

# CRS Report for Congress

## India's Nuclear Separation Plan: Issues and Views

Updated December 22, 2006

Sharon Squassoni  
Specialist in National Defense  
Foreign Affairs, Defense, and Trade Division



Prepared for Members and  
Committees of Congress

# Report Documentation Page

*Form Approved  
OMB No. 0704-0188*

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE <b>22 DEC 2006</b>	2. REPORT TYPE <b>N/A</b>	3. DATES COVERED -			
4. TITLE AND SUBTITLE <b>Indias Nuclear Separation Plan: Issues and Views</b>		5a. CONTRACT NUMBER			
		5b. GRANT NUMBER			
		5c. PROGRAM ELEMENT NUMBER			
6. AUTHOR(S)		5d. PROJECT NUMBER			
		5e. TASK NUMBER			
		5f. WORK UNIT NUMBER			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>Congressional Research Service The Library of Congress 101 Independence Ave, SE Washington, DC 20540-7500</b>		8. PERFORMING ORGANIZATION REPORT NUMBER			
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSOR/MONITOR'S ACRONYM(S)			
		11. SPONSOR/MONITOR'S REPORT NUMBER(S)			
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release, distribution unlimited</b>					
13. SUPPLEMENTARY NOTES <b>The original document contains color images.</b>					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>SAR</b>	18. NUMBER OF PAGES <b>27</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

# India's Nuclear Separation Plan: Issues and Views

## Summary

On July 18, 2005, President Bush and Indian Prime Minister Manmohan Singh announced the creation of a “global partnership,” which would include “full” civil nuclear cooperation between the United States and India. This is at odds with nearly three decades of U.S. nonproliferation policy and practice. President Bush promised India he would persuade Congress to amend the pertinent laws to approve the agreement, as well as persuade U.S. allies to create an exception to multilateral Nuclear Suppliers Group (NSG) guidelines for India. India committed to, among other things, separating its civilian nuclear facilities from its military nuclear facilities, declaring civilian facilities to the International Atomic Energy Agency (IAEA) and placing them under IAEA safeguards, and signing an Additional Protocol. See CRS Report RL33016, *U.S. Nuclear Cooperation With India: Issues for Congress*, by Sharon Squassoni, for further details on the agreement.

The separation plan announced by Prime Minister Singh and President Bush on March 2, 2006, and further elaborated on May 11, 2006, would place 8 power reactors under inspection, bringing the total up to 14 out of a possible 22 under inspection. Several fuel fabrication and spent fuel storage facilities were declared, as well as 3 heavy water plants that were described as “safeguards-irrelevant.” The plan excludes from international inspection 8 indigenous power reactors, enrichment and spent fuel reprocessing facilities (except as currently safeguarded), military production reactors and other military nuclear plants and 3 heavy water plants. Administration officials have defended the separation plan as credible and defensible because it covers more than just a token number of Indian facilities, provides for safeguards in perpetuity, and includes upstream and downstream facilities.

U.S. officials acknowledge the importance of a credible separation plan to ensuring that the United States complies with its Article I obligations under the Nuclear Nonproliferation Treaty (NPT) — to not in any way assist a nuclear weapons program in a non-nuclear weapon state. For almost 30 years, the U.S. legal standard has been that only nuclear safeguards on all nuclear activities in a state provides adequate assurances. The Administration is apparently asking Congress to back a lower level of assurance by proposing that the separation plan take the place of comprehensive safeguards.

Congress is likely to consider this issue as well as others when the Administration eventually submits its cooperation agreement with India for approval by both chambers. P.L. 109-401, signed on December 18, 2006, provides waivers for a nuclear cooperation agreement with India from relevant Atomic Energy Act provisions, and requires detailed information on the separation plan and resultant safeguards. This report, which will be updated as necessary, provides background on India's nuclear fuel cycle, a discussion of various issues involved in separating civilian and military nuclear facilities and potential concerns for Congress as it considers whether the United States has adequate assurances that its nuclear cooperation does not assist, encourage, or induce India's nuclear weapons development, production, or proliferation.

## Contents

Introduction .....	1
Background .....	4
India's Nuclear Facilities .....	6
Research Reactors .....	8
Power Reactors .....	9
Breeder Reactors .....	12
Uranium Enrichment .....	12
Spent Fuel Reprocessing .....	12
Heavy Water Production .....	12
Uranium Recovery and Conversion .....	13
Factors Influencing the Separation Plan .....	13
U.S. Guidelines: Credible, Defensible, and Transparent .....	13
Indian Guidelines: Credible and Defensible from a Different View .....	14
The Separation Plan .....	16
Assessing The Separation Plan .....	20
Quantity vs. Quality .....	20
Breeder Reactors .....	21
Other Facilities .....	21
Issues for Congress .....	22

## List of Figures

Figure 1. Indian Nuclear Facilities .....	7
Figure 2. India's Separation Plan .....	19

## List of Tables

Table 1. India's Power Reactors .....	10
---------------------------------------	----

# India's Nuclear Separation Plan: Issues and Views

## Introduction

On July 18, 2005, President Bush and Indian Prime Minister Manmohan Singh signed a joint statement that announced the creation of a “global partnership,” which would include “full” civil nuclear cooperation between the United States and India. This is at odds with nearly three decades of U.S. nonproliferation policy and practice. President Bush committed to persuading Congress to amend the pertinent laws to approve the agreement, as well as persuading U.S. allies to create an exception to multilateral Nuclear Suppliers Group (NSG) guidelines for India to allow for nuclear cooperation. India committed to separating its civilian from its military nuclear facilities, declaring civilian facilities to the International Atomic Energy Agency (IAEA) and placing them under IAEA safeguards, and signing an Additional Protocol, which provides enhanced access and information for IAEA inspectors.

The United States is obligated under the Nuclear Nonproliferation Treaty (NPT) to ensure that any cooperation it provides to a non-nuclear weapon state does not contribute to that state's capability to produce nuclear weapons. In 1978, Congress passed the Nuclear Nonproliferation Act, which strengthened the restrictions on U.S. nuclear cooperation to include comprehensive (full-scope) safeguards on all nuclear material in non-nuclear weapon states, specifically to help ensure that peaceful cooperation would not be diverted to weapons purposes. The 1978 Act followed India's 1974 peaceful nuclear explosion, which demonstrated to most observers that nuclear technology originally transferred for peaceful purposes could be misused. That test also provided the impetus for creating the Nuclear Suppliers Group (NSG).<sup>1</sup> In 1992, the NSG adopted the full-scope safeguards condition for nuclear exports, and the 1995 NPT Extension Conference and the 2000 NPT Review Conference both endorsed the NSG's new requirement.

India shares a unique status with Pakistan and Israel as de facto nuclear weapon states outside the NPT that have been treated politically, for nonproliferation purposes, as non-nuclear weapon states.<sup>2</sup> The three states do not have comprehensive nuclear safeguards. Instead, they have safeguards agreements that cover only

---

<sup>1</sup> The Nuclear Suppliers Group seeks to stem proliferation of nuclear weapons through coordinating nuclear exports and nuclear-related exports. See [<http://www.nsg-online.org>].

<sup>2</sup> The NPT defines nuclear weapon states as those that have tested nuclear explosive devices before January 1, 1967. This includes the United States, United Kingdom, France, China, and Russia.

specified facilities and materials.<sup>3</sup> Presently, very few of India's nuclear facilities are subject to international inspections.

The Bush Administration made a “credible” and “defensible” — from a nonproliferation standpoint — separation plan a prerequisite for asking Congress to create an exception to current law for nuclear cooperation with India. P.L. 109-401, the law that provides the executive branch with authority to waive restrictions under the Atomic Energy Act with respect to India, requires the President to determine that the following actions had occurred:

- India has provided the United States and the IAEA with a credible plan to separate civil and military facilities, materials, and programs, and has filed a declaration regarding its civil facilities with the IAEA;
- India and the IAEA have concluded all legal steps required prior to signature by the parties of an agreement requiring the application of safeguards in perpetuity in accordance with IAEA standards, principles, and practices (including IAEA Board of Governors Document GOV/1621 (1973)) to India's civil nuclear facilities, materials and programs as declared in the plan, including materials used in or produced through the use of India's civil nuclear facilities;
- India and the IAEA are making substantial progress toward concluding an Additional Protocol consistent with IAEA principles, practices, and policies that would apply to India's civil nuclear program;
- India is working actively with the United States for the early conclusion of a multilateral treaty on the cessation of the production of fissile materials for use in nuclear weapons;
- India is working with and supporting U.S. and international efforts to prevent the spread of enrichment and reprocessing technology to any state that does not already possess full-scale functioning enrichment or reprocessing plants;
- India is taking the necessary steps to secure nuclear and other sensitive materials and technology through the application of comprehensive export control legislation and regulations, and through harmonization and adherence to Missile Technology Control Regime (MTCR) and Nuclear Suppliers Group (NSG) guidelines; and
- the NSG has decided by consensus to permit supply to India of nuclear items covered by the guidelines of the NSG.

Indian and U.S. officials engaged for several months in discussions on identification of civilian facilities. U.S. officials encouraged India to make a

---

<sup>3</sup> These are INFCIRC/66-type agreements. They can cover nuclear material or facilities supplied under project agreements, produced in safeguarded facilities, or unilaterally submitted to safeguards by a state. See CRS Report RL33016, *U.S. Nuclear Cooperation with India: Issues for Congress*, by Sharon Squassoni, for more detail.

comprehensive declaration of its civilian infrastructure.<sup>4</sup> In various written and oral statements to Congress, State Department officials seem to suggest that more facilities under safeguards would be better than fewer, but critics (on both the U.S. and Indian sides) have suggested that some facilities would be more important to include or exclude. For example, the CIRUS reactor, reportedly the source of plutonium for the 1974 nuclear test, despite India's pledge to use it only for peaceful purposes, is important to some critics to declare as civilian and place under safeguards because of its controversial past. To U.S. officials, facilities associated with the fast breeder reactor program, which could produce plutonium for weapons in the future, reportedly would be key to get under safeguards, particularly if the United States wants to cooperate with India in the Global Nuclear Energy Partnership program.<sup>5</sup> To Indian officials, however, the fast breeder reactor program is key to the future of India's three-stage nuclear fuel cycle and must be kept out of safeguards for maximum flexibility and energy independence.<sup>6</sup>

Several nonproliferation critics of the potential agreement have suggested that no matter how many facilities India places under safeguards, the opening of the international uranium market — forbidden to India since 1992 by the NSG — in effect frees up India's domestic uranium for its nuclear weapons program, and therefore, would assist the Indian nuclear weapons program.<sup>7</sup> Consequently, only India's halt in the production of fissile material for nuclear weapons would ensure that U.S. assistance does not aid India's nuclear programs.<sup>8</sup> Indian officials note that the peaceful nuclear cooperation agreement is not about limiting their strategic program, just about expanding their peaceful nuclear program. Some critics have suggested various options for placing specific facilities under safeguards to diminish the potential "surplus effect" of opening up that uranium market.<sup>9</sup>

---

<sup>4</sup> Under Secretary of State Robert Joseph, testimony before SFRC Nov. 2, 2005 hearing.

<sup>5</sup> This program, announced in February 2006, seeks to develop, among other things, new reprocessing technologies for future fuel cycles. See [<http://www.gnep.energy.gov>] for more detail.

<sup>6</sup> "On the Record: Anil Kakodkar, Chairman of the Atomic Energy Commission and Secretary, Department of Atomic Energy," *Indian Express*, Feb. 8, 2006.

<sup>7</sup> Zia Mian and M.V. Ramana, "Wrong Ends, Means, and Needs: Behind the U.S. Nuclear Deal with India," *Arms Control Today*, January/February 2006. See also Robert Einhorn, "Limiting the Damage," *The National Interest*, Winter 2005/2006.

<sup>8</sup> Henry Sokolski, in "Fissile isn't Facile," *Wall Street Journal*, Feb. 21, 2006, suggested that "If we want to keep this aid from freeing up India's domestic nuclear resources to make more bombs...we have to get serious about India capping its nuclear weapons program." David Albright made a more direct connection in his testimony before the House International Relations Committee hearing, "The U.S.-India Global Partnership: The Impact on Nonproliferation," on Oct. 26, 2005 (hereafter, HIRC Oct 26, 2005 hearing), stating that "Without India halting production of fissile material for its nuclear weapons programs, nuclear assistance, particularly any in the areas involving the fuel cycle, would likely spill over to India's nuclear weapons program."

<sup>9</sup> David Albright and Susan Basu, "Separating Indian Military and Civilian Nuclear Facilities," Institute for Science and International Security, Dec. 19, 2005. See also the prepared statement by Leonard Spector before the HIRC Oct. 26, 2005 hearing.

One observer, Robert Einhorn, has suggested that in the absence of a fissile material production halt, safeguards on Indian facilities serve primarily a symbolic role in demonstrating India's commitment to nonproliferation.<sup>10</sup> Nonetheless, the safeguards approach, according to Administration officials, is key to assuring that the United States complies with Article I of the NPT — that U.S. cooperation does not in any way assist a nuclear weapons program in a non-nuclear weapon state. U.S. officials have stated that a voluntary safeguards arrangement like those of the other five nuclear weapon states would not meet our NPT Article I obligations. In their view, India must accept some kind of safeguards arrangement that allow safeguards to endure in perpetuity. Indian officials, on the other hand, suggested that having the same responsibilities and practices as other advanced nuclear states translates into a voluntary safeguards arrangement.<sup>11</sup>

This report provides background on India's nuclear fuel cycle, a discussion of various issues involved in separating civilian and military nuclear facilities and potential concerns for Congress as it considers whether the United States has adequate assurances that its nuclear cooperation does not assist, encourage, or induce India's nuclear weapons development, production, or proliferation.

## Background

India's nuclear program, from its inception in 1948, has been described as inherently dual-purpose.<sup>12</sup> With the establishment of its Atomic Energy Commission in 1948, India pursued both civilian and military applications of nuclear energy. The first indigenous research reactor, Apsara, was developed in the 1950s. Canada provided early assistance under the Colombo Plan, as did the United States under the Atoms for Peace program. A humiliating defeat in a border war with China in 1962, followed by China's first nuclear test in 1964, intensified India's drive for nuclear weapons. India turned to the CIRUS (Canada-India Reactor United States) reactor, as the source for plutonium for its 1974 "peaceful nuclear explosive" test. Foreign assistance dwindled after the 1974 test, but Canada had already transferred the blueprints for heavy water reactors under an agreement for peaceful nuclear cooperation. As a result, India developed a fairly independent nuclear infrastructure that supported both civilian and military purposes. For example, plutonium separated in India's reprocessing plants has been used both for weapons and to make mixed oxide fuel (plutonium mixed with uranium) for nuclear power plants.

---

<sup>10</sup> Statement of Robert J. Einhorn before the HIRC Oct. 26, 2005 hearing.

<sup>11</sup> From the July 18, 2005 Joint Statement: "India would reciprocally agree that it would be ready to assume the same responsibilities and practices and acquire the same benefits and advantages as other leading countries with advanced nuclear technology, such as the United States." The Indian Prime Minister's Office issued a background paper on the agreement in July 2005 that said: "IAEA Safeguards shall apply to facilities to be designated by India voluntarily...In this respect there will be no discrimination between India and other Nuclear Weapon States." See [<http://pmindia.nic.in/pressrel.htm>].

<sup>12</sup> See Perkovich, George, *India's Nuclear Bomb: The Impact on Global Proliferation*, (University of California Press, CA, 1999) for an excellent history of the Indian nuclear program.



India's nuclear fuel cycle development has been driven by an acknowledged lack of uranium reserves. In India's view, energy independence could not be derived from domestic uranium reserves — estimated at 0.8% of world reserves, or 50-60,000 tons — but could be from production of plutonium, recycling of spent fuel, and utilization of thorium (estimated at 32% of world reserves).<sup>13</sup> As a result, India planned 40 years ago to develop a three-stage fuel cycle to reduce its reliance on uranium and use thorium. The first stage would rely on natural uranium-fueled reactors to make plutonium; the second stage would use that plutonium in fast reactors blanketed with thorium to produce U-233 (and more plutonium); and the third stage would use U-233 fuel and thorium fuel in fast reactors blanketed with thorium to produce more U-233 for use for future fuel. India has not advanced beyond the first stage of the fuel cycle, aside from running a fast breeder test reactor (40 MWth Fast Breeder Test Reactor or FBTR) based on a French design and a small research reactor that uses U-233 fuel (Kamini).

The Chairman of the Atomic Energy Commission, Dr. Anil Kakodkar, asserted in a speech in March 2005 that indigenous uranium resources would support 10 GWe of nuclear installed capacity but that breeder reactors, using plutonium bred from indigenous uranium, could support 500 GWe of power generation.<sup>14</sup> The current energy plan is to have 12 GWe installed capacity by 2015 and 20 GWe by 2020. Reportedly, the increase to 20 GWe would be achieved through a mix of pressurized heavy water reactors (PHWRs), light water reactors and fast breeder reactors, including construction of 5 fast breeder reactors of 500 MWe each and the import of 8 light water reactors of 1000 MWe each.<sup>15</sup> India's indigenous, pressurized heavy water reactors (fueled with natural uranium) are planned to provide just half of that 20 GWe capacity (i.e., 10 GWe), but some observers have suggested that indigenous supplies of uranium may not support that many reactors and that India's uranium crisis is already acute.<sup>16</sup> For example, India's Jaduguda uranium mill produces just 220 tons of yellowcake a year, whereas the 13 operating natural-uranium fueled reactors require 300 tons per year, and consequently have reduced their operating capacity from 90% in 2002-2003 to 81% in 2003-2004 and 76% in 2004-2005.<sup>17</sup>

---

<sup>13</sup> See [[http://www.npcil.nic.in/nupower\\_vol11\\_1-3/chidambaram.htm](http://www.npcil.nic.in/nupower_vol11_1-3/chidambaram.htm)].

<sup>14</sup> A Gigawatt is one billion watts of energy; a Megawatt is one million watts of energy. Dr. Anil Kakodkar, "Energy in India for the Coming Decades," presentation to IAEA conference on *Nuclear Power for the 21<sup>st</sup> Century*, Paris, March 2005, available at [<http://www.dae.gov.in/iaea/ak-paris0305.doc>]. The estimate is 10,000 MWe for 40 years.

<sup>15</sup> M.R. Srinivasan, R.B. Grover, S.A. Bhardwaj, "Nuclear Power in India: Winds of Change," *Economic and Political Weekly*, December 3, 2005. This contrasts with State Department answers to questions for the record from Senator Lugar, dated November 2, 2005, which stated that "India's plan for its nuclear power sector seeks to provide for a 20-fold increase in nuclear-generated electricity by 2020 without reactors from foreign suppliers."

<sup>16</sup> T.S. Subramanian, "Uranium Crisis," *Frontline*, vol. 22, Issue 27, December 31-January 13, 2006.

<sup>17</sup> *Ibid.* Yellowcake is an impure mixture of uranium oxides obtained during the processing of uranium ore. It must be purified before being fabricated into reactor fuel.

According to two reports, the Department of Atomic Energy has been unable to mine certain uranium deposits because local governments have not yet given clearance.<sup>18</sup>

## India's Nuclear Facilities<sup>19</sup>

**Figure 1** depicts key sites and facilities of India's nuclear industry; not included are India's heavy water plants and associated research facilities. Apart from two light-water reactors fueled with low-enriched uranium from foreign suppliers (at Tarapur) and two under construction by Russia (VVERs at Kudankulam), India's power reactors rely on natural uranium in reactors that are cooled and moderated by heavy water, known as pressurized heavy water reactors, or alternatively as CANDU-type.<sup>20</sup> Canada built the first two CANDU-type reactors at Rajasthan, and India built the remaining eleven. Most of these produce about 220 MWe, whereas the new Russian reactors at Kudankulam will produce 1000 MWe. The foreign-supplied reactors (Tarapur, Rajasthan and, eventually, Kudankulam) are under IAEA safeguards, but the remaining domestic facilities are, largely, not safeguarded.

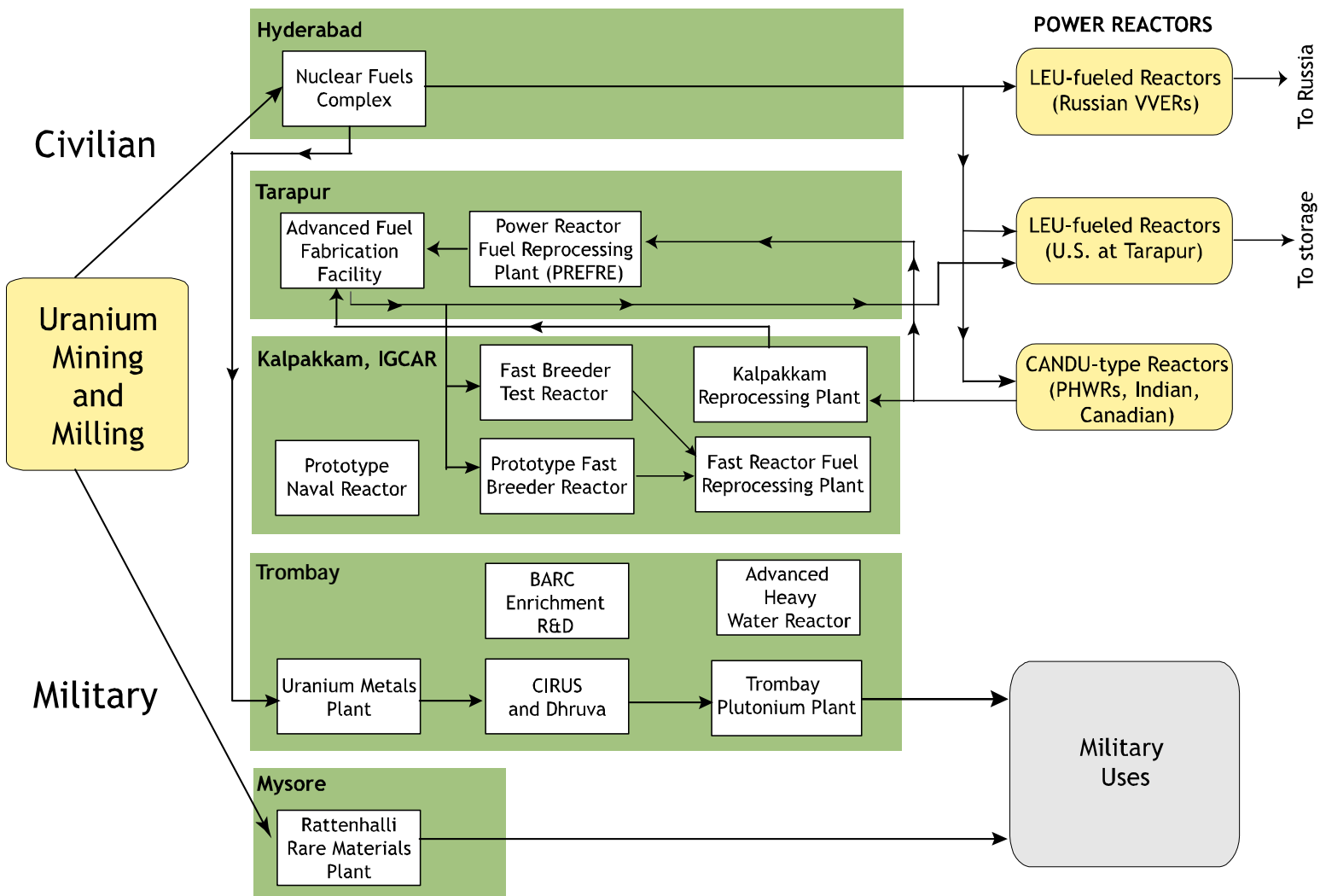
---

<sup>18</sup> T.S. Subramanian, "Uranium Crisis," *Frontline*, vol. 22, Issue 27, December 31-January 13, 2006 and Dr. A. Gopalakrishnan, "Civilian and Strategic Nuclear Facilities of India," Institute for Defense Studies and Analyses, January 5, 2006.

<sup>19</sup> Many sources were used in collating this data. See [<http://www.iaea.org/programmes/a2/index.html>] for a list of India's power reactors and [<http://www.iaea.org/worldatom/rddb/>] for a list of research reactors. Other sources include websites maintained by India's Department of Atomic Energy, the Bhabha Atomic Research Center and the Indira Gandhi Centre for Atomic Research. These are, respectively, [<http://www.dae.gov.in/>], [<http://www.igcar.ernet.in/>], and [<http://www.barc.ernet.in/>].

<sup>20</sup> These types of reactors constitute about ten percent of all reactors worldwide. Because the reactors can be refueled on-line, they are well-suited for making plutonium for nuclear weapons.

**Figure 1. Indian Nuclear Facilities**



Sources: Dr. Frederick Mackie, Lawrence Livermore National Laboratory, and the Congressional Research Service.

At present, India's nuclear facilities include the following:

- research reactors (3);
- power reactors (15 operating, 8 under construction and 3 planned);
- breeder reactors (1 operating, 1 under construction);
- uranium enrichment (1 operating)
- spent fuel reprocessing (3);
- heavy water production plants (6);
- uranium processing (3 mines; 2 copper-mine tailing extraction units, 1 mill (uranium ore concentration) many uranium conversion facilities, 3 or 4 fuel fabrication plants).

**Research Reactors.** India has three operating research reactors (CIRUS, Dhruva, and Kamini) and four decommissioned reactors.<sup>21</sup> In addition, India's oldest reactor, Apsara, may be considered operational, but is awaiting refurbishment, reportedly to test a new indigenous design of a 5-10 MWt research reactor. It has been used for various experiments, research and production of radioisotopes, and training. CIRUS and Dhruva are located at the Bhabha Atomic Research Center (BARC) in Trombay, while Kamini is located at Kalpakkam.

The CIRUS reactor has been the subject of controversy between the United States and India for much of its life. The United States supplied heavy water, which was not subject to a safeguards agreement, under a 1956 contract in which India pledged to use the material for peaceful purposes only. Yet this reactor reportedly produced the plutonium used in India's 1974 peaceful nuclear explosion. Many nonproliferation experts maintain that India violated its 1956 contract with Canada as well as its contract with the United States. Most recently, according to answers to questions for the record submitted by the Senate Foreign Relations Committee on November 2, 2005, the State Department notes that:

At the time, the debate on whether India had violated the contract was inconclusive owing to the uncertainty as to whether U.S.-supplied heavy water contributed to the production of the plutonium used for the 1974 device and the lack of a mutual understanding of scope of the 1956 contract language on "peaceful purposes."

Several nonproliferation experts have criticized the Administration for not taking this opportunity to resolve this 30-year-old controversy.<sup>22</sup> The Canadian

---

<sup>21</sup> The fast breeder test reactor, although it could technically be considered a research reactor, is discussed below in the breeder reactor section.

<sup>22</sup> An *aide memoire* presented to the Indian Atomic Energy Commission on November 16, 1970 sought to clarify the U.S. view on peaceful uses. The document, declassified in 1980, points out that the U.S. contract stipulated that the heavy water was to be used only in India in connection with research into and use of atomic energy for peaceful purposes, and that "The United States would not consider the use of plutonium produced in CIRUS for peaceful nuclear explosives intended for any purpose to be 'research into and use of atomic energy for peaceful purposes.'" Additionally, the document stated that "the use, for the development of peaceful nuclear explosive devices of plutonium produced therefrom, would

(continued...)

government in December 2005 encouraged the United States and India to declare the CIRUS reactor as a civilian reactor and place it under IAEA safeguards. Doing so, would “respect the peaceful uses assurance of our original agreement.”<sup>23</sup>

The Dhruva reactor is a larger, 100 MWt reactor that began operation in 1985. It is the other reactor that most observers assume is dedicated to India’s nuclear weapons program. CIRUS and Dhruva together can produce between 25 and 35 kg of plutonium per year, or enough for 3 to 4 bombs.<sup>24</sup> The Kamini reactor is located at the Indira Gandhi Centre for Atomic Research (IGCAR) in Kalpakkam. It became operational in 1996 and uses U-233 as fuel.

**Power Reactors.** Table 1 shows India’s 22 power reactors (excluding the prototype fast breeder reactor, which is discussed below). Of the total 22, 15 are currently operating, while 7 are under construction. Three more reactors are planned.

---

<sup>22</sup> (...continued)

be considered by the United States a contravention of the terms under which the American materials were made available.” “Aide Memoire Presented to Indian Atomic Energy Commission in Bombay, November 16, 1970,” available at [[http://www.armscontrol.org/pdf/19701116\\_US\\_Aide\\_Memoire\\_Indian\\_AEC.pdf](http://www.armscontrol.org/pdf/19701116_US_Aide_Memoire_Indian_AEC.pdf)]

<sup>23</sup> Talking points provided by First Secretary of Canada’s embassy to the United States, Kelly Anderson, Dec. 20, 2005.

<sup>24</sup> Zia Mian and MV Ramana, “Feeding the Nuclear Fire,” *Economic and Political Weekly*, Aug. 27, 2005.

**Table 1. India's Power Reactors**

<b>Name</b>	<b>Type</b>	<b>Status</b>	<b>Location</b>	<b>Net Capacity (MWe)</b>	<b>Gross Capacity (MWe)</b>	<b>Connected to Grid</b>
Kaiga-1	PHWR	Operational	Karnataka	202	220	2000
Kaiga-2	PHWR	Operational	Karnataka	202	220	1999
Kaiga-3	PHWR	Construction	Karnataka	202	220	2007
Kaiga-4	PHWR	Construction	Karnataka	202	220	2007
<b>Kakrapar-1 (KAPS-1)</b>	<b>PHWR</b>	<b>Operational</b>	<b>Gujrat</b>	<b>202</b>	<b>220</b>	<b>1992</b>
<b>Kakrapar-2 (KAPS-2)</b>	<b>PHWR</b>	<b>Operational</b>	<b>Gujrat</b>	<b>202</b>	<b>220</b>	<b>1995</b>
<i>Kudankulam-1 (KK-1)</i>	<i>VVER</i>	<i>Construction</i>	<i>Tamil Nadu State</i>	<i>917</i>	<i>1000</i>	<i>2007</i>
<i>Kudankulam-2 (KK-2)</i>	<i>VVER</i>	<i>Construction</i>	<i>Tamil Nadu State</i>	<i>917</i>	<i>1000</i>	<i>2008</i>
Madras-1 (MAPS-1)	PHWR	Operational	Tamil Nadu	155	170	1983
Madras-2 (MAPS-2)	PHWR	Operational	Tamil Nadu	202	220	1985
<b>Narora-1 (NAPS-1)</b>	<b>PHWR</b>	<b>Operational</b>	<b>Uttar Pradesh</b>	<b>202</b>	<b>220</b>	<b>1989</b>
<b>Narora-2 (NAPS-2)</b>	<b>PHWR</b>	<b>Operational</b>	<b>Uttar Pradesh</b>	<b>202</b>	<b>220</b>	<b>1992</b>
<i>Rajasthan-1 (RAPS-1)</i>	<i>PHWR</i>	<i>Operational</i>	<i>Rajasthan</i>	<i>90</i>	<i>100</i>	<i>1972</i>
<i>Rajasthan-2 (RAPS-2)</i>	<i>PHWR</i>	<i>Operational</i>	<i>Rajasthan</i>	<i>187</i>	<i>200</i>	<i>1980</i>
<b>Rajasthan-3 (RAPS-3)</b>	<b>PHWR</b>	<b>Operational</b>	<b>Rajasthan</b>	<b>202</b>	<b>220</b>	<b>2000</b>

CRS-11

Name	Type	Status	Location	Net Capacity (MWe)	Gross Capacity (MWe)	Connected to Grid
<b>Rajasthan-4 (RAPS-4)</b>	<b>PHWR</b>	<b>Operational</b>	<b>Rajasthan</b>	<b>202</b>	<b>220</b>	<b>2000</b>
<b>Rajasthan-5 (RAPS-5)</b>	<b>PHWR</b>	<b>Construction</b>	<b>Rajasthan</b>	<b>202</b>	<b>220</b>	<b>2007</b>
<b>Rajasthan-6 (RAPS-6)</b>	<b>PHWR</b>	<b>Construction</b>	<b>Rajasthan</b>	<b>202</b>	<b>220</b>	<b>2007</b>
<i>Tarapur-1 (TAPS-1)</i>	<i>BWR</i>	<i>Operational</i>	<i>Maharashtra</i>	<i>150</i>	<i>160</i>	<i>1969</i>
<i>Tarapur-2 (TAPS-2)</i>	<i>BWR</i>	<i>Operational</i>	<i>Maharashtra</i>	<i>150</i>	<i>160</i>	<i>1969</i>
Tarapur-3 (TAPS-3)	PHWR	Construction	Maharashtra	490	540	2006
Tarapur-4 (TAPS-4)	PHWR	Operational	Maharashtra	490	540	2005
			TOTALS	6172	6730	
		Reactors	— construction	2570	2810	
		Reactors	— operating	3602	3920	

**Sources:** IAEA Power Reactor Information System, Dr. Frederick Mackie of Lawrence Livermore National Laboratory, and the Congressional Research Service.

**Notes:** Those in italic print are under IAEA safeguards (INFCIRC-66) now or are scheduled to be under safeguards, irrespective of the separation plan. Those reactors in bolded print are the reactors scheduled additionally to be placed under safeguards under the separation plan. The difference between gross capacity and net capacity is the electricity needed to run the reactor. “Connected to Grid” means when the reactor is connected to the electricity grid (versus commercial operation).

**Abbreviations:** PHWR stands for Pressurized Heavy Water Reactor (CANDU-style); BWR stands for Boiling Water Reactor (use low-enriched uranium fuel).

Of the 15 operating power reactors, four are under safeguards — the two U.S.-supplied reactors at Tarapur and the two Canadian-supplied reactors at Rajasthan. Two pressurized water reactors under construction by the Russians at Kudankulam will be under IAEA safeguards also. There are 11 remaining reactors operating not under safeguards and five PHWRs under construction. In addition to the reactors under construction, there are five more planned: two at Kaiga (Kaiga 5 and 6); two at Rajasthan (RAPS 7 and 8); and the Advanced Heavy Water Reactor at Trombay.

The 15 operating power reactors have a net capacity of 3602 MWe. Nuclear energy now accounts for about 3% of India's electricity consumption, and India plans to increase the electrical generation capacity from the nuclear sector dramatically over the next few years. Estimates vary from an increase of 8000 MWe additionally by 2015,<sup>25</sup> to a total of 20GWe by 2020.<sup>26</sup> However, India's indigenous pressurized heavy water reactors will likely account for less than half of the total increase.

**Breeder Reactors.** The breeder reactor program is integral to the second stage of India's three-stage nuclear development plan. "Breeder" reactors have the potential to make more fissile material than they burn up, hence the term "breeder." Stage two envisions plutonium-fueled breeder reactors blanketed with thorium to produce uranium-233. India has run a 40 MWth (13 MWe) Fast Breeder Test Reactor since 1985 at the Indira Gandhi Centre for Atomic Research (IGCAR) and has successfully reprocessed a small amount of the unique fuel irradiated in that reactor. Construction of the 500 MWe prototype breeder reactor has begun, but the initial operating capability is not expected until 2010.

**Uranium Enrichment.** India began a uranium enrichment program in the 1980s. A gas centrifuge uranium enrichment facility at Mysore (called Rattenhalli) reportedly enriches uranium for naval fuel. There is also a pilot-scale gas centrifuge plant at Trombay for research and development, some laser enrichment-related activities also located at Trombay, and a laser enrichment facility at the Center for Advanced Technology in Indore for research.

**Spent Fuel Reprocessing.** Plutonium in India is produced for both civilian and military needs. The Trombay Plutonium Plant separates plutonium primarily for weapons purposes, whereas plutonium separation for civilian uses is performed at the Power Reactor Fuel Reprocessing Plant (PREFRE) at Tarapur and at Kalpakkam Reprocessing Plant (KARP). The Fast Reactor Fuel Reprocessing Plant and the Lead Minicell facility, both at Kalpakkam, also perform plutonium separation.

**Heavy Water Production.** India has six heavy water production plants in operation, all of which were developed indigenously. Such plants are not required to be safeguarded under comprehensive safeguards agreements, because they do not contain source or special nuclear material, but would be required to be reported under an Additional Protocol. It remains to be seen whether India would report any of these

---

<sup>25</sup> Briefing by Dr. Frederick Mackie, Lawrence Livermore National Laboratory, Dec. 14, 2006.

<sup>26</sup> T.S. Subramanian, "Uranium Crisis," *Frontline*, vol. 22, Issue 27, Dec. 31, 2005-Jan. 13, 2006.



under an Additional Protocol or perhaps just a portion of those that are not required for the military production of plutonium. The extent to which India requires more unsafeguarded plutonium for weapons or as fuel for unsafeguarded breeder reactors would determine how many heavy water plants would remain unreported.

**Uranium Recovery and Conversion.** India has three uranium mines, two copper-mine tailing extraction units, one mill, many uranium conversion facilities, and three fuel fabrication plants. Under a comprehensive safeguards agreement, the starting point of safeguards is when “any nuclear material of a composition and purity suitable for fuel fabrication or for being isotopically enriched leaves the plant or the process stage in which it has been produced.”<sup>27</sup> In other words, the material would be inspected at the end of the uranium conversion process and at the start of the fuel fabrication process. Under an Additional Protocol, a state is required to report on all nuclear fuel cycle activities, including uranium ore, mining, milling, and conversion. It is not clear how or if India will declare some or all of those front end fuel cycle activities.

## Factors Influencing the Separation Plan

### U.S. Guidelines: Credible, Defensible, and Transparent

On November 2, 2005, Under Secretary of State Joseph told members of the Senate Foreign Relations Committee that India’s separation of facilities must be credible, transparent, meaningful, and defensible from a nonproliferation standpoint. Further, Under Secretary Joseph told Members that a separation plan and resultant safeguards must contribute to U.S. nonproliferation goals, but did not elaborate which particular goals those might be. He noted that the more civil facilities India places under safeguards, the more confident the United States can be that any cooperative arrangements will not further India’s military purposes. Specifically, Under Secretary Joseph said that safeguards would have to be applied in perpetuity, and that voluntary safeguards arrangements would not be defensible from a nonproliferation standpoint. The Administration also asserted that “The safeguards must effectively cover India’s civil nuclear fuel cycle and provide strong assurances to supplier states and the IAEA that material and technology provided or created through civil cooperation will not be diverted to the military sphere.”<sup>28</sup>

One interpretation of those phrases suggests that a credible plan would (1) be perceived to strengthen the nonproliferation regime; (2) be a complete and defensible declaration of its civil nuclear facilities and programs; and (3) mitigate perceptions of nuclear weapons status for India.<sup>29</sup> Such a plan would be guided by the assumption that power reactors, regardless of their potential to produce plutonium for

---

<sup>27</sup> See INFCIRC/153, at [<http://www.iaea.org/Publications/Documents/Infcircs/Others/inf153.shtml>].

<sup>28</sup> Responses by the State Department to questions for the record submitted by Senator Richard Lugar, November 2, 2005.

<sup>29</sup> Dr. Frederick Mackie, Lawrence Livermore National Laboratory, Briefing, December 14, 2005.

weapons, have a civilian use and should be declared as civilian and safeguarded, as well as their associated fuel fabrication and reprocessing and spent fuel storage facilities.

India's breeder reactors would be safeguarded in this approach because the test reactor has been connected to the electricity grid since 1997, and the prototype fast breeder reactor will have a rating of 500 MWe and thus is meant to be connected to the electrical grid as a source of energy.<sup>30</sup> Since other advanced nuclear states with fast breeder reactors have placed them under safeguards (Japan and France), placing Indian breeder reactors under safeguards would mitigate perceptions of a double standard for India. Given their ability to produce weapons-grade plutonium, fast breeder reactors have been a proliferation concern for many years. Moreover, safeguarding breeder reactors would limit the amount of weapons-usable plutonium worldwide that is not safeguarded, which is clearly an objective of U.S. nonproliferation policy.

### **Indian Guidelines: Credible and Defensible from a Different View**

It can be argued that India also approached creating a separation plan that is credible and defensible from its perspective. Although India had hoped for a safeguards arrangement like those of the nuclear weapon states, where facilities can be put on and taken off a safeguards list at will, the United States has said that such a voluntary safeguards arrangement would not be acceptable. Therefore, in this scheme, placing a facility on the civilian list would eliminate it from any potential use for the weapons program. While Indian officials have said that the July 18<sup>th</sup> agreement is not about their weapons program, their decisions about the separation plan were fundamentally guided by their future needs in the weapons program. Prime Minister Singh told the Indian Parliament on February 26, 2006 that in deciding on the scope of the separation plan, India took into account its

current and future strategic needs and programme after careful deliberation of all relevant factors, consistent with our Nuclear Doctrine...[which envisions] a credible minimum nuclear deterrent to inflict unacceptable damage on an adversary indulging in a nuclear first-strike.<sup>31</sup>

From this perspective, a key factor for India is whether there is enough fissile material to meet the requirements of its minimal credible deterrent. If not, India must consider whether to "hedge" its future requirements by keeping some existing facilities out of safeguards so that they can produce plutonium or highly enriched uranium for weapons in the future, or to build new production facilities in the future. The July 18 agreement does not restrict India from doing so, at least until a fissile

---

<sup>30</sup> See G. Balachandran, "On separation list," January 2006, and S.B. Bhoje, and S. Govindarajan, "The FBR Programme in India," *International Journal of Nuclear Power* - Volume 18, No. 2-3, 2004, available on [<http://www.dae.gov.in>].

<sup>31</sup> "PM Makes a Case for N-tech," PTI. See [<http://ia.rediff.com/news/2006/feb/27bush8.htm>].

material production cutoff treaty is in force, but there are obvious costs to such an approach.

Some Indian observers argued to keep a handful (1-2 or preferably 2-4) indigenous pressurized heavy water reactors (PHWRs) out of safeguards for future fissile material production for weapons.<sup>32</sup> Others argued that a phased approach for placing PHWRs under safeguards would be sufficient to give India time to determine if it could meet its minimal credible deterrent.<sup>33</sup> In a controversial interview, AEC Chairman Anil Kakodkar suggested that some of the PHWRs could not be under safeguards because the breeder program, which he recommended not come under safeguards, would require unsafeguarded plutonium for fuel.<sup>34</sup>

Other commentators in India took a different perspective on this point. In a December 13, 2005, discussion at the India International Center, former Defense Research and Development Organization (DRDO) scientist and Institute of Defense Studies and Analysis (IDSA) Director K. Santhanam suggested that India could continue to meet all of its weapons plutonium needs from the CIRUS and Dhruva reactors and that plutonium from power reactors was unsuited for weapons. In a December 12, 2005 article in *The Times of India*, K. Subrahmanyam suggested that “Given India’s uranium ore crunch and the need to build up our minimum credible nuclear deterrent arsenal as fast as possible, it is to India’s advantage to categorize as many power reactors as possible as civilian ones to be refuelled by imported uranium and conserve our native uranium fuel for weapon-grade plutonium production.”<sup>35</sup>

India’s need to exclude its breeder reactor program from safeguards appears to be based several factors. Chairman of the Atomic Energy Commission (AEC) Dr. Kakodkar argued that the breeder program could not be put on the civilian list “from the point of maintaining long-term energy security and for maintaining the ‘minimum credible deterrent.’”<sup>36</sup> India’s Prime Minister Manmohan Singh told the Indian Parliament on February 26, 2006, that

We will ensure that no impediments are put in the way of our research and development activities. We have made it clear that we cannot accept safeguards on our indigenous fast breeder programme. Our scientists are confident that this

---

<sup>32</sup> G. Balachandran, “International Nuclear Control Regimes and India’s Participation in Civilian Nuclear Trade: Key Issues,” *Strategic Analysis*, Vol. 29, No. 4., Oct-Dec. 2005.

<sup>33</sup> Dr. A. Gopalakrishnan, “Civilian and Strategic Nuclear Facilities of India,” IDSA strategic comment, January 5, 2006, available at [<http://www.idsa.in>].

<sup>34</sup> “On the Record: Anil Kakodkar, Chairman of the Atomic Energy Commission and Secretary, Department of Atomic Energy,” *Indian Express*, February 8, 2006.

<sup>35</sup> K. Subrahmanyam, former head of the Institute for Defence Studies and Analysis, was appointed Head of the National Security Council Advisory Board (NSCAB) established by the first Vajpayee government to draft the Indian nuclear doctrine. He currently chairs PM Singh’s Global Strategic Developments Task Force. See also Dr. A. Gopalakrishnan, “Civilian and Strategic Nuclear Facilities of India,” January 5, 2006.

<sup>36</sup> *Ibid.*

technology will mature and that the programme will stabilize and become more robust through the creation of additional capability. This will create greater opportunities.<sup>37</sup>

In general, Indian officials seemed guided by a strong predilection to continue what has been their past approach to safeguards — to place under safeguards only those facilities that have a foreign component (e.g., fuel or technology). AEC Chairman Kakodkar noted in August 2005 that “Anything coming from...external cooperation...will be put under facilities-specific safeguards,” and that no research and development will be put under safeguards, including the prototype fast breeder reactor and facilities at the Indira Gandhi Centre for Atomic Research (IGCAR).<sup>38</sup>

Another consideration influencing Indian views are the potential financial and economic costs of separation. In some cases, facilities serve both civilian and military purposes. A. Gopalakrishnan, former chairman of the Atomic Energy Regulatory Board, suggested that certain critical plants at the Nuclear Fuels Complex at Hyderabad were not duplicated and should be kept out of safeguards until they could be replicated.<sup>39</sup>

Finally, assumptions about India’s prestige and independence may also have played a role. Some Indian officials have rejected the notion of placing any research and development facilities under safeguards because they equate such safeguards with attempts to constrain India’s independence. AEC Chairman Kakodkar told the *Indian Express* in February 2006 that:

There is a more fundamental question. If I am treated as an advanced country, where is the compulsion for me to do it? I will do R&D in an autonomous manner, finished.<sup>40</sup>

## The Separation Plan

On March 2, 2006, during President Bush’s visit to India, U.S. and Indian officials agreed upon a final separation plan. According to India’s official report, India was guided by the following principles:

- Credible, feasible, and implementable in a transparent manner;
- Consistent with the understandings of the 18 July Statement;
- Consistent with India’s national security and R&D requirements as well as not prejudicial to the three-stage nuclear programme in India;
- Must be cost effective in its implementation; and

---

<sup>37</sup> Prime Minister Singh’s address to Parliament, February 26, 2006. See “PM Makes a Case for N-tech,” PTI. See [<http://ia.rediff.com/news/2006/feb/27bush8.htm>].

<sup>38</sup> Interview in *The Hindu*, August 12, 2005.

<sup>39</sup> Ibid.

<sup>40</sup> “On the Record: Anil Kakodkar, Chairman of the Atomic Energy Commission and Secretary, Department of Atomic Energy,” *Indian Express*, February 8, 2006.

- Must be acceptable to Parliament and public opinion.<sup>41</sup>

Regarding the application of safeguards, India identified its “overarching criterion” as whether “subjecting a facility to IAEA safeguards would impact adversely on India’s national security.” Moreover, facilities were excluded from the civilian list if they were located in a larger hub of strategic significance (e.g., BARC), even if they were not normally engaged in activities of strategic significance.<sup>42</sup> This last criterion appears to suggest that the plan did not really seek to separate facilities.

The key elements of India’s separation plan are<sup>43</sup>

- eight indigenous Indian power reactors (RAPS 3, 4, 5, 6; KAPS 1, 2; NAPS 1, 2) in addition to 6 already under safeguards;
- future power reactors may also be placed under safeguards, if India declares them as civilian;
- some facilities in the Nuclear Fuel Complex (e.g., fuel fabrication) will be specified as civilian in 2008; and
- nine research facilities and three heavy water plants would be declared as civilian, but are “safeguards-irrelevant.”

The following facilities and activities were not on the separation list:

- eight indigenous Indian power reactors (Kaiga 1, 2, 3, 4; MAPS 1, 2; TAPS 3, 4);
- Fast Breeder Test Reactor (FTBR) and Prototype Fast Breeder Reactors (PFBR) under construction;
- enrichment facilities;
- spent fuel reprocessing facilities (except for the existing safeguards on the Power Reactor Fuel Reprocessing (PREFRE) plant);
- research reactors: CIRUS (which will be shut down in 2010), Dhruva, Advanced Heavy Water Reactor;
- three heavy water plants; and
- various military-related plants (e.g., a prototype naval reactor).

The eight additional reactors would be put under safeguards between 2007 and 2014.

The implementation document presented to Parliament stated that “India is not in a position to accept safeguards on the Prototype Fast Breeder Reactor (PFBR) and the Fast Breeder Test Reactor (FTBR), both located at Kalpakkam. The Fast Breeder

---

<sup>41</sup> “Implementation of the India-United States Joint Statement of July 18, 2005: India’s Separation Plan,” tabled in Parliament on March 7, 2006.

<sup>42</sup> Ibid.

<sup>43</sup> Prime Minister Singh presented “Implementation of the India-United States Joint Statement of July 18, 2005: India’s Separation Plan,” to Parliament on March 7, 2006. This is available at [[http://indianembassy.org/newsite/press\\_release/2006/Mar/seplan.pdf](http://indianembassy.org/newsite/press_release/2006/Mar/seplan.pdf)]. The plan was updated on May 11, 2006, to include names of reactors and upstream facilities, as well as dates they would be submitted to safeguards.

Programme is at the R&D stage and its technology will take time to mature and reach an advanced stage of development.” As for future reactors, the document stated that “India has decided to place under safeguards all future civilian thermal power reactors and civilian breeder reactors, and the Government of India retains the sole right to determine such reactors as civilian.”<sup>44</sup> In response to a question about whether it was possible for there to be non-civilian breeder reactors that India would build in the future, Under Secretary of State Nicholas Burns stated that “India could build reactors that would service their nuclear weapons industry...but the great majority of the growth we think will come on the civilian side.”<sup>45</sup>

As for research reactors, CIRUS would be shut down in 2010 and not subjected to safeguards. The fuel core of the Apsara reactor would be taken out of BARC and made available to be safeguarded. Some facilities in the Nuclear Fuel Complex would be specified as civilian in 2008, and the Tarapur and Rajasthan spent fuel storage pools would be made available for safeguards (Tarapur 1-2 and Rajasthan 1-2 reactors themselves are already safeguarded.) In addition, India would declare 3 heavy water plants (Thal, Tuticorin and Hazira) as civilian, but these would not be subject to safeguards; 9 research facilities would be declared as civilian also, but these would be considered “safeguards-irrelevant.”

India’s enrichment facility would not be covered, and India’s offering up the Tarapur Power Reactor Fuel Reprocessing Plant (PREFRE) for “campaign” mode safeguards after 2010 is a continuation of its current policy. The Dhruva research reactor is excluded.

Under Secretary of State Burns stated that India “would enter into permanent safeguard arrangements with the International Atomic Energy Agency.” However, the Indian statement that an Indian-specific safeguards agreement would “guard against withdrawal of safeguarded nuclear material from civilian use at any time as well as providing for corrective measures that India may take to ensure uninterrupted operation of its civilian nuclear reactors in the event of disruption of foreign fuel supplies” raises questions about exactly what kind of safeguards arrangement is envisioned. Burns noted that the arrangement “achieved a degree of transparency and oversight and impact on the Indian nuclear program that was not possible for three decades.”<sup>46</sup>

**Figure 2** shows a rough depiction of how the final separation applies to India’s civilian and military nuclear facilities.

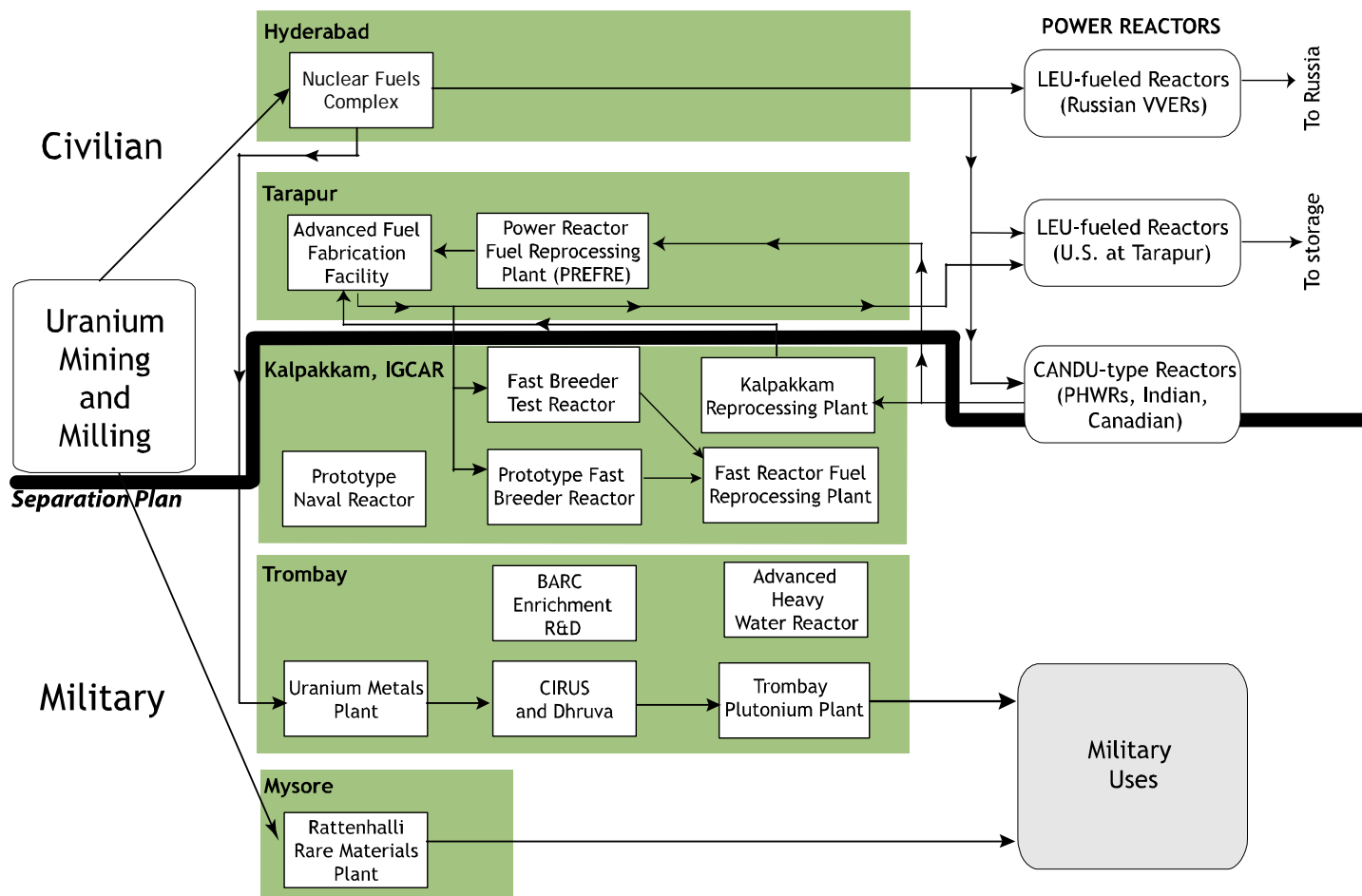
---

<sup>44</sup> Ibid.

<sup>45</sup> Ibid.

<sup>46</sup> Ibid.

Figure 2. India's Separation Plan



Sources: Dr. Frederick Mackie, Lawrence Livermore National Laboratory, and the Congressional Research Service.

## Assessing The Separation Plan

Congressional views on the separation plan, particularly whether it is credible and defensible from a nonproliferation standpoint, may have an impact on Congress's consideration of the overall peaceful nuclear cooperation agreement.

**Quantity vs. Quality.** Under Secretary of State Nicholas Burns told reporters on March 2, 2006, that “It’s not a perfect deal in the sense that we haven’t captured 100 percent of India’s nuclear program. That’s because India is a nuclear weapons power, and India will preserve part of its nuclear industry to service its nuclear weapons program.”<sup>47</sup> Although few observers would have expected to get 100% of India’s nuclear program under safeguards, one question that arises is whether the 65% mark meets the Administration’s own standard that “The safeguards must effectively cover India’s civil nuclear fuel cycle.”<sup>48</sup>

The Administration has defended the separation plan most recently as credible and defensible in this way:

For [the separation plan] to be credible and defensible from a nonproliferation standpoint, it had to capture more than just a token number of Indian nuclear facilities, which it did by encompassing nearly two-thirds of India’s current and planned thermal power reactors as well as all future civil thermal and breeder reactors. Importantly, for the safeguards to be meaningful, India had to commit to apply IAEA safeguards in perpetuity; it did so. Once a reactor is under IAEA safeguards, those safeguards will remain there permanently and on an unconditional basis. Further, in our view, the plan also needed to include upstream and downstream facilities associated with the safeguarded reactors to provide a true separation of civil and military programs.<sup>49</sup>

It should be noted that although declaring 65% of India’s reactors as civilian will result in placing almost two-thirds of the current reactors under safeguards, power reactors constitute just one part of the nuclear fuel cycle. Reprocessing capabilities are key to India’s three-stage nuclear fuel cycle development plan, and the separation plan provides nothing beyond the intermittent safeguards applied at the Power Reactor Fuel Reprocessing Plant (PREFRE) already.

Some observers could argue that a strictly quantitative approach does not address the question of whether the plan is defensible from a nonproliferation standpoint. Here too, the kinds of facilities included could be key. For example, in terms of preventing terrorist access to fissile material, safeguarding facilities like

---

<sup>47</sup> White House, Office of the Press Secretary, “Press Briefing by Under Secretary of State for Political Affairs Nick Burns,” Maurya Sheraton Hotel and Towers, New Delhi, India, March 2, 2006.

<sup>48</sup> Responses by the Administration to Questions for The Record Submitted to Under Secretary Robert Joseph by Chairman Richard G. Lugar (#4) Senate Foreign Relations Committee, November 2, 2005.

<sup>49</sup> Questions for the Record Submitted to Secretary of State Condoleezza Rice by Senator Richard Lugar (#2) Senate Foreign Relations Committee, April 5, 2006.



reprocessing and enrichment plants and breeder reactors would provide a greater nonproliferation benefit because the materials produced by these plants are a few steps closer to potential use in a bomb. In addition, safeguards on enrichment, reprocessing plants, and breeder reactors would support the 2002 U.S. National Strategy to Combat Weapons of Mass Destruction, in which the United States pledged to “continue to discourage the worldwide accumulation of separated plutonium and to minimize the use of highly-enriched uranium.”<sup>50</sup>

**Breeder Reactors.** As noted earlier, breeder reactors, which are key to India’s intended second stage of fuel cycle development, have been generally regarded as a proliferation concern because of their production of weapons-grade plutonium.<sup>51</sup> India plans to build at least five commercial-scale breeder reactors and would have the option of dedicating any one or more of those to its military program. Public statements by Indian officials suggest that they have considered the breeder reactor’s usefulness in producing plutonium for the strategic arsenal, and some domestic critics have suggested that India should clarify the purpose of the breeder program once and for all. A key obstacle may be the amount of unsafeguarded plutonium available as initial fuel, raising the question of how future civilian breeder reactors would be fueled. Would plutonium from the 10 additional reactors India will be placing under safeguards be used to fuel the reactors, or would India purchase safeguarded plutonium from other states? If the latter case, would this conflict with the Administration’s policy of discouraging the worldwide accumulation of separated plutonium?

**Other Facilities.** Prime Minister Singh told the Indian Parliament on February 26 that “We will offer to place under safeguards only those facilities that can be identified as civilian without damaging our deterrence potential or restricting our R&D effort.”<sup>52</sup> Although CIRUS, Dhruva, the Fast Breeder Test Reactor, and the planned Advanced Heavy Water Reactor have been described by Indian facilities as being research facilities, they are not included. The 9 research facilities that will be declared as civilian are considered safeguards-irrelevant, probably because they will have little if any nuclear material in them to be safeguarded.

The absence of research facilities could call into question how far India’s separation plan has ventured into the mainstream of nonproliferation. IAEA safeguards for non-nuclear weapon states include all facilities where nuclear material

---

<sup>50</sup> National Strategy to Combat Weapons of Mass Destruction, December 2002. Available at [<http://www.whitehouse.gov/news/releases/2002/12/WMDStrategy.pdf>].

<sup>51</sup> For many years, the United States discouraged plutonium reprocessing and did not engage in reprocessing in the U.S. civil nuclear fuel cycle. However, with the announcement of the Global Energy Nuclear Partnership (GNEP), the Bush Administration is seeking to develop a recycling method (so-called “proliferation-resistant”) that would not result in the separation of plutonium. It is unclear how long it would take for advanced recycling technologies to become commercially available. Regardless, it is unlikely that India could participate in the GNEP program without a commitment to place its breeder reactors under safeguards. See [<http://www.gnep.energy.gov/gnepProliferationResistantRecycling.html>].

<sup>52</sup> “Indian PM Addresses Parliament on Nuclear Pact with US,” BBC Monitoring South Asia, February 27, 2006.

is present, including research and development facilities. The case of precedents in other nuclear weapon states is not applicable, since the IAEA tends not to inspect very many of the sites or facilities on the voluntary safeguards eligible lists. Likewise, the absence of reprocessing and enrichment facilities on the separation plan also could be interpreted by some as falling short of the objective of bringing India into the mainstream of nonproliferation. In particular, the Bush Administration has identified enrichment and reprocessing technologies as sensitive parts of the nuclear fuel cycle that should be limited and has proposed specific arrangements for assured supplies of nuclear fuel that would obviate the need for states to conduct their own enrichment and reprocessing.<sup>53</sup>

India's one operating facility at Rattenhalli is reportedly used to enrich uranium for the prototype naval fuel reactor. Naval fuel occupies a curious place in IAEA safeguards. Full-scope safeguards agreements, the kind that non-nuclear weapon states have, include a provision for the non-application of safeguards to nuclear material to be used in non-peaceful activities — and naval fuel would be one such non-peaceful activity. However, no non-nuclear weapon state has ever implemented this provision for the non-application of safeguards. Under Paragraph 14 of the INFCIRC/153, a state is required to inform the IAEA that

the use of the nuclear material in a non-proscribed military activity will not be in conflict with an undertaking the State may have given and in respect of which Agency safeguards apply, that the nuclear material will be used only in a peaceful nuclear activity; and that during the period of non-application of safeguards the nuclear material will not be used for the production of nuclear weapons or other nuclear explosive devices.

Brazil has placed its enrichment facilities under safeguards, despite having a naval fuel program, which also raises the question of how far India's separation plan conforms to the standards of the nonproliferation mainstream. The five nuclear weapon states have not encountered this problem thus far, since they have not placed any naval-related facilities on their safeguards-eligible lists. It is not clear which precedent would be less desirable — placing India's naval fuel facilities under safeguards and then going through steps for the nonapplication of safeguards, or simply not safeguarding them at all on the grounds that they are of direct national security significance.

## **Issues for Congress**

U.S. officials acknowledge the importance of a credible Indian separation plan for ensuring that the United States complies with its Article I obligations under the Nuclear Nonproliferation Treaty (NPT) — to not in any way assist a nuclear weapons program in a non-nuclear weapon state. For almost thirty years, the U.S. legal standard has been that only nuclear safeguards on all nuclear activities in a state

---

<sup>53</sup> White House, "Fact Sheet: Strengthening International Efforts Against WMD Proliferation," February 11, 2004. Available at [<http://www.whitehouse.gov/news/releases/2004/02/20040211-5.html>].

provides adequate assurances. The Administration has sought, and Congress has provided, backing for a lower level of assurance by proposing that the separation plan take the place of comprehensive safeguards.

From a broad perspective, Congress may consider whether opening up international cooperation to India after all these years has a net positive effect on India's nuclear weapons program. Under Secretary of State Nicholas Burns told reporters on March 2, 2006, that the agreement will not have an impact on India's strategic program.<sup>54</sup> However, some observers believe that unless India stops production of fissile material for weapons purposes, nuclear safeguards will do little to ensure that assistance is not diverted.

From a narrower perspective, the text of a peaceful nuclear cooperation agreement is necessary for Congress to assess whether or not the United States can comply with its NPT obligations not to assist India's nuclear weapons program. P.L. 109-401, which gives the President authority to waive certain requirements of the Atomic Energy Act, still requires the Administration to send Congress not only the text of a peaceful nuclear cooperation agreement, but also a Nuclear Proliferation Assessment Statement (NPAS), which must address the extent to which U.S. treaty commitments are met.

Under P.L. 109-401, the following sections require reports to Congress related to the separation plan:

- Under the Submission to Congress provision of Section 104 (Section 104. (c) (2) (A)), the Administration will be required to provide “a summary of the plan provided by India to the United States and the IAEA to separate India's civil and military nuclear facilities, materials, and programs, and the declaration made by India to the IAEA identifying India's civil facilities to be placed under IAEA safeguards, including an analysis of the credibility of such plan and declaration, together with copies of the plan and declaration.”
- Under the Reporting to Congress provision of Section 104 (Section 104.(g)(1)) the Administration will be required to keep committees informed of
  - (A)(ii): material noncompliance with the separation plan;
  - (B): “construction of a nuclear facility in India after the date of enactment of this title”;
  - (C): “significant changes in the production by India of nuclear weapons or in the types or amounts of fissile material produced”; and
  - (D): “changes in the purpose or operational status of any unsafeguarded nuclear fuel cycle activities in India.”
- Under the Implementation and Compliance Report provision of Section 104 (Section 104.(g)(2)), the Administration is required to

---

<sup>54</sup> White House, Office of the Press Secretary, “Press Briefing by Under Secretary of State for Political Affairs Nick Burns,” Maurya Sheraton Hotel and Towers, New Delhi, India, Mar. 2, 2006.

report, 180 days after entry into force of the Section 123 agreement and annually thereafter:

- (A): a description of any additional nuclear facilities and nuclear materials that the Government of India has placed or intends to place under IAEA safeguards;
- (F): an analysis of whether U.S. civil nuclear cooperation with India is in any way assisting India's nuclear weapons program;
- (H): an estimate relating to India's production of uranium, fissile material for nuclear explosives;
- (I): an estimate of the amount of electricity produced by India's declared and undeclared reactors; and
- (J): an analysis of whether imported uranium has affected the rate of production in India of nuclear explosive devices.

In the President's signing statement on December 18, 2006, he noted that the executive branch would construe "provisions of the Act that mandate, regulate, or prohibit submission of information to the Congress, an international organization, or the public, such as sections 104, 109, 261, 271, 272, 273, 274, and 275, in a manner consistent with the President's constitutional authority to protect and control information that could impair foreign relations, national security, the deliberative processes of the Executive, or the performance of the Executive's constitutional duties." This could suggest that the executive branch might limit the scope of reporting required by Congress in those sections. Limiting the scope of reporting could have an adverse impact on Congress's ability to assess the nuclear cooperation agreement at three different times: when the agreement is submitted for congressional approval; at random times when there are certain developments in India's nuclear fuel cycle; and on an annual basis when the Administration reports on implementation and compliance.