CHAPTER-I

INTRODUCTION

In 1947 when India emerged as a free country to take its rightful place in the comity of nations, the nuclear age had already dawned. Our leaders then took the crucial decision to opt for self-reliance, and freedom of thought and action. This has required the building up of national strength through our own resources, our skills and creativity and the dedication of the people. Among the other earliest initiatives taken by our first prime-minister Pt. Jawahar Lal Nehru, was the development of science and inculcation of the scientific spirit. It is this initiative that laid the foundation for the achievement of 11th and 13th May (Second Nuclear Explosion) made possible by exemplary cooperation among the scientists from department of Atomic Energy and Defence Research and Development Organisation.

The Indian nuclear program began even before India achieved its independence, largely through the effort of Homi Bhabha. It is probable that Bhabha had worked out the ‘guidelines for India’ nuclear policies prior to the country’s independence.¹ He had created a group of Indian nuclear scientists, invoked private funding from the Tata Institute of Fundamental Research (Bombay) and commenced work in the then relatively new field of high energy physics in 1944.²

Bhabha and other Indian scientists persuaded Jawaharlal Nehru that Nuclear Energy was an area where India has a comparative advantage. It had both the nuclear scientists and vast deposits of thorium, a potential source of fissile material. India could even become an exporter of nuclear raw materials (there was a global search at that time for valuable uranium deposits). This fit in well with Nehru’s interest in science & energy and security autarky, and his belief that the scientific community could speed up India’s development by decades. The Atom, in its peaceful guise, would enable India to go from dung power to nuclear power in a single step.

At Bhabha’s insistence an Atomic Energy Commission was set up in India in 1948 – within eight months of the country’s independence. Steady (but modest) funding for the program began only in 1954 with the creation of a Department of Atomic Energy. Within the two years Bhabha had led a team of untired Indian scientists to carry out the first sustained chain reaction of an atomic pile in Asia (outside of the USSR). Code-named APSARA (Celestial Nymph) the one megawatt nuclear research reactor was constructed without foreign help (the enriched uranium fuel elements were purchased from Britain). A second research reactor (CIRUS) was provided by Canada and went critical in 1960. This reactor would figure in the 1974 nuclear test that led to the suspension of Canadian nuclear co-operation.

In the 50’s nuclear weapons testing took place above ground and the characteristic mushroom cloud became the visible symbol of nuclear age. India then took the lead in calling for an end to all nuclear weapon testing as the first step for ending the nuclear arms race.

The Government of India’s attitude to whether India should have a nuclear bomb or not, and its overall approach to nuclear weapon proliferation had been

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3 Ibid.
4 William H. Overholt, N-1, op. cit., p. 164.
5 Ibid., p. 164-165.
6 Stephen P. Cohen, N-2, op. cit., p. 158.
dominated by the views of India’s first Prime Minister Jawaharlal Nehru. As early as in 1946 he said a public meeting in Bombay that the bomb was to him a ‘symbol of evil’.\(^7\) Nehru was not only deeply committed to the complete elimination of all nuclear weapons but also opposed to their manufacture and possession by any state, including India.\(^8\) He was opposed to nuclear weapons on moral, political and strategic grounds, and demanded that their possession be declared a ‘crime against humanity’.\(^9\) He integrated this opposition into India’s foreign policy, giving it an activist edge. He was the first world leader to call in 1954 for an end to all nuclear testing following US Hydrogen bomb tests in the pacific and their disastrous radioactive fallout.\(^10\)

Along with being Prime Minister and Foreign Minister, Nehru assumed charge of the Department of Atomic Energy which was created as a separate department in 1954. He held all the three portfolios till the death in 1964. During all three years, from the available platforms both national and international, he carried on his crusade against nuclear weapons and also made it clear that India herself had nothing to do with nuclear weapons and that atomic energy would be developed for peaceful purposes.\(^11\) Making Government of India’s position clear on the issue, he categorically stated on 20 January 1957, while inaugurating India’s nuclear reactor, APSARA, at Trombay:

“No man can prophesy for the future. But I should like to say on behalf of my government – and I think I can say with some assurance on behalf of any future Government of India – whatever might happen, whatever the circumstances, we shall never use the atomic energy for evil purposes. There is no condition attached to this

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assurance, because once a condition is attached, the value of such an assurance does not go very far.”

Speaking in the Lok Sabha on 24 July 1957 during discussions on the Department of Atomic Energy he said, “we have declared quite clearly that we are not interested in making atom bombs, even if we have the capacity to do so, and that in no event will we use atomic energy for destructive purposes. I am quite sure that when I say this, I represent every member of this house. I hope that will be the policy of all future governments.”

Although Nehru was against the use of nuclear weapons. But nation’s security was his priority. If disarmament efforts were failed then he was ready to acquire these weapons. This explanation of the seeming dichotomy in Nehru’s approach to nuclear weapons is supported by an eminent biographer of Nehru, Dr. S. Gopal and mentioned by Chengappa. According to the latter, when Bhabha was keen on signing the proposal to set up a regulatory body for fissile material, Nehru noted, on file, “This is a political decision not to be taken by nuclear scientists.”

Chengappa quotes Dr. Gopal as saying: It is not generally known that Nehru wrote to Bhabha that he was against outlawing of atomic weapons. His policy was never to use it but to have it because we can’t completely abjure from it. Whereas Bhabha wanted to outlaw it completely in line with Nehru’s public speeches. Nehru said: ‘No! No! Don’t go that far’.

After China and the Soviet Union broke off relations in 1959 on the issue of insistence by China of transfer of nuclear weapon technology to it, the Chinese decided to go it alone and launched their nuclear weapon development programme. And as the Chinese moved ahead with their nuclear weapon programme and hard evidence was taking the place of rumours and guess-work, the uneasiness in India started surfacing in

12 Ministry of Information and Broadcasting, Publications Division, Jawaharlal Nehru’s Speeches (1953-57) (Delhi, 1958), p. 507.


15 Ibid.
early 1959, when China officially claimed about 50000 square miles of Indian territory.\textsuperscript{16}

On 25 March 1963, while debating grants of the department of atomic energy, a strong suggestion was made that government’s “no-bomb” policy should be reviewed and the issue at least be kept open. Nehru argued that it was entirely wrong to assume that by producing a bomb India’s defence would be strengthened or that China by conducting a test would become militarily stronger.\textsuperscript{17}

In the Lok Sabha Nehru said, “On the one hand we are asking the Nuclear powers to give up their tests. How can we, without showing the utter insincerity of what we have always said, go in for doing the very thing which we have repeatedly asked the other powers not to do.”\textsuperscript{18}

China became a member of the nuclear club in October 1964. This marked a milestone in International affairs. China’s growing nuclear capability in the context of its strained relation with India in the wake of the events of 1962 sparked a heated debate on India’s nuclear policy in both parliament and press. In September 1965 eighty-six Members of Parliament belonging to all political parties wrote to the then Prime-Minister, Lal Bahadur Shastri, that India too should decide to manufacture nuclear weapons. Shastri speaking in Lok Sabha explained India’s position on the manufacture of Nuclear weapons as follows:

“Despite the continued threat of aggression from China which has developed nuclear weapons, Government of India has continued to adhere to the decision not to go in for nuclear weapons but to work for their elimination.”\textsuperscript{19}

\textsuperscript{16} Kapur, K.D., no. 11, p. 293.

\textsuperscript{17} Ibid., p. 294.

\textsuperscript{18} Mirchandani, G.G., No. - 7, p. 23.

When China was preparing to acquire and detonate nuclear weapons, America was ready to provide nuclear technology to India to check China in Asia. But Pt. J.L. Nehru rejected that idea.

A top secret US government document of 1961, declassified in 1995, contain valuable material on the American assessment of Nehru’s commitment to opposing nuclear weapons even in the face of Chinese preparations to acquire and detonate such weapons, preparations and plans for which were detected by western intelligence agencies.²⁰ The state department document deals with anticipatory action pending Chinese Communist demonstration of a nuclear capability and considers providing active assistance in nuclear weapons technology to India as a counterweight to a nuclear China. But Nehru would reject the idea.²¹

Before China exploded the atomic bomb in 1964, India was one of the most active and vocal members of the non-nuclear states which had advocated the non-proliferation of nuclear weapons. In 1965 however, it started linking the renunciation of nuclear weapons by non-nuclear states with the similar renunciation by nuclear powers further production of these weapons with an agreement for the reduction of existing stockpiles.²²

The Chinese atomic bomb affected India’s nuclear policy. Although Lal Bahadur Shastri was opposed nuclear weapons, yet he unlike Nehru, could not, and did not seek to bind future generations to his views.²³ He told the Lok Sabha on 24 November 1964 that the Government’s policy was not static or rigid and that it would change according to the circumstances.²⁴

²⁰ Bidwai, Praful and Vanaik, Achin, No. 8, p. 64.
²¹ Ibid.
²⁴ Ibid.
After the joining of China in Nuclear weapons states India sought nuclear guarantees from the recognised nuclear weapon states.\textsuperscript{25} In parliament, Sardar Swaran Singh, the then foreign minister, said, “It is a matter of grave concern for the world and also it is a matter of importance that the principal nuclear powers... should find some answer to the situation that has been developed by new countries coming into possession of nuclear devices. Therefore, the non-nuclear world should have the assurance, should have the satisfaction, and should have the sense of security and safety... we are not asking for any nuclear shield from any particular country...”\textsuperscript{26}

India asked for a guarantee of security from super power, but he rejected the proposal of nuclear shield. However, in view of the fragility of the security guarantees provided by the U.N. security system, a victim of veto, after M.C. Chagla took over foreign affairs, India sought joint guarantees from both the US and the USSR against a nuclear attack.\textsuperscript{27} A mere statement by president Johnson that the USA would support a country treatment by China’s use of nuclear weapons was considered enough.\textsuperscript{28} India’s diplomatic efforts to persuade the USA and the USSR to give some credible guarantees were without result. Both the countries refused to commit themselves categorically. Commenting on India’s failure to wrist any such guarantees, the Prime Minister told the Lok Sabha that instead of universal declarations, what one expected was “guarantees given by the nuclear powers or at least as many of them as would find it possible to do so and belonging to different camps.”\textsuperscript{29} The Prime Minister Lal Bahadur Shastri also did not favour the security

\textsuperscript{27} Kapur, K.D., no. 11, p. 294.
\textsuperscript{29} Lok Sabha Debates, Vol. 7 (Fourth Series), 17 July 1967, Cal. 12422.
shield as “any such shield in the field of security would depend not on the spirit in which the protected power accepts such a shield but on the national and vital interest of the giver.”

Any shield given to India, thus, would primarily secure the interest of the provider rather that of India’s. It also meant compromising with India’s long pursued policy of non-alignment.

Although India did not get success in her efforts of nuclear disarmament to acquire the guarantee of her security from Nuclear China, Lal Bahadur Shastri was against to produce the nuclear weapons. Soon after the Chinese test, Dr. Homi Bhabha, supposedly an advocate for the bomb, said that Indian scientists could if they wanted produce a nuclear bomb in 18 months of government’s sanction. But Indian government rejected this idea.

It is clear that both Nehru and Shastri remained committed to the importance of disarmament. But Lal Bahadur Shastri, unlike Nehru, could not, and did not seek to, bind future generations to his views. He told the Lok Sabha on 24 November 1964 that the government’s policy was not static or rigid and that it would change according to the circumstances.

In enunciating her policy Indira Gandhi brought in the security issue as early as 1967. She maintained that the country’s defence and security would be the paramount consideration in the formulation of the government’s nuclear policy, which was “under

30 Ibid.
32 Atish Sinha and Madhup Mehta (ed.), No. 25, p. 988.
constant review”. She later reinforced this statement by asserting that we would “keep the option open”. The Indira Gandhi decided in favour of strengthening India’s nuclear option by allowing the Atomic establishment (Atomic Energy Commission) to prepare for an underground nuclear test. In April 1968 Prime-minister Indira Gandhi said in Parliament that India’s nuclear policy is framed after due consideration of the national interest, specifically with regard of national security. Indian policy pronouncements in the Indira Gandhi period underwent a subtle shift best described as one from a categorical opposition to nuclear weapons, to a ‘No Bomb Now’ orientation.

India denied to sign the NPT (Nuclear Non-proliferation Treaty) which was approved by UN General Assembly on April 24, 1968, arguing that this treaty could not truly prevents the proliferation of nuclear weapons and it had biased nature. It allowed some states to possess the nuclear weapons and debarred other countries to acquire these weapons.

The major reasons for India’s non-signature were China’s decision not to sign the NPT and India’s new reluctance to commit itself to complete or permanent future abstinence. Subsequently, however, India’s refusal to sign the NPT was invariably and repeatedly stated in terms of ‘Principled’ opposition to the ‘discriminatory’ character of the NPT, i.e., the very fact of it enshrining differential obligations for the nuclear weapons states and the non-nuclear weapons states. The NPT became an exemplar not just of an unequal global nuclear order, but of unequal distribution of power in the world.

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36 Bimal Prasad (ed.), No. 23, p. 403.

37 Bidwai, Praful and Vanaik Achin, No. 8, p. 68.

38 Ibid.

39 Bidwai, Praful & Vanaik Achin, No. 8, p. 68.
During the NPT discussions, the effort was, given the cultural aversion to nuclear weapons and the other external factors, not to turn to weaponisation at the first challenge, but to try and ensure through her nuclear diplomacy, international action to help India cope with the situation. In the event of the failure of this effort, which it spectacularly did, India’s indigenous technology was to continue to be developed, but now also in her security interests.\footnote{Atish Sinha and Madhup Mahta (ed.), No. 25, p. 999.}

Thus India’s policy towards nuclear proliferation was changed. The Indian approach under Indira Gandhi sought only to redefine the concept of nuclear proliferation. It demanded control on the race for nuclear arms among the five nuclear-weapons powers (vertical proliferation) and on the spread of nuclear weapons (horizontal proliferation) simultaneously.\footnote{Bimal Prasad (ed.), No. 23, p. 107.}

India has been critical of IAEA safeguards as an instrument of NPT safeguard system. India’s ambassador to UN, speaking before the first committee of the General Assembly contended that the safeguards should be placed on nuclear weapon production and not on the peaceful use of facilities. These safeguards were actually needed in countries which had nuclear weapons. Their application exclusively on the nuclear activities of the non-nuclear weapon states “would hinder technological development and increase the gap between advanced and developing countries.”\footnote{USA CDA Documents on Disarmament 1964, Washington DC: US Govt. Printing Office, 1965, pp. 339-40.} One of the arguments put forward by the Indian representative to the first committee of the UN General Assembly stressed that the NPT further institutionalised discrimination by imposing safeguards on non-nuclear weapon states but not on nuclear weapon states and by prohibiting the autonomous use of nuclear explosions for peaceful purposes by the former and not the latter. The effect of this would be to perpetuate and increase the
technical dependence of developing countries on the nuclear weapon states.\textsuperscript{43} India was, thus, in principle opposed to the international control of the non-proliferation regime on the indigenous nuclear programmes that did not apply to others. So, India rejected the proposal of NPT and denied to sign it.

Our decision not to sign the NPT was in keeping with the basic objective of maintaining freedom of thought and action. In 1974, we demonstrated our nuclear capability with PNE (Peaceful Nuclear Explosion) in Pokhran (Rajasthan). This explosion was a major development in nuclear policy. By this PNE India demonstrated her nuclear weapons capability. But Indian government declared that this explosion was for peaceful purposes not for the weapons.

Soon after the explosion USA, Pakistan and China and many other countries condemned the test. A group of countries called the London Club was set up to regulate the flow of technology and material to all non-nuclear countries, but particularly India, which was also monitored by the Sanger Committee.\textsuperscript{44} The London Club eventually evolved into the Nuclear Supplier Group (NSG). India introduced a new element, and began an unremitting campaign against adhoc export control groups which arbitrarily decided on access of developing countries to civilian technologies. India insisted on the difference between weapons technology and that developed for peaceful purposes.

Mrs. Gandhi’s nuclear policy after 1974, i.e. keeping the nuclear option open and also not conducting any nuclear weapon tests, has really perplexed the analysts, as the 1974 PNE hardly achieved anything for India’s national interest, rather it had all the negative effects. The Government of India, however, stuck to its policy, that it is committed to the use of nuclear energy for peaceful purposes, thus disappointing the high hopes of those who thought that India now would go nuclear. It decided to retain

\textsuperscript{43} Ibid., 1968, pp. 325-36.

\textsuperscript{44} Atish Sinha & Madhup Mahta (ed.), No. 25, p. 1001.
the status, that it could make a bomb, but would not do so and now is being “treated as a nuclear power with no nuclear teeth.” 45 India became a nuclear threshold state.

Though Pakistan had already embarked on its nuclear weapon programme. India’s 1974 PNE did provide an alibi to Islamabad to intensity its nuclear weapon programme. Though India described it as a peaceful nuclear explosion, to the rest of the world it was nothing but a nuclear weapon explosion.

The Janata government under Morarji Desai’s Primeministership declared its commitment to the Nehruvian policy of never making a nuclear bomb. 46 Morarji Desai, an ardent opponent of the nuclear option, considered the Pokharan explosion a mistake and also decided not to conduct any more nuclear explosion. 47 However, Morarji Desai had to modify Nehru’s nuclear policy since a number of developments had taken place since his death which included, relatively sophisticated level of India’s nuclear technology and the momentum it had acquired, the autonomy of India’s nuclear programme; India’s nuclear option; its non-signing of the NPT, and the Pokharan explosion with its adverse international reaction. 48 Consequently, what emerged was a policy based on five negatives: India would not manufacture nuclear weapons; would not carry out any more nuclear explosions unless absolutely necessary; would not sign the NPT unless there was convincing progress towards nuclear disarmament; would not open its nuclear facilities to international inspection except on a reciprocal basis and would not submit to international pressure in respect of its nuclear policy which would hurt the country’s national interest. 49

46 Kapur, K.D., No. 11, p. 318.
47 Ibid.
49 Ibid.
India’s nuclear policy now had to be tailored to meet the new government’s foreign policy towards its neighbours which emphasized regional cooperation in South Asia. And since Pakistan was agitated by Pokharan and had committed itself towards mobilising resources to match India’s nuclear capability, India decided to soft play its nuclear policy, and hence the new pasture. It even reversed Mrs. Gandhi’s stand and did not vote against Pakistan’s proposal to make South Asia nuclear weapons free zone at the UN General Assembly in 1977 and 1978.  

As Morarji’s policy, particularly his displeasure with the Pokharan and his decision regarding renunciation of further nuclear explosive experiments for peaceful purposes disappointed. Those who had expected a realistic response from the Indian government in view of the emerging Pakistan nuclear threat. Thus, on the one hand, he was positively hostile to PNEs, but at the same time “accepted the broad parameters of the Indian pasture of refusing to foreclose the nuclear weapon option.” Morarji’s nuclear policy, however, became a target of revere criticism and one analyst went to the extent of terming it as a ‘Nuclear Munich’.  

The External Affairs Minister, Atal Behari Vajpayee who led the Indian delegation to the “North-South Dialogue” in Paris in June 1977 told French Prime-Minister Raymond Barre that the Indian government had unilaterally decided not to manufacture atomic weapons. The development of nuclear energy was only for peaceful purposes. Earlier, on 30 September 1977, he told the council on foreign relations in New York: “It is our solemn resolve that whatever the rest of the world may

50 K.D. Kapur, No. 11, p. 319.
54 The Statesman (New Delhi), June 3, 1977.
do; we well never use atomic energy for military purposes.”55 Thus Indian Government under the Prime-Ministership of Morarji Desai opposed the Nuclear weapons & explosions. But he did also oppose the NPT & refused to sign it.

The interim government of Charan Singh abandoned the flexibility of Desai’s government. The revelation of Pakistan’s nuclear weapon programme – its efforts to build uranuin enrichment and reprocessing facilities and the fast progress towards acquisition of nuclear explosive capability was perceived as a serious threat to India. The Indian government’s attitude now seemed to be becoming more ‘hawkish’. The emerging Pakistan nuclear threat made Indian government adopt a more active defence in support of its nuclear option. C. Subramanian, the Defence minister in Charan Singh government, hinted at the prospects that India might be compelled to go nuclear before long and identified Pakistan as the most likely stimulant in India’s defence strategy in the next decade. He said this is an address to the National Defence College, New Delhi in October 1979.56

Mrs. Indira Gandhi, after she returned to power in 1980 continued with the policy of nuclear ambiguity. However, Mrs. Gandhi stuck to the earlier position, but it was also made clear that a change or even a resumption of nuclear tests could be undertaken if India’s national security demanded.57

Mrs. Gandhi’s nuclear policy, thus, had three fundamental components: (1) A dual character of the nuclear programme developing simultaneously civilian and military capabilities; (2) keeping the weapon option open and sustaining it at progressively higher levels; and (3) deliberately sending conflicting signals on whether and how India would go nuclear.58

56 Bhabani Sen Gupta, No. 45, p. 15.
57 Kapur, K.D., No.11, p. 320.
During Rajiv Gandhi’s period the same policy continued the policy of nuclear ambivalence, criticism of the non-proliferation regime on almost the same lines. However, the nuclear warnings became more frequent and amongst the positive steps. India under Rajiv Gandhi suggested a time bound action plan to rid the world of nuclear weapons by the first decade of the 21st century.

In 1988 the nuclear weapons states gave a cool response to Rajiv Gandhi’s “Action Plan” for phased global and regional nuclear disarmament. This scheme represented a change in Indian policy, as it proposed disarmament steps at the regional as well as the global level; earlier Indian position insisted on global disarmament before regional issues could be tackled.59

Amid increasing evidence of nuclear activity in Pakistan, Rajiv authorized the Defense Research and Development Organisation (DRDO) to restart the nuclear program in cooperation with the Indian Atomic Energy Commission (AEC).60 This step led to a third major national debate on nuclear policy. This time the debate was propelled by the west’s demand that India and Pakistan sign the Comprehensive Test Ban Treaty (CTBT).

In 1993, India and the US co-sponsored a resolution in the UN calling for the early completion of the CTBT in the Conference on Disarmament. As the negotiations for a CTBT, which India had pioneered, entered their final phase, New Delhi began to stall.61 Since India had been the first-ever state to propose a comprehensive test ban, the shifting Indian position was not taken very seriously by the new Clinton administration. Its highest priority was non-proliferation, and people saw India as a traditional supporter of a test ban. Yet not without reason, many Indians saw the CTBT, as it eventually evolved, as part of a strategy that would permanently for close India’s

61 Vanaik & Bidwai, No. 8, p. 70.
nuclear option. This belief was reinforced by the repeated statements of senior American officials that Washington’s goal was to cap, reduce and then eliminate India’s nuclear weapons capabilities and the capabilities of other states that were not nuclear weapons signatories of the NPT.\textsuperscript{62}

On 20 June 1996, New Delhi formally announced that it would not sign the CTBT. Soon thereafter, Arundhati Ghose, India’s ambassador at the Conference of Disarmament (CD) announced that New Delhi would not sign the CTBT ‘not now, not ever’.\textsuperscript{63} India blocked the CTBT’s passage at the CD, but in an unprecedented (and legally questionable) move, the text was taken to the UN General Assembly and signed. Hawks, both within and outside the government, raised the level of rhetoric in favour of India crossing the threshold, as if in retaliation to this manoeuvre. The BJP and right-wing commentators in the media seized on the anti-CTBT rhetoric, to which there was little organized resistance from the political left and centre.\textsuperscript{64} The debate within India over the CTBT was framed by the Indian pro-bomb lobby in such a way that opposing the CTBT was taken to be a blow for Indian autonomy and a blow against American hegemonism.\textsuperscript{65}

During the Indian nuclear debate, positions against the west hardened and led to new alliances and partnerships in the Indian strategic community. Anti-American groups joined with anti-nuclear groups in opposing the CTBT.

BJP came into power briefly in May 1996 and then again in 1998 was critical to the final decision to test and declare India to be a nuclear weapons state. In 1997 BJP started asking for overt nuclearization. Its manifesto for the February 1998 national

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\item \textsuperscript{62} Stephen, P. Cohen, No. 2, p. 173.
\item \textsuperscript{63} Vanaik & Bidwai, No. 8, p. 71.
\item \textsuperscript{64} Ibid ., p. 71-72.
\item \textsuperscript{65} Stephen P. Cohen, No.2 p. 174.
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parliament elections said the party, if voted to power, would re-evaluate the country’s nuclear policy and exercise the option to induct nuclear weapons.\textsuperscript{66}

On 11 and 13 May 1998 India conducted five nuclear explosions near Pokhran. United States President Bill Clinton says that he intends to ‘implement fully’ sanctions against India. The United Nations Security Council strongly deplores the Indian nuclear tests and appeals to India to sign the NPT and the CTBT without delay and without conditions.\textsuperscript{67}

India and USA had the differences on nuclear issue. In the field of nuclear energy USA did cooperate with India. But on the Nuclear Weapons USA and India both disagree with each other opinion. India wanted complete nuclear free world. But USA and other nuclear weapons nations were against the nuclear program of non-nuclear weapon states and hold monopoly of theirs on nuclear weapons.

The United States, in 1956, decided to sell 21 tonnes of heavy water to India to assist in its peaceful nuclear energy programme.\textsuperscript{68} And, in July 1959, India and USA Atomic Energy Commission sign a contract for the lease of 15 tonnes of heavy water for use in the Indian atomic energy research programme.\textsuperscript{69}

The United States had entered into an agreement of cooperation with India in 1963 to supply enriched uranium up to 1994 to the Tarap\textsuperscript{ur} Atomic Power station.\textsuperscript{70} In the understanding that the plant would have uninterrupted supply of nuclear fuel from the United States, the nuclear reactor was planned and the contract for its construction was given to the united states. A contract incorporating the agreement was signed in

\textsuperscript{66} Bidwai and Vanaik, No. 8, p. 72.


\textsuperscript{69} \textit{Ibid.}, p. 163.

\textsuperscript{70} Bimal Prasad, No. 23, p. 390
1966. The contract bound Indian not to obtain supplies of nuclear fuel from any other source.\textsuperscript{71} This agreement (1963) came under severe constraints after the Pokharan test (1974). Specifically the provisions of low enriched uranium fuel from the United States contracted there under become a matter of high controversy affecting the total fabric of India–U.S. relations.\textsuperscript{72}

The American case for initially refusing and thereafter, eking out supplies of low enriched uranium, on a consignment to consignment basis after the Pokharan test, was premised on general nonproliferation concerns, and its newly passed nuclear Non-Proliferation Act, 1978.

India perceived this enactment as a municipal legislation which could not in equity act retrospectively to render the Indo-US agreement on Tarapur nugatory, which had the status of an international treaty.\textsuperscript{73} India also felt that if the agreement had become inoperative, the issue of utilising the accumulated reactor plutonium needed resolution. Consequently, in terms of the agreement, if the United States would not tape it back, India gained the right to reprocess and use this plutonium for its own atomic energy programmes. A sterile dispute on transportation costs ensued thereafter which remains unresolved.

According to, a top secret US government document of 1961, declassified in 1995, USA offered India providing active assistance in nuclear weapons technology as a counterweight to a nuclear China. But Nehru rejected the idea.\textsuperscript{74}

On Nuclear Non-Proliferation Treaty (NPT) (1968) both nations are against each other. India expressed its opposition to the treaty on the ground that the treaty would deprive the non-nuclear countries of the benefits of the development of peaceful nuclear

\textsuperscript{71} Ibid.

\textsuperscript{72} P.R. Chari, Indo-Pak nuclear standoff – The role of the United States, New Delhi: Manohar, 1995, p. 57.

\textsuperscript{73} Ibid.

\textsuperscript{74} Praful Bidwai and Achin Vanaik, No. 8, p. 64.
technology. The opposition of India to the NPT was in the main an account of the fact that it neither assured equality to all nations, Big or Small, nuclear weapons or non-nuclear weapons state, nor conceded equal rights to all countries to tame the atom. On the other hand, USA sought to keep the existing international power structure intact and pressured on India to sign the treaty.

The sharp differences had arisen between India & USA over India’s implosion of a nuclear device. Despite all its diplomatic manoeuvring to convince the America of the peaceful nature of the explosion, America simply refused to accept it and considered it a nuclear weapon test. The United States news media, the writers and political parties regarded it as a “moral and political sins”, “national hypocrisy” and “callous endangerment of humanity.”

The United States Defence Secretary, Schlesinger threatened to withdraw his country’s commitment to protect India with nuclear weapons if India enters into the nuclear era. The United States senate decided by a voice vote to prohibit military aid or U.S. grant or sales of equipment to India except for military training purposes. The officials of the United States atomic energy commission also suspended on September 7, 1974 the delivery of enriched uranium fuel to India united New Delhi pledged not to use the atomic fuel in any nuclear explosion.

USA wanted to bring India’s nuclear program under International Atomic Energy Commission and pressured on India put their signature on NPT. But India always criticized NPT due to its biased nature.

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75 K.D. Kapur, No.11, p. 316.
79 Rahamathulla B., No.76, p. 73.
The other bone of contention is the Comprehensive Test Ban Treaty (CTBT), where both countries have opposite views. In fact, the nuclear weapon states, especially the United States, have pushed for the CTBT essentially as a non-proliferation measure, and even this is restricted to horizontal proliferation only rather than non-proliferation “in all aspects” as the negotiating mandate had required.80

India opposed CTBT on the ground that it was merely an extension of discriminatory NPT system. Through this treaty America and other nuclear weapon states were trying to perpetuate their monopolistic hold on nuclear weapons and their delivery system. India asserted that it would sign the treaty only after the nuclear five agreed on a timetable for total removal of nuclear weapons.

Without abandoning its belief in the propriety of total nuclear disarmament, India bucked U.S. pressure and world opinion in May 1998 to transform its status to a nuclear weapon state.81 The economic sanction imposed by the United States in response to India’s nuclear test appeared to seriously damage Indo-US relations. President Bill Clinton imposed wide-ranging sanctions pursuant to the 1994 nuclear proliferation prevention act. The United States encouraged India to sign the CTBT immediately and without any condition. The USA under G.W. Bush has lifted most of its sanctions on India and resumed military cooperation.

Now India and USA are coming together on nuclear issue through nuclear deal. Although it is a limited cooperation, only in civilian filed yet it will engage India with nuclear power nations.

**India’s Nuclear Programme**

India was the first amongst the developing countries to have started its nuclear power programme. Its nuclear activities date back from the establishment of

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the Tata Institute of Fundamental Research in 1945 and the Formation of the Indian Atomic Energy Commission in 1948 under the chairmanship of Dr. Homi J. Bhabha.\textsuperscript{82} India’s nuclear programme right from its inception was geared to achieve self-reliance in the long run.\textsuperscript{83}

The establishment of Bhabha Atomic Research Centre (BARC) in 1954 was the most momentous decision taken by the Government of India. The then Indian nuclear scientists had understood the significance of a nuclear research centre in a developing country which was meant to feed the country’s nuclear programme with skilled manpower and basic infrastructure for the development of research and development and also serve as a vehicle for the transfer of technology both from external sources of the country and within the country.\textsuperscript{84}

In addition to BARC (Bhabha Atomic Research Center) at Trombay, Bombay, the other nuclear research centers are: Indira Gandhi centre for Atomic Research, Kalpakkam, TamilNadu and Center for Advanced Technology Indore, Mahdya Pradesh. The map of Atomic Energy establishments in India.\textsuperscript{85}

\begin{flushright}
\textsuperscript{82} K.D. Kapur, p. 223.
\textsuperscript{85} http://www.dae.gov.in/publ/indmap.htm
\end{flushright}
RESEARCH REACTORS

APSARA: 1 MW (t)

The reactor became critical on 4 August 1956 and was designed and built by Indian scientists and engineers. The reactor was indigenous except for the enriched uranium fuel rods which were acquired from the U.K. It was the first research reactor to have became operational in Asia and is a swimming pool type reactor using enriched uranium as fuel rods. Its basic functions fall into three categories research in nuclear physics, training of personnel in reactor operations and maintenance and production of isotopes.86

CIRUS: 40 MW (t)

It is a modified version of NRX type Canadian research reactor and was built under the Colombo plant. It is a natural uranium heavy water research reactor. The construction of CIRUS, introduced India to Canadian CANDU type technology. CIRUS was to be used to produce pure fissile material, plutonium and uranium 233; to produce radioisotopes and provide neutrons for fundamental research. The reactor was originally known as Canada-India Reactor (CIR), but subsequently came to known as CIRUS when the United States supplied heavy water for its commissioning in 1956. It was the first major atomic project in the field of international assistance and a first step in the direction of Indo-Canadian Cooperation in the nuclear energy. The reactor became critical on 10 July 1960.87

ZERLINA: 100 Watts

(Zero Energy Reactor for Lattice Investigations and New Assemblies)

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86 G.G. Mirchandani, No. 7, p. 45.
87 Ibid.
This reactor was completely designed and constructed by Indian scientists and engineers became critical on 14 January 1961. The fuel for this reactor is also fabricated at Trombay.  

PURNIMA-I: 10 Watts

(Plutonium Reactor for Neutron Investigations in Multiplying Assemblies)

It is a zero energy fast breeder reactor which attained criticality on 22 May 1972. It is no more functional and was replaced by Purnima II.  

DHRUVA: 100 MW (t) or R-5

Earlier known as R-5, construction of this reactor started as early as 1975. The reactor with ‘natural uranium and heavy water’ has been built indigenously. It is mainly intended for scientific and engineering research as well as large-scale production of radioisotopes.

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88 K.D. Kapur, No.11, p. 227.
89 Ibid.
PURNIMA-II

In May 1984, a zero energy fast critical facility using $^{233}U$ a fuel became operational. Purnima-II was dismantled in 1986-87. Purnima II was a full-scale zero power mock-up of the Kamini reactor. It was dismantled to make way for Purnima-III experiments which was commissioned in 1988.

PURNIMA-III

Purnima-III a zero energy version of Kamini, a 30 KW research reactor currently being commissioned at Indira Gandhi Centre for Atomic Research, Kalpakkam. Purnima III, which uses U-233 as fuel, attained criticality for the first time on 29 November 1990 at BARC. Purnima-III has a fissile fuel inventory of 590 g of $^{233}U$ in the form of uranium allay plates, moderated by light water and reflected by beryllium Exide. The uranium used in the reactor was produced from thorium fuel elements irradiated in research reactors at the Trombay Centre.

Kamini ($^{233}U$ 30 kwt)

India’s Kamini research reactor at the Indira Gandhi Centre for Atomic Research at Kalpakkam was successfully commissioned in Nov. 1990. The reactor uses $^{233}U$ as fuel and has a capacity of 30 KW. The fuel for the reactor will be provided partially from reprocessed and fabricated fuel from Purnima-II reactor.

Indira Gandhi Centre for Atomic Energy: Fast Breeder Research Reactors (Kalpakkam: 40 MW (th) / 15 MW (e))

Indira Gandhi Centre for Atomic Energy (IGCAE) was set up at Kalpakkam (Tamil Nadu) in 1971 to carry out research and development pertaining to fast reactor technology. A 40 MW (thermal), 15 MW (electrical), Fast Breeder Test Reactor

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91 Ibid., p. 116.


93 K.D. Kapur, No.11, p. 238.

(FBTR) was indigenously constructed at Kalpakkam. The reactor attained critically in October 1985. The reactor was indigenously developed mixed carbide fuel. It is a fast thorium breeder and mark a major way for the use of our vast thorium reserves.\textsuperscript{95}

**Centre for Advanced Technology, Indore**

It was set up in 1984 at Indore, Madhya Pradesh, to conduct research in high technology field such as fusion, laser and accelerators. Synchrotron Radiation sources being set up at the centre will be a major research facility in the country.\textsuperscript{96}

**Reprocessing**

It was the establishment of plutonium extraction facilities at Trombay and Tarapur which, in the early sixties, created consternation in the ‘Nuclear Haves Lobby’ that India was on its way to launch a nuclear weapon programme. Both highly enriched uranium and plutonium are bomb materials. The first one is difficult to acquire being the monopoly of a few countries. All other countries except China have followed a plutonium route to nuclear capability. India however, tried to allay the fears of the Nuclear Weapons States (NWS) arguing that its interest in the procuring of plutonium was to base the future power programme on its vast thorium reserves. It was pointed out that plutonium obtained from existing and future reactors would be used as fuel for the fast breeder reactors in the second state of the breeder technology as plutonium-239 produces more plutonium-239 at the same time converting U\textsubscript{238} into fissile U\textsubscript{233}. In the third stage plutonium is mixed with thorium to produce U\textsubscript{233}.\textsuperscript{97}

**Tarapur Reprocessing Plant**

In the agreement signed between India and the USA on 8 August 1963 on the Tarapur Power Station, it had been mutually agreed upon that the special fuel from the Tarapur power station would be reprocessed at a facility which India would create in due course of time. As per the agreement India was allowed to retain the title to any

\textsuperscript{95} K.D. Kapur, p. 229.

\textsuperscript{96} Ibid.

\textsuperscript{97} G.G. Mirchandani, No. -7 , p. 71.
enriched uranium brought from the US Commission. After the US nuclear Non-Proliferation Act 1978, the US stopped the supply of enriched uranium since India refused to sign the NPT as well as accept full scope safeguards. Now the enriched uranium is being supplied by France which has replaced the US as supplies of the fuel. Tarapur reprocessing plant was meant to reprocess spent fuel from both Tarapur and RAPP (Rajasthan Atomic Power Plant).  

**Nuclear Energy and Nuclear Weapons Technology** 

A chemical element consists of basic building blocks called atoms which themselves contain “sub-atomic” particles. These particles are of three types protons, neutrons and electrons. Protons (positively charged particles), together with neutrons (uncharged particles) make up an atom core or nucleus. Electrons (negatively charged particles) are identical in number to the protons, but are found outside of the nucleus of the atom. All chemical elements are defined and distinguished from each other by the number of protons/electrons their atoms contain termed their atomic number. Examples of atomic numbers are 1 for an atom of hydrogen and 93 for an atom of plutonium.

While all atoms of an element must have the same number of protons/electrons, they may contain differing number of neutrons. These variants are called isotopes of an element. They have different nuclear properties and masses/weights but their chemical properties are identical: thus they can only separate by making use of their differing masses, and not by chemical means.

Isotopes are normally identified by the sum of their protons and neutrons. Thus “Uranium 235”, often shortened to the notation “U\(^{235}\)” (or “U-235”) indicates the isotope of uranium that contains 235 (92+143) protons and neutrons in the nucleus of each atom. “Plutonium 239”, or “Pu-239” indicates the isotope of plutonium that contains 239 (93+146) protons and neutrons in the nucleus of each atom.

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98 G.G. Mirchandani, No.7, p. 75.

Nuclear Reactions

Fission

Nuclear fission is the splitting of the nucleus of an atom into two or more parts. This is a process which normally only occurs when heavy elements such as uranium and plutonium are bombarded by neutrons under favourable conditions. Not all isotopes of these elements fission under such circumstances, those that do called fissile materials. The most frequently used fissile materials are the isotopes uranium-235 (U-235) and plutonium-239 (PU-239).

These isotopes are not found in their pure form in nature. U\textsubscript{235} forms only 0.7% of natural uranium are which is mostly made up of nonfissile U-238. Plutonium does not exist at all in natural form and has to be manufactured from uranium. This is done by placing it inside a reactor, where some U-238 nuclei will capture slow moving neutrons to form fissile Pu-239.

When a fissile material is bombarded with neutrons, it splits into atoms of lighter elements. This process releases large quantities of energy and neutrons. If these neutrons hit and split additional “fissile” nuclei more neutrons are released to continue the reaction. If there is a sufficient concentration of atoms of fissile isotopes, known as a “critical mass”, this reaction will be self-sustaining. This is a “chain reaction”.

Fusion

Fusion takes place when two nuclei of light elements such as hydrogen fuse together to make a heavier one. While this process releases much larger quantities of energy than the fission process, it also requires large amounts of energy to initiate it. For fusion to occur the repellant forces that arise between the positively changed protons in the two nuclei have to be overcome and temperatures of over 100 million degrees centigrade are normally required for this to occur. The most frequently used materials to generate fusion reactions are tritium (H-3), deuterium (H-2) and the solid lithium-6 Deuteride, which when heated to the temperature of the fusion reaction, breaks down into tritium and deuterium.
Nuclear Reactors

Fission Reactors

These are several features common to all fission or (as they are more usually termed) nuclear reactors.

The first of these is that they contain a core or mass of fissile material (the fuel) which may weigh tens of tons, within which energy is produced by sustaining a regulated chain reaction. The fissile material used varies between reactor types, but it may be natural uranium (which contains 0.7 percent fissile U-235) or uranium which has been enriched to increase the percentage of U-235 to around 3 per cent. Alternatively, Plutonium 239 produced by the irradiation of U-238 in a reactor, or uranium 233 (U-233) produced from thorium 232 (Th-232) may be used, or a combination of these mixed with uranium (mixed oxide fuels or MOX). This fuel is usually in rod or pin form, and is clad in a gastight containment material such as stainless steel.

A second related feature is the presence of a means of regulating the chain reaction. This normally takes the form of control rods which absorb neutrons and which can be inserted into the core to reduce the rate of fission or to shut down the reactor.

The fissile core of a reactor is usually surrounded by a third common feature, a moderator. This material is chosen because it slows down some of the faster neutrons so that these can more easily hit nuclei and initiate fission and thus maintain the chain reaction. The moderator can be ordinary (or light) water, heavy water (deuterium oxide) or graphite.

A fourth common feature is a means of removing the heat produced by the chain reaction from the core of the reactor. This cooling system can also provide the heat and steam to drive turbines and thus generate electricity.

Finally, there is a containment vessel which serves to shield the radioactive core from other parts of the reactor system. Lining this vessel is a reflector which increases the efficiency of the fission process. In addition, a reactor will itself normally be
surrounded by a further thick containment structure, whose purpose is to contain any 
release of radioactivity and prevent it escaping into the surrounding environment.

Reactors have been built to serve four broad purposes. First a significant 
proportion of the reactors in the world are large units designed to produce steam to 
drive turbo-generators, and thus to generate electricity for civil uses. Second, there are 
smaller units of a similar type which are used on naval vessels, especially submarines, to 
generate electricity for propulsion purposes or to drive turbines. Third, these were 
many small materials testing the research reactors, which usually have no turbo-
generators attached and are used mainly for experimental purposes. Finally, these are 
large units used by the nuclear-weapon states to produce plutonium for military 
explosive purposes, some of which do not have turbo-generators attached to them.

**Light Water Reactors (LWRs)**

This is the most widespread power reactor type found in the world today. It uses 
low enriched (3%) uranium as fuel, which enhances its efficiency as an electricity 
generator by enabling the fuel to stay longer in the reactor. It also uses ordinary water 
as both a moderator and coolant. There are two variants of this reactor, Pressurized 
Water Reactors (PWRs) and Boiling Water Reactors (BWRs), the chief difference 
between them being in their method of producing steam to make electricity. Small 
LWRs are also used to power submarines and other naval vessels. LWRs are a costly 
and inefficient way of producing Pu-239.

**Heavy Water Reactors (HWRs)**

In this type of reactors, heavy water is used as both the moderator and coolant. Heavy water absorbs so few neutrons that it permits the use of natural uranium as fuel. This type of reactor, the majority of which are called CANDUs, uses up so much of the fissile U-235 in its natural uranium fuel that it is probably uneconomic to reprocess the recycle it and the preferred option is to store it and dispose of it as waste. It is also a 
good producer of plutonium, and this type of reactor has been used in the USA without 
any turbo-generators attached to produce materials for weapon purposes. To produce
Pu-239, rather than to minimize electricity generation costs, fuel re-loading takes place more frequently. Thus a distinction between civil and military use is the length of time the fuel remains in the reactor.

Nuclear Weapons

Fission Devices

A fission weapon or device is designed so that a critical mass of fissile material can be assembled and held together before the device blows itself apart. The yield of the weapon is determined by the amount of fissile material involved, the number of nuclei fissioned, and the number of generations of fissions that can be achieved before disassembly takes place.

A simple fission weapon design, also known as a first generation nuclear weapon, can be of either the “gun barrel” or “implosion” type. A gun device involves bringing together rapidly two sub-critical masses of highly enriched uranium by propelling one of them with an explosive along a thick tube or gun-barrel so that it impacts with considerable velocity upon the other. This creates conditions for a chain reaction. This method is conceptually simple but the explosive power of the weapon tends to quickly force the fissile material apart so that little of the material goes through the fission process. It is therefore relatively inefficient in its use of fissile material. This method cannot be used with plutonium.

An implosion weapon works by compressing a sub-critical spherical mass of fissile material until it becomes critical. The fissile material is surrounded by a neutron reflector, usually of beryllium, and a heavy metal tamper of either U-238 or tungsten. Surrounding this assembly is a further hollow sphere of conventional explosives. If the conventional explosive can be detonated so as to produce a uniform, symmetrical implosion, the tamper is propelled inwards into the sphere of fissile material and compresses it into criticality. The forces generated by the conventional explosives then contain the gaseous sphere of fissile materials while many repetitions of the fissile reaction occur and the full yield of the device is produced.

Boosted-Fission Devices
A fission device can be “boosted” to increase its yield by placing within its core a small quantity of fusion material, such as tritium. At the great temperatures and pressures found within the gaseous core of an exploding device, this material fuses and releases an extra quantity of neutrons which, in turn, produce additional fissions in the uranium or plutonium used in the device. More of the fissile material is thus consumed than in a simple fission device, the efficiency of the fission process is improved and a higher yield produced.

**Fusion (Thermonuclear) Devices**

The energy released by such a device, also known as a second-generation nuclear weapon, arises primarily from nuclear fusion in isotopes of hydrogen such as tritium and deuterium. A large energy source, such as a fission device, is needed to start a fusion reaction. A fusion weapon thus has at least two stages which contribute to the yield, the fission trigger or primary device and the thermonuclear secondary device. In addition, these two devices may be contained in a shell of U-238 which constitutes a third stage of device. This material, whilst it cannot maintain a self-sustaining fission explosion, can be made to fission where there is a constant external supply of fast neutrons from other fission or fusion reactions. There can be any number of fission-fusion-fission-fusion steps and so no limit in theory to the size and yield of a thermonuclear weapon.

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