Nuclear Negotiations, Scientific Literacy, and U.S.-India Relations

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OCTOBER 8, 2008, was a proud day for most close observers of the emerging relationship between the United States and India. In the grand East Room of the White House, flanked by senators and congressmen, and in front of more than two hundred assembled dignitaries and diplomats, President George W. Bush signed into law legislation formally opening the door to civil nuclear cooperation between the two countries for the first time in almost thirty-five years.

Most of those who followed the long and arduous journey of the U.S.-India Civil Nuclear Cooperation Initiative, as it is formally known, understood that the scene unfolding that day was the culmination of many years of negotiations, compromises, and diplomatic trust. The deal represented the desire of two countries to put decades of suspicion and antagonism behind them in favor of a strong and stable partnership. As President Bush said on that day, “This agreement sends a signal to the world: nations that follow the path of democracy and responsible behavior will find a friend in the United States of America.”

While the geostrategic implications of the U.S.-India civil nuclear deal were professed loudly and often, what many do not realize is the importance that scientific literacy and expertise played in the completion of the deal. In fact, it would not be an exaggeration to say that without the scientific acumen and...
competency displayed by both countries, the deal might not have happened at all, or worse, might have been struck in a manner detrimental to global efforts on nuclear nonproliferation. In this sense, the nuclear deal with India is an example of science working hand in hand with diplomacy to advance the national security interests of the United States.

A Breakthrough in U.S.-India Relations

The India nuclear deal was, at its core, a political arrangement. Even before becoming president, Bush talked openly about his admiration for India and its strong democracy, commenting that such a country would be a natural ally of the United States. Once in office, he set about making that vision a reality, building on the initial thaw in bilateral relations established by the Clinton administration in 2000. As President Bush and his diplomatic team searched for ways to strengthen the relationship and build a true strategic partnership, one issue kept rising to the top of the agenda: civil nuclear energy cooperation.

History of the Deal

Since 1974, when India carried out its first nuclear test, the United States and its nonproliferation partners had devised a series of international agreements designed largely to keep India out of the global nuclear energy industry. Through the Nuclear Suppliers Group, a body created under the auspices of the United Nations immediately after the 1974 test, India was systematically banned from trade with any nuclear supplier.

During this time, the stated goal of the United States was to offer the prospect of nuclear trade as a carrot to persuade India to sign the Treaty on the Non-Proliferation of Nuclear Weapons, (NPT). However, India was unable to sign as a nuclear weapons state, which was restricted to the five countries that tested nuclear devices prior to 1967, and it was unwilling to sign as a nonnuclear weapons state, which would have required giving up its nuclear weapons program. For more than thirty years, this stalemate stood almost frozen in time. Meanwhile, India continued to indigenously develop its nuclear program to ever-increasing sophistication. The country shocked the world again by conducting a second round of nuclear tests in 1998.

Recognizing that the situation was unsustainable, in terms of both nonproliferation efforts and bilateral U.S.-India relations, the Bush administration, together with the Indian government, overturned thirty years of U.S. policy and searched for a way through this impasse. After years of careful analysis and foundational work, supported by scientific expertise, the nuclear deal was announced with great fanfare when Indian Prime Minister Manmohan Singh visited the White House on July 18, 2005.²
Features of the Agreement

Despite widespread criticism in the United States that the deal “rewarded” India for thirty years of intransigence, the Bush administration secured some key nonproliferation assurances from Singh’s government. These assurances demonstrated India’s commitment to nonproliferation and strengthened international efforts by bringing India in line with global standards.

Through the deal, India agreed to assume the same responsibilities and practices as recognized nuclear weapons states, despite not having a seat at the Nuclear Suppliers Group, which determined those responsibilities and practices. In addition, India agreed to seven key nonproliferation commitments:\(^3\)

- identify and separate its civil nuclear facilities from its strategic program
- voluntarily place its civil nuclear facilities under international safeguards
- sign and adhere to an Additional Protocol governing those safeguards
- continue its unilateral moratorium on nuclear testing
- work with the United States toward the conclusion of a multilateral Fissile Material Cut-off Treaty
- refrain from transferring enrichment and reprocessing technologies to countries that do not already have them and support efforts to limit the spread of these technologies
- secure its domestic nuclear program through comprehensive export control legislation and adherence to international guidelines

Taken together, these commitments by India gave the United States the confidence it sought in ensuring that nuclear trade with India would not be detrimental to global nonproliferation efforts. For its part, the Bush administration committed to work with Congress to adjust U.S. laws and policies to allow such trade and to work within the Nuclear Suppliers Group to adjust international guidelines to the same end. Once completed, these steps would deliver India from decades of nuclear isolation.\(^4, 5\)

The Critical Role of Scientific Literacy in Nuclear Negotiations

Although geopolitical considerations were the underpinnings and driving force behind the deal, it probably would not have come to fruition and had the success that it did were it not for the scientific understanding and technical knowledge that laid the foundation for the negotiations. In every step of the process, the negotiators relied on their knowledge of nuclear technology and capabilities to ensure that a robust and defensible deal was achieved. Without this background and expertise, it is quite possible that the deal could have turned out disastrously for the United States.
The role of scientific literacy in the nuclear negotiations with India manifested itself in three distinct manners: the science that directly informed the negotiations, the recognition of where gaps in knowledge existed, and the composition of the U.S. negotiating team. As the negotiations wore on over the better part of three years, all three would prove to be critical elements.

Science Informing the Negotiations

As most anyone with a passing knowledge about nuclear reactions realizes, nuclear technology and nuclear energy are incredibly complex technical subjects. These are made even more complex by the fine line that distinguishes activities necessary for a peaceful energy program from those usually associated with a strategic weapons program. Consequently, of primary importance for the negotiators was understanding nuclear technology and the implications of possessing those technologies indigenously.

For example, the U.S. negotiators were keenly aware that the nuclear technology required for civil nuclear energy is in fact the very same technology that is used to build a nuclear weapon. Both processes require enriched radioactive uranium, though at different concentrations. Therefore, a country that possesses the enrichment technology to generate its own fuel for nuclear energy can easily repurpose that technology for producing material for a nuclear weapon.

Understanding this overlap in technology, and accounting for it in the India deal, was crucial. For a country such as India, which had already developed a robust nuclear program for both energy and weapons, the comingling of civil and strategic programs was a great concern for the United States. If any cooperation was to occur, the United States (and other suppliers) was bound by NPT obligations to ensure that any technology, reactors, or fuel sent to India would be used only for the civil program and would not benefit the strategic program in any way.

As a result, based on this understanding of dual-use nuclear technology, the United States insisted that India separate its civil program from its strategic one, completely and without exception. Every reactor, research facility, kilogram of fuel, computer, and document, even every employee, was required to be declared either strategic or civil, with the intention that the two programs would not interface. The application of safeguards by an international authority would help ensure that the two programs did in fact remain separate. India’s commitment to this separation plan provided the foundation on which the deal could be built, and it was possible only through scientific expertise.

Another example of scientific knowledge driving the negotiations concerns the spread of enrichment and reprocessing (ENR) technologies. Out of the understanding and recognition that such technologies are critical to the development of a nuclear weapons program, the United States for many decades has led efforts to limit their proliferation. In fact, U.S. law prohibits the export of such technologies, except in extreme special cases. The Nuclear Suppliers Group
even offers to provide certain countries with enriched fuel and then take back the spent nuclear waste to preclude the necessity for ENR capabilities.

The U.S. negotiators in the India deal, fully aware of the sensitivity of ENR technologies, understood that nothing in the deal could be seen as contributing to their proliferation, owing to implications for global security. At the same time, however, there was a clear understanding that India had already developed these technologies indigenously. Therefore, prohibiting the export of ENR technologies to India would not in itself advance the goal of limiting the global spread of such technologies.

Armed with this knowledge—both the scientific importance of ENR technologies and the degree of scientific advancement that India had achieved—the United States was able to craft an agreement: the United States would be allowed to export ENR technologies to India (a key Indian demand), but India would refrain from then transferring such technologies to other countries that did not already possess them. Furthermore, India would support global efforts to limit the spread of these technologies. In this manner, the United States and India were able to strike an appropriate balance based on technical expertise.

One final noteworthy example here is the effort that the United States made in the negotiations to make the deal reversible. This was of key importance as the entire deal was premised on a commitment by India to continue its moratorium on nuclear testing. While the United States believed (and continues to believe) that India will live up to this commitment, the United States needed to protect itself in a worst-case scenario.

Scientific expertise came into play on this issue in two ways. The first was the understanding that nuclear tests are generally seen as significant advances in weapons development. While there was no doubt that India would continue to develop its strategic program, the completion of a test would represent a scientific leap in this regard. And the negotiators understood that. The second was the suite of provisions built into the agreement to ensure that U.S. material is tracked and accounted for, and thus could be returned if necessary. Nuclear fuel, supplies, and other materials are often fungible, and the negotiating team understood the associated scientific implications. Consequently, protecting U.S. exports against an unthinkable breach was made possible only through sophisticated scientific knowledge.

Gaps in Scientific Knowledge

As important as scientific expertise was to the success of the agreement, the negotiating team was also keenly aware of the limits of its collective knowledge and of the limits of the technology involved. And it became important not only to recognize these limitations but to ensure that the final agreement precluded any unintended consequences due to a knowledge gap.
The most important example of this in the context of the U.S.-India civil nuclear deal included the development of proliferation-resistant nuclear technologies, such as the use of thorium as nuclear fuel in place of the more traditional enriched uranium. At the time of the negotiations, India, more than most other countries, had carried out extensive research into the thorium nuclear fuel cycle and was close to operationalizing a thorium reactor. Because a thorium reactor is generally considered more proliferation-resistant, India wanted to shield its future thorium reactors from international safeguards, while still including them as facilities that would be eligible for international trade.

At the time, thorium nuclear technology was still in its early stages and so the U.S. negotiating team did not have all of the scientific knowledge necessary to evaluate the veracity of India’s proposal. Ultimately, the United States decided it could not take the risk that international cooperation would occur at thorium reactors outside of international safeguards, and the agreement was written to ensure that India’s future civil thorium reactors would be covered. In the end, the United States had to insulate itself against the uncertainty introduced by the limits of the science.

Technical Personnel in the Negotiating Room

The basic underlying science behind the negotiations, on topics such as nuclear energy and nuclear weapons development, are, of course, well-studied subjects with reams of knowledge covering every aspect. But for all of this expertise to be useful, it has to find its way into the negotiating room. And this is where the makeup of the negotiating team became critical.

Most international treaties are negotiated by the foreign service officers who make up the bulk of the Department of State’s diplomatic corps. According to their job descriptions, these officers are trained and charged with interacting with foreign governments and advancing the interests of the United States, irrespective of the specific topic of any particular agreement.

For the India nuclear negotiations, however, the core team of eight negotiators (not counting senior management) included not a single foreign service officer. Rather, all eight were technical experts steeped in the details of nuclear technology and nonproliferation. The team included a chief negotiator with more than twenty-five years of experience in international nuclear negotiations; four technical experts from the Department of State, the Department of Energy, and the Department of Defense; a nuclear researcher on loan from the national labs; a lawyer who specialized in nonproliferation law; and a PhD engineer. Recognizing that scientific knowledge and expertise would be instrumental in negotiating a robust agreement, the chief negotiator assembled a team of appropriate technical experts.

While the vagaries of the U.S. Department of State are probably not well known to the outside world, the lack of “traditional” diplomats on the negotiating team is quite remarkable. For the department’s senior leadership to entrust such a high-
profile and politically important initiative to a team from outside the confines of the Foreign Service demonstrated the important role that science played in these negotiations. And ultimately, the makeup of the negotiating team worked to serve the best interests of the agreement and of the United States.

Looking Ahead and Reaping the Scientific Benefits

Despite the high-level political support and promising start to the nuclear deal, more than six years since the finalization of the deal in 2008, implementation has been slow. Because of issues that have since arisen over nuclear accident liability and broader economic regulations regarding foreign investment into India, U.S. nuclear firms remain wary of exporting material to India and have approached the market cautiously. To date, private-sector discussions are ongoing, and no reactors are yet being built.

One of the major sticking points continues to be nuclear liability legislation that the Indian parliament passed in 2010. Although the legislation was a show of bipartisan cooperation between the ruling party and the opposition, the final language allowed nuclear equipment manufacturers to be held liable for accidents or other incidents—irrespective of cause—involving nuclear plants that they supplied. The legislation, which is inconsistent with international norms regarding nuclear trade, has significantly dampened enthusiasm for U.S. firms to enter India’s domestic nuclear market. In addition, since the deal opened the doors for India to engage in nuclear trade worldwide, U.S. firms have also seen competition from French and Russian nuclear firms vying for Indian contracts, slowing U.S. entry into the market even further.

However, even in the absence of robust bilateral nuclear trade (which many people believe will come to fruition eventually), the scientific benefits of the deal to the global nuclear and nonproliferation community are becoming apparent. Showcasing that scientific collaboration can precede political and economic gains, the nuclear deal promises some important advancements.

Increase in Collaboration between Indian and American Scientists

Perhaps the biggest avenue for scientific benefit is the renewed ability for Indian and American scientists to work together and share information regarding nuclear research and technology. Prior to the deal, Indian scientists were in effect barred from participating in many international nuclear conferences and collaborations owing to export restrictions. Because the civil and strategic portions of the Indian program were previously intermingled, all Indian scientists, regardless of their actual work and responsibilities, were considered too risky to invite to international events where nuclear technology would be discussed. Any knowledge shared could in theory be passed on to India’s strategic program and aid in the development of a nuclear weapon, thereby violating U.S. law and NPT obligations.
With the implementation of India’s separation plan, these concerns are beginning to erode. With India’s two programs now being completely separated, Indian civil nuclear scientists no longer present the same proliferation risk they once did. As a result, American and other international nuclear specialists are more liberated to fully engage and collaborate with their Indian counterparts. They can do so without the fear that any knowledge or technical information will be used to advance a weapons program.

Even better for scientific collaboration, the presence of Indian scientists in international nuclear fora is beginning to advance the field of nuclear science as a whole. As noted, the Indian program is highly sophisticated and was developed almost completely indigenously, meaning that Indian techniques and technology are different from those employed by other countries. This information is beginning to flow in the other direction as Indian scientists engage with their foreign counterparts.

What we see emerging now, albeit slowly, is that best practices are being shared among a larger circle of experts and that those best practices are coming from a greater variety of sources than they once did. As a result, the field of nuclear energy is likely advancing in a more efficient and robust manner. Without the U.S.-India nuclear deal, this probably would not have been the case.

India’s Role in the Nonproliferation Community

This same principle applies to the increase in interaction between India and the United States in international nonproliferation fora. As mentioned, since their founding, the Nuclear Suppliers Group and other regimes have specifically kept India out of the equation. For many decades, India was barred from attending meetings, even as an observer. This created an inherent tension in that these regimes attempted to stem proliferation without the cooperation or participation of a country that already had a highly developed nuclear program. Not only did the international community suffer, but India was left with little national stake in global nonproliferation efforts.

Despite this, India maintained a strong record of nonproliferation, comparable with that of the most responsible Western nations. To date, no credible information exists of any Indian government complicity or, worse, sponsorship, of outward nuclear proliferation.

Consequently, both India and the broader international community have a lot to learn from each other about nonproliferation and acceptable methods to prevent the spread of nuclear technology. By giving its blessing to the U.S.-India nuclear deal, the Nuclear Suppliers Group recognized at last that its goal of limiting proliferation would only be strengthened by bringing India “inside the tent” and giving India a stake in its efforts. Once India is formally integrated into
the appropriate regimes, the field of nonproliferation technology will likely see advancement as best practices are again shared more broadly.

**Spurring on the Private Sector**

As the deal matures and implementation begins, scientific advancement will also likely come from the private sector. India faces massive energy needs over the next fifty years, and it plans to make a significant increase in nuclear power a central pillar of its strategy to meet those needs. As a result, the opening of India’s domestic power industry represents an enormous new market for the international nuclear community. Particularly compared with the stagnant nuclear industry in the United States over the past thirty years, India will likely be a major source of new demand for nuclear reactors and technology.

This increase in demand will eventually alter the calculation for many private-sector firms contemplating investments in new nuclear technology. Previously, the weak demand forecast may have rendered impractical the business case for significant research and development. But the presence of such a large new market will undoubtedly spur new efforts in the field. As companies look to secure lucrative contracts, and compete with one another for them, being able to offer the most advanced technology will be important.

**Conclusion**

Ultimately, the United States undertook the civil nuclear cooperation initiative with India to bolster its own diplomatic objectives and national security. The deal did greatly benefit India, by design, but—contrary to what many critics have claimed—it was not an altruistic endeavor. By proposing and completing the deal, the United States made the calculation that India’s influence and standing on the world stage was only going to grow over the next fifty years. And in that context, the United States and other Western nations would be strengthened by having a strong partnership with India, rather than continue to isolate it or push it toward alliances with other countries. In addition, the United States recognized that including India was critical to furthering the goals of nuclear nonproliferation and reducing the likelihood of nuclear confrontation in South Asia. In short, the United States also realized immense gains from the deal. In this manner, the deal illustrates that national security and scientific expertise can critically complement one another.

A complete accounting of the myriad roles that science played in the nuclear deal, as well as the many scientific benefits that stand to be gained, is beyond the scope of this article. Indeed, the above examples only scratch the surface of all that the deal entailed. But they do provide a glimpse into how scientific experts and their expertise were critical to the success of the deal. They also demonstrate that
when political, diplomatic, and scientific objectives align, the results are usually to the benefit of the countries involved, and often to the world.

Condoleezza Rice put it best, only two days after the signing of the legislation in October 2008, when the secretary of state at the time said: “Indeed, what is most valuable about this agreement is how it unlocks a new and far broader world of potential for our strategic partnership in the twenty-first century, not just on nuclear cooperation but on every area of national endeavor. … There is so much that our two great nations will achieve in this new century. And with the conclusion of this civil nuclear agreement, our partnership will be limited only by our will and our imagination.”

Science made that all possible. SD

Endnotes


The opinions and characterizations in this piece are those of the author and do not necessarily represent official positions of the United States government.