

# **NUCLEAR SECURITY DEFICIENCY: HISTORICAL PERSPECTIVES ON JAPAN'S FUEL-CYCLE POLICY**



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**Masakatsu Ota**

**June 15, 2017**

## **I. INTRODUCTION**

In this essay Masakatsu Ota argues that driven by "other agendas," the Abe government will continue to support nuclear power, including MOx fuel recycling in spite of the Fukushima disaster, albeit with important modifications. He concludes that "little attention has been paid to nuclear security concern about storing and disposing spent fuels during the past policy-making process" and that "dry-cask storage should have been more widely introduced into Japanese nuclear power plants for securing safety and security of spent fuels."

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The views expressed in this report do not necessarily reflect the official policy or position of the Nautilus Institute. Readers should note that Nautilus seeks a diversity of views and opinions on significant topics in order to identify common ground.

Banner Image Credit: 2014 images of Jimmy Carter, and Japanese officials in the US-Japan reprocessing negotiations, Kumao Kaneko (right) Mr.Hiroshi Ota (left); 47News, [here](#).

## **II. SPECIAL REPORT BY MASAKATSU OTA**

### **NUCLEAR SECURITY DEFICIENCY: HISTORICAL PERSPECTIVES ON JAPAN'S FUEL-CYCLE POLICY**

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#### **Overview**

Almost every national governmental policy is a product of a wide-range of political and social factors. In this sense, as long as the Shinzo Abe administration of Japan stay at the highest office, even facing substantial and un-faded public opposition against resumption of nuclear-power-plant operation, the current Japan's fuel cycle policy which originated in "Long-term National Program on Nuclear Development and Use in 1956" will be sustained for at least several years.[\[1\]](#)

The main reason the author (Ota) assumes this to be true is the strong will and apparently unshakable determination of the Abe administration which considers nuclear power to be essential for success of Abe's front-banner economic, monetary and growth policy, "Abenomics."

In April 2014, the Abe administration decided to endorse "Strategic Energy Plan" drafted and presented by Ministry of Economy, Trade and Industry (METI). This future-policy paper on energy supply in the long run made it clear that the Government of Japan (GOJ) "will steadily promote reprocessing and plutonium use in Light Water Reactors (LWRs) while taking into consideration the past history and seeking the understanding of the relevant municipalities and the international

community,” with some modest reservation of possible future policy-review[2].

Also, in July 2015, an advisory specialists-board of METI decided and recommended that nuclear power supply should be 20-22% of the composition of entire power source as of 2030. The GOJ will substantiate and detail future energy policies based on this recommendation[3].

However, it can be expected that this basic fuel cycle policy seems to be forced to make some important modifications, pending future progress of nuclear power-plant operation, especially uncertain outcome of “Plutonium-Thermal Program” that was originally planned to consume current and future stockpile of separated plutonium in 16-18 LWRs all across Japan. After such unprecedented nuclear disaster in Fukushima, this original scenario looks unrealistic and too rosy for domestic and international keen watchers of the Japanese nuclear policy[4].

Just recently, Japanese citizens saw its first nuclear power reactor to restart for more than two years despite persistent public concern about nuclear safety issue related to future volcanic eruptions. On August 11 2015, Kyusyu Electric Power Co., Inc. restarted the No.1 reactor of its Sendai Nuclear Power Plant in Kagoshima Prefecture after it passed national safety standard which was carefully beefed up by the GOJ after the Fukushima accident[5]. As of September 2015, other major utilities in Japan, like Kansai and Shikoku, are trying to follow suit of the Sendai before the end of this year.

But, a few fundamental problems related to nuclear security have not been addressed, even though the central and local governments and major utilities has prioritized addressing nuclear safety concern which have persisted among the Japanese public. For example, a personal reliability system for workers of nuclear facilities has not been established yet by the Nuclear Regulation Authority (NRA), while necessity of the same type of personnel check system like ones in the United States and European nations has been debated in the public domain in a serious manner[6].

The Fukushima nuclear disaster was an awakening moment for the public inside and outside Japan to recognize safety vulnerability of nuclear spent fuels stored at interim pools nearby reactors. On the other hand, hard dry-casks storing spent fuels at the Fukushima site demonstrated this technology's robust safety as well as security. With the benefit of hindsight, dry-cask storage should have been more widely introduced into Japanese nuclear power plants for securing safety and security of spent fuels. And, this must be an important lesson for the nuclear community in Japan for enhancing safety and security of spent fuels in the future. However, we have not seen tangible progress on this specific point, either.

On top of that, physical protection of nuclear facilities including the Rokkasho Reprocessing Plant and the Fast Critical Assembly (FCA) in Tokai-Mura, Ibaragi Prefecture, has been a serious concern for the U.S. nuclear security authority until today. This security concern was a key motivation for the Obama administration to push Japan to transfer several hundred kilogram of the U.S and U.K.-origin weapon-grade plutonium to a more secured facility in the U.S.[7]

This paper will give an historical overview of the Japanese nuclear fuel cycle policy-making starting from the nineteen fifties and then sheds light on the fact that little attention has been paid to nuclear security concern about storing and disposing spent fuels during the past policy-making process. The author hopes that this paper may contribute to addressing explicit and residual problems surrounding the current policy and envision better policy path for our future generations.

## **Where did it come from?**

*“Japan, such resource-poor nation, has very little resources on its own. Then speaking exaggerated, (we had) an idea that the potential of uranium, a providence that God gave us,*

*should be pulled out as much as possible. Why did Japan have to rush to the Pacific War? Because Japan which suffered economic sanctions imposed by the U.S. believed in 'Shigenron (the Resource First Policy).' A motivation of the Japanese invasion of French-colonized Indochina was basically to make new oil resources available for Japan[8]."*

These are comments made by Yoshinori Ihara who was the first "nuclear foreign student" invited by the Eisenhower administration in 1955. Mr. Ihara spent half a year at the International School of Nuclear Science & Engineering of the Argonne National Laboratory to study nuclear science and technology including nuclear power generation and nuclear fuel cycle systems.

Ihara, then mid-career official of Agency of Industrial Science and Technology, was sent to Argonne by an order of the GOJ which then seriously started to consider introducing nuclear power generation for national recovery and reconstruction from ashes of World War II. After studying in Argonne and visiting and observing a pilot-plant of reprocessing in Idaho Falls, Mr. Ihara came back to Japan in 1956 and drafted "Long-term National Program on Nuclear Development and Use in 1956." In this first nuclear policy paper concluded by the GOJ, Ihara inserted these sentences;

*"Supply Plan of Nuclear Fuels...The basic idea; for nuclear fuels, it is supposed to establish a self-sufficient system domestically as much as possible. For this purpose, the Government will actively carry out exploration and development of domestic resources and encourage exploration and development in the private sector together. In addition, it will make efforts to be able to import resources from overseas for shortfall. In order to establish a fuel cycle in accordance with the Japanese domestic situation in the future, it will try to improve technologies related to breeder reactors and reprocessing of fuel elements[9]."*

This is the first moment when the GOJ expressed its intention to pursue its own nuclear fuel cycle system as a national policy. Ihara, who later became an administrative vice minister of Science and Technology Agency in mid 1970s, admitted during the interview that his drafting process had been influenced by his experience as a nuclear foreign student in Argonne. He also explained that there had been two options advocated by then policy-makers—"thorium cycle" and "uranium-plutonium cycle." Ihara advocated the latter which was formally decided as the entire national policy later[10].

According to Ihara, an extremely rare still living former policy-maker during 1950-60s, one of key reasons to have explored "uranium-plutonium cycle" was that its breeding ratio is better than "thorium cycle." Also, he added "uranium-plutonium cycle" had more research performance than the other option at that time.

After drawing up this basic national policy in 1956, the government began its step-by-step implementation process. In 1959, Atomic Energy Commission (AEC), a leading body to promote nuclear power generation and fuel cycle system in Japan, established an internal working group focusing on future commercialization of reprocessing. And, a year later this working group made a recommendation to build a pilot plant which could reprocess about 350 kg spent fuels per day. Also at the same time, Japan Atomic Energy Research Institute, a research wing of the government, started to conduct basic technical research for commercializing reprocessing in the future[11].

From these initial processes in the late 1950s, Japan, a resource poor nation, gradually accelerated implementation of its fuel cycle policy in the 1960-70s. In tandem with introduction of nuclear power plants all across the nation, the GOJ and major utility companies took steps to enforce nuclear safety measures for nuclear facilities including ones related to the fuel cycle policy, even though it was later revealed that these measures were so insufficient and deficient compared to the world standard in 2011 when huge tsunamis hit the Fukushima Daiichi Nuclear Power Plant..

But, researchers and historians of the current age could not find any historical evidence that there was ever any serious policy debate and deliberation about security of spent fuels and storage facilities. As Ihara emphasized during a series of interviews with the author[12], a main policy driver which has seized the Japanese policy-makers has been, and still is, the Resource First Policy.

### **“National crisis”**

The Japanese nuclear fuel cycle policy has been under shadow of the U.S. regulation and authority since the start. Under the bilateral nuclear cooperation agreement signed by two allies in 1968, Japan had to ask the U.S. government to consent to its reprocessing of nuclear spent fuels composed of U.S. origin-nuclear materials. The U.S. was supposed to make a decision on whether it would consent or not based on effective measures taken by Japan for safeguarding these weapon-applicable materials[13]. But, a premise the Japanese side assumed was that the U.S. would give a generous consent without any difficulty because the U.S. had been the strongest backer of the Japanese nuclear policy since the beginning.

The “moment of truth” came to two allies in 1977 when the Carter administration expressed extreme skepticism towards the already planned Japanese reprocessing operation at the Tokai Reprocessing Facility in Ibaragi due to its strong concern about nuclear proliferation. The Carter administration as well as its predecessor, the Ford Administration, was so shocked by the Indian nuclear explosion in 1974, in which New Delhi used U.S.-origin heavy water and Canadian reactor for producing amounts of plutonium that President Jimmy Carter took a draconian measure to tighten regulation and control of reprocessing, a key nuclear sensitive technology, not only domestically but also internationally.

However, for the Japanese nuclear community, Carter’s severe response to their request of reprocessing operation at Tokai came completely out of blue and not proceeding was out of the question. *“Our impression is like a national crisis came. We felt so horrible. We need nuclear fuel cycle in order to continue our nuclear power generation. So, it was unbearable for us to see this premise shaken. That was a national consensus then,”* said Tetsuya Endo, a former senior official of Ministry of Foreign Affairs (MOFA) and former Acting Chair of AEC[14].

After a series of tough and confrontational discussions between both governments, President Carter finally permitted Japan to reprocess U.S.-origin spent fuels with certain technical conditions. But, this shocking experience made Japanese nuclear policy-makers and industrial sectors to profoundly realize an undeniable fact; the U.S. holds a “life or death” authority over their nuclear fuel cycle policy.

Confronting this sort of tipping-point event impelled the Japanese nuclear community to explore obtaining a freer-hand for future reprocessing operation by revising its bilateral nuclear agreement with the U.S. government. After President Carter left the White House in 1981, the GOJ started a diplomatic negotiation to revise the bilateral agreement with the U.S. government which was required to strengthen its regulation on nuclear exports overseas under Nuclear Non-Proliferation Act (NNPA) of 1978[15].

A key benchmark of this revision negotiation for the GOJ was to acquire so called “Comprehensive Advance Consent (CAC),” which would permit Japan to reprocess spent fuel in the future at the Rokkasho Reprocessing Plant, located in Aomori, in a comprehensive manner.

Initially, there were serious concerns inside the Reagan administration about giving CAC to Japan for a few reasons. According to William Martin, then Deputy Secretary of Energy, during internal deliberations by the administration, Department of Defense (DOD) expressed a hesitation to give



Japan CAC because of proliferation concerns. DOD was afraid that other nations like the Republic of Korea might insist on the same “reprocessing right” vis-a-vis the U.S. if the U.S. permits Japanese future reprocessing in such a comprehensive manner. Nuclear Regulatory Commission (NRC) showed other reasons why they were also negative about giving CAC to Japan. The biggest concern for NRC was “material unaccounted for (MUF)” which should be left inside pipes of the Rokkasho Reprocessing Plant after reprocessing spent fuels[16].

Despite these political and technical and concerns, however, the Reagan administration finally decided to give Japan CAC, because “President (Ronald) Reagan appreciates and trusts Japan, and he is in favor of this agreement,” according to Martin[17]. In the 1980s, the Reagan administration and the conservative Nakasone administration enjoyed such a diplomatic honeymoon thanks to two leaders’ strong personal bond and intensive policy coordination on defense and economic issues that the CAC issue was resolved in Japan's favor.

Finally in November 1987, the U.S. and Japanese governments formally signed a newly revised nuclear cooperation agreement which guarantees CAC for Japan. After this diplomatic conclusion favorable for Japan, both governments’ ratification processes followed some upheaval at U.S. Congress where some Senators expressed their proliferation concerns. The revised agreement went into force in July 1988 with 30-year duration.

During the bilateral negotiation for revising the nuclear cooperation agreement, both sides, especially the U.S. side, focused on the effectiveness of nuclear safeguards for ensuring nuclear non-proliferation principle. Also, the Japanese side emphasized its necessity to reprocess spent fuels for realizing and enhancing its energy security. However, there was very little policy argument or internal discussion on both sides to address future nuclear security concern which might arise from CAC given to Japan.

### **Real agendas beyond Fukushima**

*“Nuclear fuel cycle is a supreme interest for Japan. It’s so vital for Japan. Of course, Japan will never produce a nuclear weapon, but having potential nuclear capability is so important in terms of relationship with military-expanding China and North Korea. We can never ever give up Comprehensive Advance Consent given by the U.S. for Japanese reprocessing. This is not merely a matter of nuclear or energy policy. Comprehensive Advance Consent is real bedrock for the U.S.-Japan alliance[18].”*

In a deep background exchange with the author in the summer of 2014, one well-placed Japanese governmental official in charge of nuclear policy revealed to me what he had informally conveyed to his U.S. counterpart just a day before.

As the above comment strongly indicates, a series of nuclear policy-makers of the GOJ, especially MOFA, have shared an enduring consensus view that CAC, a “privilege” given by the U.S., is an “inalienable right” for Japan which is supposed to take a unique and special position in the current nuclear world order mainly regulated by the Nuclear Non-proliferation Treaty (NPT).

Thanks to CAC which is guaranteed by the U.S.-Japan bilateral nuclear cooperation agreement, Japan has continued reprocessing nuclear spent fuels inside and outside its territory and already accumulated around 48 metric ton of separated plutonium, which could produce several thousands of nuclear bombs according to experts of nuclear physics.

Even after such a miserable nuclear disaster in Fukushima, the Abe administration seems to maintain its status quo posture to pursue the 60-year-old nuclear fuel cycle policy by sticking to this

special “privilege” even beyond July 2018 when the current bilateral nuclear agreement expires. Under the current bilateral agreement, Japan has enjoyed a special status as a sole non-nuclear weapon state in the world that can pursue a path for commercial-scale nuclear fuel cycle system that relies on reprocessing and uranium-enrichment technologies.

However, the GOJ and Japanese nuclear industry will have to face another “moment of truth” in the near future. The first priority on the agenda for both nations is how to keep a healthy balance of stockpile of Japanese separated plutonium. Once the Rokkasho Reprocessing Plant starts reprocessing, its entire stockpile will definitely increase from the current level, unless LWRs across the nation consume more volume of plutonium as Mixed Oxide (MOX) fuels than the Rokkasho facility separates.

Looking into the current situation of Japan, which is symbolized by still strong opposition against resumption of nuclear power plants, very few specialists are confident that enough reactors, at least 8-10, can burn plutonium composed MOX fuels in a coming few years. The Rokkasho facility can reprocess 800 metric ton of spent fuels per year at maximum level, which results in 7-8 metric ton of plutonium. Worse, the Japanese fast-breeder project, once expected to consume lion-share of plutonium, has become more uncertain since the nuclear disaster in Fukushima. These fuel cycle landscapes seriously overshadow practical plutonium-consumption plan in the long-run.

The GOJ has continued to make it clear that it commits to its own pledge not to possess “plutonium which has no purpose of use” since 1990s. But, the reality on the ground looks totally different; Japan has increased its stockpile of separated plutonium by more than three times for the past 20 years<sup>[19]</sup>. Japan should prepare itself to face more severe pressure from the U.S. and the international society, unless it can persuade them with tangible and concrete steps to decrease entire volume of separated plutonium.

Another crucial agenda for the Japanese fuel cycle policy is to address potential nuclear security concerns. Strengthening security and safety of spent fuel at storage pools of nuclear power plants and cycle-related facilities should be a first step. Physical protection by introducing dry-casks and beefing up security personnel on these sites are minimum measures GOJ and private utilities have to take immediately. Also, a personal reliability system for nuclear sector needs to be established in a very urgent manner. The GOJ can make another pledge for international audiences who are dubious about Japan’s nuclear security and fuel cycle policy that a personal reliability system will be established at least before considering the Rokkasho facility’s operation.

Endo, a former chief negotiator of the U.S.-Japan nuclear agreement in late 1980s, recently made a confession during a recent interview with the author; *“Before the Fukushima nuclear accident, there has been not much policy debate (about nuclear security). There were some debates just only like deploying policemen, strengthening fences around facilities and engaging Japan Coast Guard. Japan is an island nation, so people have felt like ‘no way’ (such a serious nuclear security breach will take place in Japan).”*<sup>[20]</sup>

“3・11” must be an awakening moment for Japan to evolve its “nuclear modus-vivendi” from one so obsessed with energy security based on the Resource First Policy into more balanced one which can effectively and realistically address both nuclear security and non-proliferation concerns. It is time for Japan to review the fuel cycle policy which has embraced serious deficiency on nuclear security.

### III. ENDNOTES

<sup>[1]</sup> According to a poll conducted by *Kyodo News* on August 14 and 15 this year, 55.3% said they oppose resumption of nuclear power plant operation, while 36.9% said they support it. The poll was

done just few days after the Sendai Nuclear Power Plant of Kyusyu Electric Power Co. had started generating electricity. *Jiji Press* conducted the same type of poll in July 2015 and found 54.3% against resumption of nuclear power plant. See *Jiji Press's* website; <http://www.jiji.com/jc/zc?k=201507/2015072200555> (accessed on August 18, 2015). This trend, opposition overwhelming support of early resumption, has not been basically changed since the Fukushima Nuclear Disaster starting from March 11, 2011.

[2] See "Strategic Energy Plan" on METI's homepage; [http://www.enecho.meti.go.jp/en/category/others/basic\\_plan/pdf/4th\\_strategic\\_energy\\_plan.pdf](http://www.enecho.meti.go.jp/en/category/others/basic_plan/pdf/4th_strategic_energy_plan.pdf) (accessed on August 18, 2015).

[3] "Genpatsu Niwari no Hokokusho Kettei (Policy paper recommending 20% of nuclear power was decided by the Abe Cabinet)," *Kyodo News*, July 16, 2015.

[4] Since the Fukushima nuclear disaster took place, the author has made more than 30 interviews with Japanese and foreign experts on nuclear fuel cycle policy and governmental officials of Japan and the United States. Almost all of the interviewees expressed pessimistic outlook of the future of Plutonium-Thermal Program with small exception. These exceptions include few senior officials of METI and Aomori Prefecture where the Rokkasho Reprocessing Plant is located.

[5] "Volcano issues unaddressed in nuclear power plant," *Jiji Press*, August 12, 2015, the Japan Times' website; <http://www.japantimes.co.jp/news/2015/08/12/national/volcano-issues-unaddressed-nuclear-plant-res-tart/#.VdLlavntmkp> (accessed on August 18, 2015).

[6] In July 2011, Tokyo Electric Power Co., Inc. (TEPCO) announced it was unable to make a direct contact with 198 former workers who engaged with recovery operation of the Fukushima Daiichi Nuclear Power Plant after the disaster. This news led to public outcry and revealed serious vulnerability of nuclear security. See "Renrakusaki Fumei ha 198 nin ni (Unable to contact with 198 workers)," *Kyodo News*, July 20, 2011.

[7] For details about the FCA, see the *Kaku Joho* (Nuclear Information) website; [http://kakujoho.net/ndata/pu\\_fca.html#d2](http://kakujoho.net/ndata/pu_fca.html#d2) (accessed on August 18, 2015).

[8] An interview with Yoshinori Ihara, November 28, 2013.

[9] "Long-term National Program on Nuclear Development and Use in 1956," website of Atomic Energy Commission of Japan, <http://www.aec.go.jp/jicst/NC/tyoki/tyoki1956/chokei.htm> (accessed on August 20, 2015).

[10] The Interview with Ihara.

[11] Hitoshi Yoshioka, *Genshiryoku no Shakaishi (Social History of Nuclear Power)*, Asahi Shinbun Shuppan, 2011, pp.111-116.

[12] The author conducted five interviews with Mr. Ihara since 2011.

[13] Tetsuya Endo, *Nichibei Genshiryoku Kyotei no Seiiritsu Keii to Kongo no Mondaiten (Making-process of the Japan-U.S. Nuclear Agreement and Future Problems)*, 2014, The Japan Institute of International Affairs, pp.9-11.

[14] An interview with Tetsuya Endo, July 23, 2015.



[15] Endo, *Nichibei Genshiryoku Kyotei no Seiiritsu Keii to Kongo no Mondaiten*, pp.11-14.

[16] An interview with William Martin, September 7, 2012. Endo also confirmed these points with the author. Also see Endo's book.

[17] According to Martin, Colin Powell, a senior staff of National Security Council (NSC), explained President Reagan's view during an inter-agency policy deliberation which Martin himself attended as a representative of Department of Energy (DOE).

[18] An interview with a well-placed GOJ official, June 11, 2014.

[19] In 1995, Japan's plutonium stockpile was around 15 metric ton; see the *Kaku Joho* (Nuclear Information) website, [http://kakujoho.net/ndata/pu\\_jp.html](http://kakujoho.net/ndata/pu_jp.html) (accessed on August 24, 2015). In August 1991, AEC's Nuclear Fuel Cycle Special Working Group announced its basic principle that Japan would not possess more amount of plutonium than it needs; see AEC's website, <http://www.aec.go.jp/jicst/NC/about/ugoki/geppou/V36/N08/199103V36N08.html> (accessed on August 24, 2015). Since then, a series of Japanese administrations including the Abe administration have confirmed this basic principle.

[20] Author's interview with Endo.

#### IV. NAUTILUS INVITES YOUR RESPONSE

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