



CISS WEBINAR REPORT

Pakistani and Indian Nuclear Programs: Myths and Realities

24th JUNE, 2020
3:00 pm -5:00 pm

Overview of the Webinar

The Center for International Strategic Studies (CISS) held a Webinar on Pakistani and Indian Nuclear Programs: Myths and Realities, on 24th June, 2020. Ambassador Ali Sarwar Naqvi, Executive Director CISS, gave his opening remarks and discussed the topic and its significance. The main theme related to the Pakistan's nuclear program and myths about its development and reports regarding the numbers of warheads emanating from various research organizations since 2002. A recent SIPRI report had again exaggerated the range and scope of Pakistan's nuclear program. This was picked up by the news media which has again launched a campaign of disinformation in this regard. Ms. Saima Aman Sial moderated the discussion and introduced the panelists. There were three distinguished speakers, Dr. Naeem Ahmed Salik, Dr. Maria Sultan and Dr. Mansoor Ahmed. The speakers gave presentations about the myths and realities of both Pakistani and Indian nuclear programs with factual and research analysis. The presentations were followed by Q/A session, in which different participants shared their thoughts and analyses about the given topic. The salient points of the presentations and set of takeaways drawn from the speakers' presentations and discussion are given below.





Opening Remarks by Ambassador Ali Sarwar Naqvi- Executive Director

CISS

Good afternoon ladies and gentlemen, I welcome you to second CISS webinar which is based on an important topic of myths and realities regarding the nuclear weapons program of Pakistan.

The motivation to conduct this webinar has come from the continuous publication of reports from various think tanks in the West the recent of which is SIPRI Yearbook 2020. These reports base their estimations and mere guesses and some poor sources. These reports are picked up by various news outlets who further add to the negative propaganda especially in India and West. However, Pakistani news media also do a little the figures published in these reports.

The purpose of today's webinar will be to clear the negative air surrounding the number of nuclear warheads, capabilities, fissile material stockpiles, and budgets. This webinar will debunk such myths with facts and figures and will give a Pakistani perspective on these issues.

Traditionally, Pakistan's nuclear program is only meant to meet the national security needs and Pakistan does not want to engage in an arms race with India or any other country in the world. Pakistan's nuclear policy has always been guided by the principles of restraint and responsibility based on credible minimum deterrence.

New capabilities are only developed when they become crucial to maintaining the strategic stability in the region after it has been threatened by some Indian action in form of new weapons procurement and changes in its nuclear or conventional postures. New Indian capabilities such as nuclear-powered submarines, sea-launched ballistic missiles, missile defense systems, anti-satellite tests, hypersonic weapons, precision-guided missiles of various ranges are being developed by India. These will largely disturb the strategic balance in the region and there is no outcry in the West on these developments.

The notion of the fastest-growing nuclear program and Pakistan being ahead of India in warhead count has been created without any serious research. On the contrary, several well-researched books and studies from Pakistani scholars with facts and figures have



come out of the Belfer Center at Harvard, from Bulletin of Atomic Scientists and IISS publications.

These estimates conclude that it is India which is going full throttle and has the largest unsafeguarded nuclear program in the world.

It is important to contextualize this issue, recalling that Pakistan's nuclear program was a reaction, inter alia, to India's nuclear testing in 1974. Reports by Western think tanks and negative reporting by news media ignore this fact. They do not or rarely talk about the Pakistani compulsions to pursue and develop a nuclear weapons capability.

Instead of holding India responsible for introducing nuclear weapons in the region, all their energies are directed towards criticizing Pakistan's nuclear weapons which are purely a reaction to the Indian tests in 1974 and 1998.

Not only the Western countries ignore Indian nuclear expansionism, but they have become part of this expansionism with the signing of nuclear cooperation agreements and giving India exemptions from NSG. Thus, they maintain a dual approach when it comes to dealing with Indian and Pakistani nuclear programs.

Pakistan's nuclear program should also be viewed in the backdrop of suppliers-controlled restriction in the form of NSG, which by itself was created in response to an Indian act of proliferation. The same NSG is ready to welcome India as a member but has given it waivers for entering the civil nuclear deal with the US.

It is also erroneously being assumed that the large numbers of Indian facilities can produce less fissile material than Pakistan's modest facilities. But the fact is that Pakistan has less enriched Uranium and Plutonium stockpiles than India and thus a lesser capacity to make nuclear warheads. The same is the case with the variety of delivery platforms. India has more diverse delivery systems than Pakistan. For example, the Indian sea-based nuclear capability consists of sea-launched ballistic missiles and nuclear-powered submarines with Pakistan only having Babur III cruise missiles carried by conventional submarines.

Three eminent speakers will talk about the various aspects of these myths and facts of Pakistani nuclear forces in more detail. They will also shed light on the Indian nuclear capabilities that are often underestimated by academia and media. We hope that the webinar will clear the air and presents an unbiased narrative.



Speaker I: Dr. Naeem Salik, Senior Research Fellow CISS

Topic: Erroneous Perceptions Regarding Pakistan's Nuclear Program

Dr. Salik started with rather different approach than Amb. Naqvi by focusing on the latest SIPRI report. According to his observation about the report was that this report has not brought out anything earth shaking which disturbed us unduly. It is not something very different from the usual pattern. He explained with references from four credible sources of information as far as academic discourse on such issues is concerned. Those sources are Stockholm International Peace Research Institute (SIPRI), Federation of American Scientists, Bulletin of Atomic Scientists, and Global Fissile Material report. These are the four resources from which we normally get the figures.

If we look at the figures from recent SIPRI report 2020, it says that Pakistan has 160 warheads whereas India has 150 warheads. To go back to 2019 report of SIPRI which says Pakistan has 150-160 warheads whereas India has 130-140 warheads. To take the average figure, Pakistan's number of warheads should be around 155 in 2019 and Indian figure should be around 135 warheads. So if we calculate, according to SIPRI's estimates, Pakistan has added 5 warheads in one year, whereas India has added 15 warheads in its inventory in one year. Let's go back further, he took a base line as year 2011. In 2011, SIPRI reported that Pakistan has 90-110 warheads whereas India was supposed to have 50-100 warheads. In the same year, the Bulletin of Atomic Scientists reported that Pakistan has 100 warheads whereas India has 90 warheads. They actually took the median figure in both cases. Go back to Global Fissile Material report of 2011, it also endorsed SIPRI figures of both countries. So basically, they quote each other, get data from each other and if you look at the figure they are more or less in the same range in both cases. There are, sometimes, some differences in Bulletin of Atomic Scientists and Federation of American Scientists reports. He explained why, they work on the basis of the availability of delivery systems. That is why if you read the last Bulletin of Atomic Scientists report, published in 2018, they reported that Pakistan has 140-150 warheads whereas India has 130-140. but they also mentioned that India has got fissile material for some more warheads.

The estimation of figures / numbers of warheads and fissile material of any country depends on few factors. Let's take HEU production. It depends upon the number of centrifuges in an



enrichment plant, the capacity of each centrifuge, the type of rotor used in centrifuge whether it is made of aluminum, steel or carbon fiber because the productive capacity of each depends on the quality and strength of the rotors. The core point of HEU is the material required for each warhead. The general understanding is that HEU warhead requires around 15 to 25 kilograms of HEU which is a very broad figure and unless you don't know exactly how many centrifuges are there in a plant, what is the capacity of each centrifuge, what type of rotor these centrifuges have and what is the weapon design, how much material is required to produce each weapon.

Hypothetically, let's take the amount of HEU is 150 kilograms, so if a weapon design requires 15kg per warhead, the same amount of HEU will be able to produce 10 warheads. Whereas the design requires 25kg per warhead, then 150 kg of HEU will just produce 6 warheads. So there is a difference of 4 warheads. If you take it over the period of 10 years, it will make a difference of 40 warheads which is a very substantial number. Now coming to the plutonium production.

Now the assumption here is, first of all, capacity of the production reactor. This gap is worked out more easily than HEU because you can count the cooling towers of the plutonium production plant. If you have 8-10 cooling towers, then that means this plant has the capacity of 40-50 megawatts of plutonium production.

- Second thing is the reprocessing capacity. It is one thing to produce plutonium in a production reactor, but then if you do not have ability to reprocess it, and you don't reprocess it in a year then it will be piling on and you will not be able to turn it into fissile material useful for the bomb.
- Third assumption in this case is the annual production. What generally happens is, for these estimates, they assume that the 150 megawatt plant runs for 365 days a year without any interruption and it runs in full capacity. Whereas the practical experience is that most of these plants do not run 365 days a year and not in their full capacity, but they only run on not more than their 60% capacity. Just to give an example, if 50 megawatt production reactors works on 100% capacity throughout a year, it produces 18.25kg of plutonium. Whereas if it run on 60% capacity to produce 11kg of plutonium, the difference is about 7kg per year. So if you take 10-years period, then the difference will be 70kg which will be equal to about 10-14 warheads. That is again a big difference. Again the weapon



design, you do not know how much plutonium is required for each weapon. Let's take a hypothetical amount of 70kg of plutonium. If each warhead is required to have 5kg of plutonium, the 70kg plutonium is enough for 14 warheads. But if each warhead is required to have 7kg of plutonium, 70kg will be enough for 10 warheads with the difference of 4 warheads. Taking this example for 10 years, the difference could be 40 warheads which is substantial.

- Another thing is important which is not measurable that one may be able to calculate the amount of fissile material produced to some degree of accuracy but then they do not exactly that the material produced has been converted into warheads or some of it is converted to warheads and some is stock piled to be converted and kept in reserve. Therefore, all these (reports) are best guesses / estimates and they should be taken as such.

Do these figures really matter? This whole narrative of Pakistan's fastest growing nuclear program is nullified by these reports. If we accept them correct to some degree, all these report reported that 10 years ago, the difference in Pakistani and Indian inventory was 10 warheads and today it is again 10 warheads. This means that both programs are progressing that the same speed. So there is no question of anybody moving faster or slower than the other. We should also not have perturbed by these figures because in case of nuclear weapons the count does not matter. The number of warheads beyond a certain point is material, it is not gun versus gun or tank versus tank. The destructive capacity of each nuclear warhead is such that we call great equalizing power.

He insisted that even if we have very limited number of warheads, we are able to cause unacceptable damage to the other side. That is how it should be viewed. That's why I have been repeatedly saying that 22 years down the road of nuclearization since 1998, we have gone far ahead in terms of operationalizing our capability, developing institutions, developing legislations, safety and security, and command and control mechanisms; but what we have not learnt is to behave like a self-confident and self-assured nuclear power. That is why we get unduly perturbed on these reports. These reports are worth but there are many inaccuracies in these and should not be taken too seriously.



Speaker II: Dr. Maria Sultan, Director General South Asian Strategic Stability Institute (SASSI), Islamabad.

Topic: Reassessing Indian and Pakistani Nuclear Capabilities: A Reality Check

Dr. Maria Sultan spoke on reassessing the Indian and Pakistani nuclear capabilities. She discussed the actual capabilities of India and Pakistan which exists on ground, its impact on the strategic stability, and why these assessments matter. The South Asian region is going through a major transition, not just in terms of the fissile material stocks accumulated by India and Pakistan, but in regards to how the postures of the states are being changed.

- The First change in the region is India's force posture: India's stance has been shifted from no first use to the first use and the strategy of compellence. It will determine how its posture would be developing and how their requirements will be set.
- Second aspect is that India is moving its posture from credible deterrence towards the strategy of compellence. Once we understand that India's desired objective is force in being, we understand that the nuclear warheads which they seek will also be of different category, and so will be the fissile material requirements.
- At the moment, India's got 18 different versions of ballistic missiles, 3-4 squadrons of different nuclear capable aircrafts, and 5 nuclear capable submarines. This estimate gives a broad spectrum in terms of how and where do they think these fissile materials would be required.

The preliminary assessment in terms of force in being approach being their objective suggests that the actual fissile material requirements of India are not that narrow. Secondly, in order to operationalize them, the requirements would be much more in terms of number and money which has been allocated. For instance, in 2017, India set aside \$2.5 billion to buy ballistic missiles and some different variants of missiles.



Dr. Sultan highlighted few significant questions regarding fissile material production. Such as, the question about how much fissile material they are possessing, how do we see India's future nuclear fissile material production and what are the estimates? If we look at the separated work units, a net assessment of reactor-grade material available with them, plus five nuclear submarines, which will be in force in the future, and Indian reprocessing capacity which is increasing not only in size but also in effects. We have estimated that the total number of warheads, will be somewhere between $148+50+688$ that's equal to around 756 KGs and then similarly around 936 Kgs.

In our assessment it's around 2,192 KGs of material will be accumulated. If we convert these 2,192 KGs of material and then we combine it with 1.5 tons of strategic fuel reserve –which India believes is for civilian production but at any time it might be used under war circumstances or what it provided in the additional protocols signed with the IAEA, which asked US and allies to provide strategic reserve to India, that under strategic necessity India may reorient. So, there is a caveat that the 1.5 tons of strategic fuel reserve which was kept for only civilian purposes could be used for weapons purposes and it amounts to 375 warheads.

If we include the fast breeder program, which is with the Russians, it is estimated that 2 of the Russian Pressurized Heavy Water reactors have been used—if we include that capacity as well, in terms of the planned PHWR, it amounts to 5 tons and almost around, if they use only the 1/3rd of it for weapon purposes, it amounts to 495 KGs material available to India which is equal to 125 warheads.

If we also include submarine based material, which is not currently used for submarines but is used for different categorization of weapons in terms of canisterization or else, it amounts to 325 KGs of nuclear warheads. This is based on the assessment that the separation work unit for the submarine enrichment requirement would be around 5000. Broadly, not only the number of warheads will increase in the region, but they would also top all estimates which are there.

Nonetheless, we have failed to understand that while the assessment for Pakistan has been scrutinized in terms of planned activities including the IAEA safeguarded facilities, how come these three different characterizations are under way in India:



1. Money available for buying the Ballistic Missiles (BMs) and different missile components used in missile program after India's inclusion in MTCR
2. The fact that India wants to attain a force by its posture and dominate the region.
3. Additionally, they have got number of unsafeguarded programs and facilities available which are not included into the estimates, leads us to a perception that Pakistan's nuclear program is perhaps the fastest is in sharp contradiction to the reality on ground which clearly indicates that the number of warheads required according to their own force in being status, their own deployment structures, their own state policies, is much different on ground.

Most importantly, if we were to believe what is being stated, it suggests that purely to meet these requirements, the number of warheads, the amount of fissile material which will be sought by India would be at least 200 times more than the given estimates. It would not be 160 warheads material which is available to them, our estimate is that it would be above 1000 on a minimum standard and above 2000 if we look at it liberally. It depends on the nature of assessment, whether it is a plutonium based or HeU based assessment.

Since India's program is plutonium based, hence, the number of warheads which would actually come out, would not be just 160 which doesn't quite coincide with the entire restructuring of the strategic forces command, the force posture based on it, and lastly the actual amount of facilities on ground. In our assessment, disparity is not just in a single digit, it runs in a couple of hundred digits. The story is much different and quite alarming. While the estimates may not be that relevant in terms of academics, in terms of how they picked up but what is important is what is happening on ground. The reality is that we are seeing a belligerent country which believes that it can use nuclear deterrence for leverage in terms of operationalizing its various conventional and sub-conventional strategies. It is certain that it will put the region at a greater risk. It will have a direct bearing on the strategic stability and most importantly, a miscalculation in this accord will also make all these countries which are the primary facilitators of the expansion in the Indian nuclear program are directly responsible for the strategic instability which this region will see as a result of all these false assessments on a reality which does not resonates with the actual happenings on ground.



Once threat assessments are made publically like India made in their land warfare doctrine and joint defense warfare doctrine, the primary aim is to create a sense which gives an impetus not only in terms of their production cycle, but also in terms of how they want to modernize the force.

India thinks that by being linked to Pakistan and India in a symbiotic relationship is not good for its posture, its ambitious modernization plan which is under way and its desire to come with a force in being. That's why India has been constantly rattled about in two front situation i.e. Pakistan and China. Whereas, China is being stated by India as the biggest threat and its relationship with the US is also being pegged in. so, its also a question of sensitive technologies that are being brought in, how different concessions have been leverage by them like in MTCR, NSG, Wassenaar arrangement and the list goes on.

In terms of regional security balance, while it may seem to be politically unavailable idea that there can be a large scale war between three states, the reality of the matter is that we will see incursions and this being propagated to justify domestic acquisition plans, domestic restructuring and fore mostly, for reallocation of resources to India's strategic forces as well as for India to create a rebalance between the civilian control of its nuclear armament and its military control.

While India is looking at a continental view of threat, China's threat also allows it to expand itself in the Asia Pacific and Indian Ocean region. In that case, it is at pivotal position which we also see for India in the seas which requires that the two front scenario is created and China remains central to India's threat matrix. In reality, India is not capable to unilaterally fight with China. In terms of Pakistan, they may have some strategic equivalence in certain areas but when it comes to playing out a large scale war, the chances will out way India's ability to come out of it in one way as the winner. Chances are much lower than they anticipate. These things are for their domestic as well as international power projection and to rally international support on the behest of global, geopolitical realignments. In that case, to pitch in India as a key player for the region.

The fact that India is going for miniaturization, the fact that they want to develop counter force capability, and the fact that the 1998 test for plutonium did not go that well for India suggests that there would be some design testing that they would require in the future. So,



if US which is going to be their game changing strategic partner for this region, they will definitely take advantage of global revisiting by the US on this matter. India has been very closely operating with the US. The story for nuclear testing in the region is not closed. In order for them to have a credible counter force capability, they will definitely work on that. If this happens and the US walks away, we will be entering a new era of nuclear revisionism which is going to be extremely destabilizing.

If we just look at the 50,000 SWU units that basically amounts to almost 325 nuclear warheads alone. That's not a small number to just relate to it. The fact remains that the primary uranium which they are going to gain access from their partners which are actually working globally on the other side to protect the global non-proliferation agenda.

This is a bigger question mark because:

- 1) India's nuclear fuel cycle is not separated
- 2) Their submarine program will require uranium. In that case, the effects on strategic stability defects of the actually weapons grade material which would be available is quite high.
- 3) The unenriched uranium is not all going to be mined out from India. If they are not going to be mined out from India and just brought in, they are going to pose three challenges. One, for those countries which are not traditionally seen as proliferating nuclear technology, if we look at the full nuclear fuel cycle then they will definitely be challenging that place.

Second for those countries which believe that they are not arming but if you are manning a nuclear submarine and bringing in a nuclear sea deterrent, of course they are also having an impact on strategic stability. Third, it is the actual conversion of the nuclear warhead in that facility.

The actual amount of the fissile material that will come out from India's nuclear program has to be seen in two quantities.

- 1) If it is seen as in terms of annual production capacity, will that be used to support these 5 submarines or will they be used to get nuclear missiles or nuclear weapons system.
- 2) If it is purely used to support submarine fleet, then the estimate varies and is likely to increase further.



Dr. Maria underlined the strategic reality which Pakistan is facing and dealing with a country which is looking at the development of nuclear capability in a very benign manner. Unfortunately, the international academic partners which should be at testament at this moment, it's not a question of India's strategic partnership with the US that these estimates are being rewritten. We all play with data, we can always come up with the multiple ideas on data but if as researchers we do not come up with honest assessments, 1.2 billion people of this region will suffer. It's not just about 1.2 billion people of this region, it would be in the entire world which will suffer. If there is a nuclear conflict that unleashes itself because of miscalculation, the idea that one side thinks that it is superior. In the interest of academic, it is extremely important that things are stated for what they are. Time has come where the international community and our partners in all these reputed institutions should also stand testimony to the fact that it is in global security's interest that facts are stated as they are. Playing with data really solves any situation that arises on ground.

The fact of the matter is that war is not a political matter when it comes to it actually unfolding. An unfortunate as it is, every country has the right to initiate war, but the first causality of war is an uncertainty itself. That essentially means that you can have the right to initiate the war but how the other side will respond will always be a challenge. Between nuclear armed states, there will always be a high risk that despite rationality, there will always be a high risk of miscalculation and there is always a high risk in terms of each side perceive the threat from the other side. During a particular war cycle that nuclear weapons use could be anticipated. So, for South Asia, the fact remains that we are geographically next to each other. That remains that the decision making cycle once confronted with the nuclear tract will be very limited. There are no clearly stated nuclear balance which exists between India and Pakistan which will allow both sides to actually come through and use those mechanisms. Yes, we do have certain CBMs but what we have seen that CBMs unfortunately only work during peace times. During war times, they do not work through as well as one could desire.

Pakistan has repeatedly asked for a strategic restraint regime between India and Pakistan. All these requests have been set aside. So this has left this region very vulnerable to a nuclear threat and the fact that it's always a question of how one side's military and



strategic planners and political planners perceive how the war is going on the ground and how that commanders see vis-a-vis the actions taken on the other side. Combined with this we bring in the emerging technologies, the AI, the autonomous weapons and how different ammunitions are brought in and then the subject becomes far more complicated than the usual.

We are dealing with a country does not want to recognize the fact that there is a nuclear parity between Pakistan and India and there is a need for nuclear arms control in this region in order to bring stability. They constantly lump themselves with China, they do not want to regard Pakistan's nuclear capability as an actual capability while the reality is that it is a capability, it is something which India cannot set aside no matter how much they spend on their nuclear weapons system. They nuclear reality of the region will always out way the conventional imbalances as well as the conventional deterrence runs so nuclear war and the initiation for it is never going to be followed by a broadcast. It will always be done in the haze of war. So, as unfortunate as it is it can happen in the circumstances under the Modi government which is not one of the most rational governments which this region has seen by far.

Speaker III: Dr. Mansoor Ahmed, Senior Research Fellow CISS

Topic: Materials, Warheads and Capabilities: Assessing South Asia's Nuclear

Dr. Mansoor initiated his remarks with the factual baseline of the state specific research. The first one is that the estimates of warhead counts and fissile materials is based on open sources. This is all published material that any researcher can find in different publications. Secondly, when he had published his Belfer report back in 2017, he had given a table in which there was a comparative analysis of Indian and Pakistani capabilities and the weapons worth or the weapons equivalent stockpiles of fissile materials. He never said that India has 2600 warheads or Pakistan has 200 warheads. He was only talking of the weapons worth of the available material outside safeguards in both countries. So that was a very simple methodology that he only focused on the estimates of fissile material stockpiles that are outside the safeguards of the International Atomic



Energy Agency (IAEA) and the existing infrastructure on ground which is producing this fissile material in the form of either highly enriched uranium or plutonium for nuclear weapons.

The second thing is that any kind of plutonium that is produced in nuclear reactor is weapon useable. The problem with the SIPRI report and many other similar reports is that they only consider India's weapons grade stockpiles while assessing their warhead count and they completely ignore India's highly enriched uranium stockpiles and production capabilities and their very large stockpiling of civilian plutonium or reactor grade plutonium which is very much weapon useable but is outside the safeguards of the IAEA. And very interestingly the International Panel on Fissile Materials which looks at these estimates yearly or quarterly basis. They consider civilian plutonium outside safeguards which is produced in unsafeguarded power reactors in India as part of India's military plutonium stockpiles because it is already designated as a strategic reserve or strategic stockpile by the Indians themselves. Now here he mentioned one small point that India's program is unique because its weapons program essentially is an offshoot or a subset of its indigenous nuclear energy program at three stage nuclear energy program which is outside the safeguards of the IAEA.

So the second point is that Pakistan's assessment of having a fastest growing nuclear program over the years was not contested by Pakistanis. It was allowed to grow in many publications and was repeatedly cited again and again. But why was this assessment made in the first place? It was made because in 2010 or around 2011, India decommissioned its CIRUS reactor which was dedicated to producing weapons grade plutonium for many decades. From that point on, India only had one production reactor, 100 megawatt Dhruva I reactor that was dedicated to weapons grade plutonium production. He reiterated that , they were not accounting India's enrichment capabilities and they were not talking of India's stockpiling of civilian plutonium outside safeguards and its increasing reprocessing capability. While Pakistan was said to have added three more plutonium production reactors at Khushab and was also producing weapons grade highly enrich uranium. This was the reason why it was primarily assumed that Pakistan has the fastest growing program.



Now the problem here was that nobody looked at the size of the facilities producing the plutonium in Pakistan, the size of the reactors that were coming on line in Pakistan and the amount of plutonium produced in India's Dhruva-I reactor.

He gave a comparative analysis to highlight the nuclear unbalancing terms of the stockpiles. These are updated figures by the International Panel on Fissile Materials. So, in terms of highly enriched uranium, Pakistan is believed to have about 3.7 tons of HEU enriched to weapon grade levels. India has about 4.4 to about 5.6 tons but this is said to be enriched to only 30% and not to weapon grade level. He also made clarification about the fissile material. In terms of uranium enrichment, 90% of the effort required to produce enriched uranium for nuclear weapons is from 0.7% to about 3-5%, beyond that only about less than 1/3 or only about 10-15% of the effort is required to go up till 90%. So, when India already has about 30-35% of enriched uranium stockpile for its nuclear submarine program, it can very quickly increase its enrichment levels to weapons grade by reconfiguring the [centrifuge] cascades in a matter of weeks. And nobody knows how much of India's enriched uranium is actually weapons grade and how much of that is actually available for only submarine propulsion at about 35% enrichment.

Secondly, regarding weapons grade plutonium production, Pakistan is said to have about 370 kilograms and India has about 800-900 kilograms. But the most important difference that is overlooked by western estimates comes in terms of civilian plutonium stockpiles or the reactor grade plutonium which is produced in India's indigenous pressurized heavy water reactors that were kept outside safeguards as part of the India-US nuclear deal and was therefore granted waiver by the NSG and was approved as part of the separation plan by the IAEA. So, at that point, the Indian government had very clearly said that any facility or nuclear material that would be kept outside the civilian list or on the military list would be a part or parcel of their broad strategic program and anything that was purely for civilian purposes would be kept on the civilian list. So, the International Panel on Fissile Materials considers this civilian plutonium outside the safeguards as part of India's military plutonium stockpiles. He said clearly that he is not saying that himself, it's the IPFM. Their figure is about 6.9 ± 3.5 tons of separated civilian plutonium which means that this has been reprocessed from the spent fuel and this is readily available for weaponization. The International Atomic Energy Agency says that it only takes about a few



weeks' time to convert fissile material into warheads and India has a very large industrial base and it would be very easy for them to do so, should they choose to do so at any given time.

Then he explained the production capacity in terms of warheads. At present, Pakistan's total production capacity including weapons grade plutonium and weapons grade enriched uranium is about 22 warheads. Pakistan has no plutonium stockpiles outside safeguards and its civilian stockpiles are under the safeguards of the IAEA and its military program is separate from its civilian program unlike India, where there are three overlapping streams and in terms of production capacity per year for India, he calculated that India has about the capacity to produce about 260 warheads a year which is derived from its ability to produce weapon grade plutonium and plutonium produced in its fast breeder reactor program which is scheduled for commissioning in about two years' time which has suffered repeated delays and its uranium enrichment program because all of that is part of their strategic military list. Therefore, it has to be considered as a part of their fissile material production capacity for their nuclear weapons program.

Then he gave a comparison of the sizes and efficiencies of fissile material production capacities. Again, this is based on open source information which is available in the reports of IPFM and other reports produced by the Indian Department of Atomic Energy on India's program. So, at present, Pakistan has four plutonium production reactors at Khushab. The total estimated capacity of these four production reactors is about 200 Megawatt thermal. At present, as he said earlier, India has only one production reactor, a 100 Megawatt thermal at Dhruva I which is operational but two more production reactors are under development i.e. The 125 Megawatt Dhruva II and 35 Megawatt research reactor which are likely to be completed in this decade and these facilities will match Pakistan's production capacity of weapons grade plutonium production at this point in time. But if you look at the comparison they will very clearly outstrip Pakistan's production reactor capacity if you add the breeder reactor program also, which would be equal to the 500 Megawatt and Pakistan has no breeder reactor program under development at all.

More importantly he said that India has about 2350 MWe of installed capacity in terms of its 8 indigenous power reactors outside safeguards which can produce about 1.25 tons of civilian



plutonium each year which is weapon useable. Another 2800 MWe of unsafeguarded power reactor capacity is under construction and Pakistan has no unsafeguarded power reactors under operation or under construction. In terms of reprocessing capabilities, Pakistan's capacity is believed to be about 140 tons of heavy metal per year and India's capacity currently is 350 tons and is expanding to about 1900 to 2000 tons of heavy metal per year by the end of the decade and this is based on the statements of India's leaders of the Department of Atomic Energy and other senior nuclear scientists and reports coming in from the Bhaba Atomic research center and India's DAE. In terms of uranium enrichment, Pakistan's capacity is estimated at 15000 to 45000 separative work units (SWU/yr) and India's capacity is almost the same right now but is expanding to about 126000 SWU/yr and a recent report by Jane's Intelligence Review in May 2020 says that India is also working on advanced laser isotopes separation technology and has already installed modern centrifuges which are 10 times more powerful than the earlier centrifuges and are now based on carbon fiber rotors.

These figures speak for themselves and the overall assessment of India's capacity should be made on the basis of two points:

The first one is its existing stockpiles of fissile material that are outside safeguards. This has been the basic methodology in all my assessments over the past decade and the second one is the capacity and the size of its production facilities both in India and Pakistan. So you only have to divide the available highly enriched uranium for each warhead, for example if India would require about 20 kilograms per warhead of weapon grade highly enriched uranium, same is the case for Pakistan and the rule of the thumb is that about 3-4 kilograms of weapons grade plutonium is required for one warhead and about 6-8 kilograms of reactor grade plutonium is required for the same amount of warhead.

Dr. Mansoor referred to Dr. Salik's points as well that they really do not know how much material has been converted into warheads. Nobody in India and Pakistan has made any declarations. Secondly, we really don't know what the designs are, what the efficiency is and what the yield of nuclear warheads are, which makes a big difference in warhead count because an advanced nuclear warhead design will use much less material than compared to a crude or an inefficient design.



Thirdly, the important thing to note is that in terms of delivery vehicles, again Pakistan and India have not made any declarations as to how many number of delivery vehicles or missiles are there in each class of systems and international estimates are only guesstimates at best basically.

More importantly, he mentioned that the fact of the matter is that as Dr. Maria said, as you look at the force posture developments and the requirements, they simply don't add up. The numbers of warheads for India and Pakistan, especially for India simply doesn't add up at the moment. If you add their counterforce capabilities that are being developed under the India's Strategic Forces Command (SFC). So, anything under the SFC has a dedicated nuclear rule and SFC is already equipping with Brahmos and the Nirbhay air launched cruise missiles. In addition to that, there is a long list of shorter range systems and most of these systems are at Pakistan specific ranges. When you look at their Land Warfare Doctrine, they are preparing for nuclear war fighting and escalation dominance against Pakistan.

Very interestingly, he added two more points here; by suggesting the scholars and researchers to visit the website of the International Panel on Fissile Materials and make a comparison for yourself about what China has and what India has in terms of fissile materials stockpiles because China has stopped producing fissile materials for nuclear weapons two decades ago and you will be very surprised to know that fissile material stockpile holdings of India and China are almost the same in terms of weapons worth or weapons equivalent.

He said he is not saying that India will convert all this material into warheads in a month's time or two months' time but this gives India's planners a hedging or a breakout capability and a latent capability that gives them the confidence to pursue the kind of postures that they are now pursuing and developing in terms of the development of their nuclear triad and in terms of their force posture developments. They have to look at the regional developments and what has been going on in Ladakh. They simply don't have the kind of the conventional force available for achieving military objectives in a two front war against Pakistan and China simultaneously. They will never have the capacity in term of the quantity or the quality and the command efficiency and the training to take on China on their own so it is very likely that they will now pursue an aggressive buildup of their strategic nuclear forces to compensate for the slow pace of their conventional military modernization which they themselves have been talking of, for a very long



time and now they are also likely to face budget shortfalls because of the covid-19 induced recession.

While Pakistan has not really added any new significant fissile material production capabilities except for the three reactors at Khushab that were added in the decade of the 2000's and the first Khushab reactor was added between 1986 and 1996. Pakistan is not known to have really expanded its enrichment capability and is facing uranium constraints which essentially feeds the fissile material for both enrichment program and the plutonium program because we do not have the luxury of importing uranium even under safeguards from NSG countries unlike India.

In his final word on this was about a major breakout in terms of fissile material production will occur in India once they are able to commission their first fast breeder reactor. Once they are able to complete their five or six planned breeder reactors, that will increase their weapons grade plutonium production capacity by 20 times. Now this is the figure by the International Panel on Fissile Materials.

Now the interesting thing is that they have failed to commission their first fast breeder reactor, it has suffered delays for 8 years in a row and is now expected to be commissioned in around 2021. But the implication is that they were stockpiling the civilian plutonium outside safeguards and he gave you the figure. There is about 6-8 tons of that is already available for weaponization. Out of that, two tons has already been fabricated for the first fast breeder reactor startup fuel. Their increasing reprocessing capacity will now be readily available to separate much greater quantities of civilian plutonium, about 11-15 tons that is there in spent fuel of India's unsafeguarded power reactors. That can be added to its nuclear arsenal as and when required.

We should remember that India claimed to have conducted at least one nuclear test in 1998 based on reactor grade plutonium produced in one of India's pressurized heavy water reactors. They can use any one of these power reactors for producing about 200 kilograms of weapons grade plutonium at any given time.

So, in the final analysis, the size and the growth of India's program is so large that it really gives a very complicated picture. But if you look at it from research angle and if you look at it in terms of what they are putting in their weapons program and based on international reports, it's very



clear that India right now has already stockpiled and is adding the capacities that is greater than any other nuclear armed state outside the NPT.

It's very interesting that the NSG countries that granted India the waiver, have no problem with this and the international academics are willing to accept reduced or minimum number of warheads just to show that India is not really aggressively building up its nuclear arsenal and they are trying to create a false equivalence with Pakistan basically.

At the end he said again that the figures are available publicly on the website of International Panel on Fissile Materials and these can be verified independently by any researcher at any point.

Thank you!

Takeaways from the Discussion

The presentations and remarks presented facts and figures which explained the myths and realities about Indian and Pakistani nuclear program and fissile material production. The reports from various think tanks present estimated figures without offering proof of their conclusion of actual potential of nuclear programs or capability of comparison between states.

India's existing and future nuclear capability fuels regional insecurity and instability. The civilian nuclear power program of New Delhi is undergoing a significant expansion; specially due to the civil nuclear agreement that the U.S reached with India in 2008. Such exceptionalism to New Delhi helped it to sign 13-plus nuclear cooperation agreements with other states over the past decade including STA-I and COMCASA. Under these deals, India imported around 20000 metric tons of uranium. It is significant to note the dual use quality of fissile material that every amount of imported uranium liberates every ton of Indian indigenous uranium to be converted for weapon purposes. This expansion is paving new pathways for India to acquire fissile material at a faster pace for its weapons.

The civil nuclear agreement between India and the US and the 2008 exceptional NSG waiver has aided India's efforts to stockpile more fissile material that can be utilized for weapons production. This commercial deal has opened doors of nuclear technology for



India, even though it has the largest unsafeguarded civil and military nuclear programs at both the regional and global levels. The extraordinary concessions to India also adversely affected the nuclear non-proliferation regime. For instance, India has no intention to sign the CTBT, the FMCT, and also does not abide by the guidelines of the NPT.

Additionally, India is developing a triad that includes nuclear-powered ballistic missile submarines, ICBMs, SLBMs, dual-use cruise, and ballistic missiles, and a very large naval expansion designed to project power beyond the region. India is also opting for the MIRVing as well as canisterization of its missiles. The elements of trends, trajectories in developments, deployments and doctrines are exacerbating regional arms race leading to strategic instability. India is the only country in the world that has managed to secure hi-tech technology transfers and arms transfers from all major arms suppliers simultaneously except China. This also adds to India's market potential and dangers to the balance of deterrence in South Asia.

Coverage of the Webinar Event and Press Release

1. The News

International estimates about Pakistani nukes misleading, say experts

Link: <https://www.thenews.com.pk/print/678217-international-estimates-about-pakistani-nukes-misleading-say-experts>

2. Express Tribune

International estimates about Pakistani nukes misleading, say experts

Link: https://epaper.tribune.com.pk/DisplayDetails.aspx?ENI_ID=11202006270210&ENI_ID=11202006270063&EMID=11202006270030

3. Dawn

International estimates about Pakistani nukes misleading, say experts

Link: <https://www.dawn.com/news/1565395>

4. Dailymail

International estimates about Pakistani nukes misleading, say experts

Link: <https://www.msn.com/en-xl/news/other/international-estimates-about-pakistani-nukes-misleading-experts/ar-BB161dRh>

5. Digital Media Report

Link: <https://youtu.be/vozEVSedbDw>



1. Press Release Text on CISS Website

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