NUCLEAR PROLIFERATION AND REPROCESSING

HEARING

BEFORE THE

SUBCOMMITTEE ON INTERNATIONAL SECURITY AND SCIENTIFIC AFFAIRS

OF THE

COMMITTEE ON INTERNATIONAL RELATIONS HOUSE OF REPRESENTATIVES

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NUCLEAR PROLIFERATION AND REPROCESSING

MONDAY, JUNE 7, 1976

HOUSE OF REPRESENTATIVES,
COMMITTEE ON INTERNATIONAL RELATIONS,
SUBCOMMITTEE ON INTERNATIONAL SECURITY
AND SCIENTIFIC AFFAIRS,
Washington, D.C.

The subcommittee met at 10:20 a.m., in room 2200, Rayburn House Office Building, Hon. Clement J. Zablocki (chairman of the subcommittee) presiding.

MR. ZABLOCKI. The subcommittee will please come to order.

We meet this morning to continue our consideration of an im-important facet of the nuclear proliferation problem, a subject on which this subcommittee has held extensive hearings. I might say that the subject is very complex and difficult, and to keep on top of it is extremely difficult.

Our specific interest focuses on the question of the reprocessing of nuclear fuels, the system by which large quantities of plutonium are made readily available to many States. Reprocessing, more than any other aspect of nuclear technology, has a dramatic bearing on our efforts to control nuclear spread.

No longer can we endure the risks and large uncertainties that surround this complex technology. Today, we take up where we left off several weeks ago in our markup of House Concurrent Resolution 570, when we deleted the reference to section 4, dealing with the question of multinational reprocessing centers.

As the members will recall, we elected not to place ourselves in the position of implicitly seeking to advocate a technology which was decidedly premature, and which, even in a multinational context, could be seen to possess many dangers.

NEW LEGISLATIVE REMEDY TO NUCLEAR PROLIFERATION PROBLEM

Thus, we are prepared today to consider a possible new legislative remedy to this problem in the form of a draft amendment to the Export Administration Act Amendment of 1976.

[The draft legislation follows:]

NUCLEAR EXPORTS

SECTION —. The Export Administration Act of 1969, as amended by this Act, is further amended by adding at the end thereof the following new section:

"NUCLEAR EXPORTS

"SECTION 15. (a)(1) The Congress finds that exports by the United States of nuclear material, equipment, and devices, if not properly regulated, could result in the imminent acquisition of nuclear explosive devices by an increasing number

of countries, thereby adversely affecting the foreign policy objectives of the United States and undermining the principle of nuclear nonproliferation agreed to by the United States as a signatory to the Treaty on the Non-Proliferation of Nuclear Weapons.

"(2) It is therefore the purpose of this section to implement the policies stated in paragraphs (1) and (2) of section 3 of this Act by regulating the export of nuclear material, equipment and devices which could prove detrimental to United States national security and foreign policy objectives.

"(b)(1) No agreement for cooperation providing for the export of any nuclear material, equipment, or devices for civil uses may be entered into with any foreign country, group of countries, or international organization, and no amendment to or renewal of any such agreement may be agreed to, unless—

"(A) the agreement provides that its provisions concerning the reprocessing of U.S. special nuclear material apply equally to all special nuclear material produced through the use of any U.S. nuclear reactor transferred under such agreement; and

"(B) the foreign country has agreed to permit the International Atomic Energy Agency to report to the United States, upon a request by the United States, on the status of all inventories of plutonium, uranium 233, and highly enriched uranium which are held in storage by that country.

"(2) No license may be issued for the export of any nuclear reactor pursuant to an agreement for cooperation unless the Secretary of State certifies that the recipient country, group of countries, or international organization, has agreed that the provisions of the agreement concerning the reprocessing of special nuclear material received from the United States shall apply equally to all special nuclear material, regardless of origin, produced in such reactor.

"(3) No license may be issued for the export of any nuclear material, equipment, or devices pursuant to an agreement for cooperation unless the recipient country, group of countries, or international organization, has agreed that the material subject to that agreement will not be used for any nuclear explosive device, regardless of how the device itself is intended to be used. This section will become effective one year after enactment of this provision.

"(4) When a party to any U.S. agreement for cooperation shall seek to reprocess special nuclear material produced from any material, equipment, or devices transferred under such agreement, the safeguards applying to such reprocessing shall not be determined to be effective unless the Secretary of State certifies that such safeguards provide for reliable, timely warning of any diversion of such reprocessed special nuclear material from peaceful nuclear activities to the manufacture of nuclear explosive devices. As used in this paragraph, the term 'reliable, timely warning' means notice to the United States or to the Board of Governors of the International Atomic Energy Agency of the occurrence of such diversion not less than 90 days prior to the earliest date on which manufacture of a nuclear explosive device could be completed.

Mr. ZABLOCKI. Our immediate task is to put the proliferation risk and economic feasibility of nuclear reprocessing into proper perspective. We will also try to understand the limitations of safeguards.

We do all of this with the knowledge that the stakes are high, and that the time for responsible legislative initiative is short.

Here today to assist us in this important effort are two highly competent and internationally recognized experts in the nuclear field: Dr. Henry Rowen, professor at Stanford University Graduate School of Business and formerly president of the Rand Corp., and Dr. Victor Gilinsky, of the U.S. Nuclear Regulatory Commission.

Dr. Rowen, we welcome you here, and if you will proceed.

STATEMENT OF DR. HENRY ROWEN, PROFESSOR, STANFORD UNIVERSITY GRADUATE SCHOOL OF BUSINESS

Mr. ROWEN. Thank you, Mr. Chairman. I just have a few remarks that I would like to make before the general discussion.

First, I would like to say that the proposed legislation seems to be very important with its emphasis on timely warnings of efforts to take materials used for civil purposes and convert them into bombs. It is important, first, because the capacity to make bombs is spreading.

Ten years from now, approximately 40 countries will have enough plutonium in spent reactor fuel for at least a few bombs, and at least half of these countries are planning some kind of fuel separation capacity. So they will have some plutonium. Even those who are not planning to have separation capacity will have access to large amounts of unirradiated plutonium, if it is circulated internationally in mixed oxide fuel rods. One reload for a large reactor would have enough plutonium for 50 to 100 bombs.

I should say here that suggestions which have been advanced on multinationally owned reprocessing plants really miss the point. It is the product of these plants, in the form of fuels which contain plutonium, which is the problem. If they are circulated very widely, plutonium would be readily accessible to governments.

Bomb usable materials, high enriched uranium and plutonium, are also distributed by us to others for research including breeder experiments. All of this is happening without violating safeguard agreements.

SAFEGUARDS TERMED A "MISNOMER"

Indeed, the word "safeguards" is a misnomer for it suggests that these fuel cycle processes involved are "safe" activities, and this is simply not true. They are not inherently safe, they are inherently dangerous activities.

Under existing agreements, countries can have material which is quickly usable in bombs. This is a marked change from the situation in 1945, and 1946, when the concept of safeguards was first devised. Then, "safeguards" were seen as providing timely warning, but the warning contemplated was to be measured in years. This is no longer the case.

During the fifties and sixties, emphasis in safeguards shifted to concern about theft of materials by an individual or a group that might use them for some terrorist purpose. This is an important problem that certainly needs attention, more attention than it has received in the past.

However, more important is the prospect of more governments acquiring bombs. On present prospects, many governments could be within days, or even hours, of having bombs without violating existing safeguards. Such situations, then, could be quite unstable and extremely dangerous.

GROWING INCENTIVE FOR BOMBS ACQUISTION

In addition to a growing capacity, the incentive for acquiring bombs has also been growing. It is interesting to observe that the rate at which countries have been testing bombs, the first test, has been much lower than many earlier projections suggested and it has not been rapid. On the other hand, many countries feel insecure and worry about trends affecting their future security. Most worrisome here are not so much the industrial countries of Western Europe and Japan, which are constrained and protected by alliances, but more isolated

countries, those outside of alliances or those worried about the future of their alliances. Some examples are the Republic of Korea, Taiwan, Pakistan, Iran, Israel, Egypt, Libya, and South Africa.

These are all countries that will have an increased capacity to make nuclear weapons. These countries have security concerns. In the case of one of these countries, Libya, the head of the government has reportedly been shopping for a bomb. Fortunately, he does not seem to have found one in the market.

There are possibilities that with the growth in the capacity to move quickly toward bombs, there could be sort of a branching process, or a chain reaction from country to country. What is done in India affects Pakistan, and it, in turn, may affect several other countries, Iran, the Arab countries, and so on. Eventually the large industrial countries that have an enormous potential such as the Federal Republic of Germany and Japan may be affected.

In short, political relations and, especially, alliances are crucial in affecting the incentive to acquire bombs. It is important to be aware that the spread of nuclear weapons can also affect the alliances themselves; it can help to weaken them.

CONSEQUENCES LIKELY WITH NUCLEAR WEAPON SPREAD

What are the consequences likely to be if this process proceeds far?

In short, what might life be in the nuclear crowd?

One point, I think, is evident and that is the enormous potential for destruction. A few kiloton yield weapons dropped on highly populated cities such as Cairo or Tel Aviv, would kill hundreds of thousands of people; perhaps, with several weapons, a million.

There would also be threat to allies of the United States, to American forces, and in time to American territory and people.

What can be done about this?

I don't propose to present a thorough discussion of this question, but a few salient factors are these:

FACTORS TO CONSIDER REGARDING NUCLEAR REACTORS

The first one is that nuclear power is economical in most large power systems, but not in small ones. In general, it is not economical in less developed countries which have small electric power systems and which are short of capital. Nuclear powerplants come in large increments and they are capital intensive.

As a result the spread of nuclear power through most of the less developed countries has had to be subsidized by the supplying nations, meaning the taxpayers of the supplying nations, who are paying for capacities which could later result in nuclear destruction later coming down on their heads.

Some time ago, Prof. Arthur Laffer, of the University of Chicago, testified before this committee on the role of Export-Import Bank subsidies in assisting the spread of nuclear power to the less developed countries, including to unstable countries.

A second factor which is very important and needs to be taken into account is that the recycling of spent fuel in current nuclear reactors appears to be uneconomic. This is a process which is both dangerous and probably uneconomic.

There are, of course, other arguments which are advanced in the United States and abroad for reprocessing spent fuel: Trying to achieve greater fuel independence, conserving uranium, improving waste handling, getting ready for the breeder. These arguments are dubious ones and if you have questions regarding them, I will be happy to address them.

Perhaps the most important thing to understand with respect to what can be done is to understand that the American policy in this area has been a muddle. There has been a basic tension from the beginning of the nuclear era as we, on the one hand, tried to promote the peaceful atom, while at the same time we have tried to limit and constrain the dangerous atom. Unfortunately, these are the same atoms.

So this has required exercises in attempting to draw fine lines between activities which are peaceful and civilian as distinct from those which are dangerous and military. We have not always succeeded.

GERMANY UNAWARE OF HIGH-LEVEL U.S. OPPOSITION TO BRAZIL SALE

For example, the Atom for Peace Program in the 1950's helped greatly to spread nuclear technology. As part of that program we declassified the "Purex" process for separating plutonium from spent reactor fuel. We have given away research reactors and we provide bomb usable fissile materials to others. We did not oppose the building of reprocessing plants, for example, in the Federal Republic of Germany and Japan.

On the other hand we have refused to sell reprocessing and enrichment technology. We oppose the sale of reprocessing and enrichment technology by others including France and the Federal Republic of Germany, although it is a question of whether we opposed it at a very high level in our Government. For instance, Helmut Schmidt said, at one point, with respect to the sale by Germany to Brazil of the entire fuel cycle, that he was not aware of any opposition at a high level in the United States to that sale.

We have also leaned heavily on safeguards, which, in effect, do not provide safety.

We can do better. Our position has been sufficiently incoherent that we can use the good bits, and form a more coherent posture.

There remains the question of what kind of influence do we have on the rest of the world on these matters?

U.S. INFLUENCE ON THE WORLD DERIVED FROM SEVERAL SOURCES

There are several sources of influence. One is influence which is derived from what we do at home. Especially important is our domestic decision on recycling, the commercial recycling of spent fuel in high water reactors.

If plutonium recycling is permitted in the United States, as many in the nuclear industry advocate, American efforts to stop it elsewhere will fail. It would be impossible to maintain the stance that others should not engage in an activity which we are undertaking because it seems to make sense commercially or so it would be argued.

This is a familiar phenomenon. One group in the United States engages in advocacy often using biased arguments, and enthusiasts abroad seize upon these arguments and use them against their critics.

The argument is made that they don't want to be excluded from something that Americans, who are often pretty advanced in these matters, say is essential.

This can affect our negotiations. Our negotiators are hampered in their efforts because of divisions at home, with some agencies saying one thing, and other agencies saying something else.

PLOUGHSHARE PROGRAM: EFFECT ON INDIAN NUCLEAR WEAPONS PROGRAM

A dramatic example of this, had to do with the role of the American program for peaceful nuclear explosions, once called the Ploughshare program, as it affected our ability to deal with the Indian nuclear weapons program.

We had evidence in the midsixties of an Indian bomb program, which the Indians would label peaceful. Our representatives were unable to tell the Indians, the American people and the world, that the peaceful nuclear explosion program was a bomb, partly because the Atomic Energy Commission was marketing peaceful nuclear explosions using a variety of dubious arguments. This made it hard for us to say that peaceful nuclear explosions were really not very useful, in fact they were quite unuseful for economic purposes. It was just a bomb program.

So the net effect was that our reluctance to call the Indian program what it was before the Indian test, together with the Nuclear Non-proliferation Treaty which has an explicit provision in it for peaceful nuclear explosions, helped to justify the Indian program which had a peaceful "cover".

By the time that we pretty much gave up on peaceful nuclear explosions, which we did several years ago, a lot of the damage had been done.

UNITED STATES SEEMS TO HAVE LEVERAGE WITH OTHER COUNTRIES

We have leverage, I think, in addition to the stance we take at home. We have it, with respect to the other suppliers in Western Europe and Japan despite our limited success so far in getting these other suppliers to restrict their exports of nuclear technology. I think that in large part this is due to a feeling on their part that the proliferation of nuclear weapons is an American problem, or maybe it is an American and Russian problem, but it is not a problem which is theirs, one which they can influence very much.

I believe that this is not true. Europe would be affected very much by the spread of nuclear weapons to many countries. But this is not widely perceived in Europe at the present time.

I think that we need to do more to make the Europeans aware that they have a stake, a security interest in the spread of nuclear weapons. They see it now largely as a commercial matter having to do with who gets to sell reactors which really is not so.

We also have leverage of various sorts with the less developed that are acquiring reactors. We have it through bilateral agreements, through aid, and in some countries, such as the Republic of Korea, we have alliance relationships, including in the case of Korea some 30,000 American troops.

This has given us, in effect, a considerable amount of influence in effecting plans, for example for reprocessing, but the main point is to use our leverage more effectively, much more effectively than we did in responding to the Indian bomb test.

Our response was weak, and this weak response was noticed around the world and it had a bad effect.

NEED FOR ACTION IS URGENT

The legislation seems, to me, to be very useful and particularly important in flagging the importance of timely warning. This now is the crucial variable. I think that it is very important, in fact urgent that this committee address this question, and the legislation does that.

Mr. ZABLOCKI. Thank you, Dr. Rowen.

Dr. Gilinsky, will you proceed please?

STATEMENT OF DR. VICTOR GILINSKY, COMMISSIONER, U.S. NUCLEAR REGULATORY COMMISSION

Mr. GILINSKY. Mr. Chairman, I am very pleased to join you here today to discuss international nuclear safeguards. I should like to stress at the outset that I am not here representing the Nuclear Regulatory Commission, and that these remarks reflect my own views.

International safeguards problems arise in large part because almost all nuclear power reactors which generate electricity also produce plutonium—a material which will support a nuclear chain reaction.

If separated from the spent reactor fuel, plutonium can be used to supplement the normal uranium fuel for these reactors, or it may be stored for future use, possibly to fuel "breeder" reactors.

The economic attractiveness of the use of plutonium as fuel in the near future is yet to be demonstrated. Nevertheless, many nations have recently become interested in the possibility of reprocessing their spent reactor fuel to extract its plutonium, either domestically or, where domestic facilities are lacking, in the facilities of other countries.

This development threatens to lead to a buildup of sizable stockpiles of the separated element, stored against a number of possible future peaceful needs. There are, however, dangers inherent in this developing situation since plutonium is also a nuclear explosive, and the amounts produced in the course of the operation of civilian reactors are very large, by any measure, in terms of its explosive potential.

Once this material is separated and stored, for whatever purpose, it can be appropriated suddenly and without warning for the manufacture of explosives. Unfortunately, once plutonium has passed the separation stage in the fuel cycle, the international safeguards system now available cannot be counted on, in my view, to provide adequate protection against such appropriation.

AGREEMENTS FOR COOPERATION: REQUIREMENTS OUTLINED

From the beginning of this Nation's civilian nuclear export program, the United States has sought to protect against the use of exported nuclear materials and equipment for military purposes.

The principal mechanism for achieving this objective has been our agreements for cooperation with our nuclear trading partners; all U.S. exports of nuclear reactors and fuel must be made in accordance with such agreements.

These agreements require, first of all, that the importing nation assure the United States that fuel and reactors transferred under the agreement, and plutonium produced during the course of reactor operation, will be used only for peaceful purposes.

It must be emphasized, however, that the United States has never viewed peaceful use assurances to be sufficient in themselves, to provide the security needed as a basis for export of reactors and their fuel.

Rather, we have insisted from the outset that each agreement for cooperation—with the exception of those with Britain and Canada—provide for the application of safeguards over our nuclear exports.

SAFEGUARDS DESIGNED TO INSURE COMPLIANCE

These safeguards, which take the form of material accounting and inspection, and are now almost entirely administered by the International Atomic Energy Agency, are designed to insure compliance with the pledges given in the agreements, and to deter their violation.

Implicit in the long-standing safeguards requirements in the agreements, and more recently in the Non-Proliferation Treaty, has been the recognition that circumstances may arise in which a nation might be tempted to disregard its peaceful use assurances to the United States or other nations, and that this possibility must be contemplated in assessing the adequacy of safeguards.

This imposition of such safeguards in particular instances does not imply a questioning of the good faith of the assurances they support. It is, rather, a recognition of the need for a measure of international discipline if nuclear energy is to be exploited in a manner consistent with international security.

In assessing the adequacy of safeguards as a protection against appropriation for military purposes of nuclear material stockpiles, it is important to understand that a nation tempted to disregard its peaceful use assurances is not prevented from doing so by the safeguards system.

Rather, as the President pointed out last year in a report to Congress, these systems are designed to sound an alarm, and thereby discourage "national diversion of nuclear material from peaceful application by the risk of early detection."

DISCOURAGING DIVERSION OF NUCLEAR MATERIAL

The rationale of safeguards, and this is a critical point, is that the discovery by the international community of a breach of peaceful use assurances, well before the violator can attain an actual nuclear weapons capability, exposes him to risks of international reaction which may frustrate his purpose.

Safeguards effective in this sense provide added confidence to all countries, particularly suppliers and neighbors, that a nation is not likely to violate its assurances in the first instance.

Where only the reactors and the low-enriched uranium which fuels them are involved, material accounting and inspection safe-

guards can provide this added margin of security because any plutonium produced by the reactors' operation is contained in spent reactor fuel and is still many time-consuming steps away from a form usable for nuclear explosives.

ACCOUNTING AND INSPECTION FOR SEPARATED PLUTONIUM IS OPEN TO QUESTION

Where, however, in addition to reactors and low-enriched fuel, a nation has access to stockpiled, separated plutonium, or to facilities which permit rapid separation of plutonium from spent fuel, the value of accounting and inspection as safeguards to deter a sudden switch from peaceful to military use is open to question.

Safeguarded, or alarmed, plutonium, although it may have been stockpiled against entirely peaceful future applications, is nevertheless but a short step away from use as an explosive.

Should the owner decide, for whatever reason, on a sudden move to appropriate the material for illicit purposes, the time between diversion of plutonium and completed weapons can be sharply reduced to what might be a matter of weeks, or conceivably days.

Under these circumstances, even if it were assumed that IAEA inspection and monitoring systems were improved to the point that they immediately and unambiguously signaled any violation, it is hard to imagine that an international reaction could be mustered before the assembly of nuclear weapons were completed.

This inability to provide a sufficiently early warning to permit such a response seriously undermines the deterrent effect of accounting and inspection safeguards where separated plutonium is involved.

CERTAIN IAEA SAFEGUARDS TERMED INSUFFICIENT

Consequently, unless other types of controls are in place, these accounting and inspection safeguards, even if substantially upgraded, cannot perform their intended function of reinforcing peaceful use assurances in this context and, therefore, cannot provide the additional measure of protection the United States has always sought.

A number of new Americans and international initiatives plainly, even if only implicitly, reflect the view that traditional IAEA safeguards, while vital, are insufficient in themselves where national reprocessing and stores of separated plutonium are concerned.

The best known of these is perhaps Secretary Kissinger's proposal regarding multinational fuel centers before the United Nations General Assembly in September 1975.

Others include agreements for cooperation currently under negotiation, in which the United States is seeking to obtain increased protection, including in some cases the requirement that produced plutonium be stored outside the recipient country.

Additionally, the United States has maintained a policy of restricting export of reprocessing facilities and of discouraging other supplier nations from doing so, even through these facilities would be covered by IAEA safeguards.

Moreover, the IAEA itself has apparently recognized that new measures are required to safeguard separated plutonium effectively and has embarked on a study of internationally supervised storage of spent fuel, multinational fuel cycle centers, and simliar schemes.

IAEA SURVEILLANCE OF REPROCESSING AND PLUTONIUM STORAGE IS INADEQUATE

Whatever may have been the role of IAEA safeguards in the past, therefore, there is an increased awareness that in the emerging context of reprocessing and plutonium storage IAEA surveillance of material, standing alone, cannot provide addeqate protection against the sudden appropriation of nuclear material for military purposes.

In essence, certainty as to the whereabouts and current status of stockpiled nuclear explosives under national control does not offer security against their future misuse.

Moreover, if ineffective safeguards, that is, safeguards which cannot be counted on to provide reliable early warning of illicit activity, are applied in a country, its neighbors may feel compelled to match that country's capability to shift rapidly from peaceful to military uses.

A situation in which many states are so poised will inevitably contribute to worldwide tension, and it is clearly a situation we should like to avoid.

I believe we can insure that our own exports not contribute to such a state of affairs only by demanding a strict standard of effectiveness for international safeguards systems and limiting those activities which intrinsically cannot be adequately safeguarded.

Only in this way can we keep our growing international nuclear trade compatible with the constraint we have always insisted on, that our nuclear export activities not contribute to the further spread of nuclear weapons.

Thank you, Mr. Chairman.

Mr. ZABLOCKI. Thank you, Dr. Gilinsky.

Gentlemen, you have effectively pointed out the problem, and the question of whether recycling by the United States is essential.

CURRENT SAFEGUARD SYSTEMS: DO THEY PERMIT EARLY DETECTION OF DIVERSION?

Dr. Gilinsky, you referred to the Presidential message to Congress of May 6, 1975, in which the President stated that "the international safeguards system deters diversion by the threat of early detection of such diversions should they occur at the national level. * * *"

The question arises, does the current safeguard systems effectively permit early detection of diversion? Does it permit early detection of a nation's nearness to nuclear bomb manufacture?

Is this early warning, so to speak, sufficient, and can we rest on the assurance that it is a true deterrent?

Mr. GILINSKY. As it is applied now; is that the question?

Mr. ZABLOCKI. Yes.

Mr. GILINSKY. As I point out in my statement, it depends on what kind of facilities are at issue. So long as we are dealing only with reactors, the safeguard system does have the capability to provide that kind of warning.

Inspection and material accounting, in that context, can offer adequate safeguards. It is when separated plutonium, that is, the explosive material itself is available, and it is just a short step away from use as an explosive that the present technique of safeguarding becomes questionable as a means for providing early warning.

PROBLEMS WITH SPENT FUEL

Mr. ZABLOCKI. The basic question here is what should be done with the spent fuel which contains some plutonium; do I understand the problem correctly?

Mr. GILINSKY. Yes.

Mr. ZABLOCKI. If that spent fuel is sent to another country, a nation other than the one that supplied the fuel, what assurances are there that the plutonium in the spent fuel will not be used for other than peaceful purposes, since, as you advise us, it can very easily be used for military purposes?

Mr. GILINSKY. If the spent fuel is just in storage, and has not been separated and where there is no separation facility available in that country, we have the simplest case, and we can have reasonable assurances that it would take a good deal of time to separate out the plutonium contained in that material. We would then have a good deal of warning of any such illicit activity.

SHORT STEP FROM SEPARATED STAGE TO WEAPONS APPLICATION

But if you step along the fuel cycle to the point where the material is already separated, it then takes very little time to make use of that to make nuclear explosives. That, in effect, is the point that I was trying to make.

Much of the time consuming aspects of the separation will already have been accomplished. Therefore, from the last stage, the separated stage, to actual weapons application, as I said, is only a short step and one that may not take much time.

Mr. ZABLOCKI. On page 4 of your statement you cite the example of a nation which has access to facilities which permit rapid separation of plutonium, etc.

Mr. GILINSKY. That, in a sense, is an intermediate situation. It is true that depending on the detailed circumstances, where such facilities are available and operating, the spent fuel can be put through them, and it is possible that plutonium could be rapidly extracted.

Mr. ZABLOCKI. What do you suggest should be done with the spent fuel?

Mr. GILINSKY. I think at the moment we don't have any very good solution for safeguarding separated plutonium. As a consequence I think that we would like to delay such separation of our exported materials until we can develop a satisfactory solution.

The point here is that if we relinquish control, it may be irretrievable. So, I think we want to avoid the creation of such stockpiles and avoid having the material separated until such time as it can be effectively safeguarded.

FOREIGN FUEL USED IN U.S.-SUPPLIED REACTORS

Mr. ZABLOCKI. Dr. Rowen, would you agree that the problem applies not only to U.S.-supplied fuel in U.S. reactors, where we may have some control, but that the problem is particularly acute when a recipient country using a U.S. reactor obtains fuel from some other country. In the latter case we have no control over that spent fuel. Is that correct?

Mr. ROWEN. That is a possibility unless the agreements that we make with these countries provide that fuel from any source will be covered by the terms of the agreement. This is an important provision.

Depending on what else is in the agreement, if we do not take account of the points that Dr. Gilinsky has been making on the dangers of having the separated materials, it is going to be a very serious situation.

Referring to your point of a moment ago, the Canadian Government has decided simply to store spent fuel from its reactors. To be sure, Canada is a big country, and has a lot of empty space, but they, evidently, are reasonably comfortable with a policy which says that they will not process the spent fuel, they will simply store it.

This does not have to be a decision made by the Canadians, by us, or anyone else, that will last unchanged for 1,000 years. The decision simply has to be made for the next period of time, and they have elected to store the spent fuel for a period of time. They may look at it again, and decide that they want to do something different with it later.

So it is perfectly feasible to store spent fuel. In so doing, the resulting situation, if it is in that status, as Dr. Gilinsky mentioned, is a much safer one than with separated plutonium.

GERMAN SALE TO BRAZIL: MINIMAL PRESSURE EXERTED BY UNITED STATES TO PRECLUDE SUCH SALE

Mr. ZABLOCKI. Dr. Rowen, you stated that we do have leverage with other suppliers. If that were the case, why was it not more effective in the case that you mentioned of Germany's sale to Brazil?

You quoted German Chancellor Schmidt as saying he was not aware of any opposition at a high level in the United States. ACDA Director Ikle himself, said he had talked to German officials. We seem to be getting conflicting stories.

Mr. ROWEN. I gather that in that particular case, the question was, how hard did we try, and at what level?

Representations, evidently, were made, but the public evidence suggests that they were made not at the highest level. Mr. Schmidt said publicly that nobody talked to him about this matter, and he is the highest level of government in Germany. That is quite consistent with the fact that exchanges took place at lower levels.

I think that this is simply testimony to the point that it was not judged to be of sufficient importance for heads of governments representation. I think that this has been characteristic of a number of of episodes in the last several years.

I mentioned the weak response to the Indian peaceful nuclear explosion, which is another example. It is not that we do not have an antiproliferation policy, with the suppliers, among others, there is a question as to how much importance we attached to it.

INCREASING U.S. LEVERAGE WITH OTHER COUNTRIES

Mr. ZABLOCKI. To return to my specific question, specifically what leverage would you recommend that we exert with other suppliers? Further, are you optimistic about the London Suppliers Conference? I understand that not too much has been accomplished.

Mr. ROWEN. That is privileged information which I don't have. I merely can comment from the outside, and I cannot comment on the London Conference at all because I haven't any information on that.

I think that the main leverage we have with the other supplier countries is to make it clear to them that we are all in the same boat, which we are. As I mentioned in my statement, the Europeans, at least, have not regarded this problem as really being one that they have influence over, or that affects them at all directly.

It is that the Americans are worried about this problem. It is for us to worry about it, and not for them.

I think that we can go a long way by articulating, and I would do that at the highest level of government, the joint interests that we and they have in affecting this process. There is no question in my mind that Europe will be affected.

Look, for example, at the large Spanish nuclear program. Spain has contracted with British Fuels Limited for the extraction of plutonium. It may not be too hard to persuade the other suppliers, when they focus on it, that they have a stake there.

OPPOSITION VOICED TO CUTTING OFF ENRICHED FUEL SUPPLIES

I believe that we have not done enough to influence them. I would oppose, however, efforts to hit the Europeans hard, in ways which would be counterproductive, such as cutting off the supply of enriched fuels. I think that this would have a very bad and counterproductive effect.

We should use as little muscle as it is possible to use and have an effect. We did this in the case of Korea where there was a reversal, judging from the press accounts, in the decision to get a processing plant.

Mr. ZABLOCKI. Dr. Gilinsky, can you advise the committee as to what efforts were made to dissuade Pakistan from going ahead with recycling by purchasing equipment from France?

Mr. GILINSKY. This is a matter which is far beyond the purview of my agency. We deal only with U.S. exports. So I cannot give you an answer to that question.

U.S. LEVERAGE WITH PAKISTAN IS LOW

Mr. ZABLOCKI. Dr. Rowen, do you have any knowledge of U.S. efforts made to dissuade Pakistan from proceeding with the recycling plant deal with France?

Mr. ROWEN. Pakistan is a country over which American leverage is not very high. Pakistan, after all, is a dropout from an alliance with the United States, the Southeast Asia Treaty Organization. We don't have an alliance relationship with Pakistan.

On the other hand, Pakistan is dependent, to some extent, on the United States for conventional arms and for economic assistance. Those are important sources of leverage, and I don't know whether we have exercised them.

I understand that we have tried to persuade other providers of nuclear technology not to sell a reprocessing plant to Pakistan. As for

persuading Pakistan not to buy, Pakistan faces a situation in India, which it regards, understandably, as being a dangerous one.

It is especially difficult if one has to take each of these cases in isolation. We might try to influence Pakistan's decisions, while trying to influence some of India's decisions in the nuclear area. We would deal with both jointly.

PAKISTAN'S INTEREST IN REPROCESSING

Mr. GILINSKY. I might offer the following comment. As Mr. Rowen pointed out, Canada has decided, at least for the time being, to store its plutonium from its heavy water reactors.

Pakistan has one heavy water reactor, and yet it seems to have expressed interest in reprocessing rather earlier than Canada, which would seem odd, at least from a commercial point of view.

Mr. ZABLOCKI. What you are suggesting is that it is not economically feasible.

Mr. GILINSKY. It does not appear economically sensible for them to do it.

Mr. ZABLOCKI. Regardless of whatever amendments we propose to the Export Administration Act of 1969, in the final analysis, I am sure that both of you will agree that the International Atomic Energy Agency will have to become more effective in meeting whatever deterrence we want to accomplish.

QUESTION EFFECTIVENESS OF IAEA

Now, I will ask both of you, gentlemen, in your opinion, is the IAEA effective? Has it been thus far?

Perhaps you could advise us; if an IAEA inspector discovers a discrepancy at a plant he is charged with inspecting, what procedures does he follow? Is he obligated to report the discrepancy, and to whom does he report it?

How much time elapses before the United States receives information on such an incident?

There is some real question as to whether the IAEA is as effective as it should be, or it ever will be.

Mr. GILINSKY. Let me start with some general remarks. There are things that the IAEA can do, and there are things that it cannot do. I think that the IAEA can effectively safeguard reactors and certain other country facilities. Inspection and monitoring, in that context, can provide the kind of warning that we are talking about here.

I think that the IAEA is a competent organization, and an effective one. My experience with them is that they are very forthright and very clear about what they can, and what they cannot do. They do not claim more for their system than they can accomplish.

I must add that there are some problems even in the context of reactors in that the precise safeguarding arrangements that are worked out between the IAEA and a given country, are confidential. There is a public safeguards agreement, but the actual details are contained in the confidential agreement.

REASON FOR CONFIDENTIAL AGREEMENTS IS ONE OF PROPRIETARY MATTERS

Mr. ZABLOCKI. What would be the reason for that?

Mr. GILINSKY. The rationale is to protect proprietary matters.

Mr. ZABLOCKI. What commercial interest is there in the amount of stockpiling, for example?

Mr. GILINSKY. I am just giving you the rationale. It is true that inspectors do have access to various aspects of the facilities, the plant designs, and so on, and there may, in fact, be proprietary and commercial matters involved. At any rate, this is the reason for these agreements being confidential.

This situation creates problems in that other countries, in particular other supplier countries, are not normally informed of the precise details of the agreements, nor does anyone but the IAEA have regular access to the inspection reports.

Now, you asked to whom they report? They report to their superiors in Vienna.

Mr. ZABLOCKI. They put the report on file?

Mr. GILINSKY. I am not familiar with the precise details, but what would happen is; in an instance where there might be some discrepancy, or irregularity, the person in charge of the inspection would have to make a decision as to whether or not he should bring this matter up to the Board of Governors of the IAEA.

SUPPLIER COUNTRY IS UNKNOWING OF IAEA SAFEGUARD AGREEMENTS

Mr. ZABLOCKI. Before going on, did I understand you correctly to say that the supplier country does not know under what safeguard agreements or arrangements IAEA has entered?

Mr. GILINSKY. It does not know the precise details. It is not informed by the IAEA, since these agreements are confidential.

Mr. ZABLOCKI. It was my understanding that the agreements would be generally the same with every recipient country in the use of, and purpose for, receiving the fuel?

Mr. GILINSKY. The broad agreements are public.

Mr. ZABLOCKI. Would you say that this is a loophole, then, if the details are not made available?

Mr. GILINSKY. I think that it is a situation that makes it more difficult to know to what extent to rely on such inspections.

Mr. ZABLOCKI. What effect would the proposed language have in this instance?

Mr. GILINSKY. One of the sections, and I have just had a moment to look at it, would require a foreign country importing U.S. nuclear facilities or materials to agree to permit the IAEA to report to the United States upon request by the United States on the status of stocks of potential explosive material.

It does not go so far as to discuss the details of safeguarding arrangements, but I think that it covers important information. I think that this is information that should be available.

LEGALLY BINDING EFFECT ON IAEA IF LEGISLATION IS ENACTED

Mr. ZABLOCKI. If we pass this legislation into law, what legally binding effect would it have on IAEA? In other words, can IAEA just ignore what we say in the law?

Mr. GILINSKY. It requires the foreign country to agree, but it does not require the IAEA to agree. In that sense, I think you may be right.

Mr. ZABLOCKI. If the reports go to the IAEA, and the IAEA does not agree to share them with us, what effect would this have?

Mr. GILINSKY. There are some matters which they keep from the country being inspected, which deal with IAEA inspection methods. These would apply to other countries as well. Some of these are matters one might not want to have revealed to all countries.

I think that the information addressed by this subparagraph (B) would not fall in that category, and ought to be revealed. I would expect that the IAEA would reveal it, if the country itself had no objection.

REPORTING SECTION FURTHER DISCUSSED

Mr. ZABLOCKI. Do you agree with that, Dr. Rowen?

Mr. ROWEN. Yes; I think that this is quite important information. I presume that this language would be built into new agreements. This is information that other countries might like to have too. There is a general world community interest here, I think, in having the information referred to in that paragraph being made more available.

However, it might not be a universal, or wide degree of consensus that this is information that ought to be made generally available.

Mr. ZABLOCKI. It says "all stocks of plutonium." Is that sufficient to get the information we need? Would the stocks of plutonium include whatever stocks they have of spent fuel from the reactor?

Mr. GILINSKY. It is not clear from my first reading, but one could read it either way, I suppose.

Mr. ZABLOCKI. It could be interpreted that the status of all stocks of plutonium that was separated from——

Mr. GILINSKY. That is certainly the material that is of most concern.

Mr. ROWEN. All stocks of plutonium which is separated, and that which is in spent-fuel, unseparated.

Mr. ZABLOCKI. I don't think that we are getting the entire answer with this provision.

DETERMINATION OF AMOUNT OF SPENT FUEL IS ONLY AN ESTIMATE

Mr. ROWEN. That is a point that can be easily fixed, make it explicit, "including that which is contained in spent fuel."

Mr. ZABLOCKI. May I ask; is this asking for too much?

Mr. GILINSKY. I don't really think so, but the amount of spent fuel would be an estimate, since one does not know precisely how much is in there until it is separated out.

Mr. ZABLOCKI. You mean that the scientists do not know, even before separation, how much spent fuel is available?

Can't they come pretty close, a ball park figure?

Mr. GILINSKY. Not precisely.

Mr. ZABLOCKI. They have an educated guess, though, don't they?
Mr. GILINSKY. Yes.
Mr. ZABLOCKI. Mr. Lagomarsino.
Mr. LAGOMARSINO. Mr. Chairman, I want to apologize for not being here earlier, but I had another committee hearing. In fact I will have to go back to that hearing very shortly.
I have several questions that I would like to ask either of you gentlemen; both of you are certainly free to respond.

INCONSISTENCIES SEEN IN APPLYING SAFEGUARDS FOR EARLY WARNING DETECTION

As I understand it, ever since the 1940's, the nuclear experts have spoken of the necessity of timely and early detection and warning. Does the question of timely warning still figure prominently in our consideration of nuclear exports? Are we in agreement as to what this means?
Mr. GILINSKY. I think that it is usually stated as one of the objectives whenever safeguards are discussed. But I think that there has not been consistency in applying it.
Mr. LAGOMARSINO. Do you agree with that, Dr. Rowen?
Mr. ROWEN. Yes.
Mr. LAGOMARSINO. Do you, gentlemen, agree that the concept is still a valid one?
Mr. GILINSKY. I think that it is an essential one.
Mr. LAGOMARSINO. Do we ever export highly enriched uranium directly to other countries or organizations?
Mr. GILINSKY. Yes; we do.
Mr. LAGOMARSINO. What rationale do the other countries present for wanting to acquire these materials?

IMPORTING ENRICHED URANIUM

Mr. GILINSKY. At the present time, and in the past also, it has been almost entirely for use in research reactors. The highly enriched uranium goes largely for material testing reactors, and similar research reactors. The plutonium has gone, I believe, in large part for use in R. & D. activities in connection with development of fast breeders.
Mr. LAGOMARSINO. So, essentially, it is for R. & D.?
Mr. GILINSKY. Yes, mostly. There is one power reactor abroad, operating on enriched uranium, which we are supplying.
Mr. LAGOMARSINO. What kind of evaluation do we make of these rationales?
In other words, have we been tough minded enough in assessing the implications of such exports?
Mr. GILINSKY. I think we do look at the end uses and the rationales, but we have accepted them as being valid uses in the past.
Mr. ROWEN. May I add a comment?
Mr. LAGOMARSINO. Certainly.
Mr. ROWEN. There is one area which has been quite critical, and this is the argument that was promoted for many years, that nuclear power for less developed countries was going to be a key to their development. It was made to play an enormously important role, and this

led us to promote reactors for less developed countries not on commercial terms but on subsidized terms.

As I mentioned earlier, most of the less developed countries would not have reactors, and we would not be faced so soon with this difficult problem if we had not been pushing them. We, and other supplying countries, but particularly the United States.

I think, as I said, that we have not been very critical or thinking very hard about what we have been doing in a number of these areas.

REPROCESSING: EARLY WARNING STANDARDS POSSIBLE IN FUTURE

Mr. LAGOMARSINO. As the proposed draft legislation does, if we insisted today on a standard of 90 days, or 6 months timely and reliable warning between the time when the diversion of nuclear material was first detected or announced, until the time that a bomb might be manufactured, could such a standard be met with respect to nuclear reprocessing?

Mr. GILINSKY. I would think that at the present time it could not with respect to reprocessing and associated stockpile.

Mr. LAGOMARSINO. Because of the short time needed?

Mr. GILINSKY. Yes, and I think that what is needed are institutional and technical fixes. I think we have to devote ourselves to try to develop such fixes, and in the meantime to hold on, and not let the problem get out of control.

Mr. LAGOMARSINO. You think that something can be brought to fruition, we can develop such standards?

Mr. GILINSKY. Yes; I would hope so.

Mr. LAGOMARSINO. Dr. Rowen, would you care to comment?

Mr. ROWEN. I would agree with that statement.

ECONOMIC FEASIBILITY OF REPROCESSING UNCERTAIN

Mr. LAGOMARSINO. What is, and you, gentlemen, may have spoken to some of these things before I got here, but what do we know about the economic feasibility at the present time of reprocessing and plutonium recycle?

Is it economically feasible at the present time?

Mr. GILINSKY. I think that the first thing one has to say is that it is uncertain. Dr. Rowen might want to expand on that.

Mr. ROWEN. The future is uncertain, but the present is not so uncertain. The evidence so far is that it does not pay in the United States, and there is no reason to believe that it pays anywhere else, for that matter, as a commercial process.

In the future, if the price of uranium should go sufficiently high, or the cost of enriching fuel, then that could change it. But the estimated cost of reprocessing of spent fuel has increased by roughly a factor of 10 in the last 10 years. It looks like it is pretty well pricing it out of the market. Plants have been shut down because the standards have increased, and for various other reasons.

It does not look promising today, and the future is uncertain, as Dr. Gilinsky said. It is not a very encouraging prospect for those who want to do reprocessing.

Mr. LAGOMARSINO. Is reprocessing an effective way to conserve uranium?

FIGURES DISPROVE CONSERVATION OF URANIUM BY REPROCESSING

Mr. ROWEN. I have some numbers on that, which might be of interest to you. The amount of uranium saved is often exaggerated in statements made by people who think that it is a good thing to do.

If you just take a steady state operation, which does not exist really, recycling for spent fuel would save in the order of 20 to 30 percent of the uranium that would be used if you did not recycle. There are reasons why it is no more than that.

On the other hand, in a growing system, such as in United States, Japan, or Western Europe, the saving is less than that. By the year 1990, or the year 2000, the standard projection of the amount of uranium that would be saved would be something in the order of 10 to 20 percent of the amount that would otherwise be consumed.

So we are not talking about a large conservation factor. The conservation argument is not a very good argument.

Mr. LAGOMARSINO. As matters stand, do we have authority to prevent the Indians from reprocessing fuel we supply for their reactor?

Mr. GILINSKY. Under the provisions of our agreement, before reprocessing of U.S. fuel can take place, there has to be a joint determination by both parties that safeguards can be "effectively applied." The Government is in the process of dealing with that matter at the present time.

Mr. LAGOMARSINO. We don't have the authority, then, to keep them from using mixed oxide fuel from a non-U.S. source?

Mr. GILINSKY. No; but the agreement does provide that in the Tarapur reactors, the only one supplied by the United States, only U.S. fuel will be used. So they can use it, but they would have to use it in other reactors.

Mr. LAGOMARSINO. I have no further questions, Mr. Chairman.

Mr. ZABLOCKI. Mr. Fountain.

UNITED STATES HAS NO AUTHORITY OVER THIRD COUNTRY SUPPLIED FUEL

Mr. FOUNTAIN. Thank you, Mr. Chairman.

Some of the questions I may ask, may already have been asked before I got here from another meeting.

The United States, as I understand it, reserves, in most of its agreement for cooperation, the right to either veto the reprocessing of U.S. supplied fuel, or to make a determination that effective safeguards can be applied.

Now, we have no similar authority, as I understand it, with regard to third country-supplied fuel which is used to promote plutonium in one of our reactors. Is that right?

Mr. GILINSKY. That is right.

Mr. FOUNTAIN. Does that constitute a loophole in existing U.S. safeguards?

Mr. GILINSKY. It is certainly a weakness in the overall framework; yes.

Mr. FOUNTAIN. Shouldn't the plugging of this hole be one of the logical first steps of a more serious policy on reprocessing generally?

Mr. GILINSKY. I believe that it would be desirable to have such controls; yes.

ROLE OF NRC REGARDING RECYCLING

Mr. FOUNTAIN. Is NRC considering the powerful influence, which an affirmative decision on plutonium recycling in this country would have on our efforts to stem nuclear proliferation and to persuade other nations not to export or adopt such a technology?

Mr. GILINSKY. As you indicate, this matter is before us at the present time. When the question of wide scale recycling of plutonium in U.S. light water reactors was first raised, the principal issues related to questions of public health and safety.

Then the concern shifted to safeguards and protection against terrorism, and those matters have tended to dominate the debate. The question of international implications has not so far been injected into the proceedings.

Mr. FOUNTAIN. You mention terrorist activities, and I would like to ask a question as to whether or not we may, prehaps, have been concentrating, as it is, too much on the problem of terrorist diversion, and maybe not enough on the question of shortening the time for another nation to actually divert material and assemble it into nuclear explosive facilities.

OVEREMPHASIS ON TERRORISM AT EXPENSE OF PROBLEM OF DIVERSION

Mr. GILINSKY. I think that you make a very important point here. I think, as you said, the question of protecting from terrorists is very important, but there has been a tendency to concentrate on that, perhaps, because it is a more easily fixable problem than the one of nuclear proliferation, where we are dealing with other sovereign states, and any solutions are much harder to come by.

I think that there has been some tendency to overemphasize one at the expense of the other.

Mr. FOUNTAIN. Perusing through your statement, Dr. Rowen, I note that you made a passing reference to the Indian peaceful nuclear explosive being, in effect, a military development program, or weapon development program. You stated that our country knew this, but did not do much to prevent it because we were promoting PNE at the time.

I think that this is an extremely important statement with a lot of important implications. I wonder if you would expand upon that?

Mr. ROWEN. The Indians were rather open in the mid- or late 1960's about the importance for India of having a bomb. They were very much affected by the Chinese atomic test in 1964, There were Indians at the time who said in effect: "We really need the bomb, but for domestic and international reasons, we had better call it a peaceful device."

THE INDIANS' "PEACEFUL" DEVICE

They called it a peaceful device. In essence, a peaceful device and a bomb are the same thing. The U.S. Government, and for that matter the Canadian Government, really found it hard to concentrate and focus on this problem. There were some statements made by the Canadians, but attention did not focus on what the Indians were up to.

I argued here that part of the reason was that the U.S. Government was promoting Project Ploughshare for peaceful nuclear explosions. That fact made it harder for our spokesmen to get up and say: "Anything that the Indians do, which they might call peaceful, is really a bomb."

Some of our officials were not eager to send that unambiguous and clear a signal coming through because some of our officials were saying "We can do all sorts of nifty peaceful, civil projects with these devices." Later on, we essentially abandoned that line of work, and have recognized that no interesting peaceful applications for these devices have emerged, and the American program has essentially disappeared.

However, during that period, that stance did hurt. It undermined our ability to respond, or to head off—which we might have been able to do—the Indian test program.

Mr. FOUNTAIN. As the matter now stands, do we have any authority to prevent the Indians to reprocess any fuel that we supply for their reactor?

REPROCESSING FUELS FOR TARAPUR REACTOR CURRENTLY UNDER REVIEW

Mr. GILINSKY. As I indicated earlier, before the Indian Government can reprocess the fuels supplied for the Tarapur reactor a determination has to be made by both governments that safeguards can be "effectively applied." This is now a matter under review by the Government.

So it turns, in effect, on what one means by "effective."

Mr. FOUNTAIN. I see that Mr. Findley is here, and I will yield at this point.

Mr. FINDLEY. Thank you, Mr. Chairman. I did not come here, Mr. Chairman, until I had medical advice clearly to the effect that what I have is not contagious. I have a bad case of poison ivy, but it has been arrested, so you are safe.

I am pleased to learn that both Dr. Gilinsky and Dr. Rowen have indicated their support for the language present before the subcommittee. Please, if I ask questions that have already been treated, tell me, because I would not want you to repeat.

Do either of you feel that this language represents a significant advance in the rational control of nuclear materials and equipment?

SUPPORT FOR EARLY WARNING STANDARD EXPRESSED

Mr. GILINSKY. Let me say that I have just had an opportunity this morning to read the language of this proposed amendment. What I do want to express support for is the need to maintain a strict standard of effectiveness for safeguards, and that an essential aspect of such standards relates to early warning.

Mr. FINDLEY. This would be a step in that direction?

Mr. GILINSKY. Yes.

Mr. ROWEN. I agree with that.

Mr. FINDLEY. Maybe I overstated in my opening phrase when I said that you do support the language of the legislation.

Dr. Gilinsky, is that an overstatement?

Mr. GILINSKY. I would like to review the proposed amendment in detail before I comment on the specific provisions. But I think the points it addresses are certainly all matters that need to be dealt with, and it seems to be moving in the right direction. However, I would like to have a chance to read the details.

Mr. FINDLEY. Mr. Chairman, I wonder if we could give Dr. Gilinsky the opportunity to comment in greater detail on the language before the subcommittee, in the record.

Mr. ZABLOCKI. Without objection, it is so agreed.[1]

Mr. FINDLEY. Dr. Gilinsky, it states on page 5, toward the bottom of the page, "Consequently, unless other types of controls are in place, et cetera." Could you elaborate on what other types of controls you consider wise and reachable?

OTHER POSSIBLE CONTROLS SUGGESTED

Mr. GILINSKY. At the moment, those controls might be in the form of limitations on activities which simply cannot be adequately safeguarded. They might be in the form of limitations on reprocessing and storage of plutonium, for example.

In the future, if certain other technical or institutional solutions are developed to cope with this problem, then the controls would relate to insuring that these are being applied. The manner in which we make use of these nuclear materials has to be constrained to allow safeguards to effectively operate.

I don't think that we can leave the scope of the activities unconstrained, and simply expect the safeguards to follow, whether they can or not.

Mr. FINDLEY. Do you have a piece of legislation to recommend to the committee to deal with this problem?

Mr. GILINSKY. No, I don't.

Mr. ZABLOCKI. Might it be desirable to cut back on our export activities?

Mr. GILINSKY. I think that most of our exports are reactors and the enriched uranium which fuels them. As long as we stick to these, I think that we are in pretty good shape.

It is when one adds to that certain other facilities and activities, such as reprocessing, that the whole matter takes on a different complextion. I think that we can have a safe nuclear export trade, but I think it needs to be constrained to some extent.

TYPES OF EXPORTS DISTINGUISHED

Mr. ZABLOCKI. In reply to a question from my colleague, Mr. Lagomarsino, you stated that the U.S. exports highly enriched uranium, plutonium, and other fuels. You said that it was for R. & D. usage, but can we be sure?

Mr. GILINSKY. I would put the highly enriched uranium exports in a somewhat different category than the plutonium coming out of the power reactors, for the following reasons. They do raise the problem which you mention. Material of that sort can be used for weapons and does pose a danger, and does require very tight controls.

[1] Dr. Gilinsky's comments appear on p. 32.

On the other hand, there is this difference. When we export a shipment of highly enriched uranium, it usually goes into the reactor in a rather short time. So it is, in a sense, exposed for a relatively short time, that is, from the time that it leaves here to the moment it enters the reactor.

Once it is in the reactor, it is relatively safe. One does not expect the world to change rapidly from the time that the material is exported to the time it is put into the reactor.

On the other hand, we are talking about very large amounts of plutonium which would be coming out of power reactors perhaps a decade from now, when in fact the governments or persons who have provided assurance may not be in power. It is a much more uncertain situation than in the case of highly enriched uranium exports for immediate use and the amounts are far larger.

Therefore, I consider those two problems to be qualitatively different.

GROUND RULES CONCERNING SAFEGUARDS OUTLINED

Mr. FINDLEY. So it is important at this point that we establish as quickly as we can a process in which these governments will get accustomed to inspectors, or representatives of IAEA. Would you agree with that statement, is that an essential first step to create the right climate for——

Mr. GILINSKY. I think that we have to establish a set of ground rules which will permit us to make use of these vital energy sources, under conditions of reasonable security.

Mr. FINDLEY. Do we have the ground rules now?

Mr. GILINSKY. I don't think so, no.

Mr. FINDLEY. Could you put in the record, at this point, the ground rules we should have?

Mr. GILINSKY. With regard to safeguards?

Mr. FINDLEY. Yes.

You may state them here, if you wish.

Mr. GILINSKY. I think that one of the key ground rules is to have safeguards effective in the sense of providing an adequate alarm in time for reaction.

Mr. FINDLEY. That requires onsite inspections on a periodic basis?

Mr. GILINSKY. I think that it requires more than that. Even onsite inspection may not provide you with that, because what is at issue is not the time between the breach of an agreement and detection—of course we want that to be as short as possible—but even the time to go from detection to possible deployment of the weapons themselves. In the case of plutonium stockpiles even onsite inspection would not allow for early warning in the sense we have been talking about.

LANGUAGE PROVIDES FOR EARLY WARNING

Mr. FINDLEY. It is my hope that this language will help make possible an early warning situation.

Mr. GILINSKY. I think that it would force some creative thinking about how to arrive at a situation where we once again have that kind of early warning which I think is essential.

Mr. ROWEN. I believe that the language does do that. I have not had an opportunity to study it carefully, but it does move very clearly in the direction of providing more timely warning, which simply, as Dr. Gilinsky has said, will not exist in different systems in the world that we are moving into with so many countries having access to this material which they could put into bombs in a very short period of time.

Mr. FINDLEY. Dr. Rowen, let us suppose that this language suddenly became law, how would things be different?

Mr. ROWEN. It is hard to be able to spell out in detail. As Dr. Gilinsky mentioned, it will require some inventions, both technical and institutional, to provide for 90 days of warning, which we could not expect to get under present safeguards.

I don't know exactly what those institutional or technical arrangements would be, and I think that it will be a challenge to devise them. But I think that it is one that quite conceivably could be met.

LEGISLATION ESTABLISHES TIGHTER STANDARDS FOR LICENSING

Mr. FINDLEY. In another frame, this language would establish tighter standards for licensing, not only the fissile material.

Mr. ROWEN. Tighter agreements with respect to new agreements and for licensing. That is correct. It responds to the quite dangerous situation that we are facing. I am sure that other things will have done, but this does push in the right direction.

Mr. FINDLEY. I view this as a modest step, maybe "modest" is not the right adjective, but it is a step, and it is hardly the final answer to control of nuclear materials.

I really question whether we, today, have the international institutions adequate to provide the necessary control.

Mr. ROWEN. I agree with that. In my earlier remarks, I suggested some other things that are central to affecting this process.

COMPLACENCY EVIDENT ON THE PART OF OTHER NUCLEAR SUPPLIER STATES

Mr. FINDLEY. Would either of you comment on why have the other supplier States not been more acutely aware of the dangers they face with other nuclear weapon's States. We seem to be the only nuclear supplier State that has, at least, expressed real concern on this problem.

Could either of you account for the relative complacency on the part of these other powers?

Mr. ROWEN. I did comment on that earlier. Perhaps Mr. Gilinsky would like to add to that.

Mr. GILINSKY. I don't think I can help you here.

Mr. ROWEN. I commented on this once or twice.

Mr. FINDLEY. If Dr. Gilinsky would like to add to it, I would be glad to hear.

Mr. GILINSKY. I think there are indications that other countries are beginning to take this problem a great deal more seriously than they did earlier. I hope that this trend will continue.

Mr. FINDLEY. Thank you, Mr. Chairman.

Mr. ZABLOCKI. Mr. Biester.

Mr. BIESTER. I guess I have a couple of general questions, and one fairly precise question. I will ask the precise question first, if I may.

Supposing that the United States might insist that recycling of spent fuel is not commercially justified, some countries are concerned, are they not, about the continued security of the supply of enriched uranium from the United States, and what happens in terms of identifying suppliers at the initial arrangement?

RECYCLING DOES NOT GUARANTEE INDEPENDENCE

Mr. ROWEN. That is an argument that is used. As I mentioned in response to a question, if one looks at the numbers and how much difference it would actually make in the countries that have growing nuclear power systems with, and without, recycling, it really does not help them very much. It does not give them any significant degree of independence.

In a growing system, a pretty good estimate of the amount recovered by recycling is 12 percent, roughly. But 12 percent or so is simply not going to provide the countries with independence.

Mr. BIESTER. Now my more general question. Does anybody have any estimate as to what year it will be when most countries of the world have nuclear weapons?

Mr. GILINSKY. It depends a lot on what we do.

Mr. BIESTER. Forgetting what we do. I assume that there is an earlier year, and a later year. But do either one of you gentlemen take the position that the United States can, by its policy, control whether, in fact, the countries of the world can have weapons?

CONTROL REQUIRES CONCERTED EFFORTS

Mr. GILINSKY. We obviously do not have absolute control over what goes on in the world, and this has been very forcefully brought to our attention in various areas. Clearly, if we are going to deal with the problem of proliferation effectively, we will have to do that in concert with other countries.

At the same time, it does not mean that we do not have vital obligations above and beyond what others are prepared to agree to beforehand. We have been the leaders in the development of nuclear energy, and I think that it is our responsibility to lead also in trying to control its adverse aspects.

Mr. BIESTER. That is not my question.

Mr. GILINSKY. You are asking for a prediction.

Mr. BIESTER. I will make a prediction, and you can effectively rebut it. I will say that by year x we will have nuclear weapons regardless of what the United States does.

Mr. ROWEN. Would you care to fill in the x?

Mr. BIESTER. I will stay within 75 years.

Mr. GILINSKY. It is a long time.

Mr. ROWEN. I just think that the world is just too uncertain, and has too uncertain a future for such predictions to have more than entertainment value.

Mr. BIESTER. I don't regard it as entertainment value. I regard it as a sobering proposition.

UNITED STATES INFLUENCE FOR NEXT FEW YEARS CONSIDERED VITAL

Mr. ROWEN. I don't think that it is being taken seriously enough either. But an awful lot can happen in 75 years. Some worse things might come along, and maybe some better things will too.

I don't think that we can control events. That suggests too high a degree of leverage. We can influence, as we have in the past, and do today, the behavior of other governments with respect to decisions affecting nuclear weapons. I think that we can continue to do that, perhaps not indefinitely, but certainly for a while. For a while it is worth it.

It is important if we can significantly influence what happens in the next 10 or 15 years. Then it gets hazy, and we cannot see beyond that to what will happen in 75 years.

Mr. BIESTER. I wish you could.

Mr. ROWEN. I think that we can influence events largely through our alliance relationships. The fact is that most of the countries of the world today that could have nuclear weapons today, do not do so. They are members of an alliance system. They are in Western Europe and Japan.

ALLIANCE RELATIONSHIPS INSTRUMENTAL IN CURBING NUCLEAR SPREAD

Why do they not have nuclear weapons? It is not lack of capacity, surely. Germany and Japan have very major capacities. It is their relationship with other nations, including the United States, which has been decisive.

With respect to the Soviet Union, none of the countries on the list as candidate countries to get nuclear weapons in the next 10 years or so, are in the Soviet empire. The Russians will not let them, and they do also provide them with some security protection.

So the alliance relationships are quite important.

Mr. FOUNTAIN. Would the gentleman yield at this point?

Mr. BIESTER. Yes.

Mr. FOUNTAIN. Let me ask you this: Unless some country gets caught in the crossfire, and there is a certain amount of security for some of the countries not to have nuclear weapons, and to let all the countries of the world know that they don't have nuclear weapons.

Mr. ROWEN. I think that it is true, and it is seen to be true by a number of governments. I agree with that, but I think there are others who would see it differently because their situation is different.

Mr. BIESTER. I have done some rough figuring here. If one assumes that there are 800 million people in China, 600 million people in India, 250 million people in the Soviet Union, and 230 million people in the United States, and let us say, collectively, between 80 and 100 million people in France and Britain, it seems to me that you get pretty close to one half of the world population currently living in countries that have nuclear weapons.

MAJORITY OF WORLD LIVES IN NUCLEAR WEAPONS COUNTRIES

I think that we are at a crossover point where the majority of the people of the world, at least, live in countries that have them. I think that we are pretending that there is some way in which this genie can

be put back in the bottle. I don't think that there is any way that technology can be manipulated by words, so I don't think that this is the case.

I agree with you. We can postpone by our conduct to a marginal extent the worse possibility, but I don't believe and it just seems obvious that technology is bound to express itself sooner or later among the candidate countries.

Now, as long as they are shielded by the American nuclear umbrella, and feel secure in that, I don't think that they will go to the last 36 hours. However, I am inclincd to believe that over a span of time they will put themselves in that 2 weeks, 1 year, 6 months, 36-hour position.

You are talking about complacency. There are two kinds of complacency. There is the complacency which says, OK, we cannot do very much about this, but it does not matter, which I think too many of the countries are doing; and the other complacency is that we will only work at our own laws, rules and regulations, and we can postpone this problem long enough to keep it out of our lifetime.

I think that both are mistakes in policy. What we are dealing with here is a tremendous hazard and challenge for mankind that requires response so profound as to be, I suppose in most terms, unthinkable. Therefore, we operate at a level which we can actually reach, which is writing a bill.

CHOOSING THE BEST ALTERNATIVES

Mr. GILINSKY. May I comment on that.

You started off by saying that, essentially, in the next 75 years many countries would have nuclear weapons.

Mr. BIESTER. I said most.

Mr. GILINSKY. We could adopt policies that would reduce that to 25 years or even less. What we are talking about here are various courses of action—desirable ones, less desirable ones, and alternatives in between—and trying to choose the ones that are the least worst.

I think that even if you are right, and you may be, 75 years is better than 25 years. And to continue your example, I think that 1 year warning is a lot better than 36 hours warning. Even 90 days warning is better than 36 hours.

I do not think that what is at issue here is whether or not we have a complete solution to this problem. We obviously do not. It is whether we are going to allow the margin of security which we once had to slip to the vanishing point, or whether it is worth holding on to some safety margin.

HOLDING ON TO A MARGIN OF SECURITY

I believe that it is worth holding on to some margin, that it is worth closing some of the doors to nuclear weapons, even though one cannot close all of the doors, because any country embarking on such a course is always faced with conflicting pressures it is not likely to be all or nothing. Certainly, if it were, almost every country could proceed with nuclear weapons.

A would-be nuclear power would have to assess the downstream risks. By somewhat expanding the time scale, in this case the warning that one might have, one is increasing the risk that anyone who embarks on this course has to face. One would be influencing their actions, but not controlling their actions.

Whether or not we can develop a way of using nuclear energy in a manner that is consistent with world peace and international security, is something, I suppose, that only history will tell. But I think that it is pretty clear what the answer is going to be if we just let go.

So it just comes down to trying to hold on to some margin of security in the hope that, it will itself contribute to a somewhat safer world; and also that perhaps it will give us some extra time for something better to be worked out.

Mr. ROWEN. One of the things that might be worked out is preventing a rapid pace, think of the problem with the most rapid pace one can imagine; 40 countries in 10 years is a possibility.

Mr. BIESTER. I would say so.

POLITICAL ADAPTATIONS POSSIBLE AS PROCESS CONTINUES

Mr. ROWEN. It is not all the members of the United Nations, but it would be getting up there in 10 years. This would be incredibly dangerous, and be extraordinarily unstable. Things would be happening awfully fast.

If this process is stretched out over a longer period, political adaptations are much more likely to occur. There certainly will be political adaptations necessary as this process continues.

So I vote for 75 years, if it has to happen, in the hope that political adaptions will be more likely to occur, and not in a catastrophic way which is likely if it happens in the next 10 or 15 years.

Mr. FINDLEY. Will you yield?

Mr. BIESTER. Surely.

Mr. FINDLEY. At the moment, I find difficulty in finding 40 stable governments. So it does mean instability within a short period of time.

Mr. BIESTER. The difficulty is that among those 40 governments there are some who are in the cauldron of regional conflict whose actions would trigger counterexercise of options by neighboring states or regional states.

Mr. ROWEN. That is absolutely right, and the prospect in some of those places is quite frightening.

Mr. FINDLEY. Will you yield?

Mr. BIESTER. Yes; I will yield back.

Mr. FINDLEY. Mr. Chairman, I raised the question of whether we have adequate international institutions to deal with this problem. In this context, I am reminded again that the House of Representatives has turned back a proposal to establish an Atlantic convention to explore new institutional forms. Maybe that has to be classified as one of the unthinkables right now.

Mr. ZABLOCKI. If the gentleman will yield, I have a related question. Mr. Rowen stated that within 10 years, 40 nations may have nuclear capability. What threat does this pose to the U.S. national security? In other words, won't we find the effectiveness of our own nuclear forces degraded as a result of such proliferation and our national security undermined?

Mr. ROWEN. It has major implications, I think, and some of the worse possibilities, both broadly defined and narrowly defined.

MAJOR IMPLICATIONS MAY RESULT OUT OF INCREASED PROLIFERATION

For one thing, we do not want to see nuclear weapons used anywhere in the world. It would affect us in a variety of ways, even if they are not dropped on American forces or American cities anywhere. We would be affected, of course, if they are dropped on the territory or cities of allies of the United States.

However, American forces are deployed in many parts of the world. I think that it would be unrealistic to expect that there would not be a growing threat to these forces in many parts of the world, and these forces provide very important functions. Among other things, they provide assurances to people so that they will not be as inclined to acquire nuclear weapons of their own.

If some countries get them, then these forces will be threatened. In time, more and more countries will also be able to deliver nuclear weapons against the continental United States. Delivery technology is spreading also. The long-range jet airplane can reach the United States from almost anywhere.

The concern, then, is not simply for people that we care about as human beings who would get blown up, but that we will too. That is, of course, in the longer term, but this side of the 75 years that was mentioned. We have a lot at stake, both directly and indirectly.

Mr. ZABLOCKI. I have two rather brief questions for Dr. Gilinsky. One is on page 1 of your statement, when you advise us that if separated from spent reactor fuel, plutonium can be used to supplement the normal uranium fuel for these reactors, or it may be stored for future use, possibly to fuel "breeder" reactors.

How would a breeder reactor in any way resolve the problem?

BREEDER REACTOR DISTINGUISHED FROM PRESENT REACTOR

Mr. GILINSKY. This was just meant to indicate the array of possible future uses.

Mr. ZABLOCKI. Technically, how would the breeder reactor differ from the present reactors?

Mr. GILINSKY. The breeder is fueled with plutonium. It is called a breeder because during its operation plutonium is also formed within the reactor and, in fact, it is hoped that more plutonium will be formed than is consumed. This technology is, in the long run, expected to be the principal use for the plutonium produced in the light water reactors, the present generation of reactors. It will be used to start up a future generation of advanced reactors.

Mr. ZABLOCKI. But you still have some spent fuel as a result, the problem would continue?

Mr. GILINSKY. I was not trying to speak to the problem of protecting plutonium. I was just indicating what the motives of the owners now appear to be.

STATUS OF IAEA REPORT ON MULTINATIONAL CENTERS

Mr. ZABLOCKI. If I may ask my last question.

On page 6, Dr. Gilinsky, you say that the IAEA itself has apparently recognized that new measures are required to safeguard

separated plutonium effectively. The IAEA has embarked on a study of internationally supervised storage of spent fuel, multinational fuel cycle centers, and similar schemes.

Can you advise the committee how far IAEA has progressed in that study.

Mr. GILINSKY. They have a study underway. I am not familiar with the details of the study, but it apparently deals with the possibility of having multinational fuel centers, which may develop in stages.

First, these might just include fuel storage. Later, conceivably, they might include reprocessing and so on. I think that this in part reflects the recognition that, even at the level of current IAEA safeguards, such safeguards can be more effectively applied in some institutional frameworks than in others. I think that this is what motivates these studies.

Mr. ZABLOCKI. Can you advise us as to what extent these studies will be made available to other interested organizations?

Mr. GILINSKY. I expect that they will all be made available. I think they are scheduled for completion in about a year, but I am not really sure.

Mr. ZABLOCKI. Do you have any further questions, Mr. Findley?

FURTHER COMMENTS ON LANGUAGE TO BE SUBMITTED

Mr. FINDLEY. Yes, Mr. Chairman.

Are there any changes in the language that either of you would recommend to the subcommittee based on your brief examination of the text?

Mr. GILINSKY. I would want to study the text a little more carefully before speaking to the details.

Mr. FINDLEY. Dr. Rowen, are you satisfied?

Mr. ROWEN. I, too, would rather wait. It looks all right, but I would like to have an opportunity to go over it carefully. I would like to have the opportunity to respond after having read it.

[Both Dr. Gilinsky's and Dr. Rowen's comments appear on pp. 31 and 32.]

Mr. ZABLOCKI. It was suggested earlier, on page 2 of the draft language, subparagraph (B), that perhaps we ought to spell out more precisely the status of "all stocks of plutonium" and spent fuel, make it a little more inclusive.

Mr. FINDLEY. One thing I wondered, whether there was any way to phrase section (3) on page 3 in a more precise and effective way? I know that it will take some reflection.

The other question I have, or the comment I have, the discussion this morning has related to the danger of nuclear weapon proliferation. Am I correct that this language would have some value, quite apart from that question?

It would seem to me that it would tighten up the safeguards for the handling of material and equipment within each country involved in the licensing, and make less likely diversions for military purposes, or perhaps terrorism.

Mr. GILINSKY. I think that it is probably true. In fact, I think that it is very likely.

Mr. FINDLEY. Do you see it that way, Dr. Rowen?

Mr. ROWEN. Yes.

Mr. ZABLOCKI. Are there any further questions?

Thank you, Dr. Rowen, and thank you, Dr. Gilinsky, for a profitable and informative meeting.

The subcommittee stands adjourned until further notice.

[Whereupon, at 12:05 p.m., the subcommittee adjourned, subject to call of the chair.]

[Subsequent to the hearing, the following comments on the proposed legislation were submitted by Dr. Rowen and Dr. Gilinsky:]

COMMENTS ON THE PROPOSED AMENDMENT BY DR. HENRY ROWEN

The significance of this proposed amendment is its focus on the possibility that materials associated with civilian nuclear purposes could be rapidly converted to dangerous military ones. This has long been recognized as a possibility and early discussions on nuclear safeguards recognized it. However, the existing safeguards, necessary as they are, do not go far enough. They do not prevent a government from being in a position to take safeguarded material and use it in bombs within a period of days or perhaps even hours. It appears that this could be done under present safeguard arrangements which do not prohibit a country from having plutonium or highly enriched uranium in a bomb-useable form.

The amendment seeks to achieve several important purposes. One is to assure that the reprocessing of special nuclear materials from any source, foreign as well as American, produced in American reactors will be subject to agreement. Many of the agreements we have entered into do not have such a provision.

Another, and very significant provision, is that the IAEA regularly report on the stocks of fissile material which are held in storage in various countries. It is a remarkable fact that information on such stocks is labeled "IAEA Confidential" and cannot be reported even to the country providing the enriched fuel, which is usually the U.S. Such information should be made widely and publicly available, in a suitably aggregated form which would not injure national sensibilities.

Third, and most important, is the provision that safeguards applicable to nuclear exports should provide "reliable, timely warning" and that such warning be defined as 90 days notice to the IAEA Board of Governors or the U.S. Government before the earliest date at which a nuclear device could be completed. This hardly seems like an unreasonable amount of warning to have of the diversion of nuclear materials. Consider the implication of holding the opposite position; for example, that such warning is not feasible or if feasible, not necessary. This is tantamount to asserting that exporters of nuclear technology and materials are, in effect, sending abroad a capacity to make "nearly instant" nuclear bombs. Do those involved in making decisions on the export of nuclear material in this country, or for that matter in other supplier nations, really want to do this? And even if they do, do their fellow citizens want to allow them to? One of the several merits of this amendment is that it makes it clear that what the suppliers would be offering, in effect, would be such a capacity. My guess is that not many, if any, governments among those currently suppliers of nuclear technology will want to be in a position hardly indistinguishable from that of being sellers of atomic bombs.

To be sure, there are those in the U.S. and abroad who say that we are beyond the point of no return, that every country has now, or will get, the ability to make at least a crude bomb. Many of these people also say that, whatever our past influence, the U.S. now has little leverage over the ability of others to acquire nuclear weapons. They argue that the burden of preventing nuclear weapons acquisition must be placed on maintaining benign political relationships, not on efforts to limit weapons capacities.

Although there is some truth in these assertions, there is a larger error. It is the failure to make some important distinctions. An important one has to do with the fact that most countries today able to make nuclear weapons have not done so and quite evidently are not in a position to make them rapidly. This is a much more stable situation than one in which many countries could move very

quickly to their assembly and use; the latter situation would be extremely unstable and it is important to try and avoid it. In my view, we should not give up on the possibility that this situation can be averted in the future.

Several types of measures are needed to avoid an emerging situation of great instability, the most important of which is trying to help perserve in the world a sufficient sense of order and security so that overpowering incentives to get nuclear weapons will not exist. Part of what is needed in creating a degree of order is wide recognition of the common benefits to be derived if countries will stand back some distance from the brink of having bombs in hand or nearly so. Ninety days is hardly too much.

There is, of course, a question of feasibility of getting "reliable, timely warning." Achieving this will no doubt require some technical and institutional changes as well as some innovations.

COMMENTS ON THE PROPOSED AMENDMENT BY DR. VICTOR GILINSKY

I am providing comments on your proposed amendment to the Export Administration Act Amendments of 1976. The availability of the added controls on U.S. nuclear exports which your amendment seeks to effect would put the United States in a much stronger position with regard to preventing the use for nonpeaceful purposes of plutonium produced in exported facilities.

Specifically, I believe that the safeguards protection against such misuse of U.S.-supplied facilities would be greatly strengthened if the United States were to retain control over the reprocessing of fuel used in the reactors exported by this country, a matter addressed by sections 15(b)(1) and 15(b)(2) of the proposed amendment. I have stressed the need for such control in a recent dissenting opinion concerning the export of a reactor to a non-NPT country. The consequences of the application of such conditions universally, as provided in section 15(b)(1), and their imposition immediately and without exception to all reactor exports, as provided in section 15(b)(2), however, are not entirely foreseeable and I believe some flexibility or qualification in these requirements may be appropriate. It should also be added that while such controls may be needed at present, at some future time international controls may well be strengthened to the point where they would provide an acceptable substitute. Your amendment could reflect this by providing for U.S. control until such a substitute were available, as determined, for example, by the Congress.

Information on the status of inventories of nuclear explosive material, provided for in section 15(b)(1)(B), would offer this government useful information it does not now routinely obtain. Since little more than data on total quantities of the materials would be involved, I see little reason why provision of this information should complicate conduct of peaceful nuclear activities.

As I understand the intent of section 15(b)(3), it is to correct possible ambiguities in existing Agreements for Cooperation regarding the use of U.S.-origin material and equipment for nuclear explosives. I believe the proposed language will accomplish this important purpose.

Finally, as I indicated in my testimony, I also hold to the view, implicit in section 15(b)(4) of your proposed amendment, that the effectiveness of international safeguards depends on their ability to provide warning of diversion which is sufficiently early to permit an international response before nuclear weapons have been obtained. The practical effect of making this standard explicit and applying it strictly will be to foreclose reprocessing of U.S. fuel and fuel irradiated in U.S.-supplied facilities by importing nations until technological and institutional arrangements to permit effective safeguarding can be developed and are in place. I regard the innovations necessary to accomplish this as possible, even though we do not at present see our way clearly to their application.

It would be desirable, however, to incorporate language in Section 15(b)(4) to allow some flexibility in application of this section. For example, although I believe an early warning period of several months or more is desirable, the 90-day standard set forth in this section implies a degree of precision in estimating the time necessary for the manufacture of nuclear explosives which may be difficult to achieve. One alternative would be to replace the warning "90 days prior to" the manufacture of an explosive device by a warning by "well in advance of" this event, provided it is understood that this is not meant to allow erosion of the basic standard.

Let me thank you again for the opportunity to testify before your subcommittee and to offer these further comments on this important legislation.

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