Estimation of Indian Nuclear Arsenal.- Present and Future

Estimation of the size of Indian nuclear arsenal is very difficult considering the secrecy that surrounds the program and information shared only on a need to know basis. The level of secrecy can be gauged from the fact that none of the service chiefs apart from the navy was in the know of the ATV project that materialized into the Arihant nuclear powered submarine.

I am trying to make an attempt to try to come to an estimation of what Indian nuclear arsenal may be right now and what it can be in the near future considering all reports on indian nuclear and delivery platforms that is missiles.

I will first write about Indian nuclear weapons programs and its capabilities.

India surprised the world in 1974 with a nuclear test which was called as a test for peaceful purposes. The west cried foul as it's claimed that India used plutonium from the Cirus reactor which was supplied by Canada for peaceful purpose. The Cirus reactor had the capability of producing about 10 kgs of weapons grade plutonium enough to make 2 nuclear bombs based on the technical capability of India at that time. This reactor was operational since 1960 and the plutonium separation was done at Trombay. However all this plutonium was restricted in use as per agreement with Canada about not diverting it for military application.

India in 1985 launched the 100 MW Dhruva reactor with a capability to produce about 25 kgs of weapons grade plutonium per year.India also started producing plutonium from its Tarapur plant which so far was only reprocessing fuel and also from the Madras Atomic Power Station (MAPS) at Kalpakkam.

BARC in the 1980s bought large quantities of very pure beryllium from the international market. Beryllium is used to make nuclear weapons more lighter and also reduce the amount of fissile material usd like plutonium and uranium. This indicates an increase in level of sophistication in design and also machining capabilities, casting and forging as Beryllium is a very hard metal to work with.

India has also worked hard in making Highly Enriched Uranium since the 80s .HEU is used in thermonuclear primary. In 1985 India established the Rare Materials Plant near Mysore. This facility acquired gas centrifuges to enrich Uranium.

After initial troubles in designing and operating gas centrifuges, India has perfected the design of supercritical gas centrifuges. India as late as 2006-07 tendered components in what estimates to about 3000 gas centrifuges. Over the years India may have installed about 6000 supercritical gas centrifuges and about 2000 70s design centrifuges. This gives it capacity to produce about 20,000-30,000 of Separative Work Units (SWU) which is how the capacity of the centrifuges producing uranium enrichment is measured. Major portion of the uranium enriched here goes to the prototype naval reactor and also the reactor for the Arihant's reactor.

The annual requirement for the prototype naval reactor as well as the Arihants reactor is about 15,000 SWU which leaves plenty to spare for using enriched uranium in making warheads in the future. The construction of the expanded facilities in Mysore was on as of last year to incorporate the fresh set of 3000 centrifuges that India has made.

As of 1999, some estimates were made about India,s Plutonium reserves which put it at

300-400 kgs of weapons grade plutonium, enough to make between 65-90 warheads. Since then India has continued to make more plutonium. This figure is only of known weapons grade production. Add to this is the safeguarded and unsafeguarded civilian reactors from which plutonium is extracted. By 1999, India had over 4100 kgs of fissile material from IAEA safeguarded reactors and over 3500 kgs from unsafeguarded reactors. This is good enough to make over 1000 fission bombs if weaponized.

As of 2004, the total weapons grade plutonium was about 500 kgs for about 110 warheads.

The above figures are considering usage of certain percentage of plutonium in civil nuclear reactors

The 2005 civil nuclear deal has allowed india to import fuel for its civil nuclear reactors. This frees up a fairly good amount of fissile material for use in warheads. As of 2011, it's possible that India had roughly 700 kgs of weapons grade plutonium which can make about 150 warheads.
India has large amounts of reactor grade plutonium capable of making 2000 warheads if weaponized.

The above estimates are only for fission based nuclear weapons. The production of thermonuclear weapons is not known and continues to shroud in secrecy.

A fair indication of the size of current Indian nuclear stockpile can be derived from its weapons delivery platform.

India has a host of missiles as well as air assets of the air force to deliver nuclear weapons. The air force's primary weapons delivery asset are the Mirage fighters.

India started the IGMP or integrated guided missile program in the 80s which delivered its first missile, Prithvi a short range ballistic missile.From the initial 150 kms range, it has not been tested to 300 kms. There are 100 missiles in the inventory as of now with the Army and Air Force . Though India says it's a battlefield missile to deliver conventional munition, the missile is nuclear capable and can deliver nuclear payload.

Agni 1 was first test fired in 1989. the 700 kms range missile was a technology demonstrator and Pakistan centric.The testing was shelved under international pressure for some time. After the Kargil war, India began to test this missile again and was inducted in 2000. Bharat Dynamics manufactures this missile. A rough production rate is about 12-15 missile per year which could give India an inventory of about 100 missiles as of now. This is a single stage single warhead missile.

Agni II :- First tested in 1999, this missile forms the most credible deterrent right now against China. In 2002, Mr George Fernandes the then Defence Minister informed parliament that the Agni II has been inducted and taken into production at Bharat Dynamics Ltd at the production rate of 18 missiles per year. Even if there has been any shortfall in production with a lesser figure being 12 missiles per year, India could have at least 100 missiles at the lower end and at 18 missiles a year it could be as high as 160.

Agni III:- First tested in 2006, this missile failed. Further successful tests were conducted and as of 2011 this 4500 kms range missile has been inducted into the SFC. Till the Agni V becomes operational and in numbers, this missile will form the deterrent backbone of Indian nuclear posture against China. I am going to be conservative estimate of a production rate of 8-10 missiles a year. By 2015, we could have 40-50 Agni III and by 2020, we could have 80-100 missiles.

Agni !V:- Known as Agni Prime or Agni IIA earlier, this missile bridges the gap between Agni II and III. This 3500 km range missile was first tested in 2011. It comprises of advances made on the earlier generation of missiles and will probably replace the Agni II once it becomes operational. This missile will undergo trials over the next 2 years and induction could start in 2014-15 timeframe. As with Agni II, BDL could have a production rate of about 18 missiles a year and by 2020, we could have at least 75 missiles operational.

Agni V:- Recently test fired Agni V gives India intercontinental range and will form the credible deterrent that India is looking for against China in the future. This “over 5000”km range missile which I believe is actually an 8000 km range missile covers all of China including Beijing and Shanghai. This missile will feature MIRV for the first time in Indian missile program. Reports say that the warhead India has been able to miniaturize now weighs 400 kgs with a yieled of 250KT. The missile could be used in different configurations too with lower yield warheads weighing less and incorporating more warheads on this missile which has a total payload capacity of about 1.5.
Tons. The Agni V is will be tested at least 3 more times over the next two years and get inducted and go to the production line. I expect a production figure of 4-5 missiles per year. By 2020, we could have at least 20 of these missiles with at least 3 MIRVs which means there will be at least 60 warheads set aside for this missile.

We also have heard over the years of even more longer range missiles popularly touted as Surya with a range of about 12,000kms. But I will not get into that at the moment.

We will see submarine launched ballistic missiles being tested. the K15 a 700 kms range single payload missile and the K4 based on the Agni III which could be MIRVd with 3-5 warheads. this missile again could be tested in the near future with probable induction in the 2015 timeframe which will coincide with the full operationalization of the Arihant nuclear submarine. Each Arihant class submarine will carry 4 of these missiles. This will mean that once the entire induction process of the Arihant class is over by 2020, we could have 16 such missiles with 3-5 MIRVs each giving a total warhead count of 48-80. It is said that the next boat in this class could be bigger and maybe carry six launch tubes which will further increase the number of missiles and warheads India will possess under the sea forming a potent second strike capability.

To sum it all up, based on the induction rate of missiles over the next few years leading up to 2015 and 2020, I summarise below,

	2010	2015	2020
Agni I:-	100	225	300
Agni II:-	100	160-235	may be replaced with Agni IV
Agni III:		40-50	80-100
Agni IV			75
Agni V			20 with 3-5 MIRV
K4			16 with 3-5 MIRV
K15			50

Probable total nuclear arsenal by 2015 just based on the number of missiles could be a very high figure of about 400 warheads. This not considering Prithvi to be mated with nuclear warheads.

Some of these missiles will be routinely tested and their numbers will come down. Also considering that at least 30% of the missiles be taken out by an enemy first strike, i would say that by 2015 we could have a nuclear arsenal with as high as 300 warheads and by 2020 it could be as high as 500-600 considering the the number of missiles under development and production. This number may look on a very higher side, but considering the rapidly growing pakistani arsenal and the Chinese missile force, India may get aggressive in its nuclear posture including setting aside its current stated position of no first use.

The production capacity for both fission and fusion warheads is there as formulated earlier. There is already substantial plutonium reserves and the HEU production is being expanded rapidly. India may not reserve any thermonuclear weapons for Pakistan and use only fission devices. All the thermonuclear warheads will be set aside for China on MIRVd Agni V and K15.That would mean that by 2020, we could have as many as 200 thermonuclear weapons.

Reference. ISIS for data on nuclear enrichment and progress of Indian plutonium production.
Most material is open source.