy makers viewpoint, the implication of the Energy Priority Perspective is that the problem, while significant, is not of compelling importance. Consequently, there is

only a modest need for policy devoted exclusively to containing proliferation. The Nonproliferation Priority Perspective, on the other hand, assigns the highest importance to such a policy. Virtually, all of the measures discussed in the preceding policy inventory would be endorsed by proponents of this outlook. But, at the same time, these measures would be condemned as inadequate; policy must go much further to encompass the actual curtailment of the nuclear industry.

Both the Ford and Carter Administrations have developed policies based explicitly or implicitly, on the Shared Priority Perspective. Thus, the present Administration has set as its dual objective obtaining the benefits of the peaceful atom while preventing proliferation. This is an immense and complex task with a successful outcome anything but assured.

Still, the broad components of a policy to control proliferation are reasonably clear. There would be steps designed to tip the balance of incentives and disincentives confronting potential weapon states in favor of disincentives. This would be an attempt to modify the political calculus governing Nth country policy-making. Efforts would be made to develop a comprehensive international safeguards regime, sufficient to virtually foreclose the diversion route to nuclear weapons. The viability of safeguards rests on the belief that any violation will entail high political and other costs. Consequently, safeguards serve as a close complement to disincentives. Export controls, particularly with regard to enrichment and reprocessing capabilities, would be instituted in conjunction with arrangements for the return of spent fuel to the supplier or an international repository. Such restraints serve to restrict a nation's physical access to sensitive nuclear materials. As such, they erect obstacles to the construction of dedicated facilities and reinforce the impact of incentives, disincentives, and safeguards. Sanctions would be devised to deter and even reverse proliferation occurring by any route. Sanctions would thus serve as a backup to each of the controls listed above, as well as a deterrent to future would-be proliferators. Technological remedies would be explored, including alternate fuel cycles,

nonproliferating reactors, and more sophisticated safeguards equipment. Finally, these initiatives will require a broad range of supporting domestic and foreign policy actions, in-

cluding steps to upgrade physical security measures, expand reactor-grade uranium production, and emphasize arms control negotiations.