

Canberra Commission Issue Paper

Preventing the Weapons Use of Nuclear Energy

**III. International Arrangements for the Transition
to a Nuclear-Weapon-Free World**

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January 4, 1996

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So long as intrinsically dangerous activities may be carried on by nations, rivalries are inevitable and fears are engendered that place so great a pressure upon a system of international enforcement by police methods that no degree of ingenuity or technical competence could possibly hope to cope with them.

-- from "A Report on the International Control of Atomic Energy" [the "Acheson-Lilienthal Report"] March 16, 1946.

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I. Introduction.

The analysis presented in this paper starts from the assumption that the following interim steps toward a nuclear-weapon-free world (NFWF) would already be in place or in process at the time the final steps to elimination are undertaken:¹

- (1) a Comprehensive Test Ban Treaty embracing all nuclear weapon-capable states not already bound by the NPT;
- (2) a formal "cutoff" convention, or at least an informal global moratorium (verified in some instances by national technical means and "inspection by the public") on the separation and enrichment of weapon-usable fissile materials outside of safeguards;
- (3) public declaration of U.S. - Russian fissile material (FM) production histories, current and planned production capabilities, and current inventories of weapon-usable fissile material, and cooperatively verified exchanges of detailed data to confirm these declarations;
- (4) bilateral verified reduction of the respective Russian and American *stockpiles of nuclear warheads and bombs* to 1000 or fewer intact weapons each, and continued observance of an ceiling of 500 weapons on the respective arsenals of the other declared nuclear weapon states;
- (5) bilateral monitored storage and systematic verified dismantlement of all excess weapons;
- (6) bilateral monitored storage of Russian and U.S. fissile components removed from weapons pending internationally verified disposition as reactor fuel or vitrified waste;
- (7) implementation among the Permanent Five weapon-state members of the UN Security Council of a comprehensive safeguards regime that combines the bilateral mechanisms developed for verification of U.S.-Russian nuclear weapon elimination with international safeguards on fissile material production facilities and surplus military stocks transferred to peaceful use.
- (8) acceptance by undeclared nuclear weapon states remaining outside the NPT/Perm Five regimes of the principle that further progress toward the complete elimination of nuclear weapons will ultimately require either: (a) extension of Perm 5 safeguard arrangements to include them, or; (b) a decision to become a non-weapons state under the NPT through an IAEA-supervised process of de-weaponization and implementation of full-scope safeguards.

¹ These steps are described in greater detail in another NRDC Issue Paper prepared for the Canberra Commission, entitled "Practical Interim Steps Toward a Nuclear Weapons Elimination and Fissile Material Control Regime for Nuclear Weapon States."

One of the greatest difficulties in analyzing, and ultimately choosing among alternative paths to a nuclear-weapon-free world (NFWF) is knowing when to resist, and when to succumb to the siren song of gradualism. While appearing pragmatic and politically astute, such an approach, in the final analysis, may not culminate in the achievement of the desired objective, but rather in a new nuclear status quo that, while arguably preferable to the present situation, still falls far short of a nuclear-weapon-free world (NFWF).

The first two papers in this three-part series have outlined a number of the fundamental technical and political issues that must be squarely faced and resolved either before or during the final transition to a NFWF. Precisely to the extent that these difficult issues are merely "finessed," "managed," or indefinitely postponed to an indeterminate "final stage" -- and the resulting weaknesses built into the international regime for nuclear elimination -- the community of nations will ultimately lack confidence in the structure it has built up, and the labor of decades could be undone in a few months or years.

There will be constant pressures to broaden political support for "interim objectives" in the short term at the expense of laying the groundwork for more far-reaching measures in the future.² At times it may be difficult to distinguish between what one might call "reformist reforms," aimed at reestablishing the moral and political legitimacy of the nuclear weapon states' deterrent oligopoly, and "revolutionary reforms" that have as their aim to radically circumscribe and ultimately eliminate the threat of nuclear annihilation from world politics.

² For example, both Russia and the United States could agree to further reduce their deployed nuclear forces to some mutually agreed level and announce with great fanfare that they had "eliminated" or "reduced" certain categories of weapons. But absent detailed data exchanges on the disposition of the warheads and fissile materials ostensibly removed from these systems, and a continuing regime of both cooperative and challenge inspections to confirm the information contained in such exchanges, the overall contribution of unilateral measures to the final transition to a NFWF is limited.

II. Ranking Possible End-States.

Table 1 summarizes a number of the plausible "end-states" for the nuclear arms elimination process, and attempts in a very preliminary fashion to assess their merits in light of the following criteria for evaluating the transition to a NFWF:

(1) *Diversion Resistance* -- from a technical standpoint, what is the prospect for achieving, with high-confidence, the timely detection of significant thefts, diversions or losses of weapon-usable material?

(2) *Long-Term Technical Resistance to "Breakout"* -- what level of technical constraint, in terms of technology, materials, resources, and time, is imposed on the ability of states to suddenly reverse course and break out of the NFWF regime?

(3) *Long-Term Resistance to "Breakdown"* -- what level of protection is afforded against the threat of political and social breakdown leading to loss of control over sensitive nuclear installations and stockpiles?

(4) *Compatibility with the Ultimate Goal of a Permanent NFWF* -- what degree of permanence does the proposed end-state offer for a NFWF?

(5) *Near/Long-Term Political Feasibility* -- what are the near-term (5-20) year and long-term (20-50) year prospects for political acceptability?

(6) *Overall Desirability* -- a subjective summation and weighting of the above criteria.

Table 1.
Assessing Plausible Nuclear End-States

NUCLEAR "END-STATES"	Criteria for Assessing the Transition to a NFWF					
	Technical Assurance of Non-Diversion	Technical Resistance to "Breakout" Threat	Resistance to "Breakdown" Threat	Compatibility with Ultimate Goal of NFWF	Near/Long Term Political Feasibility	Overall Desirability
(1) Residual "Virtual Arsenals" and National Closed Fuel Cycles under IAEA Safeguards	low overloads safeguards	low maintains weapon parts & HEU/PU stocks	low Pu/HEU could be seized or stolen	low would legitimize breakout option	moderate/high mimics current posture of threshold states	low but could be useful as a transitional stage
(2) Complete Warhead Destruction and Demilitarization (WD&D) of HEU/PU Stocks; All National Fuel Cycles Under Full Scope Safeguards	low overloads safeguards	low to moderate maintains "peaceful" Pu & HEU stocks	low Pu/HEU could be seized or stolen	low to moderate allows de facto breakout option	low/moderate attractive to advanced nuclear non-weapon states & non-aligned	low to moderate "civil" Pu/HEU could derail disarmament
(3) Complete WD&D and Effective International Control of all Sensitive Fuel Cycle Facilities with Remainder Under Full Scope Safeguards.	moderate to high still vulnerable to small diversions	moderate better than (2) but EIC could be violated by "rogue state"	moderate Pu/HEU more secure than (2) but seizure still possible	moderate but would maintain the tech-base for clandestine production	low/moderate potentially attractive to many nations	moderate an important option if nuclear energy prospers
(4) Complete WD&D and Effective International Control of the Entire Nuclear Fuel Cycle	high	moderate to high	moderate	moderate but same concern as above	very low/low major impositions on sovereignty & commerce	moderate to high needed if Pu fuel cycle takes hold

Criteria for Assessing the Transition to a NFWF						
NUCLEAR "END-STATES"	Technical Assurance of Non-diversion	Technical Resistance to "Breakout" Threat	Resistance to "Breakdown" Threat	Compatibility with Ultimate Goal of NFWF	Near/Long-Term Political Feasibility	Overall Desirability
(5) Complete WD&D, a Weapon-Usable Fissile Materials Ban, and "Open" Fuel Cycle Under Full Scope Safeguards	high a less demanding role for safeguards	moderate to high no Pu/HEU stocks & production	moderate to high less risk from subnational threats	high gets rid of weapon-usable materials	low/moderate Pu-recyclers opposed, but many nations in support	moderate to high deserves further analysis
(6) Complete WD&D, a Weapon-Usable Fissile Material Interim Ban, Future Option of Closed Fuel Cycle Under Effective International Control; International Custody of Spent Fuel; Open Fuel Cycle Under Full Scope Safeguards.	moderate to high allows enrichment under safeguards; could allow Pu fuel cycle long-term	moderate to high defers Pu fuel cycle until EIC; gets rid of HEU/Pu stocks; removes access to spent fuel	moderate to high eliminates stocks of HEU/Pu; reduces subnational threat	high option for tightly controlled Pu fuel-cycle only if needed to extend nuclear energy supply	low/moderate near term resistance likely; but commercial failure of recycling & breeders could lead to later acceptance	high deserves further detailed analysis
(7) Complete WD&D, a Weapon-Usable Fissile Material Ban, and Effective International Control of Entire Open Cycle	high nuclear energy without weapon materials	moderate to high reduced breakout threat still exists	high no Pu/HEU stockpiles, facilities, or access to spent fuel	high	low/low Pu recyclers would resist; requires redefining sovereignty	high a long term option
(8) Complete WD&D, Worldwide Phase-out of Nuclear Energy	high	high	high	high	low/low-to-moderate	high research and the market will decide

Plausible options for nuclear "end-states," summarized in Table 1, include the following:

(1) *Residual Weapon-State "Virtual Arsenals."*

This approach attempts to deal with the perennial problem of "break-out" from a NFWF. Under this option, weapon components are kept in internationally monitored storage sites, and backed-up by dormant skeleton production complexes and national nuclear fuel-cycle capabilities under international safeguards. Instead of placing primary emphasis on preventing breakout, -- through international ownership or verified elimination of sensitive fuel-cycle capabilities -- this approach emphasizes *detering* it by maintaining roughly equivalent capabilities to reconstitute residual arsenals to operational status. "Virtual Arsenals" attempts to turn the destabilizing threat of a single nation's breakout from a nuclear-disarmed world into a stabilizing multipolar deterrent threat that would, it is argued, more effectively maintain the "disarmament" regime than the more ambitious, sovereignty-infringing structures required by a pure prevention strategy.

To gain universal appeal, however, a disarmament regime must be global in scope and nondiscriminatory in its outcomes. By making "breakout capabilities" an explicit and functional part of the regime's strategy for maintaining international stability, the "virtual arsenals" concept will likely encourage states to compete in the development of these capabilities. The elimination of deployed arsenals would be purchased at the expense of numerous states acquiring the essential capabilities for "breakout," thus increasing the risk of nuclear weapons proliferation. The proliferation risks associated with "breakdown" would likewise increase under this scheme, as weapon components, materials, technology, and personnel would all to some degree remain on the scene.

Because it meets many of the deterrent functions that are now performed -- or believed to be performed -- by deployed and undeclared nuclear arsenals, "virtual arsenals" may enjoy greater acceptance among nuclear weapon states, including threshold powers, than the other options. In the scheme proposed in the final section of this paper, we have incorporated a modified form of the "virtual arsenals" concept, not as an "end-state," but as a penultimate stage, under the control of the Security Council, in the final transition to a NFWF.

(2) Complete Destruction of All Intact Weapons and Fissionable Weapon-Components/Demilitarization of Weapon-Usable Fissile Materials, and National Control of Nuclear Fuel Cycle Under "Improved" IAEA Safeguards.

This (and all subsequent) options would do away with even the residual "virtual arsenals," thereby more closely approaching the ideal of a nuclear-weapons-free-world. This option, however, would permit national control of sensitive fuel cycle facilities and material inventories under internationally monitored commitments to peaceful use.

Once again, a major issue would be the "breakout potential" inherent in this scheme, and the lack of a prompt and convincing means of preventing or deterring a cascading sequence of (possibly global) rearmament. In the absence of a Pu/HEU ban or an international authority with strong extraterritorial powers, this regime would also remain vulnerable to the "breakdown" threat. Because it fully protects the option of closing the nuclear fuel cycle under safeguards, this option might well appeal to Japan and other advanced industrial non-weapon states, such as South Korea, Taiwan, Belgium, and Switzerland, with similar aspirations. If the safeguards regime were truly nondiscriminatory, it would ultimately permit closed fuel cycles and plutonium stocks in countries such as North Korea, Iraq, and Libya, and a host of other countries with the potential to become embroiled in internecine conflicts.

(3) Complete Nuclear Weapon Destruction/Demilitarization and International Ownership (Amounting to Extraterritorial Control), Under Expanded Security Council Auspices, of All Sensitive Nuclear Fuel Cycle Capabilities.

This option seeks to -- and to a considerable degree probably could -- minimize the political and strategic import of national fuel-cycle breakout capabilities by "internationalizing" them. Because of the inherent technical limitations on safeguards at bulk-handling facilities, this system would still remain somewhat vulnerable to small-scale diversions and theft, and physical security measures cannot completely deter or prevent certain kinds of insider terrorist threats to nuclear installations. This scheme also remains vulnerable to the threat of societal breakdown, including a possible breakdown in the effectiveness of the international authority itself, exposing sensitive facilities and stocks to takeovers by national governments or subnational groups. A

wide range of countries that oppose nuclear weapons, but also support a strong international role in the peaceful uses of atomic energy, might be expected to support this option.

(4) Complete Destruction/Demilitarization, and UN Ownership of the Complete Nuclear Fuel Cycle.

This option is similar to option (3) except that extraterritorial control is extended to all nuclear energy facilities, providing cradle-to-grave coverage for all aspects of the nuclear fuel cycle, from uranium mining to nuclear waste storage. This was the path originally envisioned for postwar international development of atomic energy by Oppenheimer, Lilienthal, and Acheson in the "Acheson-Lilienthal Report," which became the basis of the official U.S. proposal to the UN Atomic Energy Commission in 1946 -- better known as the "Baruch Plan." Its political feasibility within the next two decades seems doubtful, and, like option (3), the proposal would leave in place, or perhaps even stimulate, under international auspices, the very technical capabilities for weapon-usable fissile material production that are the object of concern in the shift to a NFWF.

The record of heavily state-subsidized nuclear industries in Europe and elsewhere shows that "internationalization" of the fuel cycle is sometimes the last resort of big nuclear projects -- like the breeder reactor or the International Thermonuclear Experimental Reactor (ITER) -- that would otherwise fail because they are too far removed from the realities of the projected energy marketplace for at least the next half century. Nonetheless, if the growth in demand for nuclear energy defies current expectations and becomes a widely dispersed and indispensable source of electric power for even more countries in the decades to come, comprehensive international control could be the best, and perhaps the only mechanism for ensuring a NFWF.

(5) Complete Destruction/Demilitarization, and:

- (a) a Rigorously Verified International Convention Banning Production or Acquisition of Weapon-Usable Fissile Materials for any Purpose, Civil or Military; and*
- (b) Continued National Control of "Once-Through" Nuclear Fuel Cycles Under IAEA Safeguards.*

This option appears to have much to recommend it, both technically and politically. It proposes to ban those nuclear activities which are not technically amenable to safeguarding with high confidence, and to extend comprehensive safeguards coverage to -- rather than "internationalize" -- all other nuclear activities involved in the predominant "once-through" civil nuclear fuel cycle. Politically it would appear feasible, given that current use of plutonium fuels in civil reactors is confined to a very few advanced industrial countries -- France, Germany, Russia, Switzerland, Belgium, and Japan -- and in no country does it account for a significant fraction of electrical energy production. Moreover, with the possible exception of France, this situation is not expected to change markedly for several decades, because plutonium-bearing fuels are considerably more expensive than low-enriched uranium fuels. However, strong factions within the nuclear establishments of Japan and a few additional countries -- principally Russia, India, and China -- are continuing to push for development of breeder reactor technology and a shift to the plutonium fuel cycle at some time in the future.

On the one hand, the argument can be made that the narrow interests of particular factions within the nuclear industries of just a few nations should not be allowed to obstruct international agreement on robust and effective arrangements for implementing the transition to a NFWF. On the other hand, current level IAEA safeguards work reasonably well in counting discrete objects -- such as spent fuel assemblies -- and in monitoring fuel loading and discharge operations. These could be supplemented by the "93+2" safeguards enhancements recently approved (in part) by the IAEA Board of Governors.

(6) *Complete Destruction/Demilitarization, and*

(a) An International Agreement Banning Production and Use of Weapon-Usable Fissile Material (Separated Pu and HEU) in the Civil Nuclear Fuel Cycle Until the Establishment of Arrangements for Effective International Control;

(b) International Custody Arrangements for Spent Fuel; and

(c) Continued National/Multinational Control of "Once-Through" Fuel Cycle Facilities, Including Enrichment Plants, Under Improved Full-Scope International Safeguards (with a Possible Option of Effective International Control of Enrichment).

This option would modify the prospective ban on production and use of weapon-usable fissile materials to permit closed fuel cycle research, development, and deployment upon the establishment of arrangements for Effective International Control (EIC). This regime would also replace safeguards at spent-fuel storage sites and centralized repositories, thereby accommodating two major objections to ending current closed fuel-cycle programs under national control. Work could continue on the plutonium fuel cycle as a long-term energy option, and spent-fuel management concerns would be met by a cooperative multinational permanent disposal venture under EIC. The latter would in theory alleviate near-term pressures to separate plutonium for "waste management" purposes, and further boost confidence in the effectiveness of the international safeguards system by removing a major source of proliferation concern -- the plutonium (or HEU) contained in spent fuel. Unlike the situation with plutonium separation plants and fuel fabrication plants, safeguards techniques for uranium enrichment plants can reliably establish that the concentration of U-235 atoms is being maintained well below levels (> 20% U-235) usable in weapons. These facilities nonetheless would still represent a breakout threat that could be reduced in the long term through EIC arrangements like those recommended for plutonium.

(7) Complete Destruction/Demilitarization, and

(a) An International Weapon-Usable Fissile Material Ban;

(b) End to All Closed Fuel Cycle Research, Even Under International Auspices, Involving Weapon-Usable Fissile Materials; and

(c) All Remaining Nuclear Fuel Cycle Activities Under International Ownership and Control.

From the perspective of ensuring a durable arrangement for a NFWF, this is an attractive option, but politically a very demanding one, for the reasons mentioned above.

(8) Complete Destruction/Demilitarization, Accompanied by Worldwide Phase-out of Nuclear Energy

In the long run, this option would create the most secure environment for a nuclear weapons free world. While it is not economically or politically achievable in the near-term, over the next 40-50 years it might emerge as a credible alternative. Much depends, obviously, on future trends in energy consumption, environmental pressures, and the relative competitiveness of alternative sources of energy.

III. Getting to the End-State.

From this preliminary comparative analysis, summarized in Table 1, only options (5) and (6) appear to combine a moderate-to-high overall rating for ensuring a durable transition to a NFWF with at least a moderate political prospect of success in the longer term (e.g., 20 - 50 years). How would the international community actually go about implementing one, or some combination of these options? Table 2 suggests a plausible sequence of stages and steps. The initial assumptions for this analysis are that Russia and the United States have bilaterally implemented agreements verifiably reducing their total nuclear weapon inventories to 1000 or fewer deployed and nondeployed weapons, that all "active reserve", "inactive reserve", and "retired" weapons in excess of this number are systematically accounted for and committed to the process of verified destruction and demilitarization of their fissile material components, and

that other declared nuclear states have continued to observe a ceiling of 500 weapons. What should happen next?

To further reduce arsenals, perhaps to 100-200 weapons, all five declared nuclear weapon states would need to be parties to the control regime. This would consist of a multilateral arrangement for controlling intact weapons and weapon components, and IAEA safeguards for controlling fissile material permanently removed from weapons use, which in this case should include *all* fissile material removed from dismantled weapons up to that point. During, if not before, the establishment of this five power Multilateral Monitoring Regime (MMR), UN Security Council membership would be by the addition of new permanent members that are not nuclear weapon states -- such as Germany, Japan, India, and Brazil -- and by adopting a broader, more representative system for rotating membership.

Under this expanded Security Council would be formed a special inspectorate -- the United Nations Disarmament Organization (UNDO) -- with expert personnel chosen from the declared nuclear weapon states (and also possibly from undeclared weapon states that were already participating in the five-power disarmament regime), to oversee a process of demating any warheads still deployed on their delivery systems and placing those not slated for dismantlement in secure storage facilities continuously monitored by the MMR, with each nation having unlimited but UN-regulated access to these storage sites. To meet the likely requirements of military establishments, the sequestration process for the final 100-200 weapons would have to be integrated with the pace of dismantlement for the thousands of weapons already retired, such that at no time would any nation's storage sites be vulnerable to preemptive destruction without incurring an unacceptable risk of retaliation in kind. Storage sites could be located deep underground, and if necessary actively defended, to minimize the prospect of success in carrying out a preemptive attack.

Before proceeding to the final step of dismantling the sequestered weapons and demilitarizing their fissile material components, a number of collateral steps would need to be taken in the development of a global control system for implementing the transition to NFWF. All civil inventories of separated plutonium and HEU would need to be declared to UNDO and brought under IAEA safeguards, and existing stocks of these materials would need to be reduced

to levels commensurate with those remaining in weapons. Any additional production of separated plutonium or HEU under national auspices would be banned, and future peaceful uses of these materials would be permitted only pursuant to arrangements for effective international control.

Before beginning the dismantlement process for the last remaining intact warheads held by the declared weapon states, any threshold-state inventories of weapons, weapon components or fissile materials remaining outside of MMR or IAEA safeguards would have to be declared and placed under continuous monitoring by the UNDO. Such declarations would then have to be verified by UNDO through extensive analysis of production data, inventory sampling, on-site inspections and other techniques. These conditions having been met, dismantlement of the remaining intact weapons in all states would commence and their fissile components stored under UN-monitored access.

Following dismantlement of the last tranche of (perhaps 10-20) weapons remaining in each country, UNDO-monitored access to weapon component and weapon-usable fissile material storage sites would become fully UNDO-controlled access only on approval of the Security Council. In the final step, demilitarization of the remaining fissile material components would commence under direct UNDO supervision. The resulting material, mechanically, chemically, or isotopically altered to make it unsuitable for use in weapons, would be placed in storage under IAEA safeguards. As currently, the enriched uranium could be blended for use under safeguards, vitrified for direct disposal as wastes, in civil power reactors. The plutonium would be stored under safeguards or utilized, depending on the status of effective international control arrangements for its peaceful use.

Table 2.
Three Stages and Fifteen Steps
to a Nuclear Weapons Free World.

STAGES/STEPS	RATIONALE IN BRIEF
<p>STAGE I: ENDING THE NUCLEAR ARMS RACE, ELIMINATING HAIR-TRIGGER NUCLEAR ALERT POSTURES, AND REDUCING US-RUSSIAN NUCLEAR "OVERKILL" AND WARFIGHTING CAPABILITY.</p>	<p>Completion of the measures in this stage would bring U.S. - Russian nuclear arsenals and strategies into rough alignment with those of the other nuclear powers, and establish the technical and political basis for a Five-Power regime to implement further "irreversible" reductions.</p>
<p>STEP 1 - A Comprehensive Test Ban (CTB)</p>	<p>A CTB would limit further development of nuclear explosives by nuclear-weapon states and other states not already bound by NPT</p>
<p>STEP 2 - A Cutoff in Production of Fissile Material for Weapons, and Comprehensive Declarations of Existing Stocks of Warheads and Weapon-Usable Fissile Material Confirmed by Data Exchanges and On-site verification techniques.</p>	<p>An essential prerequisite for irreversible reductions in the nuclear arsenals of the weapon states, but given large disparities in existing stocks, the cutoff need not be implemented simultaneously by all relevant states</p>
<p>STEP 3 - Removal of all Nuclear Forces from "Day-to-Day" Alert Status</p>	<p>Would eliminate all launch-on-warning and launch-under attack postures for ICBM's and bombers, and end nuclear alert patrols by submarine-launched missile forces, dramatically reducing chances of accidental or unauthorized launch.</p>
<p>STEP 4 - Immediately reduce nuclear warheads on or assigned to operational U.S.-Russian nuclear systems to 1000 weapons, place all warheads in excess of this amount in bilateral monitored storage, and reach agreement on timetable and procedures in START III to: verifiably destroy/convert excess delivery systems, dismantle excess warheads; and store their fissile material components under bilateral safeguards.</p>	<p>Would swiftly reduce the threat posed by operational nuclear forces to a level that would make "damage-limiting" preemptive strikes difficult, force changes in the way Russian and U.S. military establishments think about and plan for the military use of nuclear weapons, follow through on NPT commitments to pursue further reductions, but not make cuts so deep that perceptions of deterrent stability are upset if one side or the other were to abrogate the ABM Treaty.</p>

<p>STAGE TWO: A FIVE POWER NUCLEAR ARMS REDUCTION REGIME</p>	<p>Would further reduce the arsenals of the Permanent Five to levels at which threshold states could be asked to enter regime, paving the way for complete elimination</p>
<p>STEP 5 - Implement a Multilateral Monitoring Regime (MMR) among the Weapon States to: confirm declarations of past production and existing stocks; monitor stocks of intact weapons awaiting disassembly; and monitor stocks of intact fissile material components awaiting demilitarization for civil use.</p>	<p>This step would extend the bilateral monitoring regime to include the other three declared nuclear weapon states, in order to create the verification and control mechanism for another five to ten-fold reduction in nuclear stockpiles.</p>
<p>STEP 6 - Extend IAEA full-scope safeguards to civil nuclear facilities in weapon states, beginning with sensitive nuclear fuel cycle facilities</p>	<p>This step would plug a serious gap in the current international safeguards regime and lay the groundwork for the comprehensive control of world FM inventories required for complete elimination of nuclear weapons</p>
<p>STEP 7 - Reduce weapon-state stockpiles to 100-200 intact weapons under MMR monitoring; continue dismantling all excess warheads and demilitarizing their fissile material components to a form suitable for IAEA safeguards</p>	<p>This step would create an equitable global basis for beginning the transition to a nuclear weapons free world. Declared nuclear weapon state arsenals and inventories of weapon-usable fissile material not under safeguards would be brought into rough parity at very low levels, creating the moral, political, and strategic basis for threshold states to join the nuclear disarmament process.</p>
<p>STEP 8 - Expand UN Security Council to include major non-nuclear weapon states as permanent members, and improve global representation of rotating membership.</p>	<p>An essential step to create a Security Council with the global political legitimacy to oversee the transition to a NFWF.</p>

<p>STAGE THREE - TRANSITION TO A NUCLEAR WEAPON FREE WORLD</p>	<p>Would reduce remaining arsenals from 100-200 intact weapons to zero under expanded Security Council supervision, culminating in UN-controlled access to, and eventual demilitarization of, all remaining weapon materials.</p>
<p>STEP 9 - Form UN Disarmament Organization (UNDO) under the direct authority of an expanded Security Council, to oversee and verify elimination of the remaining weapons and assume effective international control of remaining weapon-usable fissile material inventories.</p>	<p>Existing "Perm Five" organization would be merged into broader UNDO under the direct authority of an expanded Security Council with a global mandate to oversee destruction of nuclear delivery systems, rigorously verify fissile material declarations, and monitor access to storage sites for remaining intact weapons and weapon components.</p>
<p>STEP 10 - All civil stocks of separated Pu and HEU remaining outside of safeguards would have to be declared to UNDO, and the total safeguarded global stocks of these materials reduced to levels commensurate with those remaining in weapons.</p>	<p>To implement very deep reductions and ultimately eliminate weapon-state inventories of nuclear warheads and fissile material components, commensurate reductions in the stockpile of weapon-usable fissile material in civil programs will likely be required, to reduce concerns about future "break-out" potential and forestall the retention of "hedge" options that would derail the final transition to a NFWF.</p>
<p>STEP 11 - UNDO would assume supervision of the intact-weapon and component storage sites from the weapon state MMR, but unlimited monitored access by the owner states would be preserved during this phase</p>	<p>Permitting unlimited but strictly monitored access by states to their weapon storage sites during this stage may be necessary to reassure them that a modified form of deterrence remains in force during the transitional phase.</p>
<p>STEP 12 - Any hitherto undeclared threshold state inventories of nuclear weapons, weapon components and weapon-usable fissile material would have to be declared to the UNDO, and such declarations verified by extensive analysis of production data, inventory sampling, inspections, and other on-site monitoring techniques; storage sites would be brought under UNDO monitored-access regime.</p>	<p>This step is essential precondition to the final destruction of the residual weapon-state arsenals. It could occur earlier in the process -- threshold states could of course elect the unilateral denuclearization route pursued by South Africa -- but it would <u>have</u> to occur at this stage</p>

<p>STEP 13 - Remaining intact weapons in all states would be dismantled and fissile components stored under UN-monitored access.</p>	<p>If necessary, to maintain deterrence this step could be accomplished in two phases: In Phase One 90% of remaining intact weapons would be dismantled, and their fissile components placed in monitored storage; when UNDO had certified the demilitarization of these and all other excess components had been completed. Phase Two would complete the dismantlement of the remaining weapons.</p>
<p>STEP 14 - Following dismantlement of the last weapon and certification by the UNDO that no intact weapons remain in its monitored storage sites, UN-monitored access to weapon component and weapon-usable fissile material storage sites would become fully UN-controlled access only on approval of the Security Council, and UNDO would assume physical security responsibilities for the sites.</p>	<p>Ending unrestricted monitored access by individual nation states to their storage sites, and passing full control over such sites to UNDO would signify the end of the era of nuclear deterrence as an instrument of national policy. For some period thereafter -- its length determined by global circumstances -- the Security Council would retain a residual nuclear weapon capability (in the form of 10-20 fissile components in each former weapon state) that would discourage future proliferators, or in extremis, be released to their original owners to deter known violators of the regime.</p>
<p>STEP 15 - In this, the final step, demilitarization of the remaining fissile material components would commence under UNDO supervision, and the resulting fissile material made unsuitable for use in weapons and placed in storage under IAEA safeguards.</p>	<p>This final step would commence after accumulated experience with the operations of the international control regime had convinced the Security Council that its small reserve of residual weapon components was no longer required, and that any future measures to enforce compliance with the NFWW regime could be carried out without reliance on nuclear weapons.</p>

IV. Conclusion

"In the event of nuclear disarmament, it is presumed that the United States and other currently nuclear-armed states would preserve components of their nuclear arsenals under international safeguards."

- An Evolving US Nuclear Posture:
Second Report of the Steering
Committee Project on Eliminating
Weapons of Mass Destruction,
December 1995

"All animals are equal, but some animals are more equal than others."

- the Pig in George Orwell's *Animal Farm*, 1948.

It has long been commonplace to equate the vision of a nuclear weapon free world with the prospect of "world government," thereby dismissing it as a serious subject for policy planning and diplomacy. The new political opportunities created by the end of the Cold War, and increasing predominance of popular democratic forms of government in advanced industrial and industrializing states, alone argue against such reflexive skepticism. But a number of other recent trends reinforce the view that the elimination of nuclear arms can be a serious guiding objective for strategy and diplomacy:

- Indefinite extension of the NPT, the voluntary denuclearizations of South Africa, Ukraine, Kazakhstan, and Belarus, the Argentina-Brazil cooperative nuclear monitoring regime, the proliferation of regional "nuclear-free-zones," resumption of serious CTB negotiations and the strong global reaction against French test explosions, all indicate that not merely concerned publics but the majority of national governments are considerably less enthralled with nuclear weapons than previously;
- The nuclear disenchantment extends to the peaceful use of nuclear energy, which is no longer perceived by many countries as a magic bullet for meeting the technology and energy requirements of rapid economic development. In most

advanced industrial and developing states, the vision of a limitless "plutonium-economy" with electrical energy "too cheap to meter" has receded into the future, or disappeared entirely. In its place has come a more realistic appreciation of the enormous capital requirements and technical complexities of nuclear power. While thermal reactors on a "once-through" cycle will continue to play an important role in the energy supply picture of some major industrialized nations, unlike the closed cycle, this cycle can be harmonized with the rigorous control requirements of a weapons elimination regime.

- Since both national technical means and inspections can never verify to a certainty that all nuclear weapons, weapon components, or nuclear material directly usable in weapons have been turned over to international authorities for monitoring and eventual destruction, it is often inferred that the elimination of nuclear weapons can never be verified with sufficient confidence to permit transition to a nuclear-weapon-free-world. While acknowledging the limitations of formal verification schemes, proponents of such a transition argue that the residual uncertainties can be dealt with through a conscious emphasis on what they call "societal verification," or "inspection by the public." The whistle-blower phenomenon, while unpredictable, has surfaced time and again as an indicator of illegal activity, even in highly secretive states and organizations. Israel's nuclear weapons program had its Mordechai Vanunu, Russia's State Institute of Organic Chemistry and Technology had its Dr. Mirzayanov, and Saddam Hussein's had his defector son-in-law, Lt. General Hussein Kamel Hassan, who has exposed much additional information on Iraq's nuclear and CBW programs.
- If we project current political and technological trends out perhaps 15-20 years, the outlook for meaningful "societal verification" is by no means grim. In that time frame, global hand-held cellular communications will be well established, allowing instant communication of observed questionable activity from almost anywhere, including remote sites. For most technical personnel, worldwide communications will be available via the Internet. Detailed technical data and video images substantiating violations can be posted and retrieved, anonymously if necessary, over such networks. Countries who shield themselves from such developments, in the interest of maintaining the veil of secrecy, would pay a huge, and probably intolerable price, in terms of their future technological and economic development. This price is not likely to be seen as commensurate with the secret possession of a few nuclear weapons or weapon components.

- Finally, it is not necessary to postulate an end to conventional conflicts in order to gain an international consensus favoring elimination of nuclear arms. However, halting the progress has seemed at first, it is becoming increasingly clear in the post Cold War era that no major state is relying even today on nuclear weapons or nuclear "umbrellas" for its security. A combination of conventional collective-security, and more innovative cooperative-security arrangements -- with the latter gradually coming to predominate over the former -- can provide the margin of security and stability that will see us through the transition to a NFWF.