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By Frank Barnabie and Shaun Burnie

As we reach the anniversary of the end of World War II, North-east Asia has changed in so many ways since the devastation brought about by years of conflict. But tragically, many historical problems remain unresolved. The Korean peninsula is still divided; the United States is the predominant military power in the region; and nationalism remains a powerful force in Japan, China and in the Koreas. These alone should give rise to major concern for the future peace and stability of the region. But the threats to peace in the region could soon get worse.

Sixty years ago the city of Nagasaki was destroyed by one nuclear bomb containing five kilograms of plutonium. In 2005, Japan has one of the largest stocks of weapons usable plutonium in the world (45,000 kg and growing) as well as access to the most advanced missile technology. This is not by accident but design. Deliberate policy established in the late 1960's by senior politicians was to acquire the nuclear material required for atomic bombs, and the means to deliver them.1 Without having to cross the difficult threshold of actual weapons development, Japan has already become a de facto nuclear weapons state.

Successive Japanese governments have achieved this status through a nuclear energy policy based upon the production and use of plutonium, and an ambitious if flawed commercial space programme. It is this nuclear policy that will soon lead to the commissioning of the world's most expensive nuclear facility - the Rokkasho-mura reprocessing plant.2

The big question is whether or not a future Japanese government will take a political decision to develop nuclear weapons. Nuclear proliferation threats on the Korean peninsula and the growth of China's economic and military power are two important (and real) drivers that are being cited by powerful interests in Japan as justification for considering what should be the unthinkable.
So at a time when the tensions, and therefore the proliferation dynamics in North-east Asia, are becoming both more serious and complex, there is an urgent need to examine both Japan's plutonium programme and the political context of Japan's nuclear weapons policy. This briefing will seek to focus on a few of these.

Introduction

Unlike South Korea and Taiwan, which had their

pursuit of reprocessing and plutonium frustrated by direct U.S intervention, Japanese nuclear energy policy since the 1960's has been based upon the large-scale production and use of plutonium. The original plan to separate plutonium from nuclear reactor spent fuel and then use it to fuel a generation of fast breeder reactors has failed, with only the Monju fast reactor remaining. Instead the plan to use plutonium as fuel is dependent upon successful loading in conventional light water reactors. This plan too has run into major delays due to the reality of unsafe technology, poor operating standards, and a determined antinuclear movement that has, over recent decades, challenged all major developments.

Whereas in 1994, Japanese officials were predicting that plutonium demand (the amount required to fuel nuclear power plants) would be 85-90,000 kg by 2010, today in 2005 not one gram of plutonium is loaded into commercial nuclear power reactors. Moreover, while the demand side has been a disaster for Japanese government plans, its plutonium supply has run out of control, with total plutonium stocks over 45 metric tons - a fivefold rise from the early 1990's. This could rise to over 100 tons within the next fifteen years.

To date most of this plutonium has accumulated in overseas reprocessing plants in France and the UK under contracts signed with Japan. However, with plans to start up the US$21 billion Rokkasho plant, Japan will have a reprocessing capacity only equalled by the world's largest nuclear weapons states.

The pursuit of plutonium

"Can Japan expect that if it embarks on a massive plutonium recycling program that Korea and other nations would not press ahead with reprocessing programs? Would not the perception of Japan's being awash in plutonium and possessing leading edge rocket technology create anxiety in the region?"
Diplomatic cable U.S. Ambassador to Japan, to U.S. Secretary of State Christopher, March 1993.

Japan's no-plutonium stockpile policy

In response to political pressure over its plutonium programme, the Japanese government declared in the early 1990's that it would not hold more plutonium than was necessary for commercial use. The government's 'no plutonium stockpile' policy and their declared supply and demand figures for plutonium, were meant to reassure the international community, particularly in East Asia, that Japan would only possess sufficient plutonium to meet commercial requirements. However, almost from day one, Japan has possessed well in excess of its requirements, and as the 1990's unfolded the excess stock has increased.

"The squishy part of the Japanese plan, where the numbers appear vague and uncertain, is the use of MOX fuels in commercial reactors. If use is less than planned Japan will have to slow down its reprocessing and accumulate growing amounts of unreprocessed spent fuel, or will have to produce separated plutonium that is clearly excess to Japan's civilian needs."
U.S. Embassy diplomatic cable to U.S. Secretary of State, 'Japanese plutonium transport and reprocessing issues', November 15th 1991.

Nearly fifteen years on and the only thing that has changed is the volume of Japanese plutonium. Japanese plans for plutonium fuel (MOX) use remain highly 'squishy' or uncertain. At the time of this diplomatic cable (1991) Japan had a total of

9,000 kg of plutonium. The current stockpile has increased fivefold to nearly 45,000 kg.

In 1991, Japan's Atomic Energy Commission predicted that by 2010:
• 50 tons of plutonium in MOX would be loaded into light water reactors
• 10 tons of plutonium in MOX loaded in Advanced Thermal reactors;
• 20-30 tons of plutonium in MOX loaded into Fast Breeder reactors.

In reality these projections have been completely wrong. If we add Japan's current available plutonium stockpile (45,000 kg) to the cumulative supply of plutonium from Rokkasho operations through to 2020 (100,000 kg), by 2020 Japan's plutonium stockpile will reach 145 metric tons. It is clear that Japan has become the world's largest holder of weapons-usable plutonium, far surpassing that contained in the United States nuclear weapons arsenal of 100 tons.

"I admit that we have excessive amounts of plutonium, but our purpose is for research."
Yuichi Tonozuka, president of the Japan Nuclear Cycle Development Institute, April 2005.

No such justification would be permissible by a South Korean nuclear official, because the United States blocks Seoul from acquiring plutonium. Still, it is almost inconceivable that Japan's plans for plutonium MOX fuel by 2020 will use more than forty or so tons of plutonium. The history of Japan's programme would suggest that they will fail to utilize even this amount. Thus Japan's stockpile of plutonium will continue to grow with all the resultant negative consequences for global nuclear non-proliferation and regional peace and security.

The 2005 Non-Proliferation Treaty (NPT) conference failed to reach any sort of consensus. It is, therefore, urgent to strengthen the NPT regime and revitalise the Treaty. In the short term, the most important measure to do so is to strengthen the safeguards system applied by the International Atomic Energy Agency (IAEA), to make it more difficult to acquire fissile materials, plutonium and highly enriched uranium, to make nuclear weapons.

The most serious problem facing the IAEA safeguards system is that the most sensitive plants insofar as the diversion of weapon-usable materials is concerned - particularly uranium-enrichment facilities and plutonium reprocessing plants - are impossible to safeguard effectively.3 Consider, for example, large commercial reprocessing plants which separate the unused uranium, plutonium and fission products in spent nuclear power reactor fuel elements, such as the one under construction at Rokkasho-Mura.

Safeguarding the plutonium in spent nuclear reactor fuel elements before reprocessing is relatively simple. It is just a matter of counting the number of the elements. Once the plutonium is removed from spent reactor fuel elements at Rokkasho-Mura, safeguarding it is quite a different matter. There is no clear distinction between the commercial use of plutonium and its military use. To argue that the further spread of nuclear weapons must be prevented, as Japan does, while, at the same time, operating a civil reprocessing plant is, to say the least, inconsistent.

A good nuclear-weapons designer could construct a nuclear weapon from three or four kilograms of the plutonium produced by the Rokkasho-Mura reprocessing plant. To ensure the timely detection of the diversion of such a small amount of plutonium in a plant where so much plutonium is handled requires very precise safeguard techniques, requiring significantly more precision

than is currently achievable. Even with the best available and foreseeable safeguards technology it is not possible to get the precision necessary.4

The Rokkasho-Mura Reprocessing Plant cannot be safeguarded and should be abandoned

In August 2004, a leak started in a pipe connected to the accountancy tank at the front end of the THORP reprocessing plant at Sellafield and complete failure of the pipe occurred in mid-January 2005.5 Solution, containing spent reactor fuel elements dissolved in nitric acid, leaked into a cement secondary containment chamber. The leak was not detected until April 2005, eight months after it began, by which time about 83,000 litres, containing about 160 kg of plutonium, had leaked out. Opportunities to detect the leak - cell sampling and level measurements - were missed. That this incident could have occurred is one example of the inadequacies of the safeguards system for reprocessing plants.

The main reason for the difficulty of safeguarding the Rokkasho-Mura plant relates to uncertainty about the amount of plutonium entering the plant. An estimate of this amount is made from the amount of uranium in the spent reactor fuel elements sent to the reprocessing plant by the Japanese operators of the reactors. This is calculated by the reactor operators from their knowledge of the amount of uranium originally in the reactor fuel elements and of the way in which the reactor was operated while the fuel was in it. In particular the amount of heat produced by the fuel. The estimate relies on computer calculations not direct measurement.

The first measurement, as opposed to an estimate based on calculation, of plutonium in the Rokkasho-Mura reprocessing plant is made on samples taken from an accountancy tank at the beginning of the process. Using mass spectrometry, the ratio of the amount of plutonium to the amount of uranium is determined. From the calculated amount of uranium and the measured uranium/plutonium ratio, the amount of plutonium is calculated.6

There may be errors in each stage of this operation. For example, some plutonium will remain in the parts of the fuel elements not dissolved in the nitric acid (called “the hulls”). The amount is very difficult to estimate.

The operators of the Rokkasho-Mura reprocessing plant will, therefore, be uncertain about the precise amount of plutonium produced by the plant. The uncertainty is called the “material unaccounted for” or MUF. Because of the nature of the errors involved, the value of the MUF will usually not be zero even if no illegal diversion of plutonium has occurred.

The fact that there is a MUF means that the operators of a commercial reprocessing plant do not know whether or not an amount of plutonium has gone missing. For example, if the police ring up the operators and say that a terrorist or criminal group has contacted them and provided evidence that they have acquired some plutonium, enough to fabricate a nuclear explosive, the operators could not confirm with any certainty that a few kilograms had, or had not, gone missing. This is because the amount that may be missing will be within the MUF. It must be concluded that currently the IAEA cannot effectively safeguard the Rokkasho-Mura reprocessing plant.

According to recent estimates, the potential material unaccounted for (MUF) at the Rokkasho-Mura plant will be around 50 kg per year. This plant, which will include the most up-to-date safeguards technologically available, is designed to allow the application of the most effective

safeguards possible today. The plant will have the capacity to reprocess about 800 tonnes of spent fuel a year, producing about eight tonnes of plutonium. The effectiveness of safeguards on the plant, according to these estimates, is more than 99%. Nevertheless, even on these very optimistic estimates, the potential material unaccounted for still amounts to about a nuclear weapon's worth a month.

We realise that the official response to MUF is to claim that even if plutonium goes astray from the reprocessing plant, physical protection measures applied will prevent it leaving the site. We disagree with this and question the effectiveness of physical protection, and therefore still believe the safeguard system is inadequate.

The Japanese nuclear industry is keen to reprocess spent reactor fuel because it recovers unused uranium and plutonium that can be reused as nuclear fuel. The fact that there may be some plutonium unaccounted for at Rokkasho-Mura is acknowledged, but it is argued that physical protection measures can be made sufficiently effective at the plant to ensure that no significant amounts of plutonium are removed from the site. Those anxious to prevent the use of plutonium for the production of nuclear weapons by the government or by terrorists argue that any significant amount of plutonium unaccounted for is unacceptable and that reprocessing at Rokkasho-Mura plant should be abandoned.

There is no need to reprocess spent nuclear power reactor fuel elements. Civil spent reactor fuel elements can stored until they can be permanently disposed of in a geological repository - such as the one planned by the USA at Yucca Mountain. Plutonium is generally used as nuclear-reactor fuel in the form of mixed oxide (MOX) fuel. The plan is to produce MOX at the Rokkasho-Mura plant by mixing uranium dioxide and plutonium dioxide. This can be used as fuel in Japanese nuclear-power reactors instead of uranium dioxide.

MOX enthusiasts argue that the use of MOX allows plutonium to generate more energy in nuclear reactors rather than wasting this energy, and that the use of MOX would reduce the stockpiles of civil Japanese plutonium. These stockpiles are politically embarrassing for the Japanese government because the plutonium could be used to fabricate nuclear weapons. The cost of MOX fuel is, however, much higher than the cost of ordinary uranium dioxide fuel.

The use of MOX increases the risk of nuclear weapon proliferation. The necessary steps of chemically separating the plutonium dioxide from uranium dioxide and converting the dioxide into plutonium metal that can be used to fabricate nuclear weapons are relatively straightforward. The use of MOX in a nuclear-power reactor is not a satisfactory solution to the problem of excess plutonium stocks. A more rational solution would be to abandon reprocessing at Rokkasho-Mura and to immobilize existing stocks of Japanese plutonium until they can be permanently disposed of.

Safeguards and, therefore, the non-proliferation regime, would be significantly strengthened if reprocessing and the production and use of MOX at the Rokkasho-Mura plant were abandoned. This would significantly improve global security.
Not one country that has initiated a nuclear weapons programme since 1945 has done so on the basis of a democratic debate.7 Decisions were made behind closed doors in great secrecy and in the context of external threats - actual, perceived, contrived and otherwise. In the case of Japan there is a dangerous assumption that the decision to build nuclear weapons will require the overturning of public opinion, which is generally

considered to be by majority opposed to nuclear weapons. History informs us that conditions evolve that lead to debate and opposition after the threshold has been crossed, by which time it is too late.

Today, Japan is closer to those conditions than at any time since at least the 1960's, and probably since its wartime programme in the 1940's. In the case of the military programs run by the Imperial Navy and Army under the guidance of the father of the Japanese atom, Nishina Yoshio, it was lack of time, resources and fissile material that led to failure.8 In the 1960's it was the political judgement that it was not in Japan's national interest to acquire the bomb - it could rely upon the U.S. nuclear guarantee (at least for the foreseeable future) and at the same time acquire the means to go nuclear if necessary.

With the technical means to build advanced nuclear weapons within six months, what remains is the political judgement of the ruling elite of Japan first to assess its strategic imperatives and then the political consequences of going nuclear. As a de-facto nuclear weapons state under the U.S. nuclear umbrella, there remains today no immediate need for Japan to build nuclear weapons. Its plutonium stockpile is already a strategic asset. But the conditions for a decision are evolving, and the public is being softened up for a possible decision.

Since the 1950's leading politicians, including Prime Ministers and Cabinet Secretaries have pronounced on the possibility of Japan developing nuclear weapons. Many of these statements have made clear that the Japanese constitution does not prohibit Japan possessing nuclear weapons and that its three non-nuclear principles are not legally binding.

Political momentum towards nuclear weapons

Through most of this period the justification has been for obvious reasons, put in the context of national (self) defence, but in most cases without explicit threats being named (at least in public). Today the threats are now more explicitly cited. In recent years leading politicians such as Ozawa Ichiro warned that Japan could use its commercial plutonium stockpile for making nuclear weapons. Ozawa, leader of the opposition party Jiyuto (Liberal Party), declared in 2002 that if the military threat posed by China continued to grow:
"It would be so easy for us to produce nuclear warheads - we have plutonium at nuclear power plants in Japan, enough to make several thousand such warheads."9

The crisis over North Korea's nuclear weapons program, based around plutonium reprocessing, stengthened the position of those in Japan advocating nuclear weapons development.

Acknowledged by no less than the U.S. Ambassador to Japan Thomas Schieffer: "If you had a nuclear North Korea, it just introduces a whole different dynamic… That increases the pressure on both South Korea and Japan to consider going nuclear themselves." (Tokyo, June 2005). While such a declaration is intended to put pressure on China to act more forcefully with its ally in Pyongyang, it is also highly significant in terms of U.S. policy towards Japan.

In the 1960's, the Nixon administration considered the option of arming Japan with nuclear weapons. Forty years on it would be surprising if there were not those in Washington considering that such a development would be in the medium term interests of the United States. And anyway, the U.S. is already signalling that it would not be able to stop it.

Of course, according to most analysts North Korea already possesses a few or several nuclear weapons. It has not yet demonstrated their existence through an actual nuclear test, although it has been speculated that it is imminent. At which point the debate in Japan over its security vulnerability to North Korean missiles would become frantic.

More likely a test remains a threat, which will be deployed only when North Korea has run out of other options. But the general atmosphere remains threatening and therefore fertile for those in Japan who would move towards weaponisation.

A further factor to consider is the general view that international opprobrium/condemnation would be visited on Japan if it were to go nuclear. It is true that the consequences for Japan's nuclear trade would be problematic, perhaps severely damaging as Japan is supplied nuclear materials and technology under condition of peaceful use. But what of wider diplomatic and economic consequences?

It is worth considering the reality of international relations in the early 21st century. Japan's major nuclear trading partners are in possession of their own nuclear weapons (and currently modernizing them) or covered by the U.S. nuclear umbrella. Current nuclear non-proliferation policy is based upon the double-standards of opposing the programmes of Iran or North Korea while maintaining or expanding their own weapons programs. Japan is unlikely to be labelled part of the axis of evil. If triggered by a North Korean test, or equivalent dramatic development, while not welcoming a Japanese bomb, it is likely that Japan's allies would explain it as a regrettable but understandable reaction.

And it gets worse. Witness the experience of India and Pakistan in the aftermath of their nuclear weapons tests in 1998. While sanctions were applied, including by Japan, the reality today is that their relations with the United States and allies (especially Japan) have never been closer. They are both identified as strategic partners, with India seen as vital in terms of economic production and future markets, an ally in the 'war against terror' in the case of the military elite ruling Pakistan, and a counter balance to China in the case of India. The reality is that both countries have gotten away, nay thrived, in the aftermath of becoming nuclear powers. India is due to sign nuclear cooperation agreements with the United States and Pakistan is soon to take delivery from the U.S. of nuclear strike capable F-16s.

As the world's second largest economy, the important and dangerous lesson for policy makers in Japan is that the world soon learns to live with nuclear realities. If India and Pakistan can do it, then Japan certainly can. Japan's strategic importance to the United States has moved centre stage under the Bush administration. There are pressures to revise its constitution with the active encouragement of the U.S., and Japan's military is being deployed overseas, and undertaking joint training with the U.S. as never before. The prospects of Japan moving further towards nationalism and militarism are made worse by the likely successor to Prime Minister Koizumi, Shinzo Abe in 2006.

"Treat nothing as inevitable" is a good principle to live one's life by. Unfortunately, in the case of Japan's nuclear development, it may not be sufficient. The international community - read governments - will learn to live with Japanese nuclear weapons if that occasion arises. The consequences would of course be terrible for Northeast Asia. Pressure in South Korea to respond would be huge, relations with China could become disastrous, and the global nuclear non-proliferation

regime centred around the NPT reduced to a historical footnote.

Japan's existing plutonium programme is a driver for nuclear proliferation in the East Asian region and further afield. For example, Iran has cited Rokkasho to support its case for being permitted to complete its uranium enrichment plant at Natanz. There is an alternative to Japan travelling full circle from the ashes of 1945 and becoming a declared nuclear weapon state. It will come through active citizen opposition in Japan based upon informed debate and mobilization, aided by support from overseas. A change in energy policy that abandons plutonium use on the grounds of non-proliferation would be an important first towards rejecting the path chosen by governments (but not the people) in the world's nuclear weapons states. It will also strengthen Japan's calls for global nuclear disarmament.

The nuclear weapon states, in particular the United States, continue to defy their legal obligations to disarm their nuclear weapons. The 60th anniversary of the first use of the atomic bomb is a hugely important opportunity to begin the mobilization not just in Japan

1. Mainichi Shimbun, in its 1st August 1994 edition, revealed that a top secret Foreign Ministry document called "Our Nation's Foreign Policy Principles" was produced in 1969.
2. Total costs for the plant are US$21 billion. See, "Nuclear Twilight Zone", Bulletin of Atomic Scientists. May 2001.
3. Leventhal, P., "IAEA Safeguards Shortcomings: A Critique", Nuclear Control Institute, Washington, DC., September 12th, 1994
4. Miller, M. M., "Are IAEA Safeguards on Plutonium Bulk-Handling Facilities Effective?", Nuclear Control Institute, Washington, DC., August 1990.
5. Nuclear Engineering International, Thorp board of enquiry report released, Nuclear Engineering International, 29th June 2005.
6. Frank Barnaby and Shaun Burnie, "Safeguards on the Rokkasho reprocessing plant", Greenpeace International, June 2002.
7. The U.S. Manhattan project for obvious reasons was launched without Congressional debate; both France and the UK launched theirs with limited cabinet involvement and no parliamentary debate; the Soviet and Chinese program were initiated under direct orders of Stalin and Mao; India announced their program with a nuclear test in 1974; Pakistan similarly in 1998; Israel still refuses to officially confirm its program exists; South Africa dismantled its weapons only after the end of Apartheid and democratic elections. Programs run by Australia, Switzerland, Germany, Sweden, South Korea and Taiwan to name the most sophisticated were done so in great secrecy, with limited parliamentary debate in a few cases.
8. The first English language report confirming Japan's nuclear weapons program was made by David Snell in the October 3rd edition of the Atlanta Constitution, the headline read, "Japan Developed Atomic Bomb - Russians Grabbed Scientists". More substantive details on Japan's wartime bomb program, Genzai Bakudan, were provided by Deborah Shapely in Science, vol. 199, Jan. 13th, 1978. While Snell claimed that Japan progressed to the point where it conducted a nuclear test on August 10th 1945, off the coast of present day North Korea, there remain significant doubts that such a test took place. The latest thinking is that without sufficient fissile material Japan was 6-9 months away from an actual weapon.
9. Ozawa's statement was made during a lecture given in the southern City of Fukuoka, though was not supposed to be made public, April 2002, see Greenpeace International press statement, "Ozawa confirms nuclear weapons potential of Japan's plutonium program as further nuclear transports loom", April 7th 2002.

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For the full report see The Nautilus Institute website http://www.nautilus.org/

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