Feeding the Nuclear Fire

By Zia Mian and M.V. Ramana | September 20, 2005

The July 18 joint statement by U.S. President George Bush and Prime Minister Manmohan Singh has attracted a great deal of comment. The focus has been on the possible consequences of U.S. promises to support India's nuclear energy program in exchange for India clearly separating its military and civilian nuclear facilities and programs and opening the latter to international inspection.

Much of the debate on the deal has arisen between what can be broadly called nuclear hawks and nuclear nationalists. The hawks believe that New Delhi's nuclear program is a great success and that India is more than able to take care of itself. They see the deal as imposing unnecessary constraints on India's nuclear program and impeding the creation of a large nuclear arsenal—including thermonuclear weapons (hydrogen bombs)—which they believe to be essential for India to achieve "great power" status.

The clearest expression of this perspective comes from former Prime Minister Atal Behari Vajpayee and the Bharatiya Janata Party (BJP), who seek the largest possible nuclear weapons capability. Vajpayee argues: that "Separating the civilian from the military would be very difficult, if not impossible… It will also deny us any flexibility in determining the size of our nuclear deterrent." When he refers to "flexibility" in determining the size of the Indian nuclear arsenal, he does not include reducing or eliminating it. Rather, his term expresses the fear that separating civil and military facilities may curb the arsenal's size.

Nuclear nationalists have a less ambitious, more traditional perspective that considers India's nuclear program a great national technological achievement and necessary for India's economic and social development. They see the deal as offering a way to sustain and expand the nuclear energy program without unduly restricting a "minimum" nuclear weapons arsenal.

The current government has embraced this nationalist view, as have many defenders of the deal. The prime minister laid it out most clearly to Parliament on July 29, saying: "Our nuclear program … is unique. It encompasses the complete range of activities that characterize an advanced nuclear power … our scientists have done excellent work, and we are progressing well on this program as per the original vision outlined by Pandit Jawaharlal Nehru and Dr. Homi Bhabha." Singh went on to argue that "nuclear power has to play an increasing role in our electricity generation plans," and he noted that the deal is flexible because "our indigenous nuclear power program based on domestic resources and national technological capabilities would continue to grow." The expected international support, both in nuclear fuel and nuclear reactors, will help "enhance nuclear power production rapidly," he added. At the same time, he made it clear that "there is nothing in the joint statement that amounts to limiting or inhibiting our strategic nuclear weapons program."

These two positions have by and large dominated the debate so far. There are many problems with both views. The first is their shared belief in the success of India's nuclear energy program and the need to continue with and expand this effort. They fail to recognize that the deal is actually a testament to the long-standing, expensive, and large-scale failure of the Department of Atomic Energy (DAE) to safeguard health, safety, the environment, and local democracy.

Both camps also contend that nuclear weapons are a source of security, though this conviction has been extensively debunked.[1] Those who persist in this belief also ignore the essential moral, legal, and criminal questions of what it means to have—and be prepared to use—nuclear weapons. The only differences between the two camps are in the character and size of the genocidal weapons they desire and in the number of people they are prepared to threaten to kill.

A History of Failure

The establishment of the Atomic Energy Commission (AEC) in 1948 was framed by the rhetoric of indigenous national development. Led by Homi Bhabha, the AEC portrayed India as forging its own path in the new nuclear age. That was not to be. There was no progress until the United Kingdom offered the design details and enriched uranium fuel for the first Indian nuclear reactor, Apsara.[2] In what was to become a pattern, the official announcement when the Apsara reactor went critical declared the landmark a "purely indigenous affair."[3]

Similarly, the CIRUS reactor, which provided the plutonium used in the 1974 nuclear test (and quite likely some used in the 1998 tests as well), was supplied by Canada, and the heavy water used in it came from the United States. An American firm, Vitro International, was awarded the contract to prepare blueprints for the first reprocessing plant at Trombay. The first power reactors at Tarapur and Rawatbhata were supplied by the United States and Canada respectively. And foreign collaboration did not just extend to reactors. Many of India's nuclear scientists were schooled in America and elsewhere. Between 1955 and 1974, over 1,100 Indian scientists were sent to train at various U.S. facilities.[4]

Extensive foreign support of the nuclear program ended only after the 1974 nuclear test. The international community led by Canada and the United States—both of whom were incensed by India's use of plutonium from the CIRUS reactor, which had been given purely for peaceful purposes—cut off most material transfers relating to New Delhi's nuclear program. However, India's nuclear facilities surreptitiously procured components from abroad, and foreign consultants continued to be hired for projects.[5] Moreover, DAE personnel still had access to nuclear literature and participated in international conferences where technical details were freely discussed.

Even with all this help, DAE's failures were many and stark. In 1962, Homi Bhabha predicted that by 1987 nuclear energy would constitute 20,000 to 25,000 megawatts (MW) of installed electricity generation capacity.[6] His successor as head of the DAE, Vikram Sarabhai, predicted that by 2000 there would be 43,500 MW of nuclear power.[7] In 1984, the "Nuclear Power Profile" drawn up by the DAE suggested the more modest goal of 10,000 MW by 2000.[8] India never came close to meeting any of these goals.

After over 50 years of generous government funding, nuclear power amounts to only 3,400 MW, barely 3% of India's installed electricity capacity. This capacity is expected to rise by nearly 50% over the next few years but not because of the DAE. The largest component of the expansion will be two 1,000 MW reactors purchased from and being built by Russia.

This history of failure explains the escalating demands from the DAE and other nuclear advocates to gain access to international nuclear markets. Only with international help can the DAE ever hope to achieve its latest promised goal of 20,000 MW by the year 2020.

Another pressure driving the deal with Washington has been the DAE's failure to manage its existing nuclear program. In its determination to build more and more reactors—something to show for all the money that it gets—the DAE has failed to provide reactor fuel. Soon after the U.S.-India deal was announced, this oversight became apparent in a statement from an unnamed official to the British Broadcasting Corporation who admitted: "The truth is we were desperate. We have nuclear fuel to last only till [sic] the end of 2006. If this agreement had not come through we might have as well closed down our nuclear reactors and by extension our nuclear program."[9] The former head of the atomic energy regulatory board has reported that this is not a new problem, he notes that "uranium shortage" has been "a major problem for the officials of NPCIL and the Nuclear Fuel Complex (NFC) for some time."[10]

The issue is simple. Apart from Tarapur I and II, all DAE reactors are fueled using uranium from the Jaduguda region of Jharkand. The total electric capacity of the heavy water-based power reactors is 2,450 MW. At 75% operating capacity, they require nearly 330 tons of uranium every year.[11] The reactors that are supposedly dedicated to making plutonium for nuclear weapons, CIRUS and Dhruva, consume

perhaps another 30-35 tons. When mining started in Jaduguda, the average ore grade was about 0.067%.[12] Now it is reportedly less than half that. The current mining capacity is around 2,800 tons of uranium ore per day. This means the DAE may only be producing about 300 tons of uranium a year, which falls well short of the fueling requirements. The DAE has been able to continue to operate its reactors only by using stockpiled uranium from earlier days when nuclear capacity was much smaller. This stockpile should be exhausted by 2007.

The DAE has been desperately trying to open new uranium mines in India, but it has been met with stiff public resistance everywhere.[13] This local resistance stems from the widely documented negative impacts of uranium mining and milling on public and occupational health.

The limits on domestic uranium reserves have been known since the nuclear program was started. This concern was the justification for the three-phase nuclear power program that Bhabha originally proposed and that continues to be pursued.[14] This program involves separating plutonium from the spent fuel produced in natural uranium reactors and setting up breeder reactors, which in turn could theoretically be used to utilize India's thorium resources for energy production. But the three phases are far from being realized. The DAE has failed to build and sustain enough natural uranium-fueled reactors for the first phase. The second phase is still experimental, and the first plutonium-fueled power reactor has yet to be completed. Even if it becomes fully functional, breeder reactors are unlikely to be a significant source of electricity for several decades.[15] The thorium fuel cycle, the third phase, is still far in the future.

Implications of the Agreement for Nuclear Energy in India

If the deal with Washington goes through, the DAE will be free to purchase uranium from the international market for its safeguarded reactors. This has some important consequences. For starters, it will reduce pressure on domestic uranium reserves. Since imported uranium will be much cheaper than Indian uranium, it may also marginally reduce the operating costs of Indian nuclear plants. Although the DAE hides its actual costs, there is little doubt that nuclear electricity is more expensive than other major sources of power in India.[16]

At the same time, access to cheap, imported uranium will remove what has been the DAE's primary justification for much of its long-term nuclear plan. For decades, the DAE has cited a shortage of domestic uranium as justification for India's breeder program, even though poor economics and countless engineering problems have effectively killed similar breeder reactor programs in the United States, France, and Germany. The high cost of breeder reactors stems from their need for plutonium fuel produced at reprocessing plants by chemically treating spent (i.e., used) nuclear fuel from ordinary reactors. The separated plutonium is then fashioned into breeder fuel at special and costly fabrication plants. There are enormous economic costs, environmental repercussions, and public health risks associated with this whole scheme.

If cheap uranium becomes available to India, there will be no need for any of this. Even so, the DAE may balk at giving up its breeder reactor program. It may instead choose to emulate Japan, which imports uranium to power its nuclear reactors and, ignoring the costs and risks, continues to pursue its breeder reactor program. If so, the DAE's institutional interests will have once again triumphed over economic good sense and concerns about health and the environment.

India's existing nuclear capacity—and any increases in it, domestic or foreign, that the U.S. deal facilitates—should not to be considered a benefit. Nuclear electricity is expensive, and it would be far better to invest in other, cheaper sources of power as well as energy conservation measures.[17] There are also important safety concerns associated with nuclear power. At least one of the DAE's nuclear reactors has come close to a major accident.[18] One can barely imagine the consequences of a Chernobyl-like meltdown involving the release of large quantities of radioactive materials at a reactor in a densely populated country like India.[19] Other facilities associated with the nuclear fuel cycle have also experienced accidents,

though these have primarily affected workers within the plant.[20]

Apart from extreme accidents, there are many environmental and public health consequences associated with the many facilities that make up India's nuclear complex.[21] A scientific study of the health consequences on the local population around the Rajasthan Atomic Power Station (RAPS) located at Rawatbhata near Kota observed statistically significant increases in the rates of congenital deformities, spontaneous abortions, stillbirths and one-day deaths of newborn babies, and solid tumors.[22]

And, to cap it all, there is the unsolved problem of managing large amounts of radioactive waste for many tens of thousands of years. The question that really needs to be discussed (but has hardly figured in the debate) is whether India needs any nuclear power plants at all. There are many who believe India would be better off giving up this costly and dangerous technology and finding ways to meet the needs of its people without threatening their future or their environment.

How Many Bombs Are Enough?

Nuclear energy and nuclear weapons have been linked from the beginning, and this will continue under the deal with Washington. Access to the international uranium market for fueling reactors will free up domestic uranium for India's weapons program and will likely boost New Delhi's nuclear clout.

There are several ways in which India could use its freed-up domestic uranium. It could choose to build a third reactor dedicated to making plutonium for nuclear weapons. There have been proposals for a larger reactor to add to CIRUS and Dhruva at the Bhabha Atomic Research center in Mumbai.[23] India could also start to make highly enriched uranium for nuclear weapons. Pakistan has used such highly enriched uranium, produced at Kahuta, for its weapons. Both paths, which need not be exclusive, would allow India to increase its fissile materials stockpile at a much faster rate. A third use for domestic uranium would be in supplying the fuel for a nuclear submarine that has been under development since the 1970s.[24] Modest uranium availability and the more-pressing need to keep the power reactors running have restricted all such plans in the past.

If the proposed agreement is solidified, India could use both its current stockpile of weapons-grade plutonium and all future production to make nuclear weapons. The current stockpile is estimated to be perhaps 400-500 kg, sufficient for about 100 simple fission weapons. (It is usually assumed that 5 kg is needed for a simple weapon. More sophisticated designs typically require less plutonium.) CIRUS and Dhruva produce about 25-35 kg of plutonium a year. This means that by 2010 India's potential arsenal size could be about 130 warheads using only existing facilities.

But there are other sources of weapons-grade fissile material. Power reactors can be used to make weapons-grade plutonium by limiting the time the fuel is irradiated. Run this way, a typical 220 MW power reactor could produce between 150-200 kg/year of weapons-grade plutonium when operated at 60-80% capacity.

Another source of fissile material is the stockpile of plutonium in the spent fuel of power reactors. Though it has a slightly different mix of isotopes from weapons-grade plutonium, it can be used to make a nuclear explosive.[25] The United States conducted a nuclear test in 1962 using plutonium that was not weapons-grade. One of India's May 1998 nuclear tests is also reported to have involved such material.[26]

Over the years, some 8,000 kg of reactor-grade plutonium may have been produced in the power reactors not under safeguards. Only about 8 kg of such plutonium are needed to make a simple nuclear weapon. Unless this spent fuel is not put under safeguards—i.e., declared to be off-limits for military purposes, as part of the deal—India would have enough plutonium from this source alone for an arsenal of about 1,000 weapons, larger than that of all the nuclear weapons states except the United States and Russia.

Lastly, there is the plutonium produced in Kalpakkam in India's small, fast-breeder test reactor (FBTR). Even more plutonium will be produced by the 500 MW prototype FBTR now under construc-

tion. It is curious that ever since the 1960s, the DAE has resisted placing India's breeder program under international safeguards, even though both Germany and Japan, neither of them nuclear weapon states, subjected their breeder reactor programs to such safeguards. In theory, international scrutiny prevents plutonium or uranium from civil nuclear facilities from being used to make nuclear weapons. The DAE's resistance to safeguards begs the question as to whether the breeder program is, or ever was, only for civilian purposes.

A. N. Prasad, former director of the Bhabha Atomic Research Centre (BARC), has argued that these large stocks of weapons-usable material are beside the point. Prasad asserts that the deal with Washington should be rejected because "our military activities are not aimed at stockpiling nuclear weapons," since "the weapons become old, their materials degrade, [and] they have to be dismantled and replaced."[27]

But Prasad is disingenuous. It is estimated that the plutonium used in U.S. nuclear weapons may not need to be replaced for 45-60 years. The material can then be recycled into new nuclear weapons. Moreover, many of the aging effects that plutonium experiences can be avoided with proper storage, allowing existing stocks of plutonium to last indefinitely. All other nuclear weapons states have stopped producing new material for their nuclear weapons programs—only India, Pakistan, and Israel appear to be producing new weapons ingredients.

Another nuclear weapons resource is tritium, a gas used to boost the yield of fission weapons. The DAE claims to have tested a tritium-boosted weapon in 1998. However, tritium decays relatively quickly (its half-life is just over 12 years). Thus, to maintain a stockpile of tritium for a long time requires either a very large initial amount or production at a rate that balances decay. Tritium is a byproduct in nuclear reactors dedicated to producing plutonium for weapons. These reactors can also be used specifically to generate more tritium.

In short, the deal with Washington promises not only to leave New Delhi's weapons capability intact but to allow for a rapid and large expansion of India's nuclear arsenal. And both parties to the pact accept this as a good thing.

The effects of the use of both the smaller-yield fission weapons and the more-destructive thermonuclear weapons in India's arsenal are well-known.[28] Put simply, the smaller weapons will kill almost everyone within 1.5 km of the explosion, and the larger weapons will kill most people out to distances of 3.5 km. The effects of radioactive fallout would spread tens of kilometers further. Either kind of bomb would be enough to destroy a modern city. The question that needs to be asked is, "How many cities do India's leaders wish to be able to destroy?"

There are many who believe that no country should have nuclear weapons, since such weapons engender fear through the threat of genocide. In the 60 years since Hiroshima, we all should have learned that there is no security to be found in the threat to kill millions.

Conclusion

The nuclear agreement between the United States and India has many problems and raises two fundamental questions. The first is whether India needs nuclear energy for its development and the well-being of its people. A good case can be made that it does not.

The second question is whether India needs nuclear weapons if it truly wants to live in peace with its neighbors and with the world. Many believe, with good reason, that it does not.

The outcome of the proposed nuclear agreement, therefore, is a future in which a nuclear-powered and nuclear-armed India swaggers along in Washington's shadow. Such a choice could not be more stark.

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