



## Addressing South Asia's Fissile Material Conundrum

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*Editor's note: This essay is part of an initiative launched by the Stimson Center's South Asia Program which we call the [Off Ramps Initiative](#). The nuclear competition among China, India, and Pakistan is accelerating with the introduction of new ballistic and cruise missiles. Counterforce capabilities are growing. China has begun to place multiple warheads on some of its ballistic missiles, Pakistan has advertised its ability to do so, and India has demonstrated this capacity in its space program. Diplomacy is dormant as these and other nuclear capabilities expand. What to do? Stimson has asked rising talent in this field, as well as a few veterans, to offer creative ideas that can help ameliorate and decelerate this dangerous triangular nuclear competition.*

### Introduction<sup>1</sup>

South Asia is witnessing a growing competition in conventional and nuclear capabilities. During the past two decades, India and Pakistan have added more than two dozen dual-capable delivery systems and are in the process of building out their respective nuclear triads.<sup>2</sup> Of late both countries are adding counterforce capabilities and platforms to their arsenal. They are also capable of adding MIRVs or multiple independently-targetable re-entry vehicle-equipped ballistic missiles to supplement counterforce capabilities.<sup>3</sup>

Fissile material production has remained a decades-old area of competition which will continue to be a key factor in determining the size, scope, and shape of Indian and Pakistani strategic force postures. The South Asian fissile material conundrum is too wide to capture by casting a single net. A push to start negotiations on banning production at the Conference on Disarmament (CD) in Geneva has remained unsuccessful so far. Therefore, it might be useful to identify the underlying causes of this impasse.

Over the past few years, Pakistan has been reluctant to agree to participate in negotiations for a draft Fissile Material Cut-off Treaty (FMCT), primarily due to the asymmetry in existing stockpiles with India, particularly plutonium (Pu).<sup>4</sup> A lack of transparency on fissile material

stockpiles in India is an additional key hurdle in moving forward. India's civilian plutonium outside the safeguards of the International Atomic Energy Agency (IAEA) is central to the problem, given that New Delhi has designated this material as a "strategic reserve."<sup>5</sup> The International Panel on Fissile Materials (IPFM) includes separated reactor-grade Pu in its estimates of India's military Pu stocks. As of January 2017, India is estimated to have accumulated 6.58 tons.<sup>6</sup> Experts like Mark Hibbs also agree that almost all participating governments in the Nuclear Suppliers Group (NSG) process would welcome transparency in Indian stockpiles.<sup>7</sup> From a South Asian strategic stability perspective, India's existing and growing unsafeguarded stockpiles of weapons-grade and weapons-usable fissile material stockpiles is likely to have a direct bearing on Pakistan's calculus of how much it might need in terms of sufficiency, although Pakistani officials insist that the country is not aiming at nuclear parity with India.<sup>8</sup>

Pakistan has in the past proposed several bilateral initiatives to India for regional stability and arresting the perpetual action-reaction cycle that is characterized by enduring animosity and mistrust through the past seven decades. Pakistan called for establishing a Nuclear Weapon Free Zone in 1972 and 1974, simultaneous adherence to the Nuclear Non-Proliferation Treaty (NPT) prior to overt nuclearization, and has offered more recent proposals as part of a Strategic Restraint Regime such as cruise missile test notification and a legally binding bilateral moratorium on nuclear testing. Each one of these proposals have been rejected by the Indian side.<sup>9</sup> Therefore, another way forward is through a multilateral framework such as the FMCT that could help to reduce the complex security dilemma in South Asia. In this context, however, it will be unrealistic to expect any unilateral measures or concessions by Pakistan that do not address its regional security concerns and growing asymmetries in capabilities.

### **The Proposal: Safeguard All Civilian Fuel Cycles and Materials**

I propose that all unsafeguarded civil fissile material stockpiles—Pu and highly enriched uranium (HEU)—as well as production facilities designated as part of civilian nuclear energy programs in South Asia should be placed under IAEA safeguards and included in the scope of the proposed FMCT. Coupled with it, a clear and verifiable separation between civil nuclear power reactor and associated fuel cycle facilities and military activities through the IAEA should be enforced.<sup>10</sup>

As civilian stockpiles of reactor-grade plutonium are weapon usable and HEU for naval reactors can be quickly enriched to weapon-grade levels, this proposal would serve to drastically reduce the quantity of fissile material available for potential weapons use. It would also enable the application of comprehensive safeguards on all dual-use nuclear plants, facilities, and materials that might be part of civilian nuclear energy programs, but are not presently covered by any oversight. The inclusion of these facilities and materials would also improve their international safety and security standards. Should such an initiative hold a prospect of realization, Pakistan would have no reason to remain outside the negotiations towards an FMCT, thereby strengthening the nuclear nonproliferation regime.

## The Biggest Hurdles Working against the Initiative

India's unsafeguarded civilian fissile material stockpiles are declared to have been earmarked as fuel for its upcoming fleet of fast breeder reactors (FBRs)—the first of which (500 MWe Prototype FBR) is yet to be commissioned after suffering seven start-up delays.<sup>11</sup> The FBRs—part of India's three-stage nuclear energy program that have been kept outside safeguards under the IAEA separation plan—will be a ready source of an exponential increase in weapon and reactor-grade Pu production when they are commissioned. This and India's large-scale ongoing expansion of its enrichment, reprocessing, and Pu production infrastructure are also fueling Pakistan's strategic anxieties and its threat calculus which in turn is driving its operational and sufficiency requirements. Pakistan's estimated existing stockpile of about 210-280 kg of weapon-grade Pu and 3.41 tons of weapons-grade HEU is barely sufficient to meet the warhead requirements of a credible deterrent comprising a triad-based arsenal of 11 types of ballistic and cruise missiles (including short-range systems like the *Nasr*).<sup>12</sup>

A second hurdle is that Pakistan lacks an excess stock of fissile material. Pakistan was a late starter in Pu production due to bureaucratic choices made four decades ago. Pakistan began work on its first 50 MW (thermal) production reactor in 1986; it was commissioned after 11 years. It has added three small 50 MW Pu production reactors since 1998 with the third and fourth reactors going on-line as recently as 2011 and 2014.<sup>13</sup>

It is therefore reasonable to assume that Pakistan would want to utilize these reactors to produce an additional stock of Pu that meets the existing and planned sufficiency requirements—first by narrowing the yawning gap with India and then by resulting in a small excess stockpile. This is important to lend credibility to Pakistan's diplomatic stance of accounting for existing stockpiles of fissile material in the form of a Fissile Material Treaty (FMT) instead of an FMCT that only calls for a future cut-off of production. While the FMT is consistent with the Shannon Mandate governing the negotiations for an FMCT—and goes one step ahead of the FMCT in terms of advocating disarmament in addition to arms control—Pakistan's FMT position is unlikely to secure any support among the weapon-states that already have large stockpiles and have stopped production decades ago. Pakistan's FMT stance is therefore clearly aimed at addressing the asymmetry in existing stockpiles in South Asia (*Figure 1*).

The lack of excess stocks of fissile material might be one reason why Pakistan's representative to the CD highlighted concerns in the summer of 2014 regarding existing stocks of different weapons-usable nuclear materials: “We propose that this weaponized fissile material may not be touched by the treaty, and be dealt with in the future Convention on Nuclear Disarmament.” He further argued that non-weaponized fissile material—including that which has been set aside either for new warheads or for the replacement and refurbishment of existing warheads in addition to civil Pu from any unsafeguarded reactor and HEU for naval propulsion—should be accounted for and brought under the ambit of safeguards of an FMCT. He also called for “mutual and balanced reductions” of such unsafeguarded civil stockpiles—past and future—of fissile material on a regional or global basis.<sup>14</sup> This was followed by the submission of a working paper, “Elements of a Fissile Material Treaty,” at the CD in August 2015 that reiterated Pakistan's earlier position.<sup>15</sup>

Figure 1: South Asia’s Fissile Material Gap (2015-16)

	India	Pakistan
Weapon-Grade Pu	600-800 kg	210-280 kg
Civil Pu (Unsafeguarded)	6.4 ± 3.5 ton (Separated)  11-14 ton (Unseparated)	None
HEU	4.0 ton (30-45 percent U-235)	3.4 ton (90 percent U-235)
Weapon Equivalent Production Capacity of HEU+Pu / year	260 warheads	22 warheads

*These estimates are derived from: Sources: Zia Mian, et. al., “Fissile Materials in South Asia: The Implications of the US-India Nuclear Deal,” (Princeton, NJ: IPFM, September 2006); International Panel on Fissile Materials, “Global Fissile Material Report 2015,” (Princeton, NJ: IPFM, December 2015); and International Panel on Fissile Materials, “Fissile Material Stocks: India/Pakistan,” (Princeton, NJ: IPFM, February 2018).*

Paradoxically, some argue that Pakistan’s position at the CD advocating the accounting of non-weaponized or excess stocks might prove to be counterproductive, given that India could easily use it to its advantage. India could declare one portion of its unsafeguarded fissile material stockpile open for accounting under an FMT and designate a part or all the remaining as weaponized. This could permanently freeze the weaponized asymmetry in India’s favor where it would enjoy a huge advantage over Pakistan. Regardless of whether India chooses to adopt such a course or not, in the absence of a surplus Pakistani stockpile, any bilateral, regional, or multilateral reductions of unsafeguarded (civil) or military stockpiles of fissile material is a non-starter for Pakistan.

A third challenge would be to ensure transparency and verification of separation for civilian and military fuel cycle and reactor operations in South Asia. This would primarily rest on whether the IAEA would be able to monitor and verify the accuracy and completeness of such a separation. This would require that all civilian fuel cycle facilities or power and research reactors or breeder reactors that are part of any civil energy program—and the materials produced therein—are placed under safeguards.

While Pakistan has all its research and power reactors—both existing and planned—under IAEA safeguards, India was allowed in 2008 by the IAEA as part of its separation plan for the U.S.-India civil nuclear deal, to keep eight Pressurized Heavy Water Reactors (PHWRs of 2350 MWe) and its breeder reactors outside safeguards. India has announced plans for building six (600 MWe) FBRs by 2039 and ten 700 MWe PHWRs.<sup>16</sup> Despite being part of the three-stage civil nuclear energy program—these power and breeder reactors have clearly been kept out of the “military” list of plants and facilities in line with the principles of separation that only allowed designation of those facilities as civilian that were not in any way associated with India’s strategic program.

This arrangement has generated three parallel and overlapping streams of reactor operations and fuel cycle activities—civil (safeguarded), civil (unsafeguarded), and military (unsafeguarded).<sup>17</sup>

The IAEA can only certify an accurate and verifiable separation of civilian and military nuclear facilities if the 2008 India-IAEA safeguards agreement for India's separation plan is renegotiated. As John Carlson has argued, the overlap in India's civilian unsafeguarded and military nuclear facilities raises the possibility of diversion of materials under the existing IAEA safeguards, which would violate one of the conditions for membership of the NSG. Once a more effective safeguards agreement is in place, it would enable the IAEA to monitor and report on the transparency, completeness, and accuracy of its safeguards.<sup>18</sup>

Pakistan has no such intersections of civilian facilities feeding into its weapons program. While it has a small unsafeguarded military nuclear fuel cycle dedicated to producing fissile material for nuclear weapons, in 2006 the Executive Committee of the National Economic Council (ECNEC) approved a \$1.2 billion plan to establish a “purely civilian” commercial-scale nuclear fuel cycle that would be placed under IAEA safeguards. It would include all front-end facilities—uranium processing, conversion, enrichment and fuel fabrication—and would allow for the local production of pressurized water reactor fuels.<sup>19</sup>

In 2012, Pakistan's Planning Commission confirmed that it was working on developing a Pakistan nuclear fuel complex/nuclear power fuel complex comprising a chemical processing plant; an enrichment plant; a seamless tube plant-1; a fuel fabrication plant; and a nuclear fuel testing plant with an estimated cost of Rs. 51.298 billion.<sup>20</sup> Once complete, this would enable Pakistan to add a completely civilian fuel cycle—separate from its production reactors and military fuel cycle—to its already safeguarded research and power reactors under the IAEA oversight.

A fourth hurdle is whether Pakistan and India would be willing to accept intrusive monitoring of their respective unsafeguarded civilian fissile material production facilities and stockpiles. While Pakistan has zero unsafeguarded civilian stocks of spent fuel or fissile material—as all its power and research reactors are under IAEA safeguards—this might be difficult for Indian decision-makers to accept.

India is unlikely to agree either to a revision or amendment of its IAEA safeguards agreement agreed in 2008 for its civil-military nuclear separation plan. This is because its unsafeguarded civil nuclear materials (Pu and HEU) have been designated as a strategic reserve and civil production and fuel cycle facilities, and heavy water power and breeder reactors outside safeguards are associated with its strategic program.

### **Why the Initiative Might Nonetheless Be Useful**

It is now clearly in Pakistan's national security interest to address the resultant disadvantages accruing from increased Indian fissile material production, its ability to use and process unsafeguarded stocks of civilian fissile material and the “three overlapping and parallel streams of facilities.”

If, as a result, Pakistan shifts its position and rejoining negotiations at the CD, India would be placed on the defensive and is likely to overtly oppose these negotiations, getting Pakistan off the hook. But for this to happen, it is imperative that the discussion on civil stockpiles and facilities producing all unsafeguarded civilian nuclear materials be considered for inclusion in an FMCT. It would also be in India's interest if it were to undertake a clear separation of civilian and military nuclear facilities and operations. This would also favor India's stalled bid for entry into the NSG.

Besides South Asia, this proposal is also relevant to address nonproliferation concerns on the horizon emanating in East Asia that have a direct bearing on U.S. national security interests—both in terms of its alliance relationships in the region and preventing further proliferation.

The encompassing of all types of weapons-usable civilian nuclear materials under the IAEA safeguards system is pivotal to the strengthening of global arms control and nonproliferation efforts. These objectives are particularly relevant in the 21<sup>st</sup> century given that civilian Pu stockpiles are likely to be among the next big proliferation concerns with the attendant risk of cascading nuclear proliferation in tension-prone regions such as East Asia.

Japan is a case in point with the largest stockpiles of weapon-usable civil Pu second only to the United States. Japan is a NPT signatory and a very large proportion of the IAEA annual budget is spent on monitoring and safeguards of Japanese stockpiles. Yet Japan's plans to commission a large commercial reprocessing plant at Rokkasho has been, for a long time, fueling fears of South Korea following suit—which has to deal with nuclear sabre rattling from a belligerent and unpredictable North Korea on a regular basis. China, for its part, is deeply concerned about Japan's plans for reprocessing. Beijing's own large scale commercial reprocessing plans are driven by the requirements of energy security.<sup>21</sup>

However, Japan and South Korea do not have any unsafeguarded spent fuel or civilian stockpiles and China—recognized by the NPT as a nuclear weapon state—reportedly ended fissile material production for weapons long ago. Consequently, there is a prospect of a “nuclear explosive arms race in East Asia.”<sup>22</sup> Experts believe that 47 tons of Japan's civil PU stockpiles represent a direct proliferation concern with about 11 metric tons of Pu on its soil—and another 37 metric tons stored abroad—enough to make roughly 2,000 nuclear weapons.<sup>23</sup>

There are no transparency concerns with regard to Japan or South Korea. In contrast, India stands out as the only country that has the largest unsafeguarded weapon-usable civil Pu stockpile outside the NPT states. Therefore, Indian lack of transparency in unsafeguarded civil and military fissile material stockpiles leaves Pakistan worrying on what is sufficient for it to maintain the credibility of its deterrent. Thus, by addressing the issue of transparency in civil unsafeguarded fissile material stocks, the world could be nudging Pakistan to change its position at the CD.

Global nonproliferation norms can only be strengthened in the second nuclear age—witnessing a surge in vertical proliferation in South and East Asia—through a universal, nondiscriminatory, and uniformly applicable set of principles that do not create country-specific exceptions and concessions while expecting all others to adopt unilateral restraints.

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<sup>1</sup> A revised version with updated figures from the International Panel on Fissile Materials was posted on March 5, 2018.

<sup>2</sup> Toby Dalton and Jaclyn Tandler, “Understanding the Arms ‘Race’ in South Asia,” Carnegie Endowment for International Peace, September 13, 2012, <http://carnegieendowment.org/2012/09/13/understanding-arms-race-in-south-asia-pub-49361>.

<sup>3</sup> Kelsey Davenport, “India, Pakistan Escalate Missile Rivalry,” *Arms Control Today*, March 2017, <https://www.armscontrol.org/act/2017-03/news/india-pakistan-escalate-missile-rivalry>.

<sup>4</sup> “General Statement by Pakistan Delegation,” Informal Consultative Meeting by the Chairperson of the High-level FMCT Expert Preparatory Group, New York, 2-3 March 2017, [https://www.unog.ch/80256EDD006B8954/\(httpAssets\)/BBA938B952963392C12580DC0046E8C0/\\$file/Pakistan+Statement-GENERAL-FMCT++++Informals-NY-March2017.pdf](https://www.unog.ch/80256EDD006B8954/(httpAssets)/BBA938B952963392C12580DC0046E8C0/$file/Pakistan+Statement-GENERAL-FMCT++++Informals-NY-March2017.pdf).

<sup>5</sup> International Panel on Fissile Materials, *Fissile Material Stocks: India*, (Princeton, NJ, IPFM, August 5, 2016), <http://fissilematerials.org/countries/india.html>.

<sup>6</sup> International Panel on Fissile Materials, *Fissile Material Stocks: India* (Princeton NJ, IPFM, February 18, 2018). <http://fissilematerials.org/countries/india.html>.

<sup>7</sup> <https://twitter.com/MarkHibbsCEIP/status/828692019962855425>).

<sup>8</sup> Mansoor Ahmed, “India’s Nuclear Exceptionalism,” Discussion Paper, Managing the Atom Project, Belfer Center, May 2017, p. 2,

<https://www.belfercenter.org/sites/default/files/files/publication/India%27s%20Nuclear%20Exceptionalism.pdf>;

Kalman A. Robertson and John Carlson, “The Three Overlapping Streams of India’s Nuclear Power Programs,” Discussion Paper, Managing the Atom Project, Belfer Center, April 15, 2016, p. 7,

<https://www.belfercenter.org/sites/default/files/legacy/files/thethreesoverlappingstreamsofindiasnuclearpowerprograms.pdf>; and “Pakistan doesn’t want nuclear parity with India, says ex-diplomat,” *The Nation* (Islamabad), April 20, 2017, <http://nation.com.pk/20-Apr-2017/pakistan-doesn-t-want-nuclear-parity-with-india-says-ex-diplomat>.

<sup>9</sup> “Pakistan Offers India Moratorium on Nuclear Tests,” *The Express Tribune* (Islamabad), August 17, 2016, <https://tribune.com.pk/story/1164259/pakistan-offers-india-moratorium-nuclear-tests/>; Mariana Baabar, “Cruise

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missile test: Pakistan shows concern as India fails to notify,” *The News* (Islamabad), November 17, 2017, <https://www.thenews.com.pk/print/244792-cruise-missile-test-pakistan-shows-concern-as-india-fails-to-notify>.

<sup>10</sup> In South Asian context, civil Pu refers to Pu produced in power reactors that can either be under IAEA safeguards (as in Pakistan) or unsafeguarded while being part of a civilian nuclear power program, but still offer a latent breakout capability by being attached to the strategic program (as in India). The latter therefore poses a unique risk of vertical nuclear proliferation.

<sup>11</sup> Plan to make 6 N-reactors operational by 2039,” *Deccan Herald* (New Delhi), November 5, 2017, <http://www.deccanherald.com/content/641238/plan-make-6-n-reactors.html>; “More delays in India’s breeder reactor program,” *The Fissile Material Blog*, November 26, 2017. <http://fissilematerials.org/blog/>.

<sup>12</sup> Mansoor Ahmed, “Pakistan’s Tactical Nuclear Weapons and their Impact on Stability,” Carnegie Endowment for International Peace, June 30, 2016, <http://carnegieendowment.org/2016/06/30/pakistan-s-tactical-nuclear-weapons-and-their-impact-on-stability-pub-63911>.

<sup>13</sup> David Albright and Serena Kelleher-Vergantini, “Pakistan’s Fourth Reactor at Khushab Now Appears Operational,” Institute for Science and International Security, January 16, 2015, [http://isis-online.org/uploads/isis-reports/documents/Khushab\\_January\\_2015\\_reactor\\_four\\_operational\\_FINAL.pdf](http://isis-online.org/uploads/isis-reports/documents/Khushab_January_2015_reactor_four_operational_FINAL.pdf).

<sup>14</sup> Michael Krepon, “Will Pakistan and India break the fissile material deadlock?” *Arms Control Wonk*, July 31, 2014, <http://www.armscontrolwonk.com/archive/404217/fmct/>.

<sup>15</sup> “Working Paper - Pakistan - Elements of a Fissile Material Treaty (FMT),” Conference on Disarmament, Geneva CD/2063, August 24, 2015, <https://documents-dds-ny.un.org/doc/UNDOC/GEN/G15/188/37/PDF/G1518837.pdf?OpenElement>.

<sup>16</sup> “Plan to Make 6-N Reactors Operational by 2039,” *The Deccan Herald* (New Delhi), November 5, 2017, <http://www.deccanherald.com/content/641238/plan-make-6-n-reactors.html>.

<sup>17</sup> “Implementation of the India-United States Joint Statement of July 18, 2005: India’s Separation Plan,” Embassy of India, Washington D.C., <https://www.indianembassy.org/pdf/sepplan.pdf>; and Kalman A. Robertson and John Carlson. “The Three Overlapping Streams of India’s Nuclear Power Programs.”

<sup>18</sup> John Carlson, “India–IAEA Safeguards Agreement: Not Fit for Purpose,” Discussion Paper, Project on Managing the Atom, Belfer Center, January 2018, <https://www.belfercenter.org/sites/default/files/files/publication/India’s%20Nuclear%20Safeguards%20-%20Not%20Fit%20for%20Purpose.pdf>.

<sup>19</sup> “Nuclear Power in Pakistan,” World Nuclear Association (September 2017). <http://www.world-nuclear.org/information-library/country-profiles/countries-o-s/pakistan.aspx>.

<sup>20</sup> Khalid Mustafa, “Pakistan lacks technology to keep nuclear power plants running,” *The News* (Islamabad), May 27, 2016, <https://www.thenews.com.pk/print/123159-Pakistan-lacks-technology-to-keep-nuclear-power-plants-running>.

<sup>21</sup> Hui Zhang, “China worries about Japanese Plutonium Stocks,” *The Bulletin of the Atomic Scientists*, June 17, 2014, <http://thebulletin.org/china-worries-about-japanese-plutonium-stocks7248>; and Hui Zhang, “Plutonium reprocessing, breeder reactors and decades of debate: A Chinese Response,” *The Bulletin of the Atomic Scientists*, July 1, 2015, <http://thebulletin.org/2015/july/plutonium-reprocessing-breeder-reactors-and-decades-debate-chinese-response8453>.

<sup>22</sup> Henry Sokolski, “Can East Asia avoid a Nuclear Explosive Materials Arms Race?” *The Bulletin of the Atomic Scientists*, March 28, 2016, <http://thebulletin.org/can-east-asia-avoid-nuclear-explosive-materials-arms-race9295>.

<sup>23</sup> Ibid.