

International Panel on Fissile Materials (IPFM)

Developing the technical basis for policy initiatives to secure and eliminate stocks of nuclear weapons and fissile materials

Executive Yuan

No.1, Sec. 1, Zhongxiao E. Rd.,
Zhongzheng Dist.,
Taipei City 10058,
Taiwan

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Call for Taiwan Not to Send its Spent Fuel Abroad for Reprocessing

Recently Taiwan's nuclear utility, Taipower, proposed as a pilot project to send abroad for reprocessing 1200 fuel assemblies or about 200 tons of spent fuel from its Chinsan and Kuosheng nuclear power plants. Each of these plants hosts two boiling water reactors that were first connected to the grid in the late 1970s and early 1980s. The four reactors together discharge annually approximately 70 tons of spent fuel.

We understand that the reasons given by Taipower for its proposal are that:

- 1) The spent fuel storage pools of the reactors are almost full, and
- 2) The government of New Taipei City has refused to allow the use of dry-cask storage on the reactor sites.

A related issue is Taipower's interest in obtaining permission to operate the nuclear power plants for an additional 20 years beyond their current 40-year operating licenses. This would require the transfer of much more spent fuel out of the reactors' already dangerously full cooling pools.

Within the context of Taiwan's Agreement on Nuclear Cooperation with the United States, Taipower could not take back the plutonium separated from its spent fuel in any form because plutonium is a nuclear-weapon-usable material. In addition to the reprocessing contract, it therefore would have to pay a third party to dispose of the plutonium separated from its spent fuel.

The solidified radioactive waste from reprocessing the spent fuel would be returned to Taiwan after perhaps 20 years. This radioactive waste would be no less of a disposal problem than the original spent fuel.

In practice, the only country that is likely to be interested in providing reprocessing and plutonium-disposal services is France whose nuclear services company AREVA has lost virtually all its foreign reprocessing customers and is currently in desperate financial circumstances. For the right price, AREVA is likely to partner with Électricité de France, which could use the recovered plutonium in mixed-oxide (MOX) fuel for its nuclear power reactors. The approximately 2 tons of plutonium that would be recovered by reprocessing the Taiwanese spent fuel would only add marginally to the approximately 60 tons of French separated plutonium and possibly 16 tons of Japanese plutonium that France already must deal with. France will have a difficult challenge using this stockpile, however, if most of its aging MOX-using reactors are retired in the next decade.

Measured in weapons-equivalents, the plutonium in the 200 tons of Taiwanese spent fuel looms larger. It is sufficient to make 250 Nagasaki-type nuclear weapons. Also, by providing support to the dying reprocessing industry, Taiwan would be helping to keep alive the dangerous, uneconomic and wholly unnecessary practice of plutonium separation. France separates more plutonium each year than the rest of the world combined and state-owned AREVA is desperately trying to sell reprocessing services and reprocessing plants to other countries. The dangerous nature of this activity has been well understood since India used plutonium separated with Atoms for Peace assistance from the United States to test a nuclear explosive in 1974.

The much less costly alternative to reprocessing that has been adopted by 25 of the 31 countries with nuclear power plants is expanded interim storage of spent fuel until an underground repository becomes available. In the United States, this is accomplished through on-site dry-cask storage of spent fuel that has cooled for 20 years or so. There are off-site alternatives, however. Sweden, for example, has constructed underground pools for interim storage of spent fuel and Japan has built – although it is not yet using – centralized dry cask storage. Until recently, Ukraine sent some of its spent fuel to Russia for interim storage.

Under the condition that it is appropriately developed and sited, carefully constructed and monitored dry cask storage, as its principle is safer than pool storage, should be the preferred interim option. A recent U.S. Nuclear Regulatory Commission study found that removal of spent fuel that has cooled for more than five years would greatly reduce the consequences of a spent-fuel-pool loss-of-coolant accident, which Chairman Kondo of Japan’s Atomic Energy Commission described to Prime Minister Kan as the worst-case outcome of the Fukushima accident.¹ At the same time, there was essentially no concern about the safety of the spent fuel in dry cask storage on site because the casks used there are robust and passively air cooled.

Given the cost and security disadvantages of spent fuel reprocessing, we urge that the Government of Taiwan reject Taipower’s proposal and facilitate an interim storage alternative.



Gordon MacKerron,
former chair of the UK Government’s
independent Committee
on Radioactive Waste Management



Tatsujiro Suzuki,
former Vice Chair of the Japan Atomic
Energy Commission, co-chair of
International Panel on Fissile Materials (IPFM)



Yves Marignac,
former advisor to the French Government
on reprocessing economics
and a member of expert advisory groups
to the French Nuclear Safety Authority



Frank von Hippel,
former Assistant Director for National Security,
White House Office of Science and
Technology Policy
and founding co-chair, IPFM

¹ U.S. Nuclear Regulatory Commission, *Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor* (NUREG-2161), 2013
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr2161/>,