

Plutonium

Spring 2004 No.45



Opinion

Urge 'Em to Join NPT for Nuclear Non-Proliferation

Series Plutonium

**Next Step for Elimination of N-Weapons
- Sixty Years of Nuclear Non-proliferation -**

Pluto

Urns



Council for Nuclear Fuel Cycle

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Spring 2004 No.45

Council for Nuclear Fuel Cycle

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Cover : The Blue Southern Pacific

There is a big possibility that the small islands in the southern Pacific Ocean will be submerged in the sea if global warming continues. We cannot be immersed in the dull thoughts of "blue sea, blue sky" anymore.

Urge 'Em to Join NPT for Nuclear Non-Proliferation

On February 11, U.S. President George Bush stated that the proliferation of weapons of mass destruction such as nuclear weapons posed the most serious danger to the world peace, and that these weapons in the hands of terrorists and rogue countries would bring catastrophic harm to the U.S. and international community. He also proposed seven new steps for the prevention of development and spread of such mass destruction weapons. Strengthening of regulations toward the peaceful uses of nuclear materials was also emphasized in this proposal.

President Bush also stated that the Nuclear Non-Proliferation Treaty (NPT) has loopholes. Under the cover of peaceful programs, North Korea and Iran have been producing nuclear materials that can be used for weapons. To fill such loopholes, Mr. Bush proposed that countries supplying nuclear technology and materials should guarantee the stable supply of nuclear fuel at reasonable cost only to countries that give up uranium enrichment and reprocessing. To the members of the Nuclear Supply Group (NSG) that are presently operating uranium enrichment and reprocessing facilities, U.S. President proposed that they should refuse to sell such facilities or technology to any country that do not yet have these, and that only countries that have signed the IAEA Additional Protocol concerning safeguards by next year should be

given permission to import equipment for peaceful nuclear programs.

President Bush's point that the NPT has loopholes has been obvious from the time that NPT regime was established 30 years ago and even those who are not directly involved in nuclear development have recognized this. However, it is questionable whether making the NPT regulations on peaceful uses more stringent would be as effective as Mr. Bush says.

This proposal would regulate the peaceful uses of nuclear energy by non-nuclear weapon countries even more than under NPT and to easily implement this measure could overturn the right for peaceful uses which have been promised under the NPT. It is also possible that the inequality of this treaty, in which only five countries are permitted to possess nuclear weapons, would become a problem between those non-nuclear weapon countries that already have uranium enrichment facilities or reprocessing facilities and those that do not.

Even if peaceful uses by the non-nuclear weapon countries who are NPT members were further regulated, larger loopholes would be the "nuclear weapon states" such as Pakistan, India and Israel and "others that are suspected of having nuclear weapons" that are not NPT members. Because these various countries have not joined the NPT, they have no need to accept inspection by

IAEA under the treaty, nor do they do so. As can be seen from the report that Dr. A. Khan in Pakistan was giving Libya and North Korea nuclear weapon related technology -although technology disclosure is not something that one person can do-, we feel that it is becoming increasingly important to find a way to prevent nuclear proliferation by dealing with the black-market of nuclear related materials, equipment and technology.

Through the proposal by President Carter in April 1977, the International Nuclear Fuel Cycle Evaluation (INFCE) was held under the UN for two years from October of the same year to review the compatibility between peaceful uses of nuclear energy and nuclear non-proliferation measures from a technological standpoint. As a result, it was concluded that the two were compatible if effective safeguards implementation was taken. This conclusion led to the suggestion that International Plutonium Storage (IPS), International Spent Fuel Management (ISFM) and the Committee on Assurances of Supply (CAS) for international framework of nuclear materials management should be created. An evaluation was made with IAEA at the center, but these bodies never took concrete form. It may be effective to go through the international management framework that were evaluated by INFCE again at this time.

Of course, the social trend has changed

completely from the cold war period 30 years ago, when 2 major powers controlled the whole world in some degree, and there would be even more issues with operating a multilateral management regime like the above. The most difficult one of these is that nuclear electricity is already being generated in 31 countries and nuclear fuel is being marketed. Attaining a balance between a free competitive market and international management is expected to be extremely difficult.

Through the advance in the peaceful uses of nuclear energy, nuclear materials are existed all over the world. There is no guarantee that such materials cannot be converted for military uses. However, to regulate the right for peaceful uses, promised by the

NPT, even further could actually weaken the effectiveness of the only international treaty for nuclear non-proliferation. We fear that when the NPT becomes only a fetter that inhibits the essential peaceful uses of nuclear energy, the meaning of membership in this treaty decreases, leading to its dissolution. It is more effective to find measures to increase party to the NPT.

More importantly, the five big powers should work aggressively toward and pressure other "nuclear weapon states" and "suspected countries" to have nuclear weapons to relinquish their nuclear weapons and technology. In many cases, the technology in those various countries was obtained from the five major powers in some way. Even more effective toward the world-wide nuclear non-proliferation is to share the

experiences of nuclear weapons reduction conducted by the U.S. and Russia after the cold war with many countries and to show the meaninglessness as well as the economic losses stemming from the development and possession of nuclear weapons. Not only should the U.S. and Russia continue their nuclear weapons reduction, but the other three nations must make international agreements and implement the large scale reduction of nuclear weapons. Otherwise, nuclear non-proliferation cannot be advanced. It is important for the nuclear weapons states to begin with disciplining themselves.

Executive Editor

Next Step for Elimination of N-Weapons - Sixty Years of Nuclear Non-proliferation -

Ryukichi Imai

Former Ambassador, Conference on Disarmament (Geneva)
Director, Council for Nuclear Fuel Cycle

Many people must have thought, "Just as I expected," or "Now even they have done it" at the news that Libya renounced their nuclear weapons development program. Despite the necessity to firmly maintain the Nuclear Non-proliferation Treaty (NPT), it is evident that there has been nuclear proliferation in the past. It makes us wonder what we can expect of nuclear non-proliferation, nuclear disarmament and elimination of all nuclear weapons in the future. We asked Dr. Ryukichi Imai who has been engaged in the disarmament matter for a long time to write an article about this issue. (Editor)

Comprehensive Ban on Nuclear Weapons

At the 1945 Potsdam Conference, President Truman hinted at General Secretary Stalin about the success of the first US atomic bomb test in New Mexico. Stalin immediately phoned Moscow and ordered Beria to "hurry up" the Soviet own program, which successfully tested its first bomb in 1949. Since that time secret of atomic bomb making has become the important prize in international competition. In 1946, the United States proposed at the United Nations its Baruch Plan, which was to impose veto-free international control on nuclear technology and material, thus creating a world government and emphasizing US monopoly in the nuclear field. It was natural that the Soviet Union refused to go along. While emphasizing "massive retaliation" by NATO, the US in 1954 disclosed to the UN General Assembly its "Atoms for Peace" pro-

gram.

Through period such as the oil crisis of the 1970's and subsequent discussion on energy security, the world has experienced the period of nuclear electricity, which, by the end of the Twentieth Century, supplied six and half percent of energy throughout the world. Future of nuclear power as energy source is a still unsettled discussion, but the fact that military and civilian uses of nuclear energy are based on the same basic technology is certainly making the non-proliferation a complicated problem.

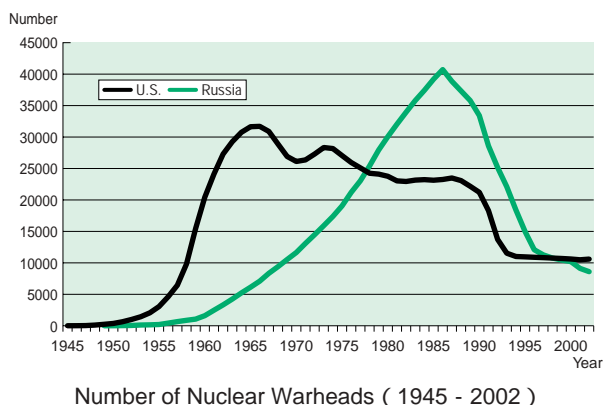
Throughout the 1950's the US out-paced USSR over nuclear weapons technology, missile flight and their numbers, and this has led to Premier Khrushchev's decision to place middle range nuclear missiles in Cuba, thus leading to a possible first real nuclear war. Fortunately the war was barely avoided (according to former secretary of defense McNamara who told me

some details during two years of Carnegie Foundation joint study in 1990's). Both countries at the time regarded nuclear war as only an extension of ordinary wars, conducting exercises of charging foot soldiers preceded by nuclear detonation(s). Knowledge and appreciation of radioactivity was not profound in those days.

In 1963, Partial Test Ban Treaty was agreed which reduced chances of new nuclear weapon states (including many technically advanced states who had to depend on nuclear explosive testing for the first step of nuclear weapons development.) Three tables and graphs are included in this paper, namely number of world's nuclear weapons since 1945, list of major international agreements on nuclear weapons control, general situation of the world nuclear electricity generation. Explaining these three is time consuming, and the author would request that readers would try to get

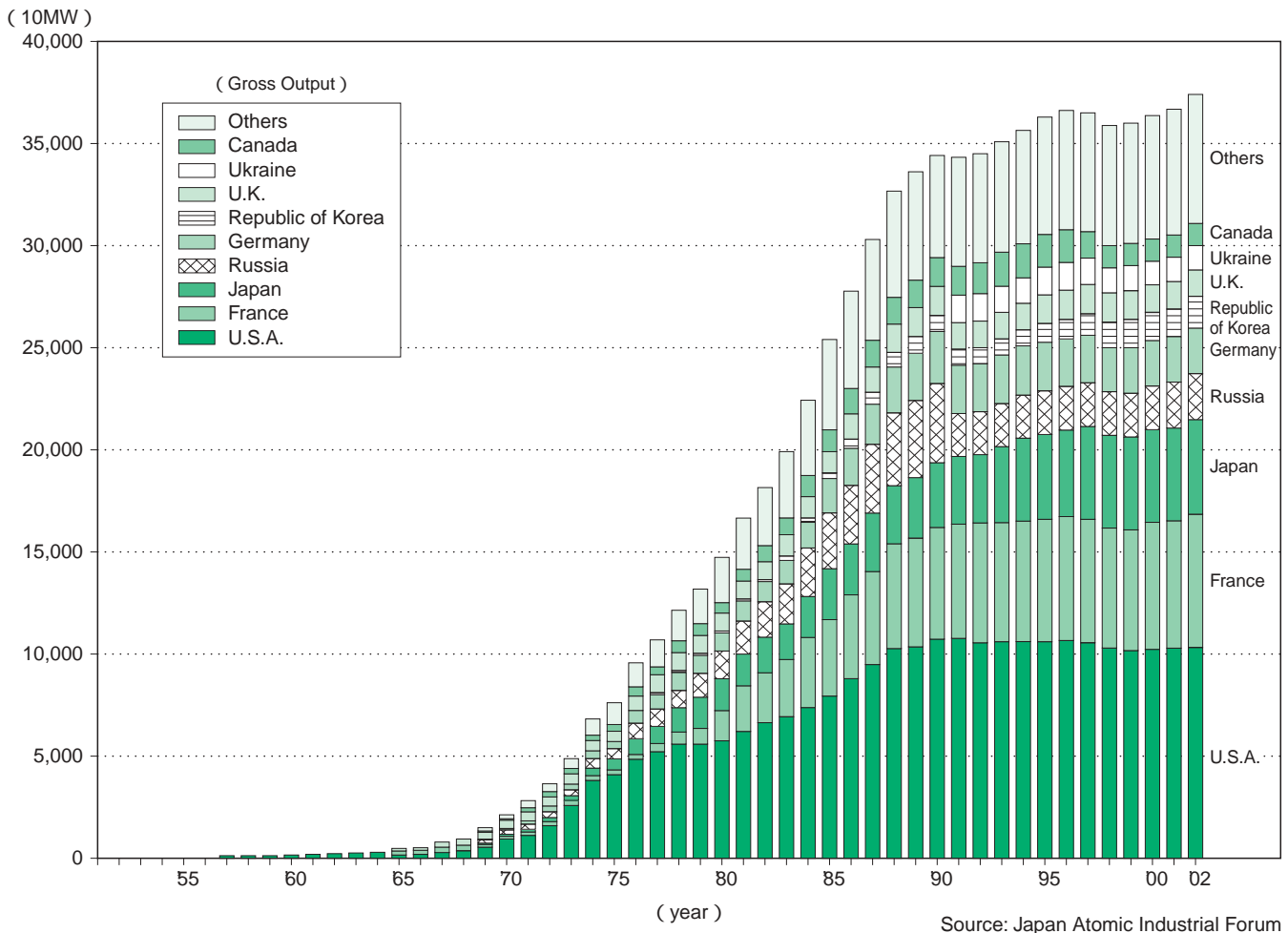
Year	U.S.	Russia	U.K.	France	China	Total
1945	6					6
1946	11					11
1947	32					32
1948	110					110
1949	235	1				236
1950	369	5				374
1951	640	25				665
1952	1,005	50				1,055
1953	1,436	120	1			1,557
1954	2,063	150	5			2,218
1955	3,057	200	10			3,267
1956	4,618	426	15			5,059
1957	6,444	660	20			7,124
1958	9,822	869	22			10,713
1959	15,468	1,060	25			16,553
1960	20,434	1,605	30			22,069
1961	24,111	2,471	50			26,632
1962	27,297	3,322	205			30,824
1963	29,249	4,238	280			33,767
1964	30,751	5,221	310	4	1	36,287
1965	31,642	6,129	310	32	5	38,118
1966	31,700	7,089	270	36	20	39,115
1967	30,893	8,339	270	36	25	39,563
1968	28,884	9,399	280	36	35	38,634
1969	26,910	10,538	308	36	50	37,842
1970	26,119	11,643	280	36	75	38,153
1971	26,365	13,092	220	45	100	39,822
1972	27,296	14,478	220	70	130	42,194
1973	28,335	15,915	275	116	150	44,791
1974	28,170	17,385	325	145	170	46,195
1975	27,052	19,055	350	188	185	46,830
1976	25,956	21,205	350	212	190	47,913
1977	25,099	23,044	350	228	200	48,920
1978	24,243	25,393	350	235	220	50,441
1979	24,107	27,935	350	235	235	52,862
1980	23,764	30,062	350	250	280	54,706
1981	23,031	32,049	350	274	330	56,034
1982	22,937	33,952	335	274	360	57,858
1983	23,154	35,804	320	279	380	59,937
1984	23,228	37,431	270	280	415	61,624
1985	23,135	39,197	300	360	425	63,417
1986	23,254	40,723	300	355	425	65,057
1987	23,490	38,859	300	420	415	63,484
1988	23,077	37,333	300	410	430	61,550
1989	22,174	35,805	300	410	435	59,124
1990	21,211	33,417	300	505	430	55,863
1991	18,306	28,595	300	540	435	48,176
1992	13,731	25,155	300	540	435	40,161
1993	11,536	22,101	300	525	435	34,897
1994	11,012	18,399	250	510	400	30,571
1995	10,953	14,978	300	500	400	27,131
1996	10,886	12,085	300	450	400	24,121
1997	10,829	11,264	260	450	400	23,203
1998	10,763	10,764	260	450	400	22,637
1999	10,698	10,451	185	450	400	22,184
2000	10,615	10,201	185	470	400	21,871
2001	10,491	9,126	200	350	400	20,567
2002	10,600	8,600	200	350	400	20,150

Source: NRDC Nuclear Notebook, Bulletin of the Atomic Scientists



International Treaties on Nuclear Non-Proliferation and Disarmament

1925	The Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare (Geneva Protocol) is signed. (It enters into force in 1928.)
1959	The Antarctic Treaty is signed. (It enters into force in 1961.)
1963	Memorandum of Understanding Between the United States of America and the Union of Soviet Socialist Republics Regarding the Establishment of a Direct Communications Link (Hot Line Agreement) is signed.
1963	The Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water (the Partial Test-Ban Treaty) is signed and enters into force.
1967	The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (the Outer Space Treaty) is opened for signature and enters into force.
1967	The Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (the Treaty of Tlatelolco) is opened for signature. (It enters into force in 1968.)
1968	The Treaty on the Non-Proliferation of Nuclear Weapons (NPT) is opened for signature. (It enters into force in 1970.)
1971	The Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Sea-Bed and the Ocean Floor and in the Subsoil Thereof (the Sea-Bed Treaty) is opened for signature. (It enters into force in 1972.)
1971	The Agreement on Measures to Reduce the Risk of Outbreak of Nuclear War between the United States of America and the Union of Soviet Socialist Republics is signed and enters into force.
1972	The Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction (BWC) is opened for signature and enters into force in 1975.
1972	The Treaty on Limitation of Anti-Ballistic Missile Systems (ABM Treaty) and the Interim Agreement on Certain Measures with respect to the Limitation of Strategic Offensive Arms (SALT-I Agreement) is signed.
1973	The Conference on Security and Co-operation in Europe (CSCE) open in Helsinki.
1974	The Treaty on the Limitation of Underground Nuclear Weapon Tests (the Threshold Test-Ban Treaty:TTBT)is signed.
1976	The Treaty between the United States of America and the Union of Soviet Socialist Republics on Underground Nuclear Explosions for Peaceful Purposes (the Peaceful Nuclear Explosions Treaty:PNE Treaty) is signed.
1977	The Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques is opened for signature. (It enters into force in 1978.)
1979	The Treaty on the Limitation of Strategic Offensive Arms (SALT II) is signed.
1980	The Convention on the Physical Protection of Nuclear Material is opened for signature. (It enters into force in 1983.)
1986	The South Pacific Nuclear Free Zone Treaty (the Treaty of Rarotonga) is opened for signature. (It enters into force in 1986.)
1987	The Treaty between the United States of America and the Union of Soviet Socialist Republics on the Elimination of Their Intermediate-Range and Shorter-Range Missiles (INF Treaty) is signed. (It enters into force in 1988.)
1990	The Treaty on Conventional Armed Forces in Europe (CFE Treaty) is signed. (It enters into force in 1992.)
1991	The Treaty between the United States of America and the Union of Soviet Socialist Republics on the Reduction and Limitation of Strategic Offensive Arms (START I Treaty) is signed. (It enters into force in 1994.)
1993	The START II Treaty is signed. The Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction (CWC) is opened for signature. (It enters into force in 1997.)
1995	The Treaty on the Southeast Asia Nuclear Weapon-Free Zone (Bangkok Treaty) is opened for signature. (It enters into force in 1997.)
1996	The African Nuclear-Weapon-Free-Zone Treaty (Pelindaba Treaty) is opened for signature.
1996	The Comprehensive Nuclear-Test-Ban Treaty (CTBT) is opened for signature.
1997	A Framework for START III negotiation is agreed.
2002	The Treaty between the United States of America and the Russian Federation on Strategic Offensive Reductions (SORT/Treaty of Moscow) is signed.



Trends of Generating Capacity of Operating Nuclear Power Plants in the World (As of December 31, 2002)

general and over-all impressions, rather than their details.

By 1970's and 1980's the central theme of US/USSR confrontation was "nuclear deterrence" based on long range, land and sea based with thousands of missiles with hydrogen war-head of megaton (millions of tons of TNT) scale. Effects were more psychological than physical realization of tens of thousands of nuclear missiles to bring about MAD (Mutual and Assured Destruction). The two countries were more concerned about the financial pressure of the large scale military deployment. When the cold war has ended and the world slid into the Gulf War of 1991, deterrence com-

petition ended in the US victory, and the both countries agreed to reduce long-range missiles to less than four to five thousands including spares and reserves. The world was more concerned about very limited numbers of weapons of mass destruction by "rogue states." India, Pakistan, Israel, Col Kadafi, Sadam Foussein, DPRK and South Africa belonged to this category.

Concern today is that non-proliferation after the cold war may be suppressing the mankind's common concern about elimination of nuclear weapons as such. US and Russia agreed in 2002 to limit warheads to 1,700-2,200 plus spare and reserves by 2012. At the same time, there is no

intention to reduce the number further, while there is a possible suspicion that the US may be discouraging peaceful uses on the ground of non-proliferation. As will be discussed later, this touch on the point Japan raised at the time of ratification of the Nuclear Non-Proliferation Treaty (NPT), and may re-ignite the serious issue again. Another problem at the time of NPT ratification was that the treaty did not contain definition of nuclear explosion, and might limit fast breeder and fusion research.

Nuclear Weapons Technology

Atomic bombs have two types, one using enriched uranium (in U235) as in

Hiroshima, and the other using metallic plutonium (Pu239) as in Nagasaki, which is produced by neutron radiation of uranium in nuclear reactors. Both are commonly for explosive power of ten to twenty kilotons (thousand tons of TNT explosives or equivalent of March, 1945 fire bombing of Tokyo downtown). Hydrogen bombs represents further sophistication in technology and are triggered by atomic bomb(s) and consist of fusion of hydrogen isotopes with explosive power of megatons (million tons of TNT). Plutonium production may be done by using research reactors as in India, or through graphite moderated natural uranium reactors such as Nyongbyon in DPRK or Calder Hall in UK. Uranium enrichment is separation of U235 isotopes from U238, and represented the most difficult technology during the Manhattan project. Such separation could be done by passing uranium fluoride gas through ceramic membrane, by using electric charge differences (magnetic), or, by using weight differences (centrifuge). Today, centrifuge is considered to be the most efficient technology. Abdul Kahn of Pakistan stole centrifuge technology from URENCO Almero plant, and is said to have spread the technology to Libya, Iran and DPRK. Magnetic method was tried in the Manhattan project, given up as impractical and declassified. Sadam Hussein is said to have started building enrichment plant in Iraq by using this technology with the help of Germany. What technology was at issue by 2003 Iraq War is not clear, for people in charge of UN inspection had told me that the magnetic technology had been uprooted in Iraq and were no longer available.

As a bomb design, using enriched uranium is easier. For production, plutonium separation can be performed by using chemicals, while isotope separation has to rely on physical process.



Dr. Ryukichi Imai

The central issue here is that plutonium produced in electricity generation reactors contains large quantity of impurities and is not fit for weapons. The author was once charged with research contract to have clarification of this point, and spent some time reading papers and discussing with friends (mostly American). What I have arrived at is simply that there is no US origin official document which clarified the problem, while American friends who have real knowledge about this point cannot discuss the problem because such would violate US Atomic Energy Act (used to include death penalty).

General conclusion was that weapons production from reactor grade plutonium is possible as far as science was concerned, while engineering of such exercise is uncertain. In 1977, the Carter Administration objected to operation of Tokai Reprocessing Plant (on the basis of Japan/U.S. Atomic Energy Agreement, while EURATOM countries were exempted from such limitation). I was sent to Washington D.C. to negotiate with Deputy Assistant Secretary Joseph Nye and an agreement was reached that the Tokai Plant will only produce U/Pu mixed oxide and not pure Pu. Thus, I have had more than one occasion to realize that

nuclear weapons technology belongs to very articulate know-how, which can make differences by how adroitly you manage your chopsticks. A lot of information available today through IAEA inspection results, satellite observation, etc. are reported in media can be subjected to all kinds of suspicion when these points are considered.

As long as the US does not explain details of weapons usability, peaceful uses can always be turned into military diversion. Japan's ratification of NPT (which she signed in 1970) was delayed till 1976, and the major reason was concern about freedom in peaceful uses. In addition to nuclear power generation at home, Japan was concerned that international competition for technology export may be placed at disadvantage compared to nuclear weapon states.

Germany had a similar concern and Japan and Germany worked together to modify IAEA Safeguards to be based on scientific and mathematical judgments and not on ad hoc international decisions. This took more than a year of international conference in Vienna (Germany's ratification was in 1975). One of the difficult issues was IAEA's right to conduct inspection without warning. It is interesting to realize that effects on peaceful nuclear activities of such inspections seem to be troubling DPRK and Iran today.

Ranges of Nuclear Weapons

Computer simulation of using 1 megaton nuclear weapon to metropolitan centers in USSR or US included calculation by US Congress Office of Technology Assessment in 1979 and covered Detroit and Leningrad. These data were included in the UN experts report on nuclear weapons made public in 1980. More impressive has been the result of one megaton explosion in New York City at the corner of Sixth Avenue

and 42nd st. at 12 noon. Range within which instant death and survivors are equal is called "death radius" and in case of one megaton, number is seven kilometer and will cover the Statute of Liberty, Columbia University, Queens and a part of New Jersey. When fire and fall out are included, radius of 15 km will be devastated, including the whole of the New York City and a large area of New Jersey. Calculations include fatality caused by blast, neutrons, heat wave, gamma radiation, and after effects. Millions will loose life or "dead while alive."

Outside of direct calculations, emergency aids will not find ways to the lying wounded. People will be left in destroyed buildings without water, food or electricity. Even if wounded can be carried out, where would one find hospitals, doctors and nurses where water, electricity and facilities for operations are available? In summer time corps will start to decay and spread epidemics. When all are considered the best means could be to burn the entirety with Napalm. This was such an overly pessimistic results that it is reported that its publication was withheld.

Fifty years ago, US H-bomb experiment at the Bikini Atoll produced very large destruction, which evaporated the atoll into a large volume of fall out, almost killed the test observers, contaminated Japanese fishing boat Lucky Dragon, contaminated the atmosphere and the entire ocean of the world within several days. Albert Einstein who had once written to President Roosevelt to initiate the Manhattan Project, joined with Bertrand Russell against both Atomic and Hydrogen bombs, starting the Pugwash movement (which later received Nobel Peace Prize). Weapons of unlimited destructive power were what Russell and Einstein opposed. In 1995 50th

Pugwash World Conference was held in Hiroshima, also in commemoration of the Hiroshima 50th year. On the other hand the world-wide campaign against nuclear weapons seems to have lost momentum.

Nuclear weapons of DPRK, Iraq, India and Pakistan, all motivated nuclear non-proliferation. With the end of the cold war, the COCOM arrangement which controlled technology export to the communist world had lost meaning. In place of that came non-export of technology to rogue states. Nuclear Suppliers Group was formulated in 1977 (as a result of Indian testing in 1974) as a supplementary arrangement by Western advanced countries to exercise self-control over export of nuclear material and nuclear reactors (9 items) reprocess, enrichment, heavy water plant (89 items). In 1992, as a result of Iraq nuclear activities, self-control was expanded from non-weapon states to the entire world, expanded the control list and demanded strengthening of IAEA safeguards, and recipients' commitment to non-proliferation.

Regarding chemical weapons and missiles, there is an Australian Group (1985), and Missile Technology Control Regime (MTCR, 1987) while conventional weapons are covered under the Wassenaar Arrangement of 1996. Japan is a party to all these arrangements. Simultaneously, (Japan's) Trade Control Act was amended to require that all weapons related exports to rogue states have to obtain export licenses (this approach is called the "catch-all" system). Kennedy School of Harvard University, meanwhile came to be concerned about the loose manner that weapons of mass destruction are being handled in the former Soviet Union, and worked to arrange for Cooperative Threat Reduction formula with budgetary and

other authorization from the US Senate (Nunn-Lugar Act), to which Japan is also cooperating.

It was reported in media that the IAEA inspection of Libya's voluntary submission has found Japanese technology to have been exported involving production of uranium fluoride gas in preparation of enrichment. This, along with German contribution to Iraq's enrichment, was before the rogue states proliferation became an important international agenda. In the 1970's, for example, URENCO wanted to export its centrifuge technology to countries like Japan, and the author was invited to visit their Almerio plant, which turned out to be a very interesting experience. Japan was then in the middle of developing her own centrifuge technology, and among the advanced countries international control on nuclear material and technology transfer, has not been very strict. It was after 1992 that MITI began the catch all and other export control of technology and asked for advice by the Industrial Structure Council (sangyo kozo singikai) National Security subcommittee for Trade Control Act amendment. The author served as chairman of the subcommittee.

Both the "catch-all system" and "rogue states" are terms involving delicate judgments in application of the law. It is much easier if countries in question will act like Brazil, Argentine, South Africa and Libya and of their own volition, give up nuclear weapons program, submit to the IAEA safeguards, and open up information. Through the Six Nations Conference and others, if DPRK would resort to such means, it would be the most desirable direction. Such would also help in obtaining cooperation by the nuclear weapon states on the over-all reduction of the world nuclear weapons level. ☞

New Progress with Japan's Pu-thermal Project: After 5 Years

- Construction of Tsuruga Unit No. 3 and 4 Agreed -

Following the press conference on March 15, with the announcement from Fukui Prefectural Governor Issei Nishikawa, agreeing to the use of MOX fuel (uranium and plutonium mixed oxide fuel) in reactor No.3 and No.4 at the Kansai Electric Power Co. Inc.(KEPCO)'s Takahama Nuclear Power Station, which had previously been a cause for serious concern, Governor Nishikawa and the Mayor Riichi Imai of Takahama City approved the use of the MOX fuel on March 20. It means that the use of MOX fuel in the light water reactors (a Pu-thermal project), which had been at an impasse since 1999, can now press ahead.

Modification of the inspection data for the MOX fuel planned to be used at the Takahama Nuclear Power Station came out at the MOX fabrication plant of the British Nuclear Fuels Ltd. in December of 1999. As a result of this, both the Pu-thermal projects at the Takahama Station, and also at the Tokyo Electric Power Co. Inc. (TEPCO)'s Fukushima Daiichi Nuclear Power Station (reactor unit No.3, loaded in 2000), and Kashiwazaki Kariwa Nuclear Power Station (reactor unit No.3, loaded in 2001), were brought to a halt. In order to prevent any reoccurrence of this type of events by overseas manufacturers, KEPCO has subsequently improved their quality assurance system, and those efforts have been recognized by the Ministry of Economy, Trade and Industry (METI), which is the national supervisory agency, and by Fukui Prefecture and Takahama City.

With this recent agreement of the local authorities, KEPCO will continue its Pu-thermal project by delivering 16 MOX fuel assemblies to the Takahama Nuclear Power Station in the year 2007 to load them into the reactor. We are expecting that this time will also present the chance to move forward on the Pu-thermal projects at Fukushima and Kashiwazaki Kariwa also.

In this country, there still are people who worry about safety of using MOX fuel, but at the end of year 2002 about four thousand MOX fuel assemblies were used throughout the world for nuclear electricity generation (see Graph). In the graph, you can see that in the past only six MOX fuel assemblies were used in commercial light

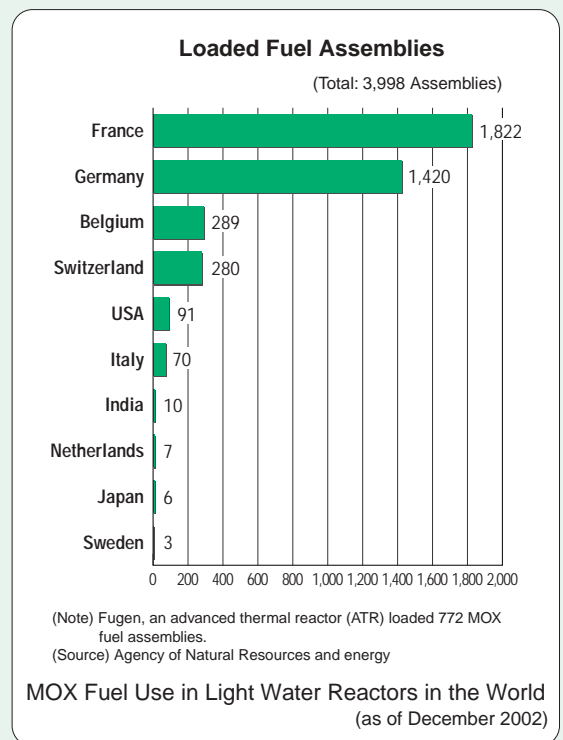
water reactors in Japan, but practically in the Japan Nuclear Cycle Development Institute (JNC)'s Advanced Thermal Reactor (heavy water moderated and light water cooled prototype reactor) 'Fugen' at Tsuruga City in Fukui Prefecture, we have thus far used 772 MOX fuel assemblies, and the record compares well with that of any other country you care to name. Also, in power reactors which use only uranium fuel, a part of uranium converts into plutonium during the three to four years while the fuel is burnt, and a part of the plutonium burns in turn. Thirty per cent of the total electricity generated comes from that plutonium burning. Fuel assemblies which are made from only uranium are thus actually converted into MOX fuel by the time they have been combusted and removed from the reactor core.

At this press conference, together with the agreement to allow the use of MOX fuel at the Takahama Power Station, there was another agreement to the construction of reactor units No.3 and 4 at the Japan Atomic Power Co.'s Tsuruga Power Station. Both of the new reactors will be 1,538 MW advanced pressurized light water reactors (APWRs). They will be of the largest capacity nuclear reactors in the country. Construction works of both units will start in May 2007, and No.3 reactor will begin operating in March 2014, and No.4 in March 2015. The total construction cost will be 770 billion yen, which comes to about a quarter of a million yen per kW. At the press conference, the governor noted, "I would like to confirm that construction works will go ahead steadily according to the planned schedule."

One more thing concerns the start of improvement on the Prototype Fast Breeder Reactor 'Monju', which was expected to be announced positively this time. However, the governor's reply at the press conference was that 'At the present time we are not in a position to make a judgement on that.' In spite of the

national government's approval of that improvement work, this is equal to a 'No' from Fukui Prefecture. His given reason was that it is necessary to ascertain whether the improvement work would be beneficial to the people of the Prefecture, and whether it would be in line with the Prefecture's development. Big factors in this are the construction of the Hokuriku Shinkansen high-speed rail link, which has become a cause for concern, and the vision for a complex of institutes for research and development in Fukui Prefecture.

The 'Monju' plant, which caused an accidental sodium leakage on December 8, 1996, appears to be not yet at the stage where improvement works can even begin, although almost eight years have already gone by. Maintenance costs for 'Monju' are said to reach 10 billion yen per year. We have heard from a person of a private company that they can not help hesitating to search a candidate site for their research facility in Fukui Prefecture, because even a national research facility has to experience such situation... Anyway, we await the local agreement on the start of the improvement of 'Monju' at the earliest possible date.



冥王星 ④③

(Pluto)

Urns

Shigeru Goto



"Is this a candy pot?"

When my friends see one of the several ceramic pieces lined up in the living room, they all ask this question.

"Candy pot? Is that what it looks like to you? This is actually a pot for saving small change."

"It is quite small. You're not a real money grabber."

"No, it is actually quite big for its purpose."

The pot is empty. It is around 10 centimeters high and round. It is Hagi-ware with a red tinge.

It must be around 3 years ago now. Ceramic artist Ryuho Harada sent me an invitation to his exhibit.

The yellow-green thread like branches hanging from the Ginza willows waved and flapped their thin leaves in the breeze. The gas lamp, restored from Meiji Period near the Sukiya-bashi was softly lighting the evening street.

The exhibit was on this street, and its contents all quite high in price. "That guy, he's sure acting the major artist."

I muttered softly to myself as I looked at bowls, earthen slabs and vases. My eyes chanced to stop at

some lidded pots. I turned back to Harada to ask him what they were, and he whispered in my ear, "urns."

"They are quite popular," he said, his nostril twitching.

From his expression, I felt him holding back the words, "why don't you buy it?" and admired him for his tact.

"The large one is ¥50,000 and the small one is ¥25,000."

"Alright, make me the small one then. Make me two."

Six months later, I was going through a busy end of the year and had forgotten all about the urns when they arrived with around 10 yuzu oranges and the following letter:

"The yuzu tree near the ceramics oven bore much fruit this year, although they are not perfect in shape."

They were beautiful art pieces that did not look at all like urns. With the faint smell of yuzu wafting from them, they gave my heart peace.

Our final abodes were done. I called my wife. We both hugged our urns for the first time, rubbing and caressing them. They were warm to the touch.

Yuzu trees are overflowing with

their yellow fruit in the old homes.

(Shiki Masaoka)

Our backyard used to have two yuzu trees. They were old trees given to my father and every year at the beginning of summer, they were covered in pretty white flowers and made my mother, who loved citron baths, happy. Gazing at a citron fruit with a leaf still attached to it, the faces of my father and mother came to mind.

I had never really cared about the kind of dishes we used every meal, but recently when I visit a store, I sometimes go up to the many small dishes haphazardly put on the shelves and end up buying one, drawn by the simple designs.

For this reason, none of the dishes or bowls form a set in our home. And the Hagi-ware urns fit right in with these as a pair. This point makes me especially happy.

I think I remember an Edo yarn "If I am dead, let me know." Issei Nakagawa, an oil painter who passed away at 97, wrote the following poem in his latter years:

"I sometimes look in the obituaries of the newspaper to clarify whether

I have not died."

Maybe it is because of age, but I deeply empathized with the painter, and my eyes are also drawn to the obituaries whenever I open a newspaper.

The other day, I had something to look up so I went to the parliamentary library. Looking at the reduced editions of the Asahi Newspaper, the following two-lined header caught my eye: "Mizumaro Ishida, researcher of the Jodo sect (Buddhism) and author of "Disappear quietly" passed away." The article was dated February 17, 1989 and said, "It was found out that he passed away of old age last November 17 at 82. By his own wishes, there was no funeral, and his death was kept secret." Thus, the three month delays in reporting the death.

Turning the pages further, on the same newspaper dated March 4, Nobuo Sugawara had sent in the following memorial:

"This is a person who wrote the modern version of Ohjohyohshuh (Collection of Essential Passages Concerning Birth in the Pure Land) by Genshin, and a person who researched all there was to know about life after death. That this person would leave instructions "No funeral or grave necessary," has deep meaning. (Eye of the Journalist; View of Afterlife by Mizumaro Ishida.)

Talking of Mizumaro Ishida, a long time ago, I was moved reading "Discussions with Shinran." It was due to this book that I went on to read "Tan-nisho" (Notes Lamenting Divergent Views).

"Shinran wanders from place to place without one disciple."

This Shinran journeyed to the capital after 70 years of age. He fled the temple, and just walked continuously intoning the Buddhist invocation

without a disciple. Mizumaro Ishida, who was drawn to Shinran, must have applied Shinran's teachings to his own bequest.

"It is said that graves with grave stones were first built in the mid Edo period, after the popularization of the Buddhist parishioner system. It was only from the Meiji Era when the house and state were tied together that people began to keep graves dating many generations." (Nikkei "Culture Watch")

In other words, other than ancient burial mounds or graves of famous historical persons, the only proof of eternal rest among the common people was some rocks on top of a mound of earth, or a most humble stupa where there was no way of knowing who it might have been built for. These then are beaten by the wind and snow and disintegrate, going back to nature.

Yasuzauemon Matsunaga, who was called the fiend for electric power development, left the following will.

"As I have said numerous times before, I achingly dislike all rituals to do with the dead such as funerals and Buddhist sermons and do not want any sort of stone or sermon. I hate incense. I donate my home, art, all furniture and appliances to the memorial museum. I also do not want any posthumous Buddhist name."

Mr. Seiichi Tanaka (former Chairman of Chubu Electric Power Co., Inc.), who was left in charge of the Will wrote about his endless memories of the older man as follows: "As per the will, we did not conduct a funeral. According to his wishes, we placed him in a grave with only a round stone on the mound. Next to him already was his wife Kazuko. (Autobiography "Low-out")

"Leaving wealth after death is what the wise do not do."

(Tsurezuregusa)

Jusaburo Ono also spoke his strong wish for "no memorial service but a private funeral by family members only." The poet Michio Kambayashi speaks of this scene as follows:

On either side of a simple picture of Mr. Ono smoking a cigarette were handshaped vases by Mrs. Sueko Ono, whom Mr. Ono always called "Okahchan (Mom)!" in a big voice. These vases were full of flowers. Under these was a white coffin. Around the coffin as well, the children had put various things such as beautiful flowers and fruits. In accordance with Mr. Ono's non-religious wishes, it was a simple but warm altar. On the wall was a picture of Guernica, and the long plaque of "Lightning storm splitting trees" drawn by Mr. Ono was still hanging. ("Parting from Jusaburo Ono," Nihon Keizai Shimbun)

There are many famous people who also chose a natural burial in the world. Albert Einstein, the physicist, is one of these, and it is said that the ashes of Edwin O. Reischauer, the former U.S. Ambassador to Japan were scattered in the ocean and mountains.

It was former Chinese Premier Zhou Enlai whose ashes were scattered all over China through his will "lay my bones in the mountains and rivers of my homeland." Deng Xiaoping, who wrote "scatter my bones in the ocean", is in the Shanghai Ocean. Since then in China there has been a sudden surge in people who wish for their bones to be scattered in the ocean or among the trees (roots). The seashore has created civilization and culture, and the ocean has spread these. I would also like to return to Mother Sea.

I have often said that I will not have a funeral. I wish only for a farewell by family members. I am happy if only they would decorate the urn with some white and red flowers. On the wall, I would like them to put the picture "crape myrtle" by Yasuo Kazuki the soul painter, which I love. Don't forget my favorite Mont Blanc pen and my works. And don't laugh if there is one of my water colors, which I started to paint after getting on in years.

It would be the best if you would let me hear the CD by the pan flautist Hidenori Iwata. The pieces in Pan Flute Fantasy: Life, Prayer and Wind are my favorites.

Humanity has created civilization on the shore, and the waterways have spread cultures. I would like to have by bones scattered in the ocean. Harimanada, where I used to fish, swim, row boats and play would be best.

"In the olden days, there was a time that old people who were not able to do much anymore would be put in a basket and taken to the mountains to be abandoned." (old story in Japan)

Gradually there are less people who have the memory of being told the old stories of The Inch-high Samurai or Urashima Taro by their grandmothers and drifting off into a deep sleep where a wonderland awaited.

Today is the coldest day of winter. Peeking into a bookstore on the way home, I was drawn by a new book called "Ryo-kan of the Wind" (Koji Nakano, Bunshun Bunko).

"I put my feet by the smoldered fire and lie down, but tonight's cold is seeping into my bones."

Imagining Rho-kan bearing the cold Echigo (now Niigata) winter in a shed with only a rush mat on a wooden floor, I read through the book without

stopping. I felt the nothingness and the emptiness of Ryo-kan's heart seeping into my own.

Ryo-kan is said to have loved Dohgen, Lao Tzu and Chuang Tzu. Koji Nakano refers to these, giving a translation of the poem by Lao Tzu, "Michi wa munashikimo, kore wo mochiureba mata mitazu. En toshite banbutsu no so taruni nitari" by poet Shozo Kashima:

A piece of pottery is made from softened clay.

The inside has been carved out and it is empty.

With an empty part to it, the pottery is finally of use.

If it was full of clay, it would be of no use.

The urns are also made from softened clay. The insides are empty. I have told my family that only two or three pieces of bone should be kept. I have been allowed to live for a long time on this Earth. I would feel bad continuing to take up space after I am dead.

There is no "rule" that the cremains have to be buried. Therefore, I chose a small urn that can be put anywhere and will not take up space. I have told my children that because it is a Hagiware artwork, I would be happy if they would use it as decoration on a shelf or something.

The religious scholar Tadao Fujii (Professor of Taisho University) has divided human views on the afterlife into two. The first is the straightforward view that life is the period between birth and death. There is no reason for a funeral and if one is held, it is a memorial service emphasizing the parting. The other is the "circular view of life" where there is belief of an afterlife. A funeral becomes the passing gate into nirvana, and the Buddhist sermons conducted on the anniversary of death are made in

prayer that the dead would be at peace in the afterlife." (The stultification of funerals, Yomiuri Newspaper) Recently, he says that views on the afterlife have become rare, and people have begun leaning strongly toward memorials.

It is said that Chomin Nakae was the first to be given a memorial service in Japan. Relatives, baffled over the will "Funeral not necessary," and friends such as Taisuke Itagaki, thought up the memorial service as a gathering to part with the deceased that was not dependent on religion.

Life's titles disappear in death. As to the memories of close friends, quoting from a poem by Ryo-kan translated by Koji Nakano:

Words disappear into the wind and clouds

Voices dissolve and flow into deep waters.

I could not even imagine sitting down and seriously talking about my own philosophy and view of afterlife, and I don't think I have the talent to write poems about death. So I just wish to quietly begin my journey.

I am guessing that the urn-keeping (rather than grave-keeping) will only last until my grandchildren's generation. The urn will break one day and go back to earth. I would be even happier if it has become the candy pot for my great grandchildren.

The poet Sumio Mori has said: "air is the great nature that enfolds our lives."

Air.

A small light silently goes out. The wind blows it back into the great nature.

The spring mountain, I bury the dead, feeling empty. Kyoshi

(Former Member of the House of Representatives)

Cutting of Nuclear Power Plant Construction Program Increases CO₂ Emissions

Agency of Natural Resources and Energy of the Ministry of Economy, Trade and Industry announced on March 31 the power supply program for new nuclear power plants starting operations in next ten years until the end of fiscal 2013 (March 2014) as many as 11 nuclear power plants generating 14,560MW of electricity. If this aim is achieved, we can expect the ratio of nuclear power installed capacity to the total capacity - now 19.5 % (as of end of March 2004) - to increase to 23.0% and the percentages of nuclear generated electricity to reach 40.4 % by the end of March 2014. Under this program four reactors are cut from the original which was released in March 2003. One of the reasons for the cutting of this power supply plan was that power companies were postponing their power plant construction due to sluggish growth of electricity demand and the liberalization of the power industry, which led to holding off of capital investment by each electric power company.

In accordance with the Kyoto Protocol for prevention of global warming, Japan's goal is a 6% reduction from the 1990 amount of CO₂ emissions by 2010. The government then needed to increase the number of nuclear power plants by 30% compared to the year 2000 in order to attain this goal. They planned to construct 10-13 new nuclear power plants by 2010, thereby decreasing the amount of CO₂ emissions by close to 100 million tons.

The new power supply plan includes only 6 new nuclear plants with approximately 7,000MW installed capacity by 2010 which is a large scale reduction from the former plan even including Onagawa Nuclear Power Station Unit-3 which began operation in January 2002.

According to the estimate by the Ministry of Environment, there will be four nuclear power plant worth of nuclear electricity less than the former government's goal and if we assume that these four nuclear power plants are exchanged for thermal power generators, CO₂ emissions would increase by an additional 20-30 million tons, increasing Japan's national CO₂ emissions by 1.5% - 2.3 %. The cutting of the nuclear power development program will necessitate Japan's immediate countermeasures toward global warming.

According to the U.S. Department of Energy's International Energy Outlook 2004 released on April 14, the worldwide

long-range energy forecast is an annual energy consumption increase of 54.2 % in 2025 compared to 2001 due to the rapid increase of energy consumption by China, India and other developing nations. It is also estimated that annual emissions of CO₂ will increase by 55.3 %. It will probably become necessary to consider the construction of nuclear power plants, which do not emit CO₂ in operation, in developing nations as well. For this purpose, there is an urgent need for countries such as Japan to take the initiative and develop and supply safer and simple operation and maintenance-free nuclear power plants such as small reactors.

Nuclear Plant Construction Program in FY*2004

Owner Company	NPS	Output (MW)	Construction Start	Commercial Operation	Status
Chubu	Hamaoka-5	1,380	Mar. 1999	Jan. 2005	Under Construction
Tohoku	Higashidori-1	1,100	Dec. 1998	Jul. 2005	Under Construction
Hokuriku	Shika-2	1,358	Aug. 1999	Mar. 2006	Under Construction
Hokkaido	Tomari-3	912	Nov. 2003	Dec. 2009	Under Construction
Tokyo	Fukushima-1-7	1,380	Apr. 2006	Oct. 2010	
5 reactors: Total		6,130			
Chugoku	Shimane-3	1,373	Mar. 2005	Mar. 2011	
Tokyo	Fukushima-1-8	1,380	Apr. 2006	Oct. 2011	
EPDC**	Ohma	1,383	Aug. 2006	Mar. 2012	
Tokyo	Higashidori-1	1,385	FY 2006	FY 2012	
JAPC***	Tsuruga-3	1,538	FY 2006	FY 2013	
Chugoku	Kaminoseki-1	1,373	FY 2008	FY 2013	
11 reactors: Total		14,562			
JAPC	Tsuruga-4	1,538	FY 2006	FY 2014	
Tokyo	Higashidori-2	1,385	FY 2008	in/after FY 2014	
Tohoku	Namie-Odaka	825	FY 2010	FY 2015	
Tohoku	Higashidori-2	1,385	in/after FY 2010	in/after FY 2015	
Chugoku	Kaminoseki-2	1,373	FY 2011	FY 2016	
16 reactors: Total		21,068			

* FY: The Japanese Fiscal Year (FY) starts in April and ends in March of the following year.

** EPDC: Electric Power Development Co., Ltd.

*** JAPC: The Japan Atomic Power Co., Ltd.

Editor's Postscripts

❖ The double-flowered cherry blossoms and dogwood flowers are beautiful now in Tokyo (April 20). However, although it is April, daytime temperatures are as high as midsummer, making it hard to keep up with our wardrobe. Last summer was cool, but this year may turn out to be very hot. The Tokyo Electric Power Co. was saved by the cool summer last year when all 17 of their nuclear power plants stopped temporarily. They say that they will have sufficient supply of electricity to handle a hot summer this year. A nuclear power plant that which doesn't generate electricity is only a useless

building. It is our hope that operations will be maintained.

❖ We have heard that because of a decrease in Japan's population, energy demand can be expected to decrease, making nuclear power unnecessary in the long run. Really? Have the two oil crises been forgotten? The 3rd oil crisis will not come suddenly but gradually through repeated ups and downs in oil price which are expected to become chronic. Is it really safe to decrease nuclear electricity generation? It would be wrong to base nuclear energy policy on likes and dislikes.

❖ Improvement of the prototype fast breeder reactor "Monju" can not be started. There is something strange about the structure where the good of the local community takes priority and the national budget is wasted as a result. Not only are our taxes being wasted but also the incentive of excellent research scientists. Monju, an internationally rare research facility, is an important facility toward international cooperation only if it is in operation. Let them at least get on with its improvement.