Japan's Atomic Energy Policy: The Structure of Changes and Consistency*

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This paper attempts to explain the nature of changes and consistency in Japan's nuclear policy since the mid-1990s. Past studies have observed remarkable consistency in Japan's nuclear policy, with the ambitious nuclear fuel cycle program being at the center. Such consistency was attributed to the close industry-state collaboration and the insular nature of the policy community. They also explain the recent changes in the plutonium program with the erosion of its economic rationale, weakening of the state-industry collaboration, and anti-nuclear forces' penetration into the policymaking process. Despite setbacks, however, the nuclear fuel cycle program firmly remains Japan's long-term policy goal. This paper puts forward a hypothesis to explain this consistency -- Japan's desire to maintain the nuclear option. Japan wishes to leave the possibility of nuclear armament open for the future, while officially advocating the peaceful use of nuclear energy. The dual nature of plutonium makes it possible.

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INTRODUCTION

This paper is about Japan's nuclear policy and its nuclear fuel cycle program, with an emphasis on the commercialization of plutonium in particular. It focuses on the policymaking process and structure within which the policy is formulated and implemented. Japan's nuclear policy is a sensitive subject surrounded by controversies not only within Japan, but also in the international community. Outside Japan, particularly among its rivals and neighbors, interests surrounding Japan's nuclear policy are substantial in amount politically, economically, and militarily.

Japan is the only country in human history that had suffered from the horrors of nuclear warfare. Quickly putting its experiences behind, however, Japan started to develop policies to use its nuclear energy for civilian purposes ever since the Eisenhower's declaration of the Atoms for Peace Program. It is now one of the largest civilian nuclear powers in the world.¹ This paper attempts to explain the nature of changes and consistency in Japan's nuclear policy since the mid-1990s with a focus on the nuclear fuel cycle program—what the exact nature and causes of such changes are, and what makes its nuclear policy consistent.

Many studies on Japan's nuclear policy have observed remarkable consistency until the early 1990s. Samuels (1987) observed that there existed continuous conflicts, negotiations, and compromises between the utilities which had control and the state which had jurisdiction over the nuclear industry, but the outcome was a stable and consistent nuclear policy based on "reciprocal consent" between the two sides. Dauvergne (1993) was interested in anti-nuclear forces as they had bearings on the economic aspect of nuclear power. He agreed with Samuels in that there was an industry-state collaboration in nuclear energy, but saw even less conflicts, within the policy community, particularly among the government agencies. He observed that although the opponents of nuclear power had an undeniable impact on decisions and market outcomes, they had little impact on the overall direction of the policy.

Donnelly (1993) observed a high degree of consistency in Japan's nuclear policy formulation as it was insulated from political and societal pressures. However, he depicted a much more complicated and messy picture in the implementation/management stage of the policy mainly due to the popular opposition against the nuclear power. Donnelly observed that the nuclear policy community might be more fragile in the implementation stage and predicted that the consistent and stable nature of Japan's nuclear policy could change drastically by some accidents or mishaps. Cohen and others (1995) argued that Japan's nuclear policy has been consistent because the policymaking process is relatively streamlined with few veto gates and had few access points for anti-nuclear forces, compared with other Western democracies. He attributed this to the institutional, and structural features of the policymaking system formed under the longtime LDP rule.

From the mid-1990s, Japan's nuclear policy (especially, its nuclear fuel cycle program) started to show some signs of change, starting with the 1994 Long-term Program which

¹ See Mounfield (1991), 41–42 for an international comparison.

scaled down the previous plutonium demand-supply projections. Then, there were major accidents in the Monju Fast Breeder Reactor and the Tokai reprocessing plant that profoundly affected the nature of Japan's nuclear policy surrounding the nuclear fuel cycle program and the commercialization of fast breeder reactors (FBR). After the accidents, there were some major adjustments made in the nuclear fuel cycle program such as the delay in not only commercializing FBR, but also in constructing the second Rokkasho reprocessing plant, as well as the shutdown of the Advanced Thermal Reactor (ATR), Fugen. Further readjustments of the plutonium program seemed inevitable.

Despite many setbacks mentioned above, consistency is still found in Japan's nuclear policy. The 1994 Long-term Program certainly slowed down the nuclear fuel cycle. However, it is not a fundamental shift in policy direction. The use of plutonium as an alternative fuel source still remains a major part of Japan's long-term nuclear policy. In early 1997, MITI reconfirmed that the nuclear fuel cycle program still remained as the national policy. In 1998, Japan's first spent fuel shipment was made to Rokkasho plant, to be reprocessed into plutonium. It is considered to be the first step toward the establishment of the domestic nuclear fuel cycle. Japan's intention to keep the cycle running is still strong.

As the economic rationale behind the nuclear fuel cycle program has been continuously eroded over the years, the collaborative ties between the state and industry have weakened. The program seems to have lost its economic merits from the industrial point of view, while the government seems determined to press on. In addition, anti-nuclear forces have managed to penetrate into the policymaking process. Such developments can be attributed to the adjustments and changes in the plutonium program. This paper confirms the findings from the previous studies in this respect. However, they focus their attention only on the economics of nuclear energy, and do not provide any explanations for the consistent nature of Japan's nuclear policy.

In an attempt to explain the consistency, a hypothesis is put forward: the military aspect of Japan's nuclear policy, with its desire to maintain the nuclear option, is an important factor that keeps the nuclear fuel cycle program going as the long-term national goal. It is not just the economic calculations alone that make up Japan's nuclear policy. The nuclear fuel cycle program is both economic and military in policy. As far as the use of plutonium is concerned, the two dimensions are inseparable. In this era of changes and uncertainties within the economics of nuclear energy, what renders Japan's nuclear policy consistent in the form of the nuclear fuel cycle program is its military aspect, namely, the nuclear option. Japan wishes to leave the possibility of nuclear armament open for the future, while officially maintaining the policy of peaceful use of nuclear energy. The dual nature of plutonium makes it perfect for such a purpose.

In order to address the issues raised above, this paper deals with the economic aspect of Japan's nuclear policy as well as the problems and challenges it faces. The paper briefly touches on the earlier developments of nuclear power industry, but concentrates on the events that occurred in the 1990s. Then, it turns to the military aspect of the nuclear policy: the American nuclear umbrella, the Non-proliferation Treaty, and the debates surrounding Japan's nuclear option.

This paper does not discuss, in detail, the domestic or international circumstances that may push Japan to nuclear armament. Most observers agree that Japan is likely to go nuclear if the U.S. nuclear umbrella is removed without any alternative security arrangements. There are two hypothetical situations. First, Korea may one day become unified and nuclear-armed. Second, the U.S. may completely withdraw from Asia while China aggressively pursues regional hegemony. Speculating Japan's response in these circumstances is beyond the scope of this paper.

ECONOMICS OF NUCLEAR ENERGY IN JAPAN

Nuclear Power as an Alternative Energy Form

The economic dimension of Japan's nuclear policy is concerned with the civilian use of nuclear energy. The basic tenor of Japan's nuclear energy policy is simple and logical. Japan is very poorly endowed with energy resources and extremely dependent on foreign energy imports, most notably petroleum. Japan depends over eighty percent of its energy on the foreign sources, and ninety-nine percent of its petroleum demand is met by imports. The share of petroleum in Japan's energy supply is nearly sixty percent which is the highest among the Organization for Economic Co-operation and Development (OECD) countries. The Japanese perceive this extreme dependence on foreign energy to be a critical weakness of their economy, vulnerable to changes in the international energy market and political instability.

Therefore, considering the ever-increasing energy demand for continued economic growth and higher living standards, it has been a top priority for postwar Japan's policymakers to reduce dependency on the imported energy and to secure an economical and stable alternative energy source. They subsequently decided that, among the conceivable alternative energy forms, nuclear energy was most practical, efficient, and stable, and therefore the most suitable source of energy for Japan in the future. The incentive for extensive development and use of nuclear energy was tremendously reinforced by the Oil Crisis in the 1970s.

Japan's energy policy thus places nuclear energy at the center of its plan in order to develop alternative energy forms into fossil fuel. As such, "the civilian use of nuclear power is central to the viability and direction of the nation's entire economic strategy" (Donnelly 1993, 179). Countries that lack fossil fuel tend to concentrate their efforts on developing nuclear energy. For instance, France, having relatively smaller fossil fuel deposits and being disadvantaged for hydropower generation, is by far the most active promoter of nuclear energy. Share of nuclear energy in such countries as France, Switzerland, Japan, and Korea is very high.

Particularly, Japan has been notable with its rapidly expanding nuclear power generation capacity, while the growth of nuclear industry in other advanced countries has been stagnant at best. In fact, Japan has the world's most ambitious plan for nuclear energy development, which is laid out in the Long-term Program for the Development and

Utilization of Nuclear Energy. The program was first issued by AEC in 1956 and the eighth revised version was put out in 1994.

In 1992, Japan had forty-two reactors operating with a total capacity of 33,404 million kW. As of 1998, it had fifty-one reactors with a capacity of 44,917 million kW, and is expected to have seventy-two reactors with a total capacity of 70,779 million kW by the end of 2010. This is the third in the world after the U.S. and France (Genshiryokusangyokaigi 1993b, 59; Shigenenerugicho 1998). Share of nuclear power in Japan's total electricity supply was 2.4% at the time of the first Oil Crisis. In 1991, the share was 27.1%, by the end of 1990s, thirty-nine percent and by 2010, it will reach forty-three percent. The share of petroleum in total electricity will drop from thirty-four percent in 1988 to fifteen percent in 2010. Share of nuclear energy in Japan's total energy supply was nine percent in 1988; it is expected to be 13.2% in 2000 and 16.7% in 2010 (Donnelly 1993, 185-86; Genshiryokusangyokaigi 1993b, 16-17).

Japan's research and development in nuclear technology also made remarkable progress. In the early stage of nuclear development, Japan had the so-called, "hitchhike" strategy. It would have been enormously costly and time-consuming for Japan to develop its own nuclear technology from scratch. Therefore, Japan was very efficient and effective in importing technology through various cooperative arrangements at relatively low costs and improving it. Japan applied its machine and electronics technology to nuclear industry (i.e., the enrichment and reprocessing facilities). It raised reactor technology up to the most advanced level in the world through the development of various types of reactors. Japan's nuclear technology, construction, equipment, and operational know-how are among the most advanced in terms of safety and efficiency.

Nuclear Fuel Cycle and Plutonium Program

At the center of Japan's ambitious nuclear energy quest lies the nuclear fuel cycle program, establishing fully autonomous nuclear fuel cycles by reprocessing spent fuel and using recovered plutonium in fast breeder reactors, which in turn generate more plutonium. It is based on the policymakers' strong conviction that the plutonium program will ensure energy security. The Atomic Energy Commission (AEC), responsible for developing the nation's long-term nuclear energy policy, first conceived a plan to develop FBR in 1956. In the 1960s, FBR and the plutonium program became pillars of Japan's nuclear energy policy. In 1967, the Power Reactor and Nuclear Fuel Development Corporation (PNC) was set up to implement the plutonium and FBR program.

The most widely used nuclear reactor type in the world is light water reactor (LWR). Most of Japan's reactors belong to this type. Light water reactors (LWR) use fuel U235, the only fissile material in nature. Natural uranium contains only 0.72% of U235 and over ninety-nine percent is U238. Nuclear fuel fabricated with uranium contains both elements. When collided with neutrons in the reactor, U235 will start nuclear fission and generate energy, while U238 will turn into Pu239, another highly fissionable material. Pu239 can be stored, or reprocessed to extract Pu239. Fast breeder reactors (FBR), while burning plutonium as fuel, can also breed plutonium from the U238 blanket, loaded in the reactors.

Since natural uranium is over ninety-nine percent U238, reprocessing spent fuel has tremendous merit in terms of efficiency. It is said that FBR can enhance the efficiency of the nuclear power generation by 120 times compared with the conventional LWR.

Japan's nuclear establishment had based its rationale for the plutonium program on economic and technological merits. It was to be the most efficient way to use nuclear energy. According to a proponent of the plutonium program, the U.S. had less incentive, to commercialize plutonium because of the availability of other energy sources and the stagnant electricity demand in the 1970s. In Japan, the demand for electricity continued to increase due to continued economic growth. Since Japan has no uranium deposits, it naturally looked for ways to use plutonium (Suzuki 1996). The government argues that, in the long run, low pricing of uranium is not guaranteed; the confirmed estimate of 3.4 million tons of the world's uranium deposits would not be sufficient enough to meet the demands after 2005 at the current price. It contends that a plutonium-based nuclear program is absolutely necessary for Japan and the only way to reduce its energy dependence on external sources (Ministry of Foreign Affairs, February 1992; Gaimusho, January 1992).

Arguments have also been made recently that using plutonium is environmentally more plausible because it can reduce pollutants (such as carbon dioxide, or sulfur dioxide) emitted from the thermal power generation, which causes air pollution, acid rain, and global warming. Reprocessing spent fuel is said to solve the problem of storing it from LWRs. Plutonium has additional economic advantages (considering the cost of treating pollutants), according to these arguments (Suzuki 1996).²

The Seventh Long-term Program of 1987 declared that through the active use of plutonium and the development of new types of reactors, Japan would reduce its external energy dependency and maximize the efficiency of nuclear energy use. In 1991, the Atomic Energy Commission issued a report which presented a projection that Japan would use eighty to ninety tons of plutonium by the year 2010 (Genshirōkokuinakai Kakunennryo Risaikuru Senmonbukai 1991, 9-12).

According to this report, FBR Joyo and Monju would consume ten tons of plutonium from 1991 to 2010, other FBRs ten to twenty tons, Advanced Thermal Reactors (ATR) Fugen and Ohma ten tons, and LWRs would use fifty tons as Mixed Oxide (MOX) fuel. Experimental FBR Joyo started the operation in 1983 and construction of prototype FBR Monju started in 1983, which was in test operation phase at the time of the report. The plan expected a full commercialization of FBR by 2010. Prototype ATR Fugen's operation began in 1979 and demonstration ATR in Oma is to start its operation in 2001.³

To meet the demands, domestic reprocessing facilities would supply fifty-five tons of plutonium by 2010: five tons to be extracted at Tokai plant, and fifty tons at Rokkashomura facilities, which would reach full-scale operation around 2005. Thirty tons would be

² For arguments against this line of reasoning, see Fukunaga (1993).

³ Monju started operation in August 1995 but has been shut down since December 1995 due to an accident. In 1994, Joyo changed its design to one that does not require the U238 blanket. Therefore, it does not breed plutonium.

supplied by overseas contractors: Cogema's La Hague facility and British Nuclear Fuel's Sellafield facility. The Atomic Energy Commission (AEC) projection maintained that demand and supply would be balanced and there would be no surplus of plutonium accumulating in Japan.

This is the world's most ambitious nuclear fuel cycle program. According to Donnelly (1993, 179), "Nuclear Quest is underway (in Japan), framed by the bureaucratic, political, technocratic, financial, and corporate elite, to create a complete Japanese fuel cycle and thus virtual national independence in all aspects of the nuclear power generation." This ambition to use a massive amount of plutonium is, however, a highly controversial issue both in and out of Japan. The material is highly toxic and a potential environmental disaster. More importantly, it can be easily converted into military use. In the early 1970s, many countries tried to develop FBRs. By the mid-1980s, most of them decided to either abandon or indefinitely postpone their FBR programs due to technical, economic, and political difficulties. The U.S. abandoned its FBR project in 1983. England's prototype FBR had an accident in 1991 and permanently shut down in 1994. France, a most enthusiastic developer of FBR, recently suspended the operation of Superphenix as a breeder. The German plan for FBR development was discontinued in 1991. However, Japan has demonstrated remarkable persistence and determination to continue with its plutonium program despite similar obstacles. In the next section, we will examine Japan's policymaking structure in which Japan's nuclear policy is formulated and implemented, and consider the factors that contribute to its consistency and stability.

Political Basis and Policy Structure

The most advanced countries with nuclear power have been facing some serious political difficulties in expanding their capacity, and in some countries they have been decreasing. Many countries are experiencing frequent confrontations with the environmental groups, residents of plant sites, and other pro- and anti-nuclear groups surrounding the nuclear power plant construction. Time taken for constructing nuclear plants has been lengthened considerably due to complicated legal procedures and often prolonged litigations. As a result, nuclear energy has lost its appeal, both politically and economically (Burton 1990, 227-28; Jasper 1988; Campbell 1988). The situation forced many governments to make fundamental changes in their policy, drastically scaling down their nuclear programs and often cancelling major projects. Until quite recently, Japan was an exception. The following produces some explanations for the consistency in Japan's nuclear policy.

Japan's nuclear policy was set up on a firm political ground as it enjoyed the support of major political figures. Nakasone, who has been one of the most active Japanese politicians in promoting nuclear energy development, was instrumental in legislating the Atomic Energy Basic Law, (initiated in 1966 a plan for FBR development and fuel cycle program) and in advocating the possession of defensive nuclear weapons in the defense white paper issued during his tenure as Defense Agency director. Most of the other postwar prime ministers (such as Kishi, Sato, Fukuda, Ohira, and Suzuki) have also supported the idea of the autonomous nuclear fuel cycle (Kim 1996, 101-2).

In the 1950s, the politicians and the utilities created a nuclear policy community that was very clearly defined and insulated from political and societal pressures (Donnelly 1993, 186-191; Samuels 1987; Dauvergne 1993). Laws, regulations, and other institutional arrangements were set up to facilitate nuclear programs, reflecting, to a large extent, the interests of the utilities. Policymaking authority was concentrated around the Science and Technology Agency (STA) and the Atomic Energy Commission. The commission was charged with formulating long-term policies for nuclear development. Ever since its inception in 1956, AEC had the goal of establishing an independent nuclear fuel cycle program. The plan for an autonomous nuclear fuel cycle was adopted in 1967, and PNC was created under STA jurisdiction to implement nuclear fuel cycle program and FBR development program.

The politicians and utilities intended to keep nuclear policymaking out of the reach of MITI. However, it was only natural that MITI became involved in nuclear policy from the industrial policy perspective. Ministry of International Trade and Industry (MITI), through the Agency for Natural Resources and Energy, manages and regulates the physical aspect and commercialization of nuclear power. Although there were disagreements concerning the details of nuclear programs and conflicts over the control of the industry between STA and MITI, they have largely been united with the utilities in the general direction of nuclear policy, reducing dependence on foreign energy imports by promoting nuclear energy as an alternative. According to Dauvergne (1993, 590), there was a high degree of cooperation and consensus between the state and the industry.

Donnelly (1993, 190) observed that "extraordinary efforts [were] made by pro-nuclear forces to keep policy issues defined as technical and so best left to the informed judgements of a limited number of qualified experts" and the institutional arrangements reflected that intention. In addition, the long-term LDP rule and the nature of the political system shaped the policy institutions in such a way that the policy process was streamlined with fewer veto gates to pro-nuclear forces while opponents of nuclear power had more limited access (Cohen, et al. 1995). Such institutional nature of Japan's nuclear policymaking gave advantages to those who had a strong interest in actively promoting nuclear energy by ensuring lower cost structure, subsidized financing, lower risk, and favorable demand structure. On the contrary, there was little penetration by external groups and public opinion into the relatively stable and coherent nuclear policy community. Regulatory arrangements allowed significant control by the nuclear authorities, a relatively minor role of courts, and the minimal legal prerogatives available to local governments (Donnelly 1993, 187).

As a result, Japan's nuclear policy formulation was able to avoid being embroiled into divisive disputes in the domestic political process. The state autonomy and concentration of bureaucratic authority afforded Japan a clear long-term goal and remarkable consistency in its nuclear policy. This coherence and consistency were enhanced as there was a general consensus in Japan on the necessity of nuclear energy from the 1960s to the early 1980s. Opposition to nuclear power was limited and isolated. The Oil Crisis in the 1970s justified a rapid expansion of nuclear capacity and galvanized the drive for nuclear power as a means to achieve energy security (Dauvergne 1993, 578). The basic

direction of nuclear fuel cycle program, if not the details, was considered a national policy (*kokusaku*) beyond open and popular scrutiny.

Forces outside the government, industries and politician triangles among the local residents and governments, opposition parties, media, courts, the general public, and the U.S. government also had some influence on the outcome of nuclear policy. The basic structure, however, remained intact: industry-state collaboration and dominance in policymaking. Opposition from anti-nuclear forces had very little impact on the overall direction of Japan's nuclear energy policy.

Contrary to policy formulation, the implementation stage of Japan's nuclear policy has been much more complicated and messier because the anti-nuclear forces, excluding from the policy formulation, managed to exert greater influence during this stage. Especially, since the Chernobyl accident in 1986, Japan's anti-nuclear forces started to gain influence and became more nationally mobilized. As in many other Western democracies, Japan came to experience a great deal of difficulty in implementing its nuclear energy policy due to political obstacles.

Until the early 1990s, the government did not make any major changes in its nuclear energy policy---the projected increase in the capacity of nuclear power and the commercialization of plutonium---despite the constant protests and legal attempts to stop construction of plants and years of delays in certain facilities (such as the Rokkasho plant). Ministry of International Trade and Industry (MITI), STA, and the utilities continued to forge ahead with ambitious plans to expand the nuclear power capacity. "Rather than altering its plans, the state and industry have responded to growing criticisms by launching expensive public acceptance campaigns" (Dauvergne 1993, 589). LDP continued to support the nuclear policy despite the mounting local resistance, public opposition, and electoral setbacks in the constituencies, where the facilities were located. From the mid-1990s, however, signs of change started to appear. The following describes the nature and extent of the recent changes in Japan's nuclear policy and explains the factors behind such changes.

Changes and Consistency

The Chernobyl accident of 1986 had a profound impact on Japan's nuclear policy in general and its drive for a plutonium economy in particular. Before Chernobyl, anti-nuclear forces---residents of nuclear sites, and some citizen groups---had been relatively isolated and fragmented, and did not get much media attention. After the accident, public opinion began to shift against nuclear energy, and the anti-nuclear groups began to gain more national influence. Media coverage also started to become much more critical on the nuclear policy. The number of demonstrations increased not only against some specific facilities or projects, but also for the general anti-nuclear cause. Incidents and mishaps in nuclear facilities did not help boost the public confidence. By the 1980s, many legal actions were taken to stop facility constructions in various localities. Nuclear plants completed in the 1980s took an average of seventeen years and four months

from the initial proposal to operations. The reactors were scheduled to begin operations in the 1990s and will take twenty-five years and seven months from the time of proposal assuming they stay on schedule (Dauvergne 1993, 579-84).

Especially with the nuclear fuel cycle and FBR program, the Japanese public became increasingly doubtful about their safety. Rokkasho, being one of the poorest areas in Japan, had been relatively receptive to nuclear facilities in the past. Rokkasho's local governments had actively sought nuclear power plants and accordingly, the sites were bought in exchange for hefty compensation. However, local opposition to the project already started from the planning stage in the mid-1980s. The residents felt excluded from the decision-making process and tried to stop the project. Especially after the Chernobyl accident, they sought court injunction and often staged large demonstrations. The issue also took the center stage at local and national elections, as the opposing candidates competed with pro- and anti-nuclear slogans reflecting the division in their constituency.

The typical government and utilities' response was to provide generous economic incentives to the communities where nuclear facilities were sited. However, buying out these communities became more and more costly as the residents had become much more prosperous compared to the past. And despite economic compensation, local opposition continued to delay the construction of facilities. The Rokkasho reprocessing plant, originally scheduled to open in 1990, began construction in 1993 and opened for test operation in 1998. Delays meant a further increase in costs. The cost of building the Rokkasho plant was expected to double the original estimate of 840 billion yen to 1.7 trillion yen. When FBR Monju was first designed, the estimated cost was thirty-six billion yen. By 1991, it was 600 billion yen (Donnelly 1993, 194-96; Dauvergne 1993, 586-89). In addition to economic strains, such delays caused serious problems with the nuclear fuel cycle program because it became increasingly difficult to balance the demand and supply of plutonium projected by the government. This also invited heavy criticism from the international community, which was concerned with the issue of non-proliferation.

Reflecting on the mounting difficulties, the Comprehensive Energy Research Council (*Sogyoenerugi Chosakai*), an advisory council serving the minister of MITI, announced in a report issued on May 12, 1994, the decision to delay the construction of demonstration FBR until the beginning of 2000. It was originally scheduled for the end of the 1990s. The operation of the second reprocessing plant in Rokkasho was to be delayed for at least ten years. It was considered a shift from an aggressive utilization of plutonium to a more prudent method (*Asahi Shinbun*, May 13, 1994). This decision subsequently had an effect on AEC's deliberation for the revision of the 1987 Long-term Nuclear Program.

On June 24, 1994, AEC issued the Eighth Long-term Program for the Development and Utilization of Nuclear Energy, announcing the government's intention to slow down the spent fuel reprocessing while accelerating the plutonium consumption. The program was the first revision of the nuclear fuel cycle program outlined in the Seventh Long-term Program of 1987. According to the program, the construction of demonstration FBR, which was originally planned to start in the end of the 1990s, would begin in the

early 2000s. Full commercialization of FBR (expected to happen between 2020 and 2030 in the 1987 program) will be delayed until 2030. The program stated that the government would be flexible concerning whether to breed plutonium in FBRs and that plutonium supply would be flexibly adjusted taking demands into consideration. Concerning the operation of the second reprocessing plant in Rokkasho, which was supposed to start from 2010, the revised plan stated that the decision about the future of the plant would be made in 2010. It was a significant delay. The 1987 program aimed at operating two LWRs for the plutothermal program by the end of the 1990s and about ten LWRs after 2000. The revised program projected that about ten LWRs would start the plutothermal program between 1991 and 1999, and fifteen LWRs from early 2000. This was to accelerate plutonium consumption (*Asahi Shinbun*, May 2, 9, & 25, 1994).

It was the first time that the Long-term Program included the plutonium supply-demand projection. Overall, the program will reduce plutonium use to about ten tons by 2010, compared with the AEC projection made in August 1991. Between 1994 and 1999, an annual supply of 0.4 ton would be provided by the Tokai plant and 1.1 tons would be returned by France and Britain. The demand includes 0.6 ton per year for FBR Joyo and Monju. ATR Eugen and plutothermal reactors would spend the rest. During the period of 2000-2010, annual demand would be five tons: existing FBRs would use 0.8 ton, demonstration FBR 0.7 ton, demonstration ATR 0.5 ton, and the LWR three tons. Annual supply would be met by 0.2 ton from Tokai and 4.8 tons from Rokkasho plant with full capacity. Thirty tons of plutonium will be supplied from overseas contractors. A total of sixty-nine to seventy-nine tons of plutonium would be supplied and consumed between 1994 and 2010. The program again maintained the no-surplus commitment (*Asahi Shinbun*, May 2, 9, & 25, 1994).

Although changes were made in the nuclear fuel cycle program, it was an adjustment, not a fundamental shift of the policy direction. It did not substantially scale down the plutonium program as widely expected, but only delayed the completion of the plutonium program by about ten years and somewhat reduced the plutonium demand-supply projection. It reconfirmed the government's commitment to the plutonium program, demonstrating its determination to pursue an independent nuclear fuel cycle program in the long run.

In the following years, the state of Japan's nuclear fuel cycle program fell into further trouble. Due to the technical complications and loss of economic merits, many of the core projects were again significantly delayed or suspended, which, in turn, rendered it impossible to implement the fuel cycle program as scheduled. Subsequently, some significant changes followed.

The first of a series of setbacks came in July 1995, when the Federation of Electric Power Companies (FEPC, *Denkijigyo Rengokai*) consisted of nine utilities, and declared that it would abort the plan to commercialize ATR. ATR had already gone through numerous difficulties, repeating the pattern of other nuclear projects (i.e., residents of reactor site opposed its construction, which caused delays, which resulted in increasing construction costs). The cost of ATR increased three times per kilowatt from the original

estimate (*Asahi Shimbun*, January 20, 1996). ATRs were supposed to consume ten percent of the plutonium supply, according to the long-term projection. It was proven to be impossible. This situation put further pressures on the plutothermal program, which had to bear the burden of consuming more plutonium. That is, the government claimed that by using plutonium in LWRs, the demand-supply balance would be maintained. However, the plutothermal program itself was also facing many difficulties.

Then, on December 8, 1995 (only four months after the initial operations began), a major accident occurred in Monju FBR, caused by a sodium leak from the cooling system. It was perhaps the most devastating blow to the nuclear fuel cycle program. Even before the accident, there were delays in the FBR project. The accident meant a further slowdown of the project by several years. It would take at least three to four years before Monju resumed operations. Even more damaging than the accident itself, it was revealed that PNC concealed an important part of the surveillance videotape that recorded the accident.

As a result of the accident, plutonium surplus became an immediate problem. The government suggested that the plutonium allotted for Monju could be used by FBR Joyo and ATR Fugen. But their annual demand is less than 0.2 tons. The utilities became more and more reluctant to continue the commercialization of FBR, which required enormous investment. Nevertheless, the future of FBR commercialization remained uncertain. Takagi (1996, 81) predicted that FBR would take over fifty years before it is fully commercialized. As of the end of 1994, Japan had thirteen tons of plutonium, and another twenty tons would be returned by the French and British contractors by 2010. The government's plan expected to have no surplus, as it would consume 600 kg of plutonium every year until the end of 1999. Monju was supposed to spend about eighty percent of that 600 kg, which became highly unlikely. After 2000, the program expected a consumption of five tons of plutonium per year. Demonstration FBR (to be built after 2000) was supposed to spend 700 kg annually. But, the accident rendered the government plans unrealistic altogether. Along with FBR, the development of the plutothermal program using MOX for LWR was another pillar of Japan's nuclear fuel cycle program. STA was counting on the MOX project to consume a major portion of plutonium: 3.7 tons annually. MOX was supposed to be used in a few LWRs by 1999 and in over ten LWRs after 2000 (*Asahi Shimbun*, January 20, 1996). MOX's idea was also in trouble, and hard to justify economically. Limited fuel-fabrication capacities in Europe and Japan also made the project very unrealistic (Takagi 1996, 73-74).

In early 1996, the Federation of Electric Power Companies (FEPC) was supposed to request the local governments of Fukui and Fukushima for approval to introduce the plutothermal program into their plants. The prefectures were in no mood. They wanted a clear explanation of the Monju accident before proceeding any further with the program. On January 23, 1996, Fukui, Fukushima, and Niigata prefectures requested the government to overhaul the nuclear fuel cycle program. Sensing that the prefectural approval was unlikely, the FEPC decided to postpone the implementation of the plutothermal program. This further reduced plutonium demand (*Asahi Shimbun*, January 24, 1996).

On the same day, the Japan Nuclear Fuel Industries (*Nihongennetsu*) announced a three-year

delay in the full operation of the Rokkasho reprocessing plant until 2003 and a major scale-down of its capacity. STA and PNC poured in a huge investment for thirty years to commercialize the reprocessing process, for they have a very strong interest in the operation of the Rokkasho plant. However, the utilities (responsible for funding the construction of the plant) wanted to cut down their investment. The cost of construction by that time had already doubled from the original budget. The decision reflected the view of the utilities that there was no need to rush with the reprocessing facilities (*Asahi Shinbun*, January 23, 1996).

Paralleled with these technical difficulties, delays, rising cost, and suspension of nuclear projects, popular opposition grew stronger. On August 5, 1996, the Maki Village in Niigata held a popular referendum, the first-ever in Japan over the issue of nuclear plant construction. Over sixty percent (60.86%) opposed the planned construction. The result was not legally binding, but certainly had a profoundly damaging effect at the political level (*Asahi Shinbun*, August 5, 1996).

All those developments put enormous pressure on the government to reassess the state of the nuclear fuel cycle program. In August 1996, STA decided to conduct "a complete overhaul" of the plutonium program, as the existing plutonium supply-demand projection became unrealistic in the immediate future. The government became increasingly concerned about its no-surplus commitment. STA suggested that it could adjust the production of plutonium in accordance with its consumption. But STA maintained that the long-term supply-demand projection was still valid.

Then, another disaster fell. On March 11, 1997, an explosion occurred at PNC's Tokai reprocessing plant, leaking radiation outside the facility. Tokai facilities have had a number of accidents before, usually minor mishaps in which one or two workers were exposed to radiation. This one, however, was the most serious accident up to that point (*Asahi Shinbun*, March 12, 1997). Politically, it was an even bigger disaster as PNC again tried to cover up the details. This time, the public outrage was so fierce that, in order to diffuse the situation, the government decided (on April 18, 1997) to dissolve PNC and to shut down the prototype ATR Fugen. It was reported that Fugen had seven minor leaks in 1992-93, which were not notified to the local authorities (*Asahi Shinbun*, April 20, 1997). To replace PNC, the government decided to establish a new entity funded by the government (*Asahi Shinbun*, April 19, 1997).⁴

The accidents had more fundamental impact on Japan's nuclear policy than the delays in schedule and rising costs. Not only did they seriously undermine public confidence in Japan's nuclear program, prompting demands for a major review of the entire nuclear policy, but also started to widen the gap between the anti-nuclear forces which attempted to penetrate into previously insulated policy community and to influence the policymaking process. That is, the accidents and the attempted cover-ups completely discredited the government's nuclear policy establishment. It was pointed out that many of the troubles were attributable to the lack of public consensus in policymaking. Public distrust spread widely about the policy process and institutions. Demand for more open and transparent

⁴ On October 1, 1998, the Nuclear Fuel Cycle Development Institute was inaugurated.

policy process was loudly voiced. It was in this context that the government finally started to open up and allowed more systematic public participation in the nuclear policy formulation.

After the Monju accident, AEC held a series of roundtable discussions (Roundtable Conference on Atomic Energy Policy: *Genshiryokuseisaku Entakukaigi*) in which citizen participation was invited. Out of the Roundtable Conference, the FBR Discussion Meeting (*Kosokujishokuro Kondankai*) was set up within AEC to examine the future of FBR development program. It reflects a new open approach to nuclear policymaking by STA. The FBR Discussion Meeting is made of sixteen members: two thirds of them are legal experts, economists, journalists, and citizen representatives.

In February 1997, the FBR Discussion Meeting held twelve sessions on the future of FBR. The discussions included the possibility of abandoning the FBR commercialization plan outlined in the Long-term Program. The prevailing opinion of the meeting was that the price of fossil fuel and uranium had been stabilized and commercialization of plutonium became uneconomical. The utilities, responsible for FBR development from the demonstration reactor phase, submitted their opinion to the meeting. They would decide upon the commercialization of FBR, after considering public acceptability and technical advancement. They did not abandon FBR, but wanted to see how things would go with Monju. "It is certain that construction of demonstration reactor will take place after 2010. In order to evaluate and verify various technology forms, Monju's test operation is essential. Without that, no further steps will be taken," according to one of the utilities⁵ (*Asahi Shinbun*, October 1, 1997).

On December 1, 1997, the FBR Discussion Meeting compiled its report. The report changed the tone of the plutonium policy. Previously, FBR was the main pillar (*chukaku*) of Japan's nuclear fuel cycle program. The report stated that continuing the research and development for FBR's commercialization was necessary, but downgraded FBR as one of the important (*yoryoku*) fuel alternatives (*Kosokujishokuro Kondankai* 1997, 12). The meeting called for a flexible approach concerning the development of demonstration FBR and full commercialization thereafter, taking into consideration economic viability, safety issues, and future energy demand. The report avoided writing in a definite schedule for the full commercialization of FBR (*Kosokujishokuro Kondankai* 1997, 17). The AEC decision on December 5, 1997 (*Genshiryokuinkai* 1997a) on FBR development closely reflected this report.

The FBR Discussion Meeting was a major departure from the policymaking process of the past, which was relatively insulated from the public and dominated by the rigid bureaucratic ideology. The plutonium program was a national policy (*kokusaku*) beyond doubt. The meeting provided anti-plutonium forces with an opportunity to challenge what had been accepted as a given: the necessity and political legitimacy of the plutonium economy. During the debate over whether FBR was really necessary for Japan, the chairperson Nishizawa Junichi (former president of Tohoku University) commented, "this debate should have happened a long time ago" (*Asahi Shinbun*, October 7, 1997). The

⁵ The Vice President of Kasai Electric Company was quoted in *Asahi Shinbun* (October 7, 1997).

meeting established the principle of citizen participation and open deliberation. The meeting even invited audiences. During the process of deliberation, the meeting made public the draft of its report and invited outside opinions. It received 1613 written opinions (*Asahi Shimbun*, November 29, 1997). STA kept a low profile throughout the deliberation. It would be extremely difficult for Japan's nuclear policymaking process to go back to its old ways.

With all those delays, accidents, and major policy adjustments, however, we still see consistency in Japan's nuclear policy. Japan's long-term goal of establishing an independent nuclear fuel cycle remains intact. The 1994 Long-term Program somewhat scaled down the fuel cycle program. But it only reflected the unavoidable delays due to technical difficulties. In the program, FBR commercialization was delayed for ten years. The projected plutonium supply and demand were reduced to about ten tons. The program changed the pace of the plutonium program but not the direction. It reflected the true intention of the government, although it was later forced to change again.

In January 1997, a subcommittee of MITI's Advisory Council for Comprehensive Energy issued an interim report in which the ministry reconfirmed that the nuclear fuel cycle program was the national policy (*Asahi Shimbun*, January 21, 1997). The AEC policy statement, on January 31, 1997, also clearly reconfirmed that, in order to ensure stability of long-term nuclear power generation, smooth progress of the nuclear fuel cycle program was essential. The program will come to depend more upon the pluthermal program than FBR in the foreseeable future. But, the policy clearly stated the government's intention to reprocess all of the spent fuel from LWRs (*Genshiryokukai* 1997b).

On September 30, 1998, Tokyo Electric Power made its first shipment of spent fuel to the Rokkasho reprocessing plant operated by the Japan Nuclear Fuel Industries amid the protests by local residents. It was the first time that spent fuel was shipped to a commercial reprocessing facility in Japan, that is, the beginning of the domestic nuclear fuel cycle. Therefore, this shipment was very important for the continuation of the plutonium program (*Asahi Shimbun*, September 30 & October 3, 1998). On October 1, 1998, the Nuclear Fuel Cycle Development Institute (*Kakumenryo Risaikuru Kaibatsukiko*) was inaugurated in place of the defunct PNC. Its mandate was to continue research and development for the nuclear fuel cycle program and the reactors using plutonium (*Asahi Shimbun*, April 25, 1997).

Why this persistence? Many reasons can be cited: organizational inertia on the part of the nuclear policy establishment; reluctance to write off the investments already sunken; nonexistence of other clear alternatives. As one more possible explanation, I suggest that we look at the military dimension of Japan's nuclear policy.

MILITARY DIMENSION OF JAPAN'S NUCLEAR POLICY

U.S. Nuclear Umbrella and the Nuclear Option

Japan is the only country in human history against which nuclear weapons were used.

Therefore, military implication of nuclear energy is a very sensitive issue. Japanese reaction to the military dimension of nuclear energy is typically described as "nuclear allergy." This has determined the domestic political atmosphere. It would be a mistake, however, to presume that there is no nuclear policy in the context of Japan's military/security strategy.

Militarily, the basis of Japan's nuclear policy is the U.S.-Japan Security Treaty. The treaty is to protect Japan against conventional and nuclear threats by offering the American nuclear umbrella. To this date, the alliance remains as the main pillar of Japan's security policy and is considered indispensable to the stability of the region. Thanks to the U.S. nuclear umbrella, Japan did not need to possess its own nuclear capability.

In case the U.S. were to bring nuclear weapons into Japan, consultation was required between the two governments. That is, Article 6 of the revised U.S.-Japan Security Treaty of 1960 stipulated that the U.S. could use military facilities in Japan to maintain the security of the Far East. Over this issue, the Secretary of State Christian Herter and Foreign Minister Kish Nobusuke exchanged notes⁶ with which they agreed that consultation was necessary if any important changes were to be made in the deployment of U.S. troops or equipment in Japan. The important changes in equipment included nuclear weapons. Although Japan was dependent on the U.S. nuclear umbrella, there was a strong anti-nuclear sentiment in Japan, and it became a highly controversial issue.

Pressured by opposition politicians to clarify Japan's nuclear status, Prime Minister Sato Eisaku declared on February 5, 1968 at the Diet that Japan would not produce, possess, or introduce nuclear weapons. This statement became the Three Non-nuclear Principles. In 1969, however, there was a controversy at the Diet of the principle not breached by the U.S. nuclear ships or aircraft entering into Japanese ports. When pressed, the Prime Minister stated that although there were no legal grounds to prohibit U.S. nuclear submarines' calls at the Japanese ports, he would object, considering the sentiments of the Japanese public. Subsequently, the Cabinet Secretary also declared that he would not allow the introduction of U.S. nuclear weapons into Japan even if requested (Langdon 1973, 137-39).

Despite such a policy stance taken by the Japanese government in public, Japan was tacitly allowing American nuclear weapons into Japan by not challenging Washington's NCND (Neither Confirm, Nor Deny) policy. Acceptance of the NCND policy meant that prior consultation was not strictly observed between the two countries concerning movements of nuclear weapons in and around Japan. Such discrepancy between official policy and reality became a soft spot in Japan's nuclear policy and invited a great deal of criticism from the opposition parties and intellectuals.

The nature of the debate on the U.S. nuclear umbrella changed somewhat in the 1970s. The Nixon administration's Guam Doctrine, the Soviet military build-up in the Far East, its invasion of Afghanistan, and the U.S.-Soviet nuclear parity highlighted Japan's security dilemma. In this context, Japan's main concern was whether the U.S.

⁶ First Exchange of Notes, Washington, January 19, 1960.

nuclear umbrella would guarantee Japan's security or whether the American security commitment was fully credible.⁷

Shimizu Ikuraro, once a leading figure in Japan's postwar peace movement, observed that unlike the time the U.S. had absolute nuclear superiority vis-a-vis the Soviet Union, a nuclear parity had changed the strategic paradigm. That is, if the Soviets invaded Japan, there would be no guarantees that Washington would provide the appropriate assistance. Taking note of Kissinger's warning against the European over-dependence of their security on the U.S., Shimizu questioned whether the U.S. would guarantee an ally's security while risking its own nuclear confrontation with the Soviet Union. He argued that military weakness invited foreign invasion, and that the only way to maintain international peace was through the balance of power. He criticized that Japan had relinquished its statehood after World War II and argued that Japan should establish independent military capability and should secure its nuclear option in order to reclaim its status as a normal state and exercise its sovereign rights in the international society (Shimizu 1980, 39-45).

This kind of argument corresponded with Washington's idea of establishing theater nuclear deterrence capability by its allies, compensating for the limitations of the U.S. strategic reach in Asia or Europe. An American official said in a media interview that the U.S. was prepared to provide Japan with nuclear warheads or technology to manufacture nuclear weapons. This situation encouraged Japanese policymakers to entertain the idea of possessing tactical nuclear weapons (Harrison 1996, 17).

Subsequently, a heated debate was aroused in Japan. Oda Susumu (1980) and Inoki Masamichi (1980) denounced the argument as preposterous since Japan's political or military status in the international society could be enhanced by going nuclear. They saw that the idea of Japan becoming a military power entirely ignored its negative implications imposed on the stability of the region, since Japan's neighbors would not sit by idly over Japan's nuclear armament. Moreover, the U.S.-Japan alliance would be undermined, thereby leading to even more serious security problems.

Shimizu's critics have also rejected his argument that the U.S. security commitment was not credible in times of crisis. They maintained that Japan should never attempt to become a nuclear power and that, since the Constitution did not deny the right to have military forces for self-defense, it was desirable to concentrate on building conventional military capability to effectively resist Soviet invasion until American assistance arrived (Oda 1980; Fin 1980; Inoki 1980). Nakagawa Yatsuhiko agreed with Shimizu that Japan should have a nuclear option, suggested that Japan should repeal the Three Non-Nuclear Principles, and allowed the introduction of the U.S. nuclear weapons into Japan rather than pursuing independent defense capability through nuclear armament. Thereby, this had strengthened the U.S. nuclear umbrella and enhanced the credibility of the alliance (Nakagawa 1980, 106).

There were others who were also concerned about the Soviet military expansion, the nuclear parity, and the resultant uncertainty of the American security commitment by

⁷ See, for example, Japan Echo (1980), pp. 83-110.

prescribing different solutions. A former Defense Agency official, Takeoka Katsumi, maintained that since the nuclear weapons on Japan's territory would only provoke the Soviet's preemptive strike, Japan should strictly adhere to the Non-nuclear Principles, while exerting more effort in the international nuclear arms reduction. He believed that Japan would be the biggest loser, particularly having considered the higher possibility of limited nuclear conflicts in East Asia due to deployment of intermediate range nuclear missiles by the Soviet Union. He argued that Japan should reduce the possibility of nuclear war by pursuing nuclear arms reduction and should maintain its posture as a non-nuclear peaceful state, thereby not giving the Soviets any pretext for an attack (Takeoka 1983, 29-32).

Military aspects of Japan's nuclear policy were predetermined by the American nuclear umbrella. It provided a kind of insurance which made possible Japan's bold declaration of the Three Non-nuclear Principles, despite the complications it caused concerning the introduction of nuclear weapons by the U.S. forces in Japan. Under the umbrella, however, Japan has taken into account the option of going nuclear. It has shown the willingness to consider nuclear armament and made a conscious decision not to pursue the path, given the circumstances. Japan's intention to keep the option open was there. It was clearly demonstrated in the negotiation processes of the NPT.

Non-proliferation Treaty (NPT) and the Nuclear Option

Japan's nuclear energy policy caused some discord between the U.S. and Japan over the non-proliferation policy (Lester 1982, 417-33). After the announcement of the "Atoms for Peace" program, the U.S. provided nuclear fuel and technology to other countries including Japan. Japan and the U.S. later formalized their cooperation by signing a nuclear agreement, and the former started to develop its nuclear industry with the U.S. assistance.

Japan started its plan to use plutonium from the first Long-term Program for the Development and Utilization of Nuclear Energy of 1956. In the 1970s, Japan began the construction of reprocessing facilities to establish the domestic nuclear fuel cycle. The U.S. government became concerned with the effect of Japan's plutonium program on the non-proliferation regimes and tried to restrain it.

Japan has been dependent on the U.S. for about seventy percent of its enriched uranium supply and other technology and services. Washington often used it as a leverage, putting pressures on Japan to follow its non-proliferation policy (Drifte 1990, 34). The revised bilateral "Agreement for Cooperation in the Peaceful Uses of Nuclear Energy" (signed in 1968) stipulated that Japan should obtain U.S. approval to reprocess spent fuel from the uranium of U.S. origin. When Japan did not have its own reprocessing facilities, it needed prior approval from Washington whenever it shipped spent fuel to European plants. The Ford and Carter administrations were vigorously against Japan's nuclear fuel cycle program (Hayes 1992, 232; Drifte 1990, 35).

In 1982, Tokyo and Washington started negotiations to revise the nuclear agreement, and Japan demanded blanket approval for reprocessing spent fuel overseas. However,

this was in direct conflict with Washington's policy, as expressed in the Non-proliferation Act of 1978, which imposed stricter control over the reprocessing of spent fuel. As a result of five-year negotiations, the two countries signed a new agreement in 1987 which was to remain effective for the next thirty years. Concerning the reprocessing of spent fuel or movements of plutonium, the U.S. gave Japan a "programmatic approval," doing away with the case-by-case approval stipulated in the previous agreement (Drifte 1990, 35).

The Republican administrations, led by Reagan and Bush, have shown more flexibility with Japan's nuclear program. However, the Congress had concerns about deficiencies in the American non-proliferation policy, and passed a resolution urging a complete ban on the production of plutonium. President Clinton has also stated in Congress that he, in principle, was opposed to the commercial use of plutonium. Japan's policymakers, on the other hand, were not happy that the U.S. was trying to impose its non-proliferation policy on Japan and to meddle with its nuclear program.

This tension between the two countries was most clearly demonstrated during the negotiation processes of the nuclear Non-proliferation Treaty (NPT). The Non-proliferation Treaty prohibits nuclear countries from passing nuclear weapons, materials, or technology to non-nuclear countries, and bans the latter from developing their own weapons. The treaty was initiated mainly by the U.S. and the Soviet Union in 1966.

An economic implication of the NPT was a major concern for the Japanese government. Japan's position was that the NPT should not pose any constraints on the civilian use of nuclear energy and its independent development of nuclear industry. In January 1968, Prime Minister Sato declared at the Diet that the absolute condition for Japan to sign the NPT was the assurance of equality among all nations concerning the peaceful use of nuclear energy (Langdon 1973, 139-40).

From the perspective of military interests, Japan has also shown serious misgivings about the NPT. Although Japan was protected by the U.S. nuclear umbrella, officially making an international commitment to forsake the option of developing nuclear weapons for twenty-five years proved problematic for Japan's policymakers, given the uncertain security environment. When it was first proposed, the Vice Minister of Foreign Affairs, Shimoda Takeso, stated that he rejected the treaty that did not require arms reduction among the nuclear powers while banning the non-nuclear powers from developing their own. There were many LDP politicians who shared similar opinions. They opposed the NPT because it would deprive Japan of nuclear options and because it was an unequal treaty. While advocating Japan's right to develop its own nuclear weapons, the Secretary General Fukuda Takeo said that his colleagues need to outgrow the "nuclear allergy." Prime Minister Sato made a similar statement later arousing sharp criticism from the opposition parties (Harrison 1996, 7). Confronted with the mounting criticism, however, Sato had to declare the so-called, "Three Non-nuclear Principles" in 1968. On November 21, 1971, the Diet formalized this policy to a resolution (Harrison 1996, 8).

Critics argued that the NPT was an evident case of self-centeredness of nuclear powers and that NPT would only weaken Japan and not contribute to world peace (Shimizu 1980, 41). Due to the reasons mentioned above, the Japanese government dragged

its feet, trying to evade the issue until it decided (pressured by Washington) to join the treaty in 1969. Neither was deemed desirable, however, for Japan to openly oppose the NPT or suggest the possibility of going nuclear. Eventually, Japan signed the treaty on February 3, 1970. But domestic opposition continued and it took another six years before the Diet ratified the treaty.

Upon the signing of the treaty, the Ministry of Foreign Affairs declared that the treaty would only permit the existing nuclear powers to possess nuclear weapons and that this discrimination should ultimately disappear through the elimination of nuclear weapons by all nuclear-weaponous states. Japan exerted a great deal of effort in securing the best possible conditions in exchange of joining the NPT, while demanding reduction of nuclear weapons stockpiles of nuclear powers and equal rights among all countries for developing nuclear energy for civilian purposes. Japan insisted that the IAEA's Safeguard Agreement should not hinder Japan's commercial interests in nuclear energy (Drifte 1990, 31-32; Harrison 1996, 11). To induce Japan into joining the NPT, the State Department assured the continued supply of enriched uranium and promised to allow Japan to pursue an independent development of nuclear industry and to build enrichment or reprocessing facilities. In 1976, the Diet finally ratified the NPT and the government signed the IAEA Safeguard Agreement in 1977.

Japan's reluctance to make an unequivocal commitment to non-proliferation was again clear during the negotiations for an indefinite extension of the NPT in 1995. At the Tokyo G7 summit in 1993 in Tokyo, the Japanese government showed reservations about the NPT's extension beyond 1995. Then Foreign Minister Muto Kabun said, "Japan needs time to build consensus on this matter." Some LDP politicians showed strong displeasure for being pressured into accepting an indefinite extension of the treaty. Japan's policymakers could not easily accept an unconditional and indefinite extension of the NPT, considering the uncertain security environment of the post-Cold War era (*International Herald Tribune*, August 13, 1993). Okamoto Yoshifumi, the deputy director of MOFA's Nuclear Division, had said in a media interview that the NPT was an unequal treaty and that, if North Korea was to obtain nuclear weapons, it would seriously weaken Japan's commitment to the NPT.⁸

As mentioned above, many LDP politicians were critical about the NPT when it was first signed in the 1970s. It is to be noted that the economic factor was not the main justification for their reluctance to support the treaty to be further extended. Some politicians have openly advocated the maintenance of the nuclear option, citing the threat of the North Korean nuclear program. Foreign Minister Muto stated that although Japan can deal with North Korean nuclear threats by relying on the U.S. nuclear protection, it is important to have the will to possess nuclear weapons when the threat becomes too serious (*International Herald Tribune*, July 30, 1993). When Muto added Japan's support for the NPT extension, it was rebuked by Prime Minister Miyazawa (Harrison 1996, 29).

During the non-LDP coalition government, Prime Minister Hosokawa Morihiro had

⁸ Interviewed by the French Daily Liberation July 9, 1993. Cited in Harrison (1996), p. 29.

officially stated during his inaugural speech at the Diet that he supported the NPT and a complete eradication of nuclear weapons. President Sakigake Takemura Masayoshi was also known to favor the indefinite NPT extension. However, they were confronted with widespread opposition. Many politicians within the coalition have also opposed the NPT extension, arguing that it would perpetuate the status of present nuclear powers (*Far Eastern Economic Review*, November 30, 1993).

Given the scale and technological level of Japan's nuclear industry, it is not convincing that the NPT was of any hindrance to Japan's nuclear development for civilian use. Therefore, Japan's resistance to the idea of an indefinite extension of the NPT seems to reveal its military intention to maintain a nuclear option. Japan eventually signed the NPT extension under heavy pressures from the U.S.

There are evidences that have a more direct bearing on Japan's clear intention concerning the nuclear option. There have been attempts in Japan to make the Three Non-nuclear Principles into a law, but they have failed due to persistent opposition by the politicians and the Ministry of Foreign Affairs, which were not willing to legally rule out the nuclear option. An official from the Ministry of Foreign Affairs said in a newspaper interview that the nuclear option was its diplomatic strength and that Japan should have the plutonium and rocket technology necessary for converting into missiles.⁹

During the controversial debate over the NPT in 1967, Prime Minister Sato had secretly commissioned a study on the Japanese nuclear policy, in which he specifically wanted an opinion regarding whether it was possible and desirable for Japan to develop independent nuclear forces. The study concluded that there were no technical or economic impediments to going nuclear, and that it should have the option open although it should not pursue nuclear armament at that time. By the end of 1969, Prime Minister Kishi declared that peaceful use of nuclear energy would be of great help in case Japan promotes nuclear weapons. Foreign Ministry in its secret internal study in 1969 also made calculated decisions about nuclear weapons. The study said that, although Japan should maintain non-nuclear status, it should obtain the economic and technical capability to build nuclear weapons (Harrison 1996, 8-9; Takagi 1996, 76).

Even after signing the NPT, Japan continued to criticize the discriminatory nature of the treaty and regretted that its right had been forsaken. Yasuhiro Nakasone criticized the NPT for perpetuating two superpowers' dominance in nuclear technology and weapons. He saw the treaty as a means to deter Japan and Germany from challenging the U.S.-Soviet nuclear hegemony. The highly controversial 1970 defense white paper, written under the Nakasone regime, declared that Japan could possess purely defensive tactical nuclear weapons within the framework of the Peace Constitution. Nakasone and other advocates of nuclear option pressured the AEC to permit basic nuclear weapons research. The 1980 white paper also noted that defensive nuclear weapons would not violate the Constitution (Harrison 1996, 12-13).

Japan maintains that nuclear armament does not make sense for Japan due to its densely concentrated population on narrow strip of islands. According to the estimates

⁹ Quoted from *Asahi Shimbun* on November 29, 1992. Cited in Tasagi (1996), p. 76.

by Nakagawa, in the late 1970s, it would take Japan about ten years to have strategic nuclear capability based on SLBMs, but that it would be meaningless if waged against Japan's potential enemy, the Soviet Union (Nakagawa 1980, 101-4). And, as far as the U.S.-Japan alliance remains intact, it is very unlikely that Japan would go nuclear. Even if the American nuclear umbrella were to be removed, Japan may not automatically start arming itself with nuclear weapons. Japan recognizes that its nuclear armament would be too disruptive. In the present situation, having an option to go nuclear seems enough (Izumi 1993, 42; MacDougall 1993).

Political support for Japan's nuclear option seems strong. Many prominent conservative politicians such as Nakasone, Kishi, Sato, Ohira, Miyazawa, and Muto had made clear their desire to maintain the nuclear option. They have allies in the bureaucracy. Although the Ministry of Foreign Affairs is officially committed to the NPT and nuclear arms reduction and has no declared policy on the nuclear option, occasional comments by officials and the secret study conducted under Sato regime demonstrate that its position on the nuclear option is similar to that of the politicians. Since the nuclear option is not an official policy but a latent intention of the policymakers, there has been no systematic policy debate or public scrutiny over the nuclear option. Only sporadic debates have been held when occasions arise. However, when we consider military implications of the plutonium program, Japan's nuclear option looms more real.

Plutonium Program and the Nuclear Option

Japan's nuclear fuel cycle and FBR programs have been justified as an essential means to achieve energy security. But they also "reflected a clear recognition on the part of many key bureaucrats and political leaders that these programs give Japan the critical elements of nuclear weapons capability" (Harrison 1996, 24). Japan's policymakers were well aware from the beginning of its plutonium program that it had an innately military nature and that Japan did not need to explicitly pursue nuclear weapons program. For instance, a 1968 study by a think-tank sponsored by Defense Agency estimated that if Japan devoted its nuclear reactors entirely for plutonium production, it could produce twenty to thirty nuclear warheads per year (Harrison 1996, 9).

Japan has a plan to utilize massive amount of plutonium supposedly for civilian use. Japan justifies this in terms of economic necessity. Fast breeder reactor (FBR) is much more efficient than LWR in theory. In reality, however, it is unclear whether FBR can be a reliable method of power generation in the foreseeable future given its technical costs and problems. Today, economic rationale supporting the plutonium program is very shaky. There is an oversupply of plutonium worldwide. At present, twenty-two countries possess plutonium stockpiles or reprocessing plants that can produce plutonium. As of 1993, the total stockpiles are thought to be about 1,000 tons. Some 260 tons are for military purpose, of which about ninety percent are owned by the U.S. and the former Soviet Union. About 530 tons are unprocessed in spent fuel form, and 120 tons are reprocessed and ready for use either commercially or militarily (Perkovich 1993, 154). Some 135 tons of plutonium will be extracted for the next twenty years from

the nuclear warheads dismantled by the two superpowers in accordance with the nuclear arms reduction agreements. Civilian nuclear power plants will continue to generate plutonium embedded in spent fuel (Mathews 1993). In the 1970s, the spot price of processed uranium was expected to reach 400 dollars per kilogram; it cost less than twenty dollars in the mid-1990s, one-sixth of what it was at its peak in 1976 (*Economist*, November 27, 1993).

The issue of economic merits is also related to the technical difficulties as described in the previous sections. Most FBR developments in other countries have been discontinued due to the accidents such as the meltdown of fuel rods, radiation leakages from pipes or container ruptures, and therefore, plans for commercialization have been all abandoned. Handling plutonium is extremely costly due to the safety concerns. Given the prospects of uranium price and supply, there seems very little chance of plutonium becoming an economically viable fuel for electricity generation within a few decades. All the other leading countries in FBR development such as the U.S., France, England, and Germany either suspended or abandoned their programs.

Uranium is cheaper, plenty in supply, harder to convert to military use, and less toxic than plutonium. Therefore, it is both militarily and environmentally less threatening. Some estimate that the confirmed global uranium stocks and deposits today can fuel all nuclear reactors in the world for fifty years (*International Herald Tribune*, December 2, 1993), and others predict that low cost uranium supply would continue at least until the end of the twenty-first century (Perkovich 1993, 154). Leventhal argued that uranium supply from the U.S., Australia, Canada, and African countries would be more than sufficient to satisfy Japan's present needs, and Japan could stockpile enough uranium for use for another hundred years. If Japan imported and processed highly enriched uranium extracted from disassembled Russian warheads, it can run every Japan's nuclear reactors for the next twenty years (Rebensaru 1992, 60-61). Economically, pursuing plutonium program as a means to secure stable energy source does not seem to make much sense.

Japan's plan to produce and use massive amount of plutonium is a real global concern. The Japanese government has been justifying its policy by claiming that it would consume all the plutonium within the given time frame, therefore leaving no plutonium stockpile in Japan. However, the recent turn of events has proven that the numbers do not fit. Before the adjustment of the nuclear fuel cycle program over the past few years, many analysts pointed out that the Japanese government inflated the demand of plutonium to be used by FBRs and LWRs, and that in reality, demand would fall far short of supply (Walker and Berkhout 1992, 3-10). Leventhal criticized that, in order to fill up the gap, AEC counted in plutonium demands of certain reactors which would not be operational in the foreseeable future. He predicted that Japan's capacity to consume plutonium was rather limited and that it would take over forty years before FBR could be fully commercialized. Experts also raised doubts about the feasibility of the MOX project (Rebensaru 1992, 54-55; Hayes 1993). Japan's utilities are also against the use of costly and technically complicated MOX. MOX is four to six times as costly as enriched uranium to produce and would not be profitable for some time. None of Japan's

utilities supported Oma's ATR either, and the project was eventually suspended.

Various predictions were made as to how much surplus plutonium would accumulate in Japan. Takagi (1996, 73-74) predicted that Japan would accumulate eleven to twenty-five tons of plutonium by 2000, and fifty to eighty tons by 2010. Peter Hayes' figure was 43.3 tons (Hayes 1993, 4-5). According to the Korea Institute for Defense Analysis, Japan would consume about 49.76 tons of plutonium between 1993 and 2004, while 62.57 tons would be supplied during the same period (Kim 1996, 98). One does not have to look far to see the possibility of plutonium surplus in Japan. In 1992, plutonium processed in France was returned to Japan. The government claimed that it was urgently needed for Monju. But a substantial portion of it remains unused. Plutonium from the Tokai plant alone would have been enough to fuel Monju, Fugen, and Joyo until the end of the century (Takagi 1996, 73). Now Monju will not resume full operation for many years and Fugen has been shut down. Even official projections indicated that buffer stocks of five tons of plutonium were likely at any given time, which could be turned into about 1,000 warheads depending on the design and desired explosive yield (Harrison 1996, 18). According to STA's announcements, there were 6.3 tons of surplus plutonium at the end of 1992, 8.842 tons in 1993, 11.588 tons in 1994, and the stockpile is continuously increasing (Takagi 1996, 71).

In the past, reactor grade plutonium was considered unsuitable for military purpose. However, some people argue that difficulty in using reactor grade plutonium for building nuclear weapons can be overcome by today's technology.¹⁰ Japan would be able to master such technology in a short time if it wishes. Therefore, distinction between commercial and military use of plutonium becomes fuzzy. There are different ways to obtain weapon-grade plutonium. The best option would be separating the supergrade plutonium from FBRs uranium blankets. The prototype FBR Monju, which began its operations in 1995 had accumulated about ten kilograms of plutonium in its blanket when it was shut down after the accident. If it is restored and ready for operation, additional seventy kilograms per year could be accumulated. The experimental FBR Joyo had accumulated forty kilograms of plutonium in its blanket when the reactor switched to a design that does not require a uranium blanket. Fast breeder reactor (FBR) could produce a large amount of supergrade plutonium that can be used for military purposes with particular ease (Harrison 1996, 19-20).

Although Japan claimed to have no intention or justifiable strategic rationale to develop nuclear weapons in the present situation, it is quite clear that many of the policymakers have shown their desire to maintain the option of going nuclear when necessary. The key to this nuclear option is the plutonium program, and as such it does not make sense to separate military and economic dimension of Japan's plutonium development program. Plutonium, due to its dual civilian and military nature, enables Japan to keep the nuclear option and to develop its full military potential, while claiming that their nuclear fuel cycle program is purely for economic purposes.

¹⁰ See Appendix B: Reactor Grade Plutonium and Nuclear Weapons in Harrison (1996) and Paine (1996).

CONCLUSION

The nature of Japan's nuclear policy is changing. The government considerably slowed down Japan's nuclear fuel cycle in a few major policy adjustments. Such adjustments not only scaled down the plutonium program in terms of quantity, but also functioned as a cause and effect of important changes in the policymaking process. By the end of the 1980s, most analysts observed that Japan's nuclear policy community was relatively insulated from outside pressures and maintained autonomy which ensured consistency in policy. However, the nature of Japan's nuclear policymaking process has changed in the recent years. One of the factors contributed to such changes was the loss of economic merit in the nuclear fuel cycle program. Confronted with the prolonged and numerous delays involving important projects--caused by growing popular resistance, technical complications, and accidents--the utilities increasingly saw the fuel cycle program and new reactor development projects economically unsound. This caused the weakening of the state-industry collaboration. In addition, serious accidents and subsequent attempts of cover-up fundamentally undermined the credibility of the government, which provided anti-nuclear forces an opportunity to penetrate into the policymaking process. This situation resulted in major adjustments of the nuclear policy.

Most analysts were correct in pointing out that the coherent and insular nature of Japan's nuclear policy community, and in attributing the recent policy adjustments to the erosion of consensus within the policy community and the penetration by anti-nuclear forces. Dauvergne might have overemphasized the unity between the industry, STA and MITI. Samuels' concept of "reciprocal consent" and "industry control" seems to hold. The breakdown of reciprocal consent between the utilities and the state seems to have forced the latter to make some adjustments in the 1994 Long-term Nuclear Program. Park observed the divergent interests between the state and industry. The opening of the policymaking process to societal groups was seen as the contributing factors for the policy adjustment. Donnelly's suggestion that accidents and mishaps in facilities could drastically change the status of Japan's nuclear policy has been proven valid. The collapse of the LDP government and the ensuing political complications seem to back up the argument, put forward by Cohen and others, that the institutions formed and consolidated during the long-term LDP rule were the main factor behind Japan's consistently ambitious nuclear program.

Changes in Japan's nuclear policy have been incremental, however. They mostly represent adjustments, albeit significant, rather than a fundamental shift in the policy direction. The long-term policy goal remains intact and shows remarkable consistency. The 1994 Long-term Program slowed the pace of the nuclear fuel cycle but did not touch the fundamentals. The report issued in 1997 by the Nuclear Energy Subcommittee of MITI's Comprehensive Energy Advisory Council stated that Japan would continue to pursue an autonomous nuclear fuel cycle program. AEC's policy statement in the same year also clearly reconfirmed that the nuclear fuel cycle program was essential for Japan, although it now depended more on the plutonium program than on the FBRs. That

is why AEC decided to speed up the pluthermal program, despite the reluctance of the utilities. It is a stepping stone to the full fledged plutonium program with FBRs. In September 1998, the shipment of spent fuel went to a domestic reprocessing plant in Rokkasho for the first time, although the prospects for the reprocessing plant operation seemed uncertain. The newly created Nuclear Fuel Cycle Development Institute will continue to conduct research and development for the FBR and nuclear fuel cycle program.

This consistency cannot be fully explained by the thesis put forward by the analysts mentioned above. There is a common trait in all of their analyses. They pay little or no attention to the fact that Japan's nuclear fuel cycle program and commercialization of FBR have military implications. They consider plutonium program mainly in terms of economic terms, and conclude that, since the economics of plutonium program has lost its merits, it is faced with problems. Commercialization of plutonium is quite an expensive proposition for the utilities. It does not make much economic sense.

Japan's policymakers contend that its nuclear program, although costly today, is necessary in the long run. One could argue that it is their far-sightedness that keeps the nuclear fuel cycle going. This paper does not deny Japan's need for the future energy security. However, energy security does not have to be pursued by establishing autonomous nuclear fuel cycle. It is estimated that Japan could use the existing uranium and plutonium for as long as a century. Massive domestic production of plutonium seems hardly justifiable.

This study suggested the military dimension of Japan's nuclear policy (i.e., nuclear option), as another possible explanation that may help understand the nature of Japan's plutonium program. Militarily, one of the major considerations of Japan's nuclear policy is the maintenance of the nuclear option as has been previously observed, and the plutonium program holds the key. Compared with uranium-based nuclear energy programs found in other countries, Japan's large-scale plutonium program has significant military-strategic implications. Moreover, on many important occasions, Japan's political leaders and policymakers betrayed their intention to keep the nuclear option. Now that the economic justifications for the plutonium program have all but collapsed, the military consideration seems to be a constant.

The evidence is circumstantial rather than definitive. However, that is precisely the nature of Japan's nuclear option: the concept does not in itself mean that Japan has a covert nuclear weapons development program, is preparing for one at this moment, or intends to have one soon. It just means that Japan keeps the possibility open for the future. Japan can go along with the NTP, the IAEA Safeguard Agreement, the CTBT, and the Nuclear Suppliers Group among others—its records have been impeccable. At the same time, it can legitimately maintain its nuclear option. The dual nature of plutonium makes it perfect for Japan to secure an essential technological potential for nuclear weapons development without having to officially commit to such a program.

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