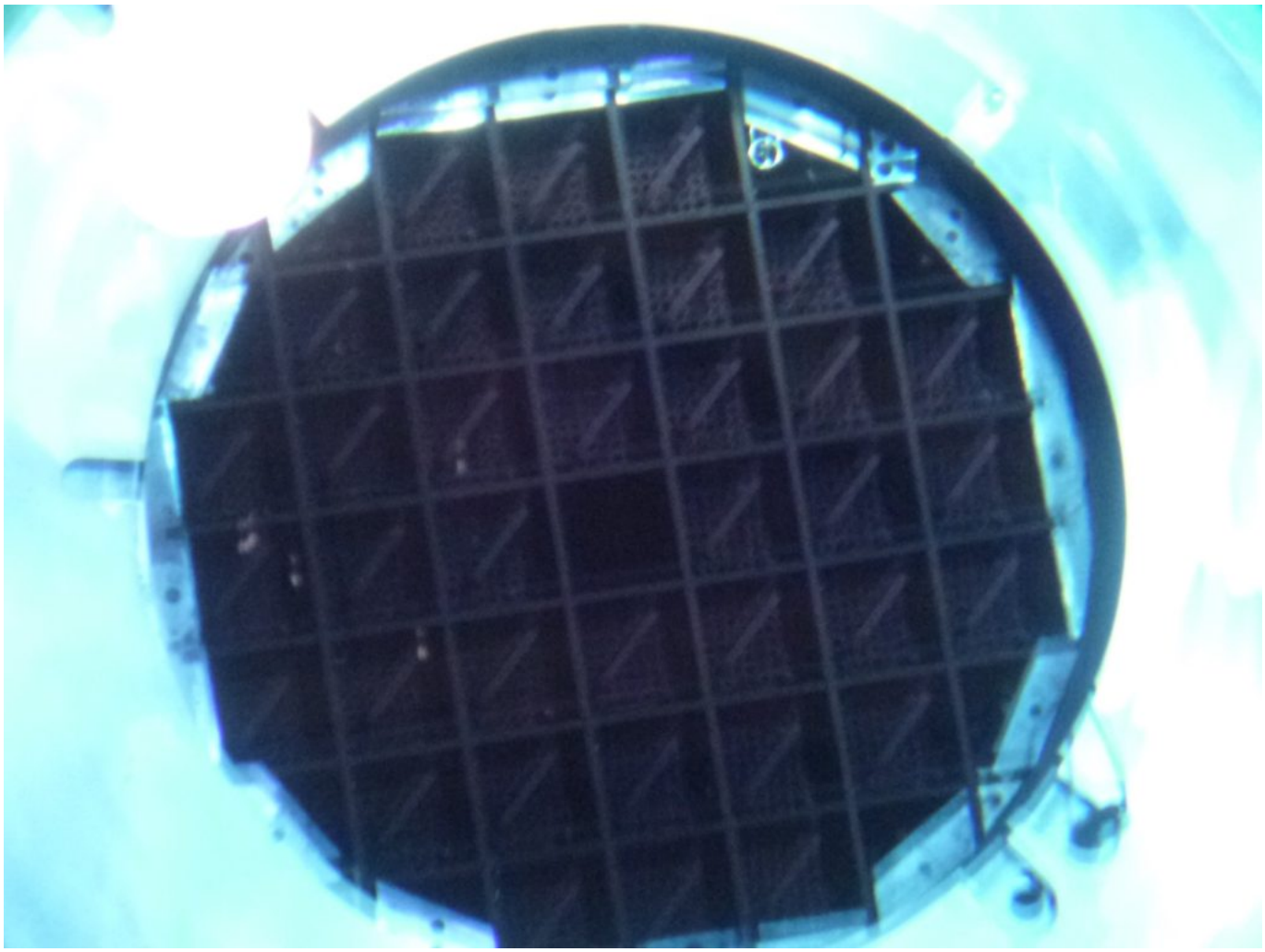
# NUCLEAR TERRORISM AND SPENT FUEL STORAGE IN NORTHEAST ASIA



## Recommended Citation



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**I. INTRODUCTION**

In this essay, Nobuyasu Abe concludes that "it may be useful to have international arrangements to share the supplies and material in case of [a nuclear terrorist attack] emergency. Cooperation among regional neighbors is a logical conclusion given the advantage of having emergency supplies in the nearby neighborhood. For such a regional cooperation to be effective the equipment and supplies to be shared should have a maximum interoperability with common specifications as far possible.  Thus, it would be useful to convene a coordinating meeting for a regional nuclear emergency cooperation."

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Banner image: Report of Inspection Results of the First Dry Storage Cask at Fukushima Daiichi Nuclear Power Station, March 27, 2013, from TEPCO photo library here.

## II.  NAPSNET SPECIAL REPORT BY NOBUYASU ABE

## NUCLEAR TERRORISM AND SPENT FUEL STORAGE IN NORTHEAST ASIA

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**What are the realistic scenarios for terrorist attacks on spent fuel in Northeast Asia?**

Most of the spent nuclear fuel in Japan is in the water pools located on the nuclear power station sites, in transit to the nuclear fuel reprocessing plant at Rokkashomura in Aomori Prefecture, or in storage space there waiting for reprocessing. In terms of the attractiveness for any terrorist, the Fukushima Daiichi accident revealed the vulnerability of the water tanks to the loss of cooling water that can be caused either by their physical destruction, by disrupting the water supply to their cooling system, or by disrupting the power supply for that purpose. The latter may be easier to do but can be restored after the terrorist (group) was overcome by security forces. The Government of Japan and the Nuclear Regulation Authority are promoting the efforts to build interim dry-cask storages and encouraging power companies to move the spent fuel from cooling pools to dry-cask storages as soon as possible.

In terms of "attractiveness", the plutonium separated from spent fuel and yet to be manufactured into MOX fuel may be more or as attractive as the spent fuel which has to be left to be overheated and explode for the radioactive fission products to be released, which then has to be flown away distant to enough to cause any havoc in the neighborhood. Terrorists will have to wait for the luck to have the fission products released and blown away by the winds. In comparison, stealing separated plutonium, particularly in powder form, and dispersing it in populated neighborhood may be more attractive and easier way to create a panic among the people because of the known health risk of inhaling plutonium. While plutonium separated from light-water reactor spent fuel may not be high grade for weapon purpose, it may be even better terrorist weapon for its higher spontaneously

decaying Pu240 content. Indeed, the handling of plutonium when manufacturing a Pu-containing explosive device can be highly hazardous to health if the terrorists care about it.

The cooling pools in Japan are all located on the nuclear power station premises and very often housed in the same building as the reactors. Thus, they are guarded with the same perimeter defenses as the reactors themselves. For the purpose of physical destruction, the cooling pools may be easier to destroy than the reactors and the container vessels that are made of tough metal alloys to withstand potential internal explosions. The cooling pools located outside the reactor houses may be easier to attack but the attractiveness of the spent fuel there may be a little less because they are cooler and less prone to become overheated and explode. There is a risk for spent fuel being transported to be intercepted or thrown into an accident to cause public panicking. But, the spent fuel had been cooled down enough to be loaded into transportation casks and thus may be less attractive. Obtaining plutonium or any hazardous radioactive material from spent fuel rods for the use in a dispersal device may be a hard job to do.

As discussed above, separated plutonium in powder form may be a most attractive target for terrorists to obtain. It exists at the end of the reprocessing process at a reprocessing plant and in a storage space waiting for manufacturing into MOX fuel. At Rokkashomura, they are both in the same reprocessing plant compound.

**What is the best way to reduce the vulnerability of spent fuel and nuclear facilities to terrorist attack, especially the insider risk?**

***Defending spent nuclear fuel***

For the purpose of defending spent nuclear fuel from possible theft or terrorist attacks, it would be best not to have spent nuclear fuel around in the first place, and if it is not possible, it would be better to have as small amount of spent fuel kept as possible. As shown in Convoy Escort Theory, it would be better to concentrate the spent fuel in a smaller number of locations and guard it heavily than to keep it scattered at various locations with different degrees of thinner protection. This way the guarding costs may also be reduced. For the sake of safety spent nuclear fuel should better be removed from the cooling pools housed in the reactor buildings. Separate cooling pools and dry-cask storages might better be co-located in the nuclear power plant site which is already heavily guarded. Once removed from the reactor sites they would be best placed in as few locations as possible, for example, Rokkashomura Reprocessing Plant or Mutsu Interim Storage Facility.

***Defending nuclear facilities***

In Japan possible attacks against nuclear facilities appeared to be considered only as a chance with low intensity threats, i.e. terrorists with small arms attacking facility and forcing intrusion. Attacks with higher intensity, i.e. with heavier weapons or semi-military armaments, are not considered as a realistic scenario in Japan. Thus, under the current arrangements, the defense of the nuclear facilities in Japan falls under the responsibility of the police forces which is only lightly armed. Even the kind of higher intensity threats, however, cannot be entirely ruled out, especially, in case when bilateral relationship with North Korea or China worsens in future.

Under the current arrangement in Japan, the protection of the nuclear power stations is designated as one of the important facilities to be protected the Self-Defense Forces and the responsibility is assigned to the regiment covering the area. There is no specific unit designated for the defense of nuclear facilities. When the situation proves serious enough the government may give an order to mobilize forces nationwide. This may delay the engagement of the Self-Defense Forces in case of quasi-military attacks against nuclear facilities. The involvement of the Self-Defense Forces needs to

be strengthened for sufficiently equipped and trained units to be ready enough to cope with any quasi-military attacks against nuclear facilities. For this reason, the protection of nuclear facilities should be designated as a major task of the Self-Defense Forces.

### *Defending against the insider risk*

Japan still has a long way to go in terms of defending nuclear facilities against the insider risk. The Nuclear Regulation Authority last year issued a rule requiring the nuclear operators to verify the reliability of their employees on the basis of the data submitted voluntarily by them. The confidential information cannot be shared with police authorities. This was certainly a progress from the previous situation but falls far short of a rigorous background checking. The submission of the personal information needs to be made mandatory and the information exchange with police authorities should be started. If two-way exchange of confidential information is not feasible, at least, the authorities should be given the opportunity to check the data kept by the operators against their black lists.

The dual key system and two-man principle have been introduced at certain critical points. To make such system to be meaningful, background checking of employees should be strengthened. It may be also useful to have third-party verification of the critical points to be guarded against the insider risk. The process would take a sophisticated analysis and simulation exercises.

## What is the best response to such attacks should they occur, especially the role of regional cooperation?

### *Similarity with the response to nuclear accidents*

The responses and consequence managements of the terrorist attacks against nuclear facilities are similar to those to the nuclear accidents in many ways but may present greater difficulties than accidents. Initial response would be efforts to stop the progression of nuclear accident/attacks, that is, stopping the reactor, cooling the reactor and containing the spread of radioactive fission products. The case may be more difficult as the intentional attacks target the most vulnerable points in comparison to non-intentional and random attacks by natural disaster or mechanical failure. The situation may become even more difficult if the infiltrators remain and try to obstruct the efforts to contain the damages.

### *Difficulty of preparing against nuclear accidents or terrorist attacks in light of infrequency of the events*

Preparing against such occurrence takes preparation of a corps of trained personnel to cope with the accidents/attacks, and to prepare necessary equipment and material for such operation and planning and training drills for the prevention, evacuation and remediation. The experience of Fukushima Daiichi accident revealed the difficulty of preparing all these things beforehand. The development of radiation-resistant robots for such operation, for example, was in progress for some years after the experience of 1999 Tokai criticality accident but was soon abandoned because the kind of accident that require the use of such robots seemed very much remote unlike firefighters who are ready to fight fires that happen almost every day in big cities. The kind of serious nuclear accidents/attacks that involve radiation release take place only rarely. Nuclear terrorist attack has not taken place yet. Under such circumstances, it is difficult to maintain sustained public support for the long-standing preparedness, equipment and supplies, and necessary trained personnel. In the case of the Fukushima accident, Japan received supplies from France and the United States.

### *Role for a regional cooperation for a nuclear emergency*

For these reasons, it may be useful to have international arrangements to share the supplies and material in case of an emergency. Cooperation among regional neighbors is a logical conclusion given the advantage of having emergency supplies in the nearby neighborhood. For such a regional cooperation to be effective the equipment and supplies to be shared should have a maximum interoperability with common specifications as far possible.  Thus, it would be useful to convene a coordinating meeting for a regional nuclear emergency cooperation.

## III.  NAUTILUS INVITES YOUR RESPONSE

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