

Separation of Civilian and Military Nuclear Facilities

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Recently, Prime Minister of India Manmohan Singh made the reassuring statement that work on separating India's civilian and military nuclear facilities was at a fairly advanced stage. India has agreed to identify and separate its civilian and military nuclear facilities in a phased manner and place all its civilian facilities under the International Atomic Energy Agency (IAEA) safeguards regime to fulfill its part of the nuclear cooperation agreement with the United States (US). The agreement on nuclear cooperation is the primary element of the new strategic partnership that is being explored between India and the US, and its successful implementation would depend on how the US views India's plan for separation of facilities as well as its commitment to comply with an additional protocol.

The separation of facilities is the primary nonproliferation selling point of the deal, and its purpose is to ensure that outside assistance does not benefit India's nuclear weapons program. In November 2005, the US ambassador to India stated that India must present a plan for civilian-military separation and begin to implement it before the US administration would request congressional approval. More recently, Richard Lugar, the Chairman of the US Senate Committee on Foreign Relations mentioned to a visiting Indian delegation that the current debate in the US Congress centers on this aspect of India's obligations, and that the separation plan must ensure that any cooperation does not assist India's nuclear weapons program. An important aspect of the plan would be the nature of safeguards being implemented between India and the IAEA.

What is the likely nature of the safeguards agreement under the plan? The joint statement does not commit to any particular form of safeguards. The safeguards agreements between the IAEA and the NPT recognized nuclear weapons states (NWS) allow the removal of civilian facilities from safeguards and the transfer of nuclear materials out of them for national security reasons. However, as suggested by senior US governmental officials, India should not be expected to be treated the same as NWS and such variable safeguards are unlikely to be acceptable to the US. It is likely that India would be expected to adopt facility-specific safeguards in perpetuity once a facility is declared as civilian, requiring that these facilities may not be used to process nuclear materials for the military sector.

The Indian negotiators of the deal would therefore be steering a course between what is desirable, given the requirement of a beneficial outcome for the civilian and military sectors at an affordable cost, and what is acceptable to the US, the Nuclear Suppliers Group (NSG) members, and the international nonproliferation regime. In any separation arrangement, the civilian sector would benefit if a large number of existing facilities are declared as civilian for two reasons. First, access to inputs from abroad such as financing, technology and fuel supplies would accrue only to this sector. To illustrate, India's power program is uranium-constrained and some heavy-water reactors have slowed operations to conserve natural uranium fuel. The enriched uranium that Russia has supplied for the Tarapur light water reactors will be exhausted in 2006. To conserve enriched uranium, fuel containing 10 percent mixed oxide fuel (MOX) has been used at Tarapur and it is possible to increase this fraction up to 30 percent without expensive

design changes. Therefore, India's need for uranium imports would place a lower bound on the number of power reactors in its civilian nuclear complex. Second, to the extent that safeguards would result in the duplication of many facilities to separately serve the civilian and military sectors, the cost of duplication would affect the economics of nuclear power.

On the other hand, since there is no constraint on transfer of materials from the military to the civilian sector, it might appear expedient for India to retain its military option by declaring a large number of facilities to be military. Recently, the Chairman of the Indian Atomic Energy Commission (AEC) stated that only facilities that have no national security significance will be civilian. Most Indian facilities have played a dual role in the past, and this approach would minimize the size of the civilian sector. In addition to being detrimental to the civilian sector, such a strategy is unlikely to be acceptable to the US or the NSG.

Partitioning of Plutonium Reserves

The main reason why sections of the Indian strategic and nuclear establishments would want

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to keep a large number of facilities in the military sector is to retain India's options for generating weapons-usable plutonium. Currently, India's weapons-grade plutonium is produced in two research reactors - CIRUS and Dhruva, located at the Bhabha Atomic Research Center (BARC) campus. These reactors are operated with a low-burnup, and the fuel rods are removed after brief irradiation and the resulting plutonium separated. Such low burnups are not efficient for power production. High burnups used in power production result in higher isotopes of plutonium, which are suboptimal for weapons production. However, the inherently dual nature of this part of the nuclear program lies in the fact that, despite

the higher isotopes in reactor grade plutonium, it can also be used to make fission weapons.

The plutonium produced in India's power reactors is also an integral part of its plans for three stage power programme - the plutonium produced in the first stage is to be used in the second stage in its proposed Fast Breeder Reactors (FBR) to produce fissile uranium-233. The rate at which uranium-233 fuel is made available for its third stage that would use India's plentiful supplies of thorium, therefore depends on the quantities of plutonium produced in its first stage. In addition, plutonium separated from its power reactors can be used as MOX for its light water reactors in Tarapur.

One implication of where the lines are drawn in separating India's nuclear facilities, therefore, is the partitioning of plutonium supplies for weapons production on the military side and as fuel for FBRs and MOX fuel for the civilian programme. This calls for reflection and discussion within the nuclear and strategic establishments on what India's nuclear posture should be. For example, it is estimated by some analysts that India already has a stock of weapons-grade plutonium from CIRUS and Dhruva for a hundred weapons of 20-kilotons each. If this is sufficient, there is no reason for the power reactors to remain in the military sector.

Uranium Enrichment and Fuel Reprocessing

India's main uranium enrichment plant in Rattehalli, Karnataka, produces enriched uranium for its nuclear submarine program. Its enrichment capacity is much lower than what is needed to power a single light water power reactor. It is not clear whether material from safeguarded facilities can be used to power nuclear submarines under this agreement, but its status as a potential source of highly enriched uranium for India's thermonuclear weapons program makes it likely that it would be in the military sector. India has a pilot-scale ultracentrifuge enrichment plant in BARC that can produce 2 kg of weapons grade uranium each year and is likely to become a part of the military sector.

Plutonium reprocessing is where duplication of facilities will inevitably arise in any separation programme, because the plutonium extracted from spent fuel is useable in both the weapons and the proposed fast breeder program. The

medium-scale reprocessing facility operated by the AEC in Trombay is not under international safeguards currently and processes fuel from CIRUS and Dhruva. As the main source of plutonium for the weapons program, it is likely to be part of the military sector. The large-scale plant at Tarapur reprocesses fuel meant for the Fast Breeder Test Reactor (FBTR) and Tarapur's MOX fabrication facilities. The Kalpakkam Atomic Reprocessing Plant is another large scale plant that has been earmarked for India's FBR programme, and currently reprocesses fuel from MAPP and FBTR. The eventual status of these two reprocessing plants would depend on the status of the upstream and downstream facilities. If, as senior Department of Atomic Energy (DAE) officials have suggested, FBTR is declared military then the reprocessing plant that supplies them cannot remain in the civilian sector. The Tarapur facilities should then be declared civilian so that it can continue to supply MOX fuel to the power program.

Contours of Separation

As part of its plans for separating its facilities, India will eventually begin discussions with the IAEA about the nature of safeguards it will implement. Current safeguards on Indian facilities do not enforce separation. For example, safeguards apply to the reprocessing plant and mixed oxide fabrication facility in Tarapur only while processing safeguarded spent fuels such as the fuel from the Rajasthan reactors. India's negotiators should gauge whether continuing such arrangements on currently safeguarded facilities would be acceptable to India's partners in the deal.

In the face of uncertainty about the exact form the safeguards arrangements would eventually take, Indian planners must be willing to make choices in the context of complete separation. Given the existing plutonium stocks and the potential for further plutonium production from the research reactors Dhruva and CIRUS, the power reactors are not necessary for the military complex and should be open to safeguards. The FBTR is likely to remain unsafeguarded, and it remains to be seen what plans the DAE has for operational FBR's once they come on stream. Keeping these reactors in the military sector will complicate access to uranium for the first stage reactors that would supply the second stage of

this program. Furthermore, the heavy water reactors are not required to produce tritium for its weapons program. That leaves the research reactors, in addition to the facilities controlled by BARC, under the military blanket. In partitioning dual-use enrichment, fuel fabrication and reprocessing facilities the following questions should be asked: First, are they useful to the civilian nuclear power program? Second, are they essential to the military nuclear weapons program?

Because materials, facilities and personnel are involved only the experts in the DAE can work out the details of separating these facilities.

If the India-US deal moves forward and is approved by the

US Congress and NSG, this would give it greater freedom to pursue cooperation with countries possessing nuclear materials and technology. Perhaps its greatest benefit would be the flexibility to cooperate with countries that have experience with FBRs. Or perhaps the emphasis would be on obtaining access to natural and enriched uranium fuel for its first stage reactors. While all these avenues may be simultaneously pursued, it must be remembered that international cooperation would require the facilities receiving assistance to be subject to safeguards, and to that extent India's priorities for international cooperation must be articulated. Having clear priorities would also help India's negotiators navigate a situation in which offers of cooperation come with strings attached.

A Note of Caution

The ancillary costs of nuclear power in India will increase if dedicated facilities have to be established to separately service the civilian and military sectors. The DAE is clearly sensitive to this fact, and the Chairman of the AEC indicated that cost would be a factor in identifying what is civilian. But if facility-specific safeguards happen, then some of the initial costs of replication will be

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unavoidable. Efforts must be made to understand the effects of separation on the costs of nuclear power by studying the costs of the kind of facilities that are being duplicated over their lifetimes.

Progress in the deal should not be seen as a referendum in favor of nuclear power. Rather, the choice of generation technology should be based on assessment of costs. To assess the economics of nuclear power in comparison to other sources such as natural gas and coal a complete analysis of its economics, including the costs of fuel fabrication, heavy water, spent fuel reprocessing, and waste storage and disposal is necessary. The cost estimates published by the DAE omit these factors. More generally, there is a need for establishing methodology for integrated resource planning to identify energy choices and this must be openly subject to discussion.



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