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ＮＰＴ再検討・延長会議ＮＧＯ資料一覧

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注１）(5),(6),(7) は (1)のsubsection毎に単独資料としたもの。

注２）(1) の１頁目は、PNC での保障措置実績を1990年と1993年で評価した２種類が有ります。

Office of Nuclear Non-proliferation

In the Power Reactor and Nuclear Fuel Corporation (PNC)

1. Introduction

The discussion concerning nuclear non-proliferation has been animated, due to the changing character of threats around the world following the end of the "Cold War" and the issue of extending the Non-proliferation Treaty (NPT) extension in 1995. Japan has been very active in promoting the goal of non-proliferation and our country is going to have the responsibility, as a pioneer in developing the peaceful use of plutonium in the future, for monitoring the present status and the plans for the peaceful use of plutonium in other countries. We wish to be assured that such developments are fully compatible with non-proliferation objectives. Under such conditions, the Power Reactor and Nuclear fuel development Corporation (PNC) newly established an Office of Nuclear Non-proliferation within the Nuclear Materials Control Division to be a central focal point in the corporation for managing issues relating to nuclear nonproliferation, and to reinforce appropriate countermeasures against wide nuclear proliferation. This new office will seek to assure that PNC's effort to promote the peaceful and economic use of separated plutonium will take place under very responsible and prudent non-proliferation conditions.

2. PNC's Efforts for Nuclear Non-proliferation

The Japanese government, playing a central role in Japan, has traditionally actively promoted of nuclear non-proliferation objectives. Thus, Japan has adhered to the NPT, and has accepted IAEA full-scope safeguards based on the NPT, as well as the introduction of London Guidelines into the national laws, etc. Japan also has actively supported to strengthening the IAEA safeguards system.

PNC has effectively promoted measures to incorporate effective safeguard requirements into the design stage of the nuclear fuel cycle facilities. Furthermore, until now PNC has been examining the resistance of different nuclear options to nuclear proliferation mainly from a technical viewpoint, incorporating the knowledge gained from plutonium and uranium handling technology, as well as its experience in nuclear fuel cycle technology. To this effect, since the time of the INFCE discussions Japan has explored mixing-conversion method as a way to increase the proliferation resistance of plutonium handling

3. The Role of the Office of Nuclear Non-proliferation

The office is developing a plan which will appropriately respond to defined nuclear non-proliferation issues while promoting the purely peaceful use and development of plutonium by PNC under conditions designed to provide the maximum technical and institutional resistance to nuclear proliferation.

Furthermore, the office intends to use this plan in developing guidelines for appropriate Japanese countermeasures against nuclear proliferation.

The office will coordinate the facilities and the research and development activities of PNC, taking into consideration the nature of the resistance to nuclear proliferation.

4. Activities of the Office of Nuclear Non-proliferation

Issues relating to nuclear non-proliferation involve both political and technical aspects. It is important that PNC keeps well informed of international developments in the field and that it communicates its own objectives, programs and accomplishments to others in an effective manner. The political aspects of the matter include promoting a proper understanding of the activities of PNC from both international and Japanese perspectives. It also demands continually collecting and analyzing information, and accurately grasping international viewpoints as well as the situations of various countries, etc., from a nuclear non-proliferation perspective at the present time. At the same time, PNC, possessing significant experience and technology concerning the handling of plutonium, must continually examine and evaluate issues and proposals from the technical point of view, and as appropriate, promote necessary technical developments.

The on-going comprehensing evaluation of nuclear non-proliferation issues from a political and technical perspective should help to facilitate the eventual use of plutonium in Japan in a way that only forters peaceful objectives.

(1) Activities concerning nuclear non-proliferation measures

(a) Survey, analyze and evaluate the present nuclear non-proliferation developments and tendencies.

The Office is prepared to assist in conducting research on timely countermeasures for nuclear proliferation, surveying, analyzing, and evaluating the issues relating to nuclear non-proliferation, such as the nuclear non-proliferation policies of major countries, e.g. the United States, which have a great impact on worldwide nuclear non-proliferation policies; Japan's nuclear non-proliferative relationship with other nations; NPT and regional non-nuclear treaties; and the peaceful use of atomic

energy.

(b) Research on the resistance to nuclear proliferation

The office, in an effort to enhance PNC's contribution to non-proliferation serves as a focal point in the monitoring studies designed to enhance the proliferation resistance of different fuel cycle concepts and also overseas research and development addressed to this objective.

(2) Execution methods for activities

(a) Survey of nuclear non-proliferation trends

* Survey by interview, etc, of PNC and other personnel
* Collection of information by the overseas offices
* Surveys studies by Japanese and foreign universities, research organizations, researchers, etc.

(b) Research on the resistance to nuclear proliferation

* PNC research
* Joint research with DOE of USA, etc.
* Research by Japanese and foreign universities and research institutes
* Promotion of and participation in international discussions (e.g. seminars and symposiums)

(c) Establishment of the measures for nuclear non-proliferation

(i) Establishment of guidelines

* Investigations by experts (establishment of committees consisting of PNC and other experts)
* Promotion of and participation in international discussions (e.g. seminars and symposiums)

(ii) Utilization of guidelines

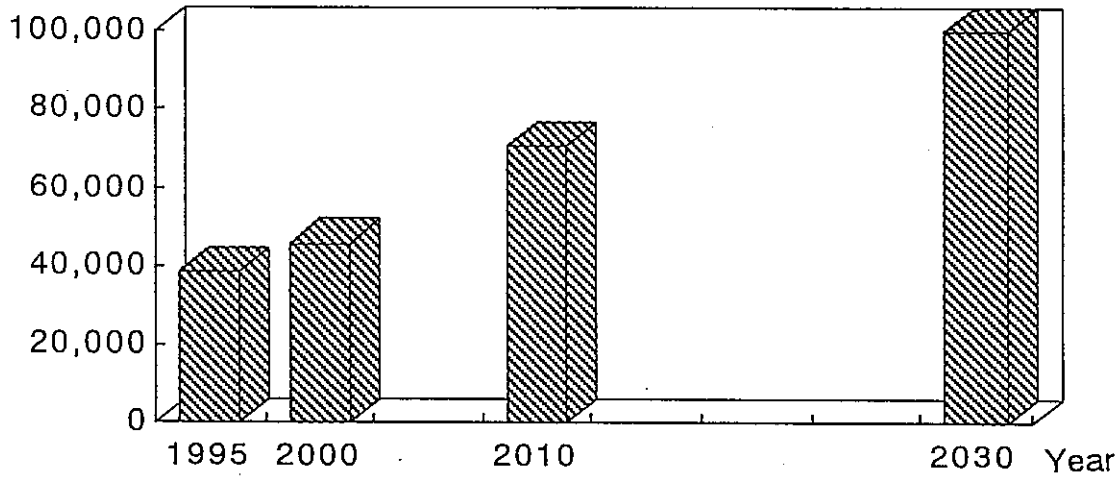
* Impact of the guidelines for enhancing the resistance to nuclear proliferation on PNC activities
* Contribution to the NPT extension conference
* Support of the Japanese government in pursuing countermeasures for nuclear non-proliferation, etc.

THE NUCLEAR POWER PROGRAM OF JAPAN

(A Strong Commitment to the Peaceful Uses of Atomic Eergy)

Japan's Basic Needs and Energy Strategy

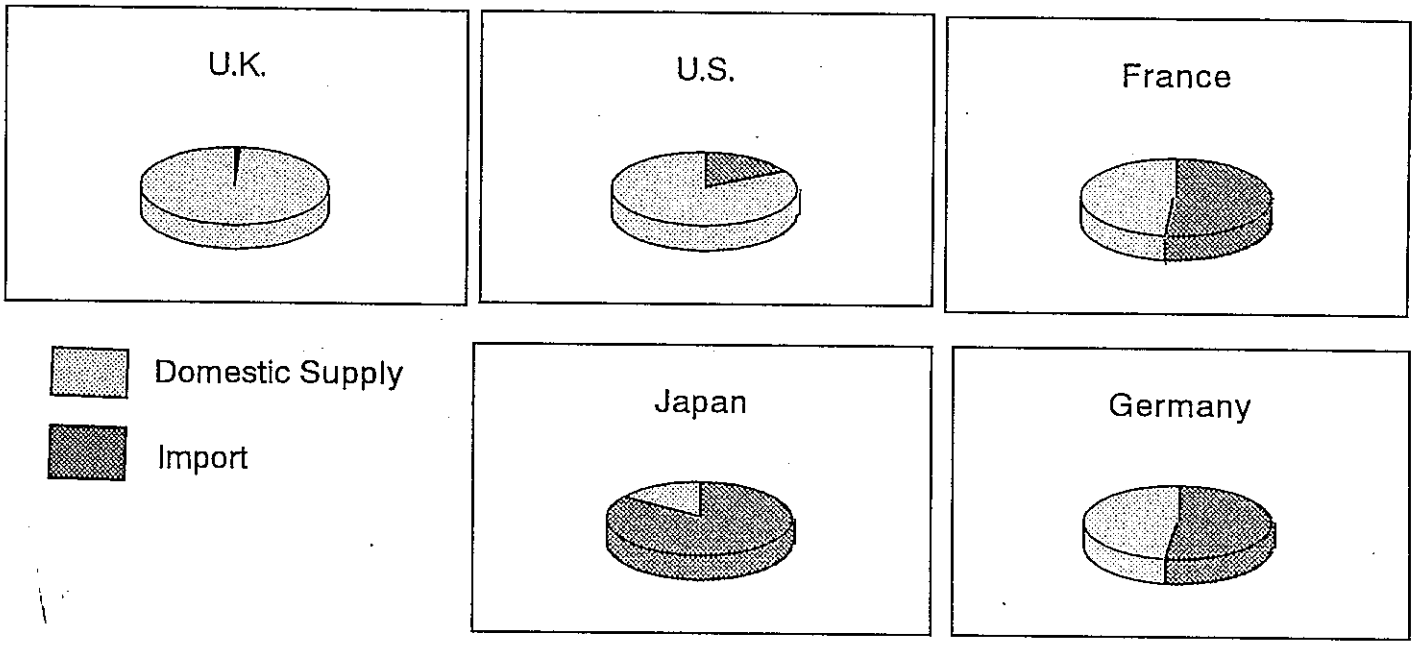
For several decades the Government of Japan, in partnership with industry, has been promoting the utilization of nuclear power as a vital and critical component of Japan's energy system. This is done within the context of a long-term program for nuclear energy which is updated every five years. At the present time, Japan's installed capacity of commercial nuclear power plants is 38,376,000kw, which accounts for nearly thirty percent of total generated output. This figure is expected to grow to 45,600,000kw of installed capacity by the year 2000 (or 33% of the total power generation) and to 70,500,000kw by the year 2010 (or 42% of the total).



Capacity of Projection of Nuclear Power (MWe)

This heavy commitment to nuclear power is indicative of determined policy on the part of Japan to Diversify its sources of energy supply in order to counter Japan's excessive dependency on imported fossil fuels. At the present time Japan's energy supply system is extremely vulnerable to outside interruptions in supply since the country depends on imports for more than eighty percent (80%) of its energy. Sixty percent (60%) of Japan's energy currently comes from oil and practically one hundred percent of Japan's oil comes from imports. Most of this comes from the Middle East. Also, ninety four percent of Japan's coal and ninety-six percent of its natural gas are imported. By way of comparison, imports of energy account for 16.4% of the total for the United States, 52.7% for

Germany, 51.7% for France and 1.3% for the United Kingdom. Furthermore, Japan's status as an island nation serves to aggrevate the problem since unlike some European countries it cannot readily receive imports of electricity across its national boundaries from its neighbors.



Japan depends on imports for more than 80% of its energy

Within this context, Japan strives to maintain an energy supply structure that is not overly dependent on any one source. As such, the country has selected nuclear energy whose supply is relatively more stable than that of petroleum as its central alternative to conventional fossil fuels. The use of nuclear power also is judged to have many environmental benefits since nuclear power emits no pollutants such as carbon dioxide or the sulphur oxides to the atmosphere. Approximately eighty percent of carbon dioxide emissions have been attributed to the consumption of fossil fuels. Such fuels also account for a considerable portion of the emissions of sulfur oxides and nitrogen oxides which are the substances responsible for acid rain. Hence, the development and use of nuclear energy is an important element of the Japanese support of the international "Action Plan for the Prevention of Global Warming."

It must be stressed, however, that uranium resources, just like fossil reserves, are clearly finite and limited in nature. Accordingly, even though current uranium supplies are ample, the market is likely to become very tight in the next century even if one makes conservative estimates of probable increase

in population growth, energy demands and the role of nuclear power in meeting these needs.

As an advanced industrialized country practically lacking its own indigenous energy resources, it is indispensable that Japan plan for its energy security on a basis that recognizes and prudently takes into account such future developments. It is crucial that we take such a longer term view in developing our energy strategy. As a consequence Japan is firmly committed to now developing a nuclear fuel cycle that visualizes the reprocessing of spent nuclear fuel, the recovery and beneficial utilization of plutonium and uranium and, over a period of several decades, the ultimate commercialization and deployment of the fast breeder reactor.

This is an orientation toward the use of nuclear power that is shared in common by Japan and other nations in Western Europe as well as Russia. It is an approach to the nuclear fuel cycle that is judged to be vital to the future energy security of the nation. It also is a responsible way to husband and recycle valuable natural resources, it serves to reduce adverse effects on the environment and it is an approach that significantly helps in the management of radioactive waste.

Putting Plutonium to Beneficial Peaceful Use

At the present time the Japanese nuclear power program is centered on the use of light water reactors which will serve as the mainstream of the Japanese program for many years to come. However, from a longer term perspective, and given the critical importance of using finite uranium resources in the most effective manner that is possible, Japan, as noted, is actively pursuing the development of the fast breeder reactor. Fast breeder reactors produce more nuclear fuel than they consume and Japan hopes to be able to commission such reactors commercially by about the year 2030. This would be done after first passing through the prototype reactor and demonstration reactor stages.

With this goal in mind, it is important to now establish the necessary comprehensive technological infrastructure for using plutonium in a safe and secure manner. This makes it essential to carry out some nuclear fuel recycling at this time. Therefore, Japan is now moving actively to recycle plutonium in light water reactors as well as in Japan's so-called advanced thermal reactor. It also is amplifying its existing pilot reprocessing capability at Tokai Mura by building an 800 tone per year commercial reprocessing plant at the Rokkasho site.

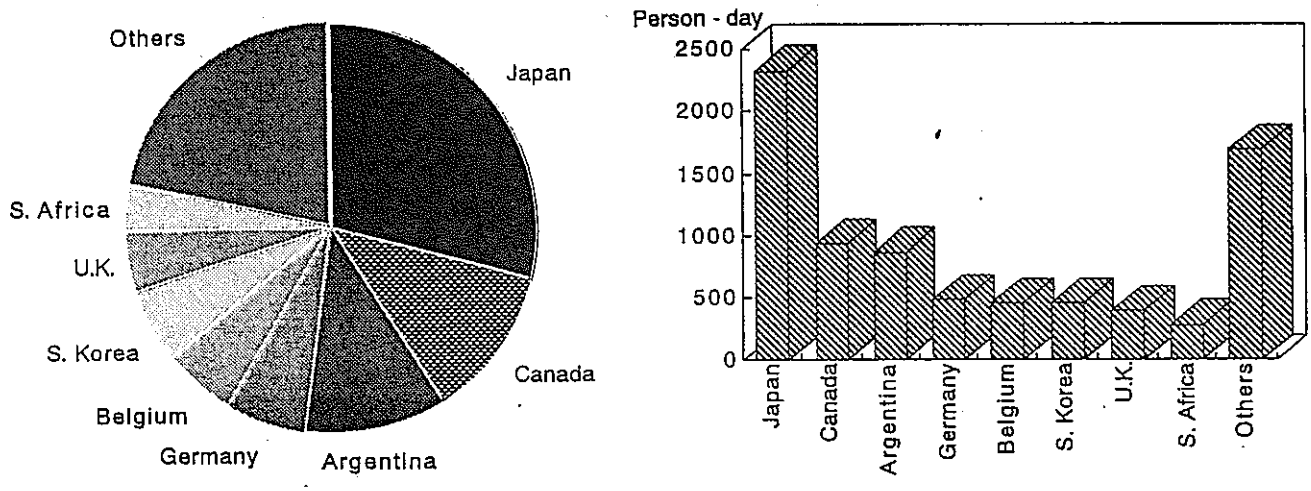
It is recognized that at this transitional stage the recycling of MOX fuel by light water reactors will be somewhat more costly than the direct disposal of spent fuel. However, there is substantially no difference if one considers total power generation cost. Also with time, experience and greater pressures on the uranium market, it is expected that the economics of plutonium recycling will improve. Moreover, if one wishes, for non-proliferation reasons, to achieve a true balance between the production of plutonium - including that contained in spent fuel and the consumption of this material, then the best way to achieve this is by burning the plutonium in reactors. Indeed, with an eye for possibly improving the management of plutonium, there has been a notable increase in interest in various technical circles, in the possible use of the liquid metal reactor as well as deep burn reactor concepts as a way of ultimately bringing about a better balance between plutonium demand and supply.

Japan's Determined Support of Non-Proliferation Values

Japan is the only nation in the world that has suffered from the horrific effect of nuclear weapons. As such it has long been firmly committed to using atomic energy only for peaceful purposes. It also is firmly dedicated to the goal of discouraging the international spread of nuclear weapons. Under no circumstances will Japan ever possess nuclear weapons and any implication to the contrary would be outrageous and would be deeply offensive to the Japanese people.

There have been numerous ways in which Japan's very solid commitment to the goal of non-proliferation has manifested itself.

Japan's Basic Atomic Energy Law strictly limits the development and utilization of nuclear energy to peaceful purposes and under conditions that provide for considerable transparency as to the ways nuclear activities are managed. Japan also is a party to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), it is a very active member of the International Atomic Energy Agency, it has adhered to the International Convention applicable to the physical security of nuclear materials and it has long been an adherent to the various international guidelines that govern the conditions for exporting nuclear materials to other countries. In this context it adheres to the policy that significant nuclear exports only should be made to non-nuclear weapon states that submit to full-scope IAEA safeguards, Roughly 30% of the inspection effort of the IAEA is devoted to the inspection of Japanese facilities.



Inspection Effort of IAEA in 1993: Roughly 30% of IAEA's inspection effort is devoted to Japanese facilities.

Japan also has been a strong supporter of indefinite extension of the NPT. It is the position of Japan that the Nuclear Non-Proliferation Treaty is the very centerpiece of the global nuclear non-proliferation regime. The NPT places important obligations on both the nuclear weapons and non-nuclear weapons states and it provides the very foundation for orderly civil nuclear cooperation between nations around the world. The Treaty also appropriately recognizes in Article IV the inalienable right of the adherents to derive the full benefits from the peaceful atom. Any major moves to undermine the principles in Article IV could undermine the entire integrity and effectiveness of the NPT, itself.

Article VI of NPT

1. Nothing in this Treaty shall be interpreted as affecting the inalienable right of all the Parties to the Treaty to develop research, production and use of nuclear energy for peaceful purposes without discrimination and in conformity with articles I and II of this Treaty.
2. All the Parties to the Treaty undertake to facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy. Parties to the Treaty in a position to do so shall also cooperate in contributing alone or together with other States or international organizations to the further development of the applications of nuclear energy for peaceful purposes, especially in the territories of non-nuclear-weapon States Party to the Treaty, with due consideration for the needs of the developing areas of the world.

At the same time, Japan fully recognizes that nuclear facilities and materials (including plutonium) can be misused to make nuclear weapons and that it is absolutely vital that the protective measures to keep the atom peaceful are applied on a basis that keeps pace with the spread and use of nuclear technology. In practical terms, the spread of weapons usable nuclear materials to nations of proliferation concern or to those located in highly volatile regions should be discouraged.

The Government of Japan also appreciates that it has an important responsibility to explain the course and direction of the Japanese nuclear program, including plutonium recycling and use to its citizens and to other countries to avoid any possible misunderstandings. In light of these considerations the Government of Japan and Japanese industry have been pursuing a multi-pronged effort to strengthen the non-proliferation regime and enhance international confidence that the separation and use of plutonium occurs under the most secure and rigorous conditions.

For example, at multilateral level Japan, as noted, has long been a strong supporter of the technical improvement and advancement of the IAEA safeguards system, including the ability of the IAEA to apply the most up to date and state-of-the-art safeguards to large-bulk handling facilities, including commercial scale reprocessing facilities. This included active Japanese participation in the so-called LASCAR study by several highly qualified safeguards experts from several countries that concluded that adequate IAEA safeguards can be applied to large reprocessing plants. In the view of Japan, it is fundamentally incorrect, to suggest that IAEA safeguards can not do an effective job in safeguarding such facilities.

Also, in consultations in Vienna, Austria with other advanced countries, Japan has been strongly advocating the concept that greater transparency should be applied to the programs of countries that are actively involved in plutonium separation and recycling. As an important evidence of its commitment to this principle, Japan recently publicly disclosed up-to date information on its own plutonium demand and supply situation.

In this regard, it should be stressed that Japan has adopted a basic policy that the nation's supply of separated plutonium (whether from Japanese or European facilities) should not exceed its needs and that the stockpiling of separated plutonium under Japanese national

control should be avoided. At the practical level the actual need for plutonium in Japan, will in fact, be in close balance with supply over the next several years.

It also is to be noted that much of Japan's plutonium is being separated in this period in European reprocessing plants and that the mixed oxide (MOX) fuel to be employed in several Japanese nuclear power plants will be fabricated in Europe. Thus, over the next several years quantities of plutonium as well as high level wastes will be returned to Japan from Europe by sea. It is the firm policy of Japan and of the interested European countries to make sure that such materials are shipped only under the most rigorous conditions form a safety, physical security and navigational standpoint - taking into account the international standards that exist in this area. Indeed, in several instances the protective measures that are being applied substantially exceed international standards, Moreover, the carriers being employed have had years of experience in shipping comparable cargoes and their safety records have been outstanding.

All of these considerations support the view that Japan is continuing to make very important contributions to the strengthening of the international nuclear non-proliferation regime, that it has compelling reasons for continuing to move forward with its plutonium recycling programs, and that these activities are being planned and implemented with utmost care and concern from a safeguards, physical security and safety perspective.

THE DETERMINED COMMITMENT OF JAPAN TO THE GOAL OF NUCLEAR NON-PROLIFERATION

It is the fundamental policy of Japan to utilize nuclear energy solely for peaceful purposes and to work earnestly with other nations to help abate the spread of nuclear weapons. This policy has manifested itself in a wide variety of ways and it is the purpose of this brief paper to summarize the highlights.

First, with respect to domestic policy, Japan's Basic Atomic Energy Law strictly limits the development and utilization of atomic energy to peaceful purposes. Japan's legislation, including its status as a free and open democracy, also tends to assure that its nuclear programs, including its relationship with other countries are given much visibility and transparency.

Much more importantly, Japan has been the only nation in the world that has suffered the horrors of nuclear war and this national trauma has made the idea of acquiring nuclear weapons totally repugnant to Japanese society. Under no circumstances will Japan ever possess nuclear weapons and any suggestions that Japan may be cultivating a weapons option are outrageous and deeply offensive to the Japanese people.

Japan also is strongly committed to the goal of nuclear disarmament and to strengthening the international nuclear non-proliferation regime and its strong commitment to these objectives has been manifested in a wide variety of ways.

As a key point, Japan has been a party to the Non-Proliferation Treaty and has come out strongly in favor of indefinite extension of the Treaty. The Government of Japan also has been engaged in a wide range of activities that have been designed and intended to strengthen the NPT regime. For example, working bilaterally and through the International Atomic Energy Agency, Japan has endeavored to share its advances concerning the peaceful uses of atomic energy with other countries and it has given preference in its cooperative activities to states that are Party to the Treaty. Japan also is one of the largest contributors to the assessed budget of the IAEA and it also has made major contributions to the IAEA's voluntary fund, which has been particularly important in assuring that the benefits of the peaceful atom are made available to developing countries.

Japan also has been an active member of the NPT Exporters Committee, known as the Zangger Committee, and it has worked with other nations to help assure that a consistent interpretation is made of Article III.2 of the NPT, which calls for the application of IAEA safeguards on nuclear exports to non-nuclear weapon states. Further, Japan has been one of the 30 members of the so-called Nuclear Supplier's Group (NSG) that have adopted a policy of requiring that so-called "full-scope safeguards" be a condition for nuclear supply. It also has implemented export controls on significant nuclear related dual use items and technology and has agreed not to transfer nuclear or nuclear related items to any country unless it is satisfied that the transfers will not contribute to the proliferation of nuclear weapons or other nuclear explosive devices.

Article III of NPT

2. Each State Party to the Treaty undertakes not to provide: (a) source or special fissionable material, or (b) equipment or material especially designed or prepared for the processing, use or production of special fissionable material, to any non-nuclear weapon State for peaceful purposes, unless the source or special fissionable material shall be subject to the safeguards required by this article.

As another very important point, in close cooperation with the IAEA as well as the United States, Japan has made some very important contributions to the technological development and advancement of the international safeguard and inspection activities carried out by the IAEA. This has included several significant financial and technological contributions to safeguards research as well as allowing Japanese facilities (mostly run by the Power Reactor and Nuclear Fuel Development Corporation of Japan) to be used as "test beds" for the application of advanced IAEA safeguards techniques. Possibly no other country - other than the United States - has invested more effort in attempting to add to the technical competence of the IAEA safeguards system.

Much of this effort has been devoted to upgrading safeguards at reprocessing or other plutonium handling facilities and Japan also has taken a lead in helping to organize multinational studies in these areas that have involved the participation of highly qualified safeguards experts from many countries. Japanese safeguards experts share the views of safeguards experts from several other countries that "effective safeguards can be applied to reprocessing plants, plutonium fabrication plants and other bulk-handling facilities".

To place Japan's role in IAEA safeguards development in perspective, it has been estimated that approximately 30% of the Agency's inspection effort is devoted to inspecting Japanese facilities.

Also, in consultations with other advanced countries, Japan has been strongly advocation the concept that greater transparency should be applied to the programs of countries that are actively involved in plutonium separation and recycling. As important evidence of its commitment to this principle, Japan recently publicly disclosed up-to-date information on its own plutonium demand and supply situation. It should be stressed that Japan has adopted a basic policy that the nation's supply of separated plutonium (whether from Japanese or European facilities) should not exceed in needs and that the stockpiling of separated plutonium under Japanese national control should be avoided. At the practical level the actual need for plutonium in Japan, will, in fact, be in close balance with supply over the next several years.

An effective non-proliferation regime also requires the application of rigorous physical security measures by appropriate national authorities to assure that sensitive nuclear facilities and activities are protected from theft, seizure or sabotage by subnational groups. In this regard, the appropriate Japanese national authorities apply a rigorous physical security system within Japan and Japan is an adherent to the International Convention on the Physical Protection of Nuclear Material. This convention specifies measures to protect shipments of nuclear materials and also specifies actions to be taken in case of theft.

It should be noted that substantial quantities of separated plutonium are to be shipped form Europe to Japan by sea, for use in the Japanese civil nuclear program. This being so, it is the firm policy of Japan and of the interested European countries to make sure that such materials are shipped only under the most rigorous conditions from a safety, physical security and navigational standpoint - taking into account the international standards that exist in this area. Indeed, in several instances the protective measures that are being applied substantially exceed international standards. Moreover, the carries being employed have had years of experience in shipping comparable cargoes and their safety records have been outstanding.

All of these examples serve to underscore Japan's firm commitment to non-proliferation. They also serve to underscore that Japan is determined to use nuclear energy only for peaceful purposes, that it is firmly committed to support of the global non-proliferation regime and that it is determined to assure that its nuclear activities are conducted with the highest regard for the health and safety of the public.

PNC's Mission and Technical Experiences with Plutonium Use

Established in 1967 under the Power Reactor and Nuclear Fuel Development Corporation Law, PNC has been carrying out various important functions in the conduct of Japan's nuclear energy development program. A key objective of this program is to realize the full potential of nuclear power by establishing a well-balanced nuclear fuel cycle to fully utilize the vast energy potential of plutonium. Plutonium is a byproduct of nuclear reactor operations that can be recovered from spent fuel. For more than 25 years PNC has been intensively engaged in developing technologies essential for the effective use as well as the safe and secure handling of this material. The scope of the relevant PNC programs ranges from prospecting for uranium to conducting pilot reprocessing activities. It also includes the important development of new types of reactors such as the fast reactor and the advanced thermal reactor(ATR).

(1) Reprocessing

The construction of the pilot plant at Tokaimura began in June, 1971. Plant operations began in January, 1981 with three major goals in mind : to establish relevant key technologies, to reprocess a portion of the spent fuel coming from Japanese nuclear power plants, and to supply plutonium for the Fugen advanced thermal reactor as well as the Joyo and Monju fast reactors. In its first 15 years of operation the Tokai Reprocessing Plant (TRP) reprocessed about 717 tons of spent fuel (as of the end of December 1993). Lately the plant has been maintaining a reprocessing volume of 90 tons per year. When spent fuel reprocessing reaches the commercial stage in Japan with the operation of the Rokkasho reprocessing plant owned by Japan Nuclear Fuel Limited, the focus of the activities of the TRP will change. There will be a shift from supplying reprocessing services to more intensive R&D on the reprocessing of future high-burnup LWR spent fuel and MOX fuel from advanced reactors.

(2) Fuel Fabrication

Plutonium is an essential element in the fuel for new reactors such as the ATR and fast reactor. As such it is combined with uranium to form mixed oxide (MOX) fuel. PNC has developed its own technique known "microwave-heating direct denitration process" to carry out the conversion the plutonium and uranium immediately after extracting plutonium. This process, which has some non-proliferation advantages, has been used since 1979 at the Tokai Plutonium Fuel Fabrication Facility (PFFF).

The Tokai Plutonium Conversion Development Facility, with a daily co-conversion capacity of 10kg MOX, went into operation in 1983, using plutonium nitrate and uranium nitrate from the Tokai

reprocessing plant to produce MOX powder for use in the prototype advanced thermal reactor Fugen, the experimental fast reactor Joyo, and demonstration fast reactor Monju. PNC work in this field began years ago as a study on plutonium handling, and of MOX fuel properties. It also included work on fuel fabrication at the Tokai Plutonium Fuel Development Facility (PFDF). Initial core fuel assemblies were completed for Joyo in 1975 and for Fugen in 1978.

It is quite significant to note that as of the end of 1993 more than 129 tons of MOX fuel, and tens of thousands of fuel rods had been successfully irradiated with no failures. The current effort is to demonstrate the mass production technology at the Tokai Plutonium Fuel Production Facility (PFPF) for fuel supply to Monju and Joyo fast reactors. The fast reactors fuel production line at PFPF started operation in 1988 with a capacity of 5tons of MOX fuel per year. Another line now under construction will supply 40 tons of MOX fuel per year for the Fugen ATR and other plants. It is scheduled to start operation in 1997.

(3) Reactor Developments

The Advanced thermal reactor (ATR) known as Fugen, which has been developed indigenously in Japan, can utilize both uranium and plutonium fuel and has been a vital link in the development of new uranium-plutonium mixed oxide (MOX) fuel. The ATR will also serve to put to beneficial peaceful use the supplies of plutonium from spent LWR fuel that will develop in the years before commercial fast breeder reactors in Japan. The development of ATR dates back to 1966 - one year before PNC was established. In 1989, Fugen generated a total of 10 billion KWh electricity and performed at an overall capacity of 61%, which is a good record of performance for an experimental reactor. In 1988, Fugen closed the nuclear fuel cycle when fuel reprocessed from the reactor's own spent fuel was loaded into its core. The ultimate goal of the reactor is to transfer the experience gained in new technology to practical commercial application. This objective is now in sight since the construction of a 606 MWe demonstration ATR plant is scheduled by Electric Power Development Co. to start in 1995 with operation planned by 2001.

Another major role of PNC is to carry out R&D to develop commercial-scale fast breeder reactors that are competitive with LWRs in terms of safety and economy. Much of the basic R&D was carried out on the experimental reactor Joyo. Joyo first achieved criticality in 1977 and had a maximum output of 50 MWt in 1978. After a new core was installed, the output was doubled to 100 MWt in 1983. The nuclear fuel cycle was first closed in 1984.

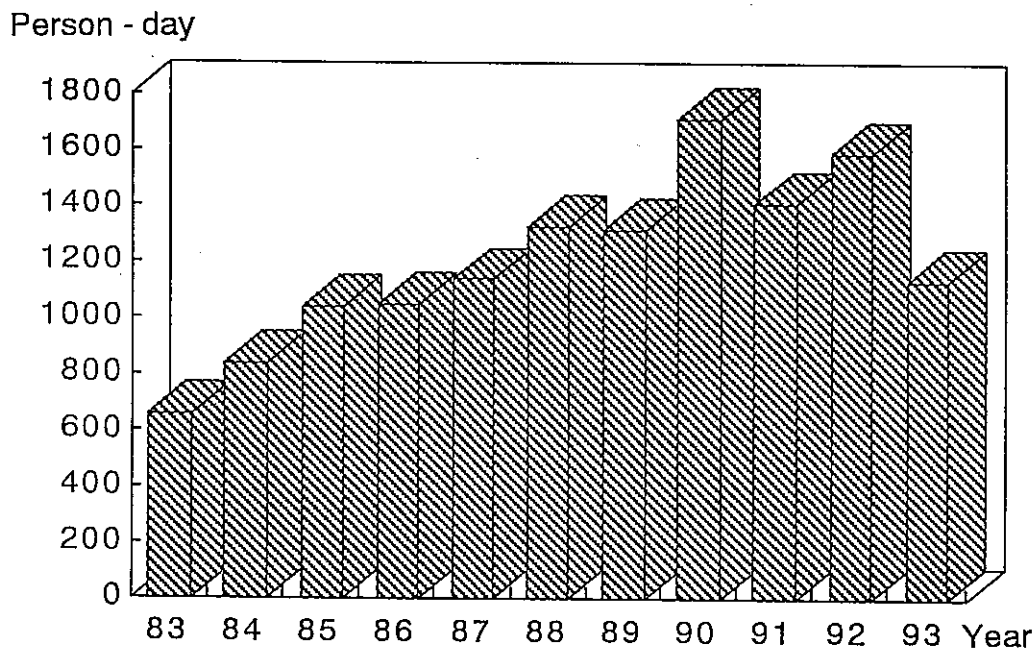
In 1985, construction began on the prototype fast reactor Monju. The reactor achieved initial criticality in April 1994 and performance tests are being conducted so that full operation can be achieved in December 1995. This 280 MWe facility will serve as a bridge between the experimental reactor stage and future commercial reactors. Pursuant to the latest Japanese long-term plan for nuclear energy the fast reactor is expected to achieve commercialization by around 2030.

(4) New Technology

In addition to researching every phase of the nuclear fuel cycle, PNC is involved in research and development on a wide range of other advanced technologies, including artificial intelligence (AI), lasers, robotics, and superconductivity. The main objectives of this R&D are to improve the economy and efficiency of the relevant activities. PNC's goals are to fully automate as many facets of the relevant operations as possible, to reduce the risks of human error and to reduce any significant exposures to radiation.

PNC's Efforts to Promote the Cause of Nuclear Non-Proliferation

PNC's R&D operations are subject to international safeguards administered by the IAEA to verify that nuclear materials such as plutonium to be used only for peaceful purposes are not diverted to the manufacture of nuclear weapons. Also various physical protection measures are taken by PNC and the interested Japanese authorities to protect nuclear material from theft or unauthorized removal and to prevent the sabotage of nuclear facilities. PNC began its relationship with safeguards in 1966, when its Plutonium Fuel Development Facility took delivery of 260 grams of plutonium from the United States. That relationship has expanded greatly in scope, quantity, form and content, with the development of PNC's various plutonium fuel facilities and the commissioning of the Tokai reprocessing plant, an enrichment plant as well as other facilities. In fact, the inspection efforts made by IAEA at PNC's various nuclear facilities (and which are vital to non-proliferation) have increased year by year, reaching 1,713 person-day in 1990. This figure accounts for 16.5 % of the total inspection efforts performed by IAEA world-wide in 1990. Much of this activity has contributed greatly to improving the IAEA's proficiency and skill in applying its safeguards system.



Inspection Effort of IAEA on PNC's facilities

Along with these activities, PNC has established and maintained a material accounting system as a fundamental element in the safeguards system in each facility and has accumulated valuable knowledge in the implementation of this system. Perhaps most importantly PNC has sponsored major work on safeguards research and development and has participated in various international programs designed to improve the effectiveness of the international safeguards system. These programs have included cooperative activities with countries such as Australia, France, Germany, the United Kingdom, and the United States. The results of several of these joint projects are currently being applied to existing PNC facilities. Some examples include the development of the microwave method for plutonium/uranium mixed conversion, which adds to the proliferation resistance of the process; the development of non-destructive assay technologies for timely determination of the quantity of nuclear material; and the development of advanced containment and surveillance techniques that, inter alia, apply the latest electronic technology. There have been numerous examples of worthwhile projects in this fields and PNC's contributions have received significant international recognition. In July 1990, the Industry Award of the Institute of the Nuclear Materials Management (INMM) was given to PNC in the 31st annual meeting of the INMM. PNC believes its efforts to promote cooperative arrangements with other institutions committed to safeguards improvement as well as its efforts to introduce aggressively advanced technologies into routine technical operations helped to pave the way for this special award. A further description of the PNC's contributions that led to this award is enclosed with this paper.

PNC believes the system of international safeguards administered by the IAEA is a crucial element in helping to assure the peaceful use of strategic materials such as plutonium. PNC believes that international studies in which PNC has participated clearly serve to demonstrate that, given the resources, the IAEA can apply effective safeguards to large bulk handling facilities including reprocessing and plutonium fabrication facilities.

PNC's efforts in support of non-proliferation objectives go well beyond important contributions to the development of safeguards technology. For example, PNC established an Office of Nuclear Non-proliferation in July 1993 to be a focal point and centrally manage issues designed to foster nuclear non-proliferation goals and to reinforce appropriate countermeasures against nuclear proliferation. The office is developing a multi-faceted plan to study and promote institutional and technical techniques for improving resistance to nuclear proliferation. The office intends to use this plan in developing guidelines for future activities. The office will coordinate the relevant facilities and

research and development activities of PNC, taking into consideration the importance of improving the overall resistance to nuclear proliferation. For example, the office will review the proliferation resistance aspects of PNC's current program aimed at the development of actinide recycling, and will promote the transparency of PNC's activities to the general public by establishing an improved communication system covering non-proliferation related information.

(Attachment)

PNC receives award from the Institute of Nuclear Material Management

On July 17, 1990 at the 31st Annual Meeting of the Institute of Nuclear Management (INMM) in Los Angels, PNC received an award in recognition of outstanding efforts in the technical development of safeguards.

PNC has a long history of utilizing plutonium for peaceful purposes, as well as contributing to the development of safeguards techniques and encouraging international cooperation in safeguards.

Power Reactor & Nuclear Fuel Development Corporation (PNC) began its relationship with safeguards in 1966, when its Plutonium Fuel Development facility took delivery of 260 grams of plutonium from the United States. That relationship has expanded in quantity, form and content, with the advancement of plutonium fuel facilities and the commissioning of a reprocessing plant, an enrichment plant and other facilities.

Along with the above-mentioned development activities, PNC has established and maintained a material accounting system as a fundamental measure for safeguards in each facility and accumulated valuable knowledge in the implementation of such safeguards.

To pursue safeguards research and development for these facilities, PNC joined various international programs prior to the operation.

Two such international colloquia, the Tokai Advanced Safeguards Technology Exercise (TASTEX), a joint study project by Japan, the United States, France and the International Atomic Energy Agency (IAEA) for finding a safeguards regime suitable for reprocessing facilities, and the Hexapartite Safeguards Project, a joint study by Japan, the United States, Australia, the TROIKA (the United Kingdom, West Germany and the Netherlands), IAEA and the European Atomic Energy Community (Euratom) for developing a safeguards regime suitable for enrichment facilities. As a follow-up to the above meetings, JASPAS (Japan Support Program for Agency Safeguards) and PNC/DOE (a joint program with the U.S.Department of Energy) are currently proceeding with international cooperative activities for the development of more effective and efficient safeguards technology.

The results of these joint projects are currently being applied to existing PNC facilities. Some examples include the development of the microwave method for plutonium/uranium mixed conversion, which has an advantage in nonproliferation capabilities; development of non-destructive assay technologies for timely determination of the quantity of nuclear material; and development of advanced containment and surveillance systems applying the latest electronic technology.

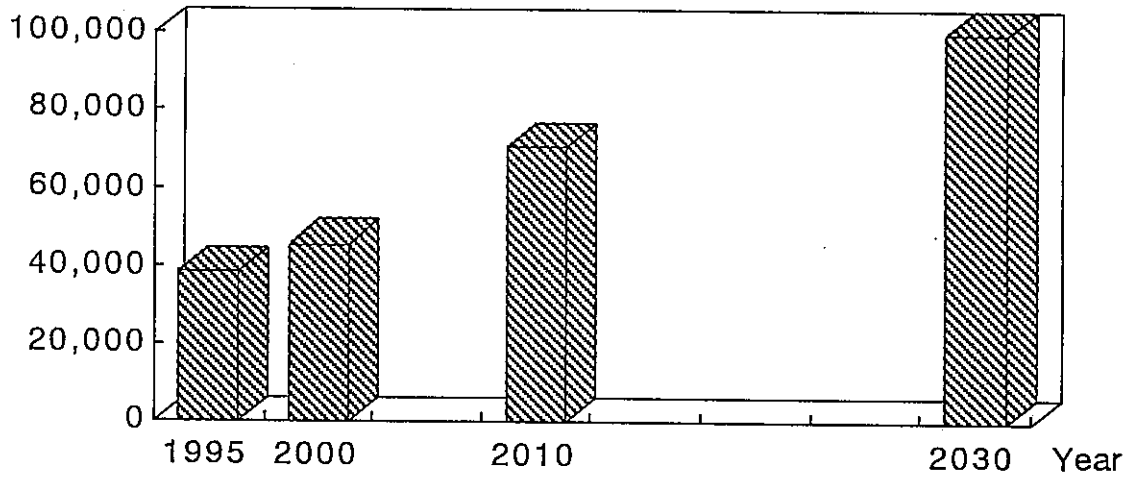
PNC's shining example of superior safeguards technology is the advanced safeguards system at Tokai Plutonium Fuel Production Facility (PFPF), which began operations in 1988. PFPF is a showcase facility featuring the latest remote-controlled and automated safeguards technology such as on-line and real-time systems.

Japan must rely on overseas resources for virtually all energy supplies and therefore is committed to reprocessing and plutonium recycling with a long-range view, to encourage more effective use of uranium resources and to stabilize the nuclear power supply.

"Nuclear energy for peaceful use only, and securing nuclear safety" as provided for in the "Atomic Energy Basic Law," is the fundamental nuclear policy of Japan. Based on this, PNC is concerned with reprocessing, enrichment, and plutonium fuel production and with the development of new types of reactors, such as the ATR and FBR. In fact, most of the plutonium utilization facilities in Japan are concentrated in PNC.

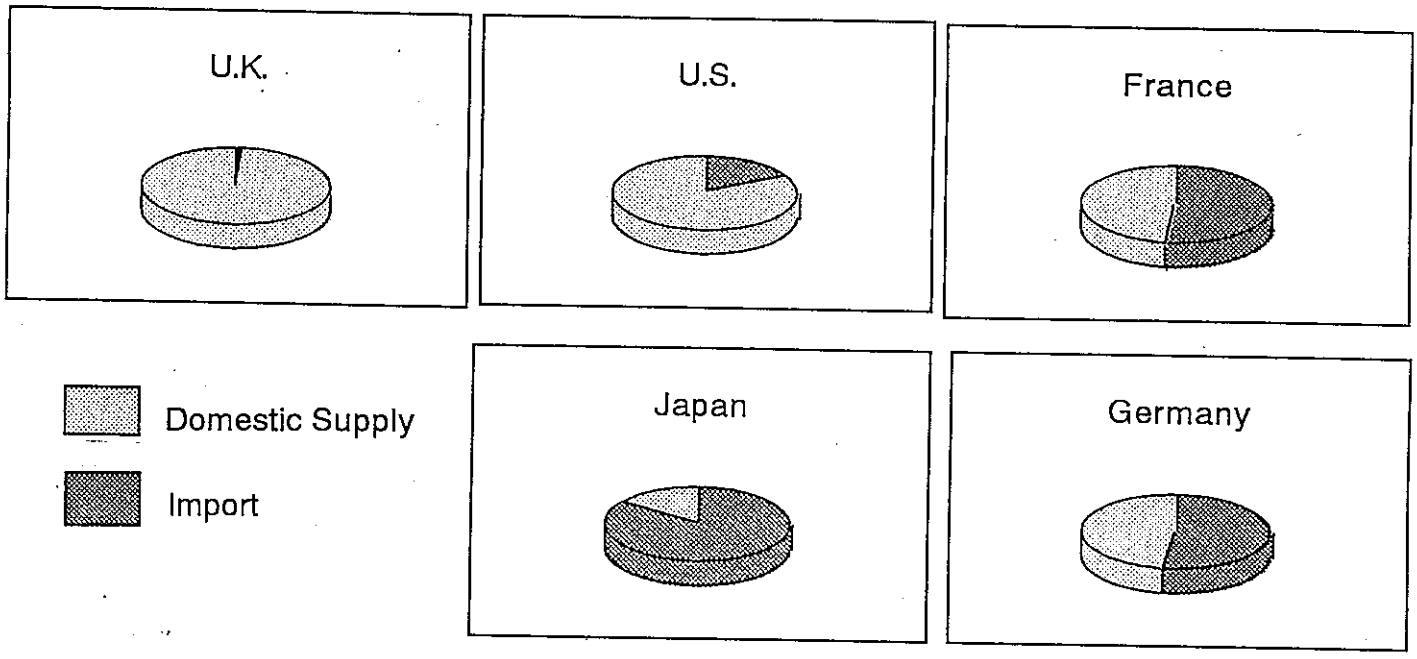
JAPAN'S BASIC NEEDS AND ENERGY STRATEGY

For several decades the Government of Japan, in partnership with industry, has been promoting the utilization of nuclear power as a vital and critical component of Japan's energy system. This is done within the context of a long-term program for nuclear energy which is updated every five years. At the present time, Japan's installed capacity of commercial nuclear power plants is 38,376,000kw, which accounts for nearly thirty percent of total generated output. This figure is expected to grow to 45,600,000kw of installed capacity by the year 2000 (or 33% of the total power generation) and to 70,500,000kw by the year 2010 (or 42% of the total).



Capacity of Projection of Nuclear Power (MWe)

This heavy commitment to nuclear power is indicative of determined policy on the part of Japan to Diversify its sources of energy supply in order to counter Japan's excessive dependency on imported fossil fuels. At the present time Japan's energy supply system is extremely vulnerable to outside interruptions in supply since the country depends on imports for more than eighty percent (80%) of its energy. Sixty percent (60%) of Japan's energy currently comes from oil and practically one hundred percent of Japan's oil comes from imports. Most of this comes from the Middle East. Also, ninety four percent of Japan's coal and ninety-six percent of its natural gas are imported. By way of comparison, imports of energy account for 16.4% of the total for the United States, 52.7% for Germany, 51.7% for France and 1.3% for the United Kingdom. Furthermore, Japan's status as an island nation serves to aggrevate the problem since unlike some European countries it cannot readily receive imports of electricity across its national boundaries from its neighbors.



Japan depends on imports for more than 80% of its energy

Within this context, Japan strives to maintain an energy supply structure that is not overly dependent on any one source. As such, the country has selected nuclear energy whose supply is relatively more stable than that of petroleum as its central alternative to conventional fossil fuels. The use of nuclear power also is judged to have many environmental benefits since nuclear power emits no pollutants such as carbon dioxide or the sulphur oxides to the atmosphere. Approximately eighty percent of carbon dioxide emissions have been attributed to the consumption of fossil fuels. Such fuels also account for a considerable portion of the emissions of sulfur oxides and nitrogen oxides which are the substances responsible for acid rain. Hence, the development and use of nuclear energy is an important element of the Japanese support of the international "Action Plan for the Prevention of Global Warming."

It must be stressed, however, that uranium resources, just like fossil reserves, are clearly finite and limited in nature. Accordingly, even though current uranium supplies are ample, the market is likely to become very tight in the next century even if one makes conservative estimates of probable increase in population growth, energy demands and the role of nuclear power in meeting these needs.

As an advanced industrialized country practically lacking its own indigenous energy resources, it is indispensable that Japan plan for its energy security on a basis that recognizes and prudently takes into account such future developments. It is crucial that we take such a longer term view in developing our energy strategy. As a consequence Japan is firmly committed to now developing a nuclear fuel cycle that visualizes the reprocessing of spent nuclear fuel, the recovery and beneficial utilization of plutonium and uranium and, over a period of several decades, the ultimate commercialization and deployment of the fast breeder reactor.

This is an orientation toward the use of nuclear power that is shared in common by Japan and other nations in Western Europe as well as Russia. It is an approach to the nuclear fuel cycle that is judged to be vital to the future energy security of the nation. It also is a responsible way to husband and recycle valuable natural resources, it serves to reduce adverse effects on the environment and it is an approach that significantly helps in the management of radioactive waste.

PUTTING PLUTONIUM TO BENEFICIAL PEACEFUL USE

At the present time the Japanese nuclear power program is centered on the use of light water reactors which will serve as the mainstream of the Japanese program for many years to come. However, from a longer term perspective, and given the critical importance of using finite uranium resources in the most effective manner that is possible, Japan, as noted, is actively pursuing the development of the fast breeder reactor. Fast breeder reactors produce more nuclear fuel than they consume and Japan hopes to be able to commission such reactors commercially by about the year 2030. This would be done after first passing through the prototype reactor and demonstration reactor stages.

With this goal in mind, it is important to now establish the necessary comprehensive technological infrastructure for using plutonium in a safe and secure manner. This makes it essential to carry out some nuclear fuel recycling at this time. Therefore, Japan is now moving actively to recycle plutonium in light water reactors as well as in Japan's so-called advanced thermal reactor. It also is amplifying its existing pilot reprocessing capability at Tokai Mura by building an 800 tone per year commercial reprocessing plant at the Rokkasho site.

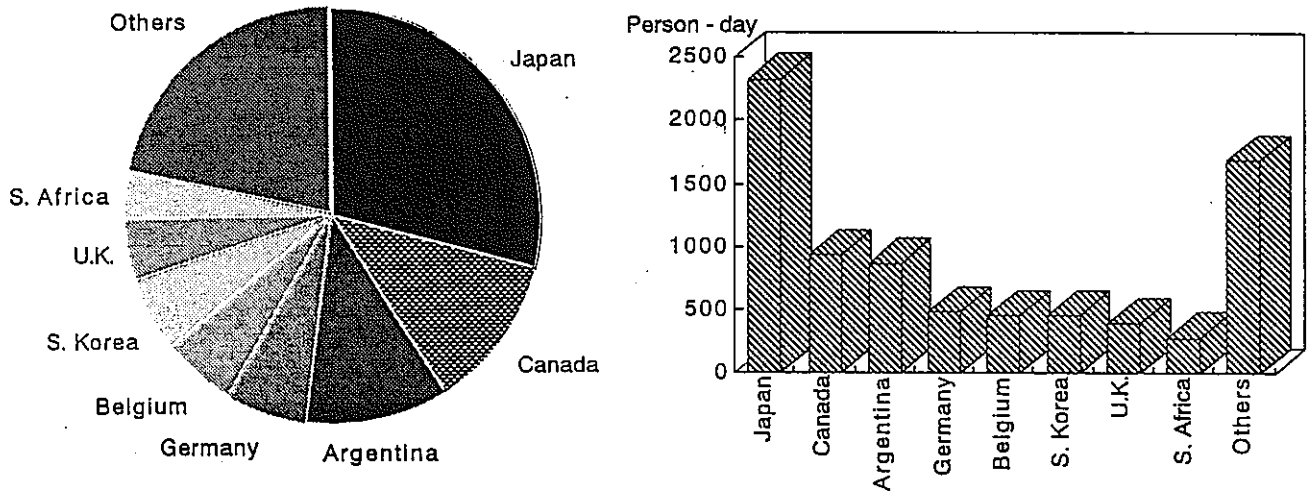
It is recognized that at this transitional stage the recycling of MOX fuel by light water reactors will be somewhat more costly than the direct disposal of spent fuel. However, there is substantially no difference if one considers total power generation cost. Also with time, experience and greater pressures on the uranium market, it is expected that the economics of plutonium recycling will improve. Moreover, if one wishes, for non-proliferation reasons, to achieve a true balance between the production of plutonium - including that contained in spent fuel and the consumption of this material, then the best way to achieve this is by burning the plutonium in reactors. Indeed, with an eye for possibly improving the management of plutonium, there has been a notable increase in interest in various technical circles, in the possible use of the liquid metal reactor as well as deep burn reactor concepts as a way of ultimately bringing about a better balance between plutonium demand and supply.

JAPAN'S DETERMINED SUPPORT OF NON-PROLIFERATION VALUES

Japan is the only nation in the world that has suffered from the horrific effect of nuclear weapons. As such it has long been firmly committed to using atomic energy only for peaceful purposes. It also is firmly dedicated to the goal of discouraging the international spread of nuclear weapons. Under no circumstances will Japan ever possess nuclear weapons and any implication to the contrary would be outrageous and would be deeply offensive to the Japanese people.

There have been numerous ways in which Japan's very solid commitment to the goal of non-proliferation has manifested itself.

Japan's Basic Atomic Energy Law strictly limits the development and utilization of nuclear energy to peaceful purposes and under conditions that provide for considerable transparency as to the ways nuclear activities are managed. Japan also is a party to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), it is a very active member of the International Atomic Energy Agency, it has adhered to the International Convention applicable to the physical security of nuclear materials and it has long been an adherent to the various international guidelines that govern the conditions for exporting nuclear materials to other countries. In this context it adheres to the policy that significant nuclear exports only should be made to non-nuclear weapon states that submit to full-scope IAEA safeguards, Roughly 30% of the inspection effort of the IAEA is devoted to the inspection of Japanese facilities.



Inspection Effort of IAEA in 1993: Roughly 30% of IAEA's inspection effort is devoted to Japanese facilities.

Japan also has been a strong supporter of indefinite extension of the NPT. It is the position of Japan that the Nuclear Non-Proliferation Treaty is the very centerpiece of the global nuclear non-proliferation regime. The NPT places important obligations on both the nuclear weapons and non-nuclear weapons states and it provides the very foundation for orderly civil nuclear cooperation between nations around the world. The Treaty also appropriately recognizes in Article IV the inalienable right of the adherents to derive the full benefits from the peaceful atom. Any major moves to undermine the principles in Article IV could undermine the entire integrity and effectiveness of the NPT, itself.

Article VI of NPT

1. Nothing in this Treaty shall be interpreted as affecting the inalienable right of all the Parties to the Treaty to develop research, production and use of nuclear energy for peaceful purposes without discrimination and in conformity with articles I and II of this Treaty.
2. All the Parties to the Treaty undertake to facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy. Parties to the Treaty in a position to do so shall also cooperate in contributing alone or together with other States or international organizations to the further development of the applications of nuclear energy for peaceful purposes, especially in the territories of non-nuclear-weapon States Party to the Treaty, with due consideration for the needs of the developing areas of the world.

At the same time, Japan fully recognizes that nuclear facilities and materials (including plutonium) can be misused to make nuclear weapons and that it is absolutely vital that the protective measures to keep the atom peaceful are applied on a basis that keeps pace with the spread and use of nuclear technology. In practical terms, the spread of weapons usable nuclear materials to nations of proliferation concern or to those located in highly volatile regions should be discouraged.

The Government of Japan also appreciates that it has an important responsibility to explain the course and direction of the Japanese nuclear program, including plutonium recycling and use to its citizens and to other countries to avoid any possible misunderstandings. In light of these considerations the Government of Japan and Japanese industry have been pursuing a multi-pronged effort to strengthen the non-proliferation regime and enhance international confidence that the separation and use of plutonium occurs under the most secure and rigorous conditions.

For example, at multilateral level Japan, as noted, has long been a strong supporter of the technical improvement and advancement of the IAEA safeguards system, including the ability of the IAEA to apply the most up to date and state-of-the-art safeguards to large-bulk handling facilities, including commercial scale reprocessing facilities. This included active Japanese participation in the so-called LASCAR study by several highly qualified safeguards experts from several countries that concluded that adequate IAEA safeguards can be applied to large reprocessing plants. In the view of Japan, it is fundamentally incorrect, to suggest that IAEA safeguards can not do an effective job in safeguarding such facilities.

Also, in consultations in Vienna, Austria with other advanced countries, Japan has been strongly advocating the concept that greater transparency should be applied to the programs of countries that are actively involved in plutonium separation and recycling. As an important evidence of its commitment to this principle, Japan recently publicly disclosed up-to date information on its own plutonium demand and supply situation.

In this regard, it should be stressed that Japan has adopted a basic policy that the nation's supply of separated plutonium (whether from Japanese or European facilities) should not exceed its needs and that the stockpiling of separated plutonium under Japanese national control should be avoided. At the practical level the actual need for plutonium in Japan, will in fact, be in close balance with supply over the next several years.

It also is to be noted that much of Japan's plutonium is being separated in this period in European reprocessing plants and that the mixed oxide (MOX) fuel to be employed in several Japanese nuclear power plants will be fabricated in Europe. Thus, over the next several years quantities of plutonium as well as high level wastes will be returned to Japan from Europe by sea. It is the firm policy of Japan and of the interested European countries to make sure that such materials are shipped only under the most rigorous conditions form a safety, physical security and navigational standpoint - taking into account the international standards that exist in this area. Indeed, in several instances the protective measures that are being applied substantially exceed international standards, Moreover, the carriers being employed have had years of experience in shipping comparable cargoes and their safety records have been outstanding.

All of these considerations support the view that Japan is continuing to make very important contributions to the strengthening of the international nuclear non-proliferation regime, that it has compelling reasons for continuing to move forward with its plutonium recycling programs, and that these activities are being planned and implemented with utmost care and concern from a safeguards, physical security and safety perspective.